Sustainability Planning Report

67-75 Lords Road, Leichhardt

67-75 Lords Road, Leichhardt, NSW, 2040

STUDY

PREPARED FOR
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SUSTAINABILITY PLANNING REPORT

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
17.07.2018	A	Preliminary	Northrop	I.VanEerden
28.08.2018	B	For Comment	Northrop	A.Girgis
25.09.2018	C	For Planning Proposal	Northrop	I.VanEerden

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1. EXECUTIVE SUMMARY

The project will be targeting the following sustainability objectives to enhance the environmental performance of the site:

- BASIX Certification – compliance with the requirements of the NSW SEPP BASIX 2004;
- SEPP 65 – Compliance with the requirements of *SEPP 65 – Design Quality of Residential Apartment Development* and the related *Apartment Design Guide.*
- Green Star – Targeting the inclusion of a 5 Star Design & As Built v1.2 rating from the Green Building Council of Australia.
- Additional sustainability initiatives to incorporate Australian Best Practice Sustainability principles within the project design, as listed in Section 1.

Through the projects commitment to achieving the above it exhibits Australian Excellence in sustainability, efficiently using resources, meeting planning requirements and protecting the sites biodiversity.

TABLE OF CONTENTS

2. INTRODUCTION

Northrop Consulting Engineers (Northrop) have been engaged by Platino Properties to undertake a sustainability assessment to accompany the Planning Proposal for the redevelopment of 67-75 Lords Road, Leichhardt NSW.

Northrop have reviewed the Urban Design Study prepared by Stewart Hollenstein & Matthew Pullinger Architects in preparation of the development of this report. Sustainability initiatives have been proposed for future consideration in developing the design of the precinct.

Eight key areas were explored to consider the potential social, economic and environmental impacts of the site:

- Energy Efficiency
- Occupant Comfort
- Water Management
- Sustainable Transport
- Waste Management
- Materials Selection
- Land Use and Ecology
- Community & Liveability

Additionally Platino Property are targeting an Australian Excellence 5 Star Green Star rating through the Green Building Council of Australia. These measures have been detailed in Section 10 of this report.

2.1 Site Description

The site is located on the western edge of Leichhardt, approximately 8km from Sydney's CBD, and bounded by Lords Road to the South, Lambert Park to the North and the Sydney Light Rail L1 line to the West.

Boarding the Western boundary of the site is a densely vegetated Light Rail embankment and the Hawthorne Canal which drains to Parramatta River. Platino Properties intends to repurpose the land to facilitate five buildings for residential and commercial uses.

Figure 1: Site Context

2.2 Sustainability Objectives

The project will be targeting the following sustainability objectives to enhance the environmental performance of the site:

- BASIX Certification – compliance with the requirements of the NSW SEPP BASIX 2004;
- SEPP 65 – Compliance with the requirements of *SEPP 65 – Design Quality of Residential Apartment Development* and the related *Apartment Design Guide.*
- Leichhardt LEP and DCP, and other relevant planning instruments.
- Green Star – Targeting the inclusion of a 5 Star Design & As Built v1.2 rating from the Green Building Council of Australia.
- Additional sustainability initiatives to incorporate Australian Best Practice Sustainability principles within the project design, as listed in Section 1.

2.3 Referenced Documentation

The following documentation was referenced in the development of this report:

- 67-75 Lords Road Urban Design Study – Stewart Hollenstein & Matthew Pullinger Architects
- 67-75 Lords Road, Leichhardt Green Travel Plan – The Transport Planning Partnership

2.4 Limitations

Due care and skill has been exercised in the preparation of this report.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Northrop for detailed advice, which will take into account that party's particular requirements.

3. ENERGY EFFICIENCY

Platino have a strong commitment in terms of ensuring energy efficiency throughout the project. This encompasses considerations for the sites layout, construction and the selection of systems and equipment. Although this is considered holistically as part of the targeted Green Star rating the project is also considering how each element of the design can contribute to this including both passive and active systems. Some of these measures are detailed below.

3.1 Passive Design

The site characteristics and orientations can have a large effect on the amount of energy that is required to heat, cool and ventilate a building.

Key considerations will include designing high performance facades including glazing selection and extent, external shading, daylight direction devices, insulation levels, surface properties and possible natural ventilation openings.

3.1.1 Natural Ventilation

Natural ventilation, unlike fan-forced ventilation, uses the natural forces of wind and buoyancy to deliver fresh air into buildings. Ventilating a building naturally can significantly reduce energy consumption of HVAC systems, whilst providing 100% outdoor air into the spaces it serves, creates a very clean environment for occupants.

In Leichhardt, the predominant wind directions occur from the south east, south and west; this would be the governing factor when considering building orientation on the site as seen in the wind rose diagram in Figure 2. Natural ventilation will be maximised by implementing a precinct wide consideration of wind direction and speeds in preparation of building orientation design to optimise passive cooling opportunities across the site.

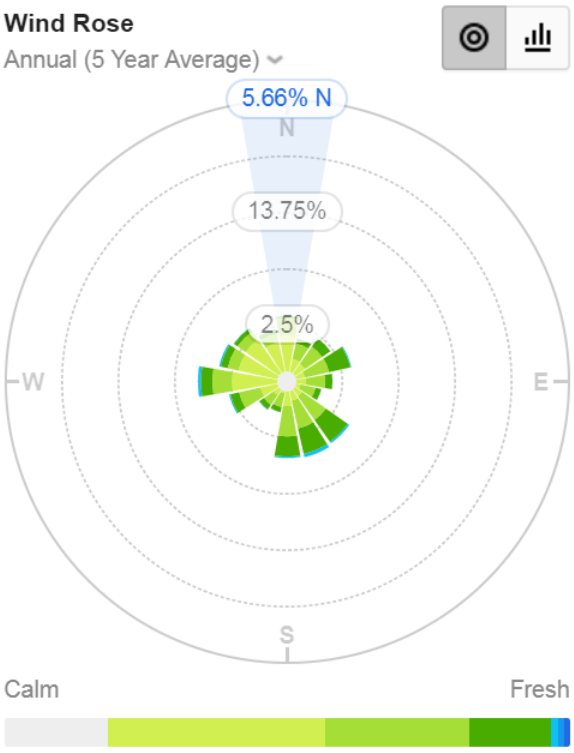


Figure 2: Prevailing Winds (5 year average) – Leichhardt NSW

3.1.2 Solar Amenity

Good solar amenity is essential for considering passive design principles for the site. A balance between natural daylight and solar access is required to optimise thermal performance of the buildings on the site to create comfortable living environments and minimise the carbon footprint of the development.

Opportunities will be explored as part of the detailed development stage to enhance the solar amenity across the site, including:

- Well performing glazing
- Selection of glazing with high Visual Light Transmittance (VLT)
- Winter gardens
- Optimised shading

3.2 HVAC Systems

Typically apartment buildings in Sydney are served by individual reverse cycle split air conditioning systems for each dwelling. While split systems provide high flexibility for individual control and simplicity from a body corporate outgoings point of view, this is not always that best outcome from an energy, operational cost and aesthetic perspective.

Various options will be investigated to provide an improved energy efficient outcome system that provides a better level of control. This will include equipment selection (with priority for higher energy efficiency ratios), control strategies and day/night-time zoning.

Additionally, the feasibility of district heating and cooling systems will be explored to investigate the opportunities to provide the central production and distribution of thermal energy.

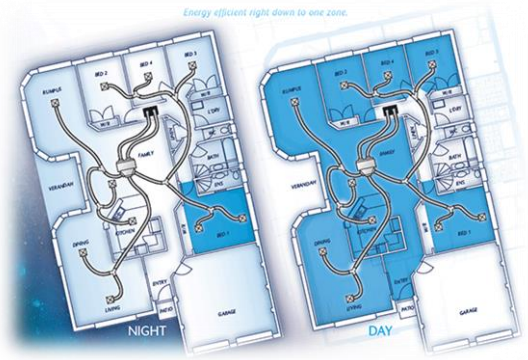


Figure 3 Day/night zoning configuration

3.3 Energy Efficient Appliances

Minimum Energy Performance Standards (MEPS) specify the minimum level of energy performance that appliances, lighting and electrical equipment must meet or exceed before they can be offered for sale or used for commercial purposes.

High MEPS rated appliances will be considered beyond mandatory product ranges in Australia and New Zealand. These products must be registered through an online database and meet a number of legal requirements before they can be sold in either of these countries.

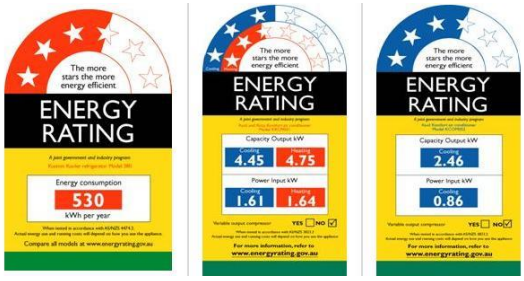


Figure 4: Typical Energy rating labels

3.4 Energy Efficient Artificial Lighting

The provision of highly energy efficient lighting is to be incorporated into the building design to minimise the lighting density. In particular, LED lighting provides the maximum efficiency and has become a robust cost effective lighting technology.

Control strategies are also vital to reduce excess energy use, including:

- Daylight sensor and motion sensor control for hallways, lobbies and shared spaces.
- Lift lighting connected to lift call buttons.
- Motion sensor or time-based lighting for undercover car parking, switch rooms and service areas.
- Motion sensors in fire stairs to trigger between standby (dimmed) and full light outputs

3.5 Alternative Energy Sources

3.5.1 Solar Photovoltaic (PV)

Rooftop solar power within the development has the potential to provide a portion of the building energy use across the year. Using a system connected to the base building systems will offset energy used by the central services such as lifts and common area lighting. Rooftop solar will also provide a benefit to the projects BASIX compliance levels for the residential developments of the site and NABERS ratings for commercial office areas.

If there was a desire to maximise the amount of solar PV to be installed, this could be incorporated with an embedded network to allow the use of the output electricity in the precinct.

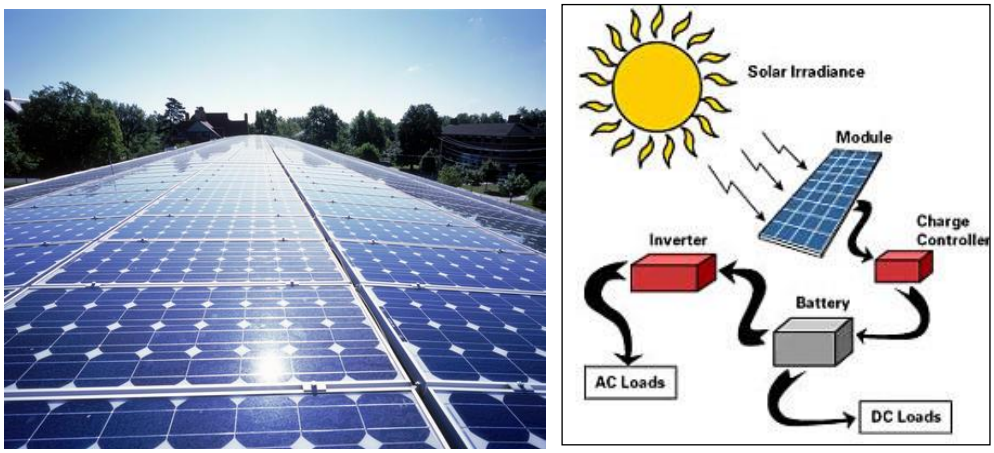


Figure 5: Solar PV components

3.6 Smart Energy Metering and Monitoring

Metering for each tenant will allow them to monitor their own energy use and result in behavioural or equipment changes. Real-time energy tracking will also raise occupant awareness of the potential excess energy in their everyday environment.

A user-friendly interface for monitoring will also increase interaction with the building and give the tenants a greater sense of control of their space. Display screens located in accessible common areas will be considered to display energy consumption in the building in effort to reduce the carbon footprint of the precinct.

3.7 Embedded Networks

A Micro grid is a private electricity network that uses local energy generation sources (e.g. rooftop solar) which can be connected to battery storage systems and supply loads within that network. An integrated micro grid would allow the precinct to manage the system within its borders and interact with the larger grid network as a single entity under an Embedded Network arrangement. .

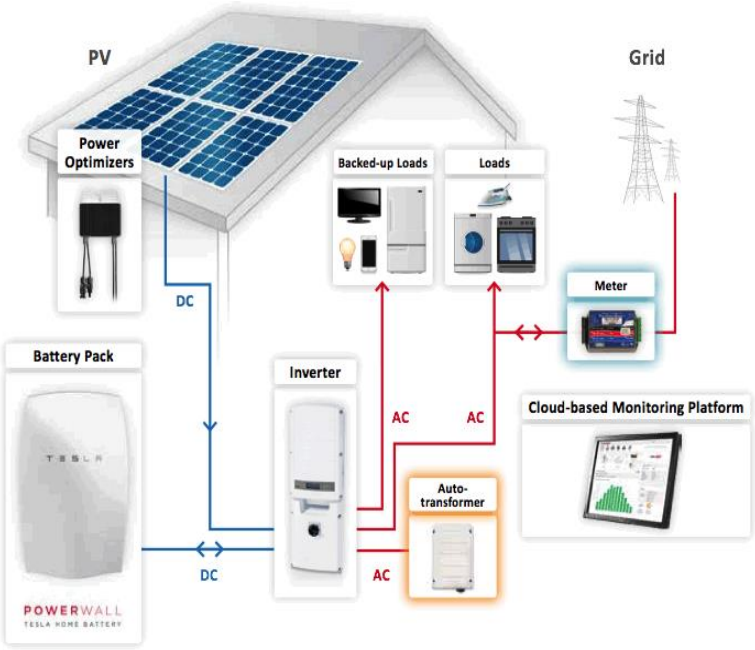


Figure 6: Example of connectivity of an embedded network

The embedded network would serve each of the dwellings within the building and connect these to a central connection point. Electricity can be purchased in bulk at a lower cost than is available to individual residents which could potentially provide revenue generation opportunities for Platino Properties if managed privately. Billing is then provided by either the building or through a third party (Origin, OC Energy, WIN Energy etc).

These systems are attractive as they can often provide reduced energy costs for residents and can assist in the distribution of onsite energy generation and storage.

Overall the use of an embedded network would allow further exploration of PV generation and the installation of battery storage to provide lower electricity bills for residents.

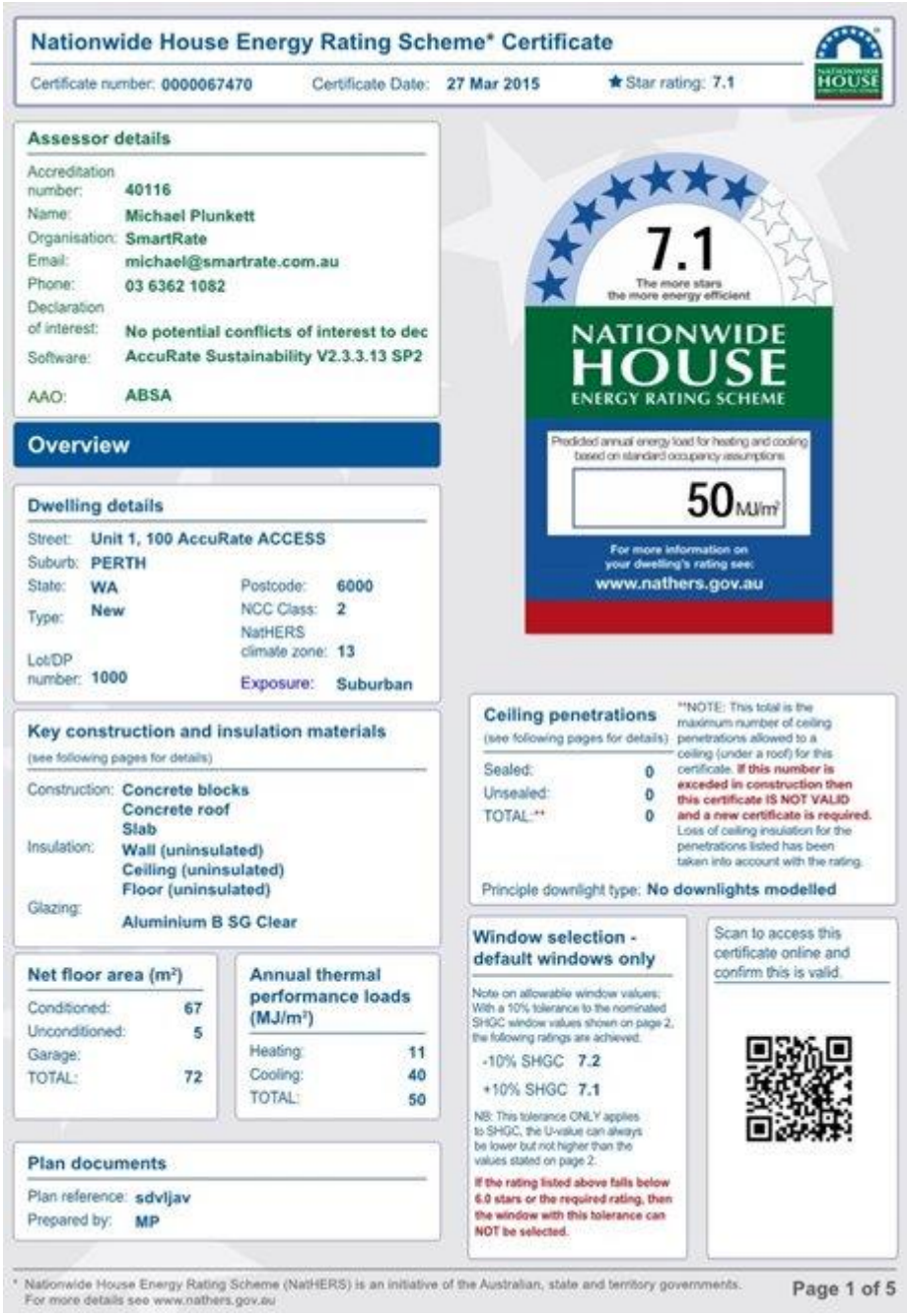
4. OCCUPANT COMFORT

Comfortable, healthy and enriching spaces are of high significance for their all building occupants. The promotion of indoor environment quality results in a greater liveability of the development. The biggest impact of this will be around thermal comfort, however things such as materials selection and the associated off gassing of chemicals, acoustic comfort and the management of smells are also things being considered by the design team. Some key elements are outlined below with further measures also considered as part of the projects commitment to Green Star.

4.1 Thermal Comfort

Thermal comfort is typically dictated by the building fabric selections, façade performance, air-conditioning system design & selection and individual controls.

The residential portion of the project will consider targeting an average NatHERS rating of 6 stars. The commercial components will target designing systems with optimised air distribution and individual level of control.



Nationwide House Energy Rating Scheme* Certificate

Certificate number: 0000067470 Certificate Date: 27 Mar 2015 ★Star rating: 7.1

Assessor details

Accreditation number: 40116
Name: Michael Plunkett
Organisation: SmartRate
Email: michael@smartrate.com.au
Phone: 03 6362 1082
Declaration of interest: No potential conflicts of interest to dec
Software: AccuRate Sustainability V2.3.3.13 SP2
AAO: ABSA

7.1
The more stars the more energy efficient
NATIONWIDE HOUSE ENERGY RATING SCHEME
Predicted annual energy load for heating and cooling based on standard occupancy assumptions
50 MJ/m²
For more information on your dwelling's rating see:
www.nathers.gov.au

Overview

Dwelling details

Street: Unit 1, 100 AccuRate ACCESS
Suburb: PERTH
State: WA Postcode: 6000
Type: New NCC Class: 2
NatHERS climate zone: 13
Lot/DP number: 1000 Exposure: Suburban

Key construction and insulation materials

(see following pages for details)

Construction: Concrete blocks, Concrete roof, Slab
Insulation: Wall (uninsulated), Ceiling (uninsulated), Floor (uninsulated)
Glazing: Aluminium B SG Clear

Ceiling penetrations

(see following pages for details)

Sealed: 0
Unsealed: 0
TOTAL:** 0

**NOTE: This total is the maximum number of ceiling penetrations allowed to a ceiling (under a roof) for this certificate. If this number is exceeded in construction then this certificate IS NOT VALID and a new certificate is required. Loss of ceiling insulation for the penetrations listed has been taken into account with the rating.

Principle downlight type: No downlights modelled

Net floor area (m²)

Conditioned: 67
Unconditioned: 5
Garage:
TOTAL: 72

Annual thermal performance loads (MJ/m²)

Heating: 11
Cooling: 40
TOTAL: 50

Window selection - default windows only

Note on allowable window values: With a 10% tolerance to the nominated SHGC window values shown on page 2, the following ratings are achieved:

-10% SHGC 7.2
+10% SHGC 7.1

NB: This tolerance ONLY applies to SHGC, the U-value can always be lower but not higher than the values stated on page 2.

If the rating listed above falls below 6.0 stars or the required rating, then the window with this tolerance can NOT be selected.

Scan to access this certificate online and confirm this is valid.

Plan documents

Plan reference: sdvljav
Prepared by: MP

* Nationwide House Energy Rating Scheme (NatHERS) is an initiative of the Australian, state and territory governments. For more details see www.nathers.gov.au

Page 1 of 5

Figure 7: Typical NatHERS home owners certificate

4.2 Trickle Ventilation

A trickle vent is a very small opening within a buildings fabric that allows a small amount of ventilation into spaces when major elements of the ventilation systems, such as windows and doors, are closed. Trickle ventilators can also provide a greater level of control over the provision of outside air to inside spaces. A number of products are available that control ventilation flow based on temperature and pressure, allowing outside air into spaces when it would be beneficial to the internal conditions and automatically shutting this off when it would result in increased heating or cooling costs.

A well-controlled trickle vent will also reduce condensation risk, avoid over ventilation (reducing air-conditioning energy and improve comfort through minimising drafts. The provision of trickle ventilators would not remove the requirements for openable windows but could assist with acoustic and ventilation controls while providing a continuous source of fresh outside air.

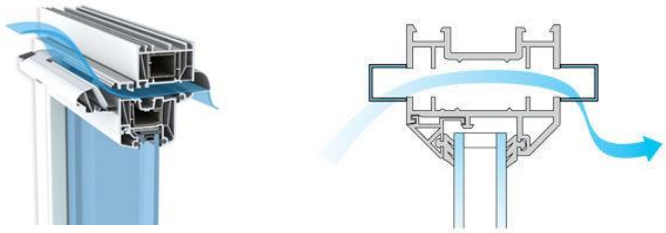


Figure 8: Example of trickle ventilation systems

4.3 Low Toxicity Finishes

Interior finishes such as paints, adhesives, sealants and flooring contain volatile organic compounds (VOC) that are inherent to the use of solvents during the manufacturing process. Consequently, these become sources of indoor pollutants which have health implications. The design team will consider and aim to minimise the VOC and formaldehyde content of all products specified in the design process of the development.

4.4 Acoustic Comfort

Acoustic conditions of the site will be assessed in the future stages of the development to ensure that appropriate internal noise levels and reverberation levels are compliant with AS/NZ 2107:2016 standards.

5. WATER MANAGEMENT

Given the current drought conditions being experienced in NSW the project is looking to minimise the impact that it will have Sydney's water systems. Through the use of efficient fixtures and fittings, rainwater collection and water sensitive design initiatives the site will not just consider the consumption of residents but also the effects of stormwater runoff, landscape maintenance and how leaks are identified and repaired. Some measures being considered are described below.

5.1 Water Efficient Fixtures and Fittings

Water Efficient Fixtures and Fittings will reduce the water consumption of the site. As an indication, the following Water Efficiency Label (WELS) rated fittings and fixtures will be considered:

- Wash hand basin taps - 5 star WELS
- General taps - 5 star WELS
- Toilets dual flush - 4 star WELS
- Urinals - 6 star WELS
- Shower heads – 4 Star WELS

5.2 Water Reuse

5.2.1 Rain Water Harvesting

At a minimum, inclusion of rainwater harvesting will be implemented for non-potable uses. Possible rainwater reuse opportunities could be to supply irrigation systems, car washing, communal laundries and cooling tower make up supply, to reduce the potable water demand on site and lessen the impact to the local authority networks.

5.2.2 Fire Sprinkler System

During the design of the fire protection design in the consideration of sprinkler systems, the recirculation and storage of sprinkler testing water will be considered. This water can potentially be captured and stored in storage tanks for reuse during the next sprinkler test or connected to the rainwater tank for top up supply.

5.3 Water Sensitive Urban Design

Implementing Water Sensitive Urban Design (WSUD) practices reduces the reliance of stormwater infrastructure whilst enhancing the biodiversity of a site. Special attention to vegetation selection and water quality measures will need to be considered in order to appropriately address the proximity to the adjacent Hawthorne Canal.

WSUD options that will be considered as part of this design approach are:

- Rain Gardens or plantings around building entrances;
- Sub-surface stormwater detention systems
- Tree Gardens/pits & Bio swales for storm water runoff treatment

Figure 8: Bioswales could be located in streetscapes to improve the water quality in the precinct

- Native vegetation where applicable

5.4 Smart Water Metering & Monitoring

Water sub-metering with alarms for leak detection for common area facilities will provide a system for effective maintenance of the site. Smart metering which is connected to a monitoring system will allow for real-time consumption tracking and flag potential leaks at the moment they occur, minimising water wastage and protecting the building from water damage.

6. SUSTAINABLE TRANSPORT

Transport is an area of environmental impact that most development projects do not actively consider, the Lords Road project however have actively considered how residents will integrate with existing transport networks and provide a variety of transport options to residents. Some of the measures are outlined below.

6.1 Pedestrian and Cycle Links

Pedestrian pathways and cycle ways will be integral to the design of the precinct to encourage public transport use and high urban amenity areas. Cycle ways and pathways can provide ease of connection to near-by light rail stations and surrounding suburbs as indicated in the precinct's Travel Plan.

It is opportune for Platino Properties to provide clearly marked cyclist pathways and pedestrian access around these areas, designed to include sufficient accessibility to ensure for a resilient precinct.

6.2 Cyclist Facilities and Access

The practice of cycling assists human health and reduces environmental impact by mitigating pollutants that would otherwise have been released by other transport options. According to the ABS over one third of daily car trips are less than 3km in length. Most of these trips could be replaced with cycling. Providing secure bike storage facilities for residents will promote the use of bicycles as a form of transport.

Providing secure storage, either as a communal storage cage in the basement or a nook adjacent to dwelling entries, assists in encouraging cycling though the precinct. The provision of bike racks outside of the main building entries across the site will also be implemented where possible.

Figure 9: Hybrid bike rack and bench

This measure will also be recognised as part of the targeted Green Star rating for the site.

6.3 Car share hubs

The provision of a building precinct specific share car network would allow building occupants to relinquish car ownership entirely and would greatly reduce the number of parking spaces required within the building. The provision of a cluster of vehicles could be coupled with a site mobile phone app, allowing for a centralised booking system.

A third party such Go-Get could also be provided with a dedicated space, as recommended in the Travel Plan, with residents given access to their booking system. This would reduce management requirements and move responsibility for the provision and maintenance of vehicles away from Platino Properties or building management.

Providing access to car share facilities will also allow more flexibility to residents as to how they use transport allowing them to select vehicles appropriate to the task at hand.

7. WASTE MANAGEMENT

Waste management throughout construction is relatively straightforward however the project is also looking to set in place measures to ensure that effective resource management is able to be maintained longer term. This is achieved through the provision of adequate space and equipping residents with the tools required to use them effectively. Some of the waste management measures are outlined below and will be complemented by the operational waste management planning that will occur as part of the targeted Green Star rating.

7.1 Construction and demolition waste

Building materials account for approximately half of all materials and about half the solid waste generated worldwide incurring significant environmental impacts at each process interval. It is proposed that a significant portion of construction and demolition waste is to be diverted from landfill to reduce the carbon footprint of the site whilst reducing waste fees associated with landfill rates. This commitment could be incorporated in to the head contractors' Environmental Management Plan for the site. Reclamation of high value building materials should be considered first preference. Where reclamation is not viable, materials such as asphalt, bricks, timber, plastics (including PVC) and concrete should be recycled accordingly.

7.2 Waste Sortation

Waste-sorting bins will be considered for all internal and external spaces to enable users to sort their rubbish and recyclables. Back of house areas will require sufficiently sized and conveniently located waste storage and sorting areas for ease of removal by waste contractors.

An organic waste stream could be introduced with a communal worm farm or compost system to support community gardens and educational programs rolled out in the precinct.

Figure 10: Waste stream sortation

7.3 Unified bin design

Unified bin design throughout the precinct is proposed as part of a waste strategy to create a waste sortation culture in the building. Not only should each be a different colour e.g. Red for general waste, yellow for co-mingled recycling, blue for paper and green for organics but should be consistent throughout the site. This is to assist with clarity and develop effective waste sortation prior to disposal. The waste strategy should be as part of the Waste Management Plan and considered during the early stages of the development to ensure appropriate design integration across all building uses.

7.4 Waste education

Waste educational in terms of effective signage displays or programs would have a positive benefit to the community as part of a wider approach to enhance community participation, create social diversity and provide fun educational activities for residents and surrounding suburbs.

This inititive could be coupled with the digital signage in the common lobbies as a way of updating residents of different waste pick updates or other useful Cumberland LGA initiatives.

Figure 11: Waste Education Programs

8. MATERIALS SELECTION

A major portion of the impact of the building is within its embodied energy. As such the considered selection of materials can result in significantly improved environmental outcomes. The use of locally sourced materials will reduce transport emissions and using certifications and reporting to make informed decisions will allow Platino Property to construct a project that minimises its embodied impacts.

8.1 Sustainable Use of Resources

When choosing building materials for this project, particular attention will be paid to:

- **Low Embodied CO_2** – Many modern building materials such as aluminium or concrete are high in embodied energy (the energy required to produce, transport and install a material), and with that contribute substantially to the overall carbon footprint of the building.
- **Sustainability of Resource** – many building materials are derived from finite resources and should be avoided or limited. Major building elements should have recycled content where possible (recycled steel and/or aggregates in concrete, recycled timber, cellulose fibre insulation using recycled paper etc.).
- **Health Impact** – All materials should be considered in regard to their impact on occupants' health. For example, some types of fibreglass insulations have very fine fibres that, once airborne, can easily enter into the lungs and cause severe irritation.
- **Third Party Certifications** – materials which have been certified or approved by independent bodies such as Ecospecifier or Good Environmental Choice Australia should be preferred over non-certified products. These rating systems provide evaluation of various products across a range of environmental performance criteria.
- **Recycled Content** – Recycled content should be specified in:
    - Concrete – fly ash and recycled aggregates; and
    - Structural and reinforcement steel
    - Recycled building rubble

Figure 12: Examples of Third Party Certification Labels

8.2 Locally sourced products

Locally sourcing products for use in the construction of the precinct would help to keep transport and distribution impacts to a minimum. It will also help to support local employment and improve economic resilience of the Sydney manufacturing industry.

Utilising local manufacturing and suppliers should also help to minimise lead time for products, build positive relationships and make supply chain auditing easier. Overall the sourcing of locally sourced products should be explored and implemented where economically feasible.

9. LAND USE AND ECOLOGY

9.1 Increased Ecological Value

Being situated near community infrastructure, the development is considered to have a significant urban activation potential.

The development will significantly improve the ecological value of the site with the following being considered;

- Street landscaping;
- Vertical gardens;
- Roof gardens.

Native vegetation will also minimise the ongoing environmental impact of the project by minimising soil erosion and land degradation, improving water quality and provides habitat for native flora and forna.

9.2 Native vegetation

Native vegetation plays a key part in the biodiversity and ecological stability of the site.

Endemic native vegetation plantings have the benefit of:

- Controls erosion through protecting soils and riverbanks
- Reduces land degradation and salinity
- Improves water quality and availability
- Provides habitat for a wealth of unique and threatened species.

In addition, native vegetation stores a significant amount of carbon, mitigating the effects of climate change. The planting of native vegetation throughout the precinct will reduce the water needed for irrigation systems, reduce vegetation maintenance requirements, promote biodiversity and improve compliance under BASIX.

9.3 Heat Island Effect

Urban heat island effect is defined as hard surfaces within a development heating up due to lower Solar Reflectance Indexes (SRI), compared to a natural area. This results in additional heat retention in the surrounding area, as well as allowing more heat to penetrate individual buildings.

The following will be considered in the development to reduce heat island effect;

- Roof Gardens;
- Artificial water bodies & water courses;
- Increased vegetation areas;
- Selection of paint finishes with high SRI properties such as light coloured exterior finishes.

9.4 Rooftop Gardens

Plants have the ability to reduce the overall heat absorption of the building which then reduces energy consumption. The primary cause of heat build-up in cities is solar radiation, the absorption of heat by roads and buildings in the city and the storage of this heat in the material. By installing roof gardens, the development is creating a passive solution to this build-up of heat with the plant surfaces cooling the space through the process of transpiration. This will help to minimize temperature rise in these spaces to no more than 4-5°C above ambient improving thermal conditions within the buildings across the site and minimising the precinct effect on urban heat islands.

Figure 13: roof gardens help to cool the space and reduce the urban heat island effect.

9.5 Non obtrusive outdoor lighting

Light pollution released into the night sky (sky glow) or spilling on to neighbouring properties can harm the environment in many ways including effects on:

- Migratory birds – nocturnal birds use the moon and stars for navigation and can become disoriented by lights shining upwards into the sky;
- The disruption of biological rhythms and other effects on the behaviour of nocturnal animals and insects;
- Greenhouse gas emissions are emitted to unnecessarily light the night sky.

Ensuring that no outdoor lights face up into the night sky would not attract any additional costs and would provide ongoing operational and maintenance savings and reduce the sites impact on the natural environment.

10. COMMUNITY AND LIVABILITY

10.1 Communal Gardens & Facilities

The provision of urban agriculture that promotes education and community through garden facilities, will promote community cohesion within the residents of the precinct and provide a valuable educational facility.

The community gardens should be incorporated in to the space design with the overall aim of creating a self-sustaining community initiative managed by the residents of the building. Initially there will need to be a commitment of time and financing for the construction of the physical gardens and for the education of residents regarding the effective management of these facilities.

Overall the benefits of providing the provision for urban agricultural facilities will include;

- Providing residents with access to fresh food,
- Reducing household waste going to landfill though the provision of composting facilities
- Reducing the need to provide private “backyard” space
- Promoting community engagement
- Educating residents about food production; and
- Providing biological diversity across the site.

Figure 14: Community gardens would promote social cohesion and a sense of community

10.2 Environmental Education

To assist the environmental education of building occupants and visitors, the following opportunities will be considered;

10.2.1 Community programs

Scheduled events and programs is a good way to encourage access to a diverse range of people in the community; celebrating culture and heritage that drives positive growth and joy in the neighbourhood.

Community events could include sustainable educational workshops with varying topics, for example, permaculture classes, composting and worm farming to complement the proposed communal gardens.

10.2.2 Environmental Displays

Creating interactive spaces is an effective way to encourage environmental education whilst providing a fun and vibrant atmosphere. Interactive digital display screens can be used as a tool to provide such a space which provides education to the occupants by making resource savings and consumption data readily accessible in the public space, such as the lobby areas or lifts. Information could for example detail live water and energy consumption data in the form of a touch screen display and relate back to the carbon footprint of the site in context of the individual, building or precinct.

10.3 Wayfinding

At its essence, wayfinding is the science of understanding how people perceive the environment and make decisions while navigating unfamiliar spaces and then responding with intuitive signage and information layouts.

Figure 15: Internal Wayfinding example

A high-functioning way finding system makes the environment “unique” and enhances the visitors’ experience as it increases their comfort, builds their confidence, and encourages them to discover unique events, attractions and destinations on their own.

Way Finding can also be utilised to direct occupants to key facilities and amenities in fun and creating ways. Like the interactive façade initiative above, public art incorporated into way finding signage in the building could open opportunities for local schools and community group competitions.

11. GREEN STAR

11.1 Overview

The Green Star rating tool is an internationally recognised system that provides independent verification of sustainable outcomes throughout the life cycle of the built environment. Green Star was developed by the Green Building Council of Australia (GBCA), which is the nation's leading authority on sustainable buildings and communities.

The relevant Green Star rating tool for the Lords Road Leichhardt Development is Design & As-Built, which focuses on the design and construction of new buildings. This section will reference the Green Star – Design & As-Built v1.2 framework to provide the project team with a strategy to meet a rating of 5 Stars or Australian Excellence in Sustainability.

The Green Star – Design & As-Built v1.2 framework incorporates ESD principals across nine major categories. These include:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

Points are awarded to a project based on the degree to which the project meets the various requirements within these nine categories.

11.1.1 Rating Tool Eligibility

The eligibility criteria for the Green Star – Design & As-Built v1.2 rating tool include:

- Building Type
- Spatial Differentiation
- Timing of submission for certification
- Conditional Requirements

67-75 Lords Road, Leichhardt meets these eligibility criteria given that:

- It is a group of connected Class 2 residential buildings.
- The buildings are distinct
- Green Star Accredited Professionals (Northrop) have been engaged during the project design phase
- The project is targeting conditional requirements under the Greenhouse Gas Emissions and Sustainable Sites credits

11.1.2 Rating Bands and Categories

Green Star Design & As Built awards achievement at 3 levels (4, 5 or 6 star), depending on the points achieved after assessment by an independent panel. The points corresponding to each award level (rating) are as follows:

- 4 Star – 45-49 points, recognising industry “Best Practice”
- 5 Star – 60-74 points, recognising “Australian Excellence”
- 6 Star – 75+ points, recognising the project as a “World Leader”

Points are assigned to the nine categories according to Table 1 below:

Table 1: Green Star Categories and Available Points

Category	Reference Code	Maximum Available Points
Management	MAN	14
Indoor Environment Quality	IEQ	17
Energy	ENE	22
Transport	TRA	10
Water	WAT	12
Minerals	MAT	14
Land Use and Ecology	ECO	6
Emissions	EMI	5
Innovation	INN	10
Total Available Points		110

11.1.3 Green Star Targeted Credits

67-75 Lords Road, Leichhardt is targeting 68 points for a 5 Star Green Star rating. These points and their associated credits are displayed in Table 2.

Table 2: Targeted Green Star Credits

LIST OF CREDITS			
Index	Credit	Points Available	Points Targeted
MANAGEMENT			
1	Green Star Accredited Professional	1	1
2	Commissioning and Tuning	4	3
3	Adaptation and Resilience	2	2
4	Building Information	1	1
5	Commitment to Performance	2	2
6	Metering and Monitoring	1	1
7	Responsible Building Practices	2	2
8	Operational Waste	1	1
INDOOR ENVIRONMENT QUALITY			
9	Indoor Air Quality	4	3
10	Acoustic Comfort	2	2
11	Lighting Control	3	3
12	Visual Comfort	3	1
13	Indoor Pollutants	2	2
14	Thermal Comfort	2	1
ENERGY			
15	Greenhouse Gas Emissions	20	10.4
16	Peak Electricity Demand Reduction	1	1
TRANSPORT			
17	Sustainable Transport	10	6
WATER			
18	Potable Water	12	6
MATERIALS			
19	Life cycle Impacts	7	2
20	Responsible Building Materials	3	3
21	Sustainable Products	3	0
22	Construction and Demolition Waste	1	1
LAND USE AND ECOLOGY			
23	Ecological Value	3	0
24	Sustainable Sites	2	1
25	Heat Island Effect	1	1
EMISSIONS			
26	Stormwater	2	2
27	Light Pollution	1	1
28	Microbial Control	1	1
29	Refrigerant Impacts	1	0
INNOVATION			
30	Innovation	10	6
Total		**109**	**68**

11.2 Management

11.2.1 Accredited Professional

One point is available where a Green Star Accredited Professional – Design & As Built (GSAP) has been contractually engaged to provide advice, support and information related to Green Star principles, structure, timing and processes, at all stages of the project, leading to certification.

This will be achieved via the engagement of Northrop Consulting Engineers.

11.2.2 Environmental Performance Targets

In order for the minimum requirement to be met, documented targets for the environmental performance of the project must be set.

This will be demonstrated through the development (early in the design phase) of a design intent report or an owner's project requirements (OPR) document. This document must be prepared by the design team at the design phase stage and outline at least the following items:

- Description of the basic functions, operations, and maintenance of the nominated building systems including:
    - A description of its intended operation and maintenance requirements; and
    - A list of what the main components are (including controls), their operation and the importance of their efficient use.
- The targets for the project energy and water consumption and energy and water budgets for all nominated building systems.
- Description of how energy, water, and aspects of indoor environment quality are metered and monitored. This includes a meter diagram that illustrates how energy and water budgets are confirmed in operation.

11.2.3 Services Maintainability

One (1) point is awarded where a project team can demonstrate that a comprehensive services and maintainability review has been conducted, led by the head contractor or the owner's representative (or the ICA where applicable), during the design stage and prior to construction.

The services and maintainability review is to facilitate input from the design team, the facilities manager and operations staff (if known), and any relevant suppliers and subcontractors (if engaged).

The review must address the following aspects for all nominated building systems:

- Commissionability;
- Controllability;
- Maintainability;
- Operability, including 'Fitness for Purpose'; and
- Safety.

The services and maintainability review and its outcomes must be summarised in a 'Service and Maintainability Report'. This report must be agreed and signed off by the involved parties. Action items resulting from this review shall be incorporated in the design intent report or OPR as outlined in 2.0. Information on the requirements of this review are outlined in the approved standards and guidelines (refer to Guidance section).

11.2.4 Building Commissioning

One (1) point is awarded when a project team can demonstrate that the pre-commissioning and commissioning activities have been performed based on the approved standards and guidelines. To demonstrate compliance, the following must be documented:

- Commissioning Specification: The contractual tender or construction documentation must list the commissioning requirements for each system. It is not sufficient to state that systems must be commissioned to the relevant standard. Instead, the documentation must:
    - List the design parameters for each system;
    - List the required commissioning activities;
    - Define how each system is intended to operate; and
    - List the acceptable tolerances during commissioning.

Contractual documentation must clearly indicate divisions of responsibilities, pre-commissioning procedures, commissioning requirements, witnessing requirements, phased completion requirements (if needed), post occupancy checks, and any training requirements for the operator.

- Commissioning Plan: A commissioning plan shall be developed and include at least the following, the:
    - Objectives, or basis, of the design;
    - Scope of the commissioning plan;
    - Commissioning team list, the individual responsibilities and interface matrix;
    - General sequence of commissioning;
    - Proposed commissioning procedures;
    - Witnessing requirements;
    - Commissioning program; and
    - Requirements for subcontractor commissioning manuals.

For a project to claim this criterion, the commissioning must have taken place in accordance with the requirements laid out in the contractual documentation and the commissioning plan. The commissioning report must certify that this is the case, and be signed by the designer, the head or main contractor, the commissioning manager (or ICA), and the project manager (or owner's representative).

The person responsible for the commissioning of the nominated services must have specific and demonstrable knowledge of the types of systems to be commissioned. As an example, a general sub-contractor is unlikely to be able to fill this role.

11.2.5 Building System Tuning

One (1) point is awarded where, following practical completion and prior to occupation, the owner/client has formally committed to a tuning process for all nominated building systems. At a minimum, the commitment must include quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties. The scope of the tuning works will determine the relevant tuning period.

The building tuning process will require the analysis of data from the monitoring systems and assessment of feedback from occupants on building conditions. During the tuning period, the owner/client must commit to take steps to adjust nominated building systems to account for all identified deficiencies.

The commitment from the building owner must confirm that there is a requirement for a building tuning process and responsibilities are assigned to have all nominated building systems tuned after practical completion. This commitment can be included in the Commissioning Plan or provided as a separate document from the building owner. The commitment must include at least the following:

- Operating and Maintenance Manuals have been developed in accordance with approved standards and guidelines (refer to Guidance);
- A building tuning manual, or a building tuning plan, has been developed in accordance with the approved standards and guidelines;
- A building tuning team has been created including the facilities manager, the owner's representative and the ICA (if applicable). The head contractor and the services design professionals are available to address specific tuning issues where required; and
- The owner has engaged parties to tune the nominated systems. This engagement includes requirements for:
    - Verification that nominated systems are performing to their design potential at full and part load conditions;
    - Reviews of environmental performance against the environmental targets;
    - Collection of user feedback to match the system performance with the occupant's needs;
    - Adjustment of all the systems to account for all deficiencies discovered; and
    - Management, communication, and assignment of responsibilities for the tuning process within the team.

11.2.6 Implementation of a Climate Adaption Plan

Two (2) points are awarded where the following Compliance Requirements are met:

11.2.6.1 Climate Adaption Plan

The Climate Adaptation Plan must contain as a minimum the following information:

- Summary of the project's characteristics (site, location, climatic characteristics);
- Assessment of climate change scenarios and impacts on the project using at least two time scales (e.g. 2030, 2040, 2050 or 2070), relevant to the projects anticipated lifespan. This must include a summary of potential direct and indirect climate change impacts (environmental, social and economic) on the project;
- Identification of the potential risks (likelihood and consequence) for the project and the potential risks to people. This risk assessment is to be based on a recognised standard (section 4.5.3.3);
- A list of actions and responsibilities for all 'high' and 'extreme' risks identified; and
- Details of stakeholder consultation that was undertaken during plan preparation and how the issues raised have been incorporated.

11.2.6.2 Developing Climate Change Scenarios

Prior to undertaking the 'Initial Assessment', the Australian Greenhouse Office (AGO) Guide calls for climate change scenarios to be developed and reviewed. The scenarios used by the project team must be sourced from the Intergovernmental Panel on Climate Change (IPCC) endorsed Global Circulation Models (GCMs) and may include:

- CSIRO projections;

- State or Federal climate projections; or
- Projections determined by a more detailed climate model.

The project must justify the selection of the climate scenario and emissions scenario used.

11.2.6.3 Recognised Standards

For the purposes of this credit, the recognised standards are listed below:

- AS 5334:2013 Climate Change Adaptation for Settlements and Infrastructure; or

The following two standards when combined:

- ISO 31000-2009 – Risk Management – Principles and Guidance; and
- The AGO's Climate Change Risks and Impacts: A Guide for Government and Business.

Should project teams wish to demonstrate compliance using an equivalent alternate standard or framework, a Technical Query may be submitted to the GBCA to confirm equivalency.

11.2.6.4 Risk Assessment

The project team is required to undertake the 'Initial Assessment' outlined in Sections 4-6 of the AGO Guide. The ISO 31000 Standard must be used for further guidance in undertaking the risk analysis process prescribed in Sections 5.1-5.6 of the AGO Guide.

The consequence/success criteria in the AGO Guide have been refined to be more applicable at the development scale and are provided in the Guidance section of this credit. Alternatively, organisations may use internal corporate success/criteria tables.

Alternatively, the project team may follow the approach within AS 5334:2013 for buildings. The analysis must include a discussion of all climate change elements described and follow the risk analysis and mitigation sections of the standard.

The assessment of climate change impacts must address a minimum of two time scales (e.g. 2030, 2040, 2050 or 2070) relevant to the anticipated building lifespan for the primary effects of temperature, precipitation and sea-level rise. The plan must then consider the secondary effects of relative humidity, drought/flood, wind, cyclones and bushfire as a minimum.

11.2.7 Building Information

One (1) point is awarded where the project team can demonstrate that:

- Comprehensive operations and maintenance (O&M) information is available to the facilities management team. Compliance may be demonstrated with one document that includes operations and maintenance information (in accordance with 4.5.4.1) and the building log book information (in accordance with 4.5.4.2), or a number of separate documents that contain the same information.
- Current building user information is available to all relevant stakeholders, in accordance with 4.5.4.3 and 4.5.4.4.

11.2.7.1 Operations and Maintenance Information

The project team must confirm that operations and maintenance information is provided for all nominated building systems and that the following criteria are achieved:

- Appropriate content for all nominated building systems is readily available;

- The appropriate user group has access to the information they require to deliver best practice environmental outcomes; and
- Guidance on keeping information up–to-date is provided to the facilities management team in these documents.

11.2.7.2 Building Log Book

The project team must develop a building log book to present to the building owner before practical completion of the project. The building log book must:

- Be developed in line with CIBSE TM31: Building Log Book Toolkit;
- Cover all nominated building systems; and
- Include links or references to all relevant operations and maintenance information.

11.2.7.3 Format of Building User Information

Building user information is a source of up-to-date, relevant information for the building user. The information must address the intended use of all nominated systems within the building.

The amount and details of building user information must be relevant to the project's audience.

For example, if the premises are owner-occupied, the information provided to users must be geared towards general staff that occupy the space. If the space is leased from a landlord, the information provided must also be geared towards the person responsible for the management of the tenanted space; this may be a tenant representative or an office manager.

Building user information must be able to be updated and edited by the facilities management team, or other appropriate stakeholder group, to ensure it remains current and relevant to users throughout the life of the building.

11.2.7.4 Delivery of Building User Information

All building user information must be available to the building owner and facilities management team at the time of practical completion. It is acknowledged that ongoing tuning may require updates to building user information and its content may extend beyond practical completion.

The method of delivery of the information provided may differ based on the target audience. However, due to the live nature of building user information it must be provided in a digital format and made available through any combination of digital signage or interactive information kiosks in high traffic public areas (e.g. building foyer, lift lobby or lift displays), induction or training material, website or intranet, or applications for mobile devices.

It must be made clear at the time of submission for certification how this information has been presented to the relevant audience or user group. It is the project team's responsibility to clearly identify the relevant user groups and deliver building user information tailored to their needs.

11.2.8 End of Life Waste Performance

One (1) point is awarded where at least 80% of the project's GFA, excluding car parking areas, has a formal commitment in place to reduce demolition waste at the end of life of an interior fit out or base building component. A smaller proportion of compliant space may be rewarded partial points on a sliding-scale to one decimal place.

Compliance must be demonstrated by providing a commitment to either:

- Establish contractual agreements, in accordance with 4.5.5.1; or

- Achieve a certified operational performance rating for the building, addressing waste from refurbishments, in accordance with 4.5.5.2.

11.2.8.1 Contractual Agreements

For this option, contractual agreements must be in place to demonstrate the credit criteria. Projects may demonstrate this using one of the models outlined below that is most applicable to their context:

- Formal agreement;
- Internal requirement;
- Strata management for multi-unit residential.

If the project is not adequately described by one of these options, project teams are invited to submit a CIR.

11.2.8.2 Certified Operational Performance Rating

For this option, the project must commit to achieving the 'Waste from Refurbishments' credit (23) from the Green Star – Performance rating tool. This credit must be used to report on the measured results of the end-of-life waste commitments set by the parties involved.

11.2.9 Metering

It is a conditional requirement of this credit that project teams must provide accessible metering to all energy and water common uses and major uses, and to energy and water sources provided by the base building as follows;

Metering distinct uses or floors:

- Metering shall be provided to allow for monitoring of the relevant areas or functions of the project. In most cases floor by floor metering will suffice if the entire floor has a single use.
- Where a load for a single item exceeds 5% of the total energy use for the building, or 100kW, it must be independently metered.
- Where a common water use consumes 10% of the project's water use, these must be independently metered.

11.2.10 Monitoring Systems

One (1) point is awarded where a monitoring system is provided capable of capturing and processing the data produced by the installed energy and water meters. The monitoring system must accurately and clearly present the metered data and include reports on consumption trends, in accordance with the following requirements.

The monitoring strategy must be developed in accordance with a recognised standard, such as CIBSE TM39 Building Energy Metering. The same principles described in the standard shall be used for developing water metering and monitoring strategies.

The monitoring strategy must include a metering schedule. This schedule shall address the estimated loads for energy and water and must list:

- The incoming input (electricity, gas, water, etc.);
- The end use (lighting, HVAC, fans);
- The estimated energy consumption for the end use;
- Which meter(s) provide the required information; and
- The individual estimated end consumption.

The project team must provide automatic monitoring systems that record both consumption and demand of energy or water, and are capable of producing reports on quarter hourly, hourly, daily, monthly, and annual energy use for all meters.

The installed meters must be capable of producing an output that can be transmitted to a central location (either onsite or offsite). This central location must provide data retrieval and reporting mechanisms.

11.2.11 Environmental Management Plan

It is a minimum requirement of this credit that a project-specific best practice EMP is developed and implemented, to assist the Principal/Head Contractor and its service providers to manage environmental performance, conditions and impacts arising from demolition, excavation and construction. The EMP must cover environmental impacts arising from construction works, and it must be site-specific.

The EMP must be compliant with best practice guidelines and must be implemented from the beginning of construction works, including any excavation and demolition. The requirements for EMPs, as outlined within the NSW Environmental Management Systems Guidelines, are considered best practice. The edition of the guidelines current at the time of construction must be used.

11.2.12 Formalised Environmental Management System

One (1) point is awarded where project teams demonstrate that a formalised systematic and methodical approach to planning, implementing and auditing is in place during construction, to ensure compliance with the EMP.

The plan must be implemented by a responsible party with a formal environmental management system in place. For the purposes of this credit, this is achieved through a formalised environmental management system implemented by the key party responsible for managing the site.

There are two compliance pathways for this criterion. Project teams must demonstrate compliance with the pathway specified for the project's contract value, below:

- For projects with a contract value less than $10 million, the environmental management system (EMS) must comply with either NSW Environmental Management Systems Guidelines or a recognised standard.
- For all other projects, the formalised Environmental Management System must have been independently certified to a recognised standard, such as AS/NZS ISO 14001, BS 7750 or the European Community's EMAS. The certification party must be members of the International Accreditation Forum.

In all cases, an auditor report confirming evidence of effective use of the formalised EMS must be provided to demonstrate compliance. An auditor report for the organisation, rather than the site, will suffice. Where nonconformities with the EMS have been recorded, corrective and preventive actions must also be demonstrated to have been applied, in order for credit compliance to be achieved.

11.2.13 High Quality Staff Support

One (1) point is available where high quality staff support practices are in place that:

- Promote positive mental and physical health outcomes of site activities and culture of site workers, through programs and solutions on site; and
- Enhance site workers' knowledge on sustainable practices through on-site, off-site, or online education programs.

11.2.13.1 Health Impacts of Site Activities

To comply with this requirement, programs and policies in place must go beyond legal requirements for occupational health and safety (OHS) and extend into wellbeing promotion. The responsible party must

implement policies and programs to promote health and wellbeing on-site. The programs must target both physical and mental health outcomes. At least three distinct issues, with one of those specifically addressing mental health impacts, must be addressed. Issues that may be considered include:

- healthier eating and active living
- reduced harmful alcohol and drug and tobacco-free living
- increase social cohesion, community, and cultural participation
- understanding depression
- preventing violence and injury
- suicide prevention
- decrease psychological distress

The responsible party should carry a needs analysis of site workers and contractors to determine appropriate actions. The policies and programs must be relevant to all construction workers on site for the whole duration of construction. A mix of programs is acceptable throughout the duration of construction.

11.2.13.2 Knowledge of Sustainable Practices

The responsible party must provide training to site workers on project specific sustainable practices and initiatives. The training must include information on any sustainable building certification(s) sought; explain the value of certification; and the role site workers play in delivering a sustainable certified building.

The training must be provided to all contractors and subcontractors that were present for at least three days on site. Training can be provided through one, or a combination of:

- On-site training, such as by including the items above as part of site induction practices.
- Off-site training, such as by providing sustainability training to site workers via a TAFE or similar program within the last 3 years
- Online training, such as by a third party service that can provide training on sustainability topics and track personnel who have taken the relevant materials within the last three years

11.2.14 Operational Waste – Performance Pathway

One (1) point is awarded where a qualified waste auditor prepares an Operational Waste Management Plan (OWMP) for the building in accordance with best practice approaches. The requirements or recommendations made in the Operational Waste Management Plan must then be reflected in the design of the building's facilities.

For information on what qualifications are required to be deemed a qualified waste auditor, please see the Guidance section. OWMPs can influence the amount of waste recycled and generated by occupants, tenants and visitors. For the purposes of this credit, the OWMP must be developed for implementation at the site and building level, and be applicable to the Green Star project boundary. OWMPs are usually implemented by building owners or operators.

The OWMP must be developed by a qualified waste auditor. As a minimum, the OWMP must:

- Identify the site boundary, the waste streams relevant to the project, and the individual roles responsible for delivering and reviewing the OWMP;
- Set diversion from landfill targets and/or targets for reducing total materials generation (general waste materials and recyclable/reusable materials), as well as monitoring and measurement procedures for waste and recycling streams by weight;

- Outline methods for encouraging the separation of waste streams, such as bins, storage areas, or recycling facilities in public areas as required;
- Identify storage areas for all waste streams and outline best practice safety and access requirements for their collection;
- Identify safe methods for vehicle access and transfer of waste; and
- Incorporate a review process to assess the success of the OWMP and make improvements, based on operational experience.

11.3 Indoor Environment Quality

11.3.1 Ventilation System Attributes

One (1) point is awarded where project teams demonstrate that the ventilation system meets all of the following conditions:

- The entry of outdoor air pollutants is mitigated - The building services must be designed to comply with ASHRAE Standard 62.1:2013 in regards to minimum separation distances between pollution sources and outdoor air intakes.
- The system is designed for ease of maintenance and cleaning; and
- The system has been cleaned prior to occupation and use.

11.3.2 Provision of Outdoor Air

Up to two (2) points are awarded where at least 95% of the nominated area is provided with sufficient outdoor air to ensure that levels of indoor air pollutants are maintained below acceptable levels.

For mechanically ventilated or mixed-mode spaces:

- One (1) point is awarded where outdoor air is provided at a rate 50% greater than the minimum required by AS 1668.2:2012, or carbon dioxide (CO2) concentrations are maintained below 800ppm; or
- Two (2) points are awarded where outdoor air is provided at a rate 100% greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 700ppm.

11.3.3 Exhaust or Elimination of Pollutants

One (1) point is awarded where project teams demonstrate that pollutants from printing and photocopying equipment, cooking processes and equipment, and vehicle exhaust, are limited from the nominated area by either:

- Removing the source of pollutants; or
- Exhausting the pollutants directly to the outside.

A combination of methods can be used to demonstrate compliance.

11.3.4 Internal Noise Levels

One point is awarded where project teams demonstrate that internal ambient noise levels, in the nominated area, are no more than 5dB (A) above the “satisfactory” sound levels provided in Table 1 of AS/NZS 2107:2016.

The noise measurement and documentation must be provided by a qualified acoustic consultant in accordance with AS/NZS 2107:2016.

11.3.5 Acoustic Separation

One (1) point is awarded where the project addresses noise transmission in enclosed spaces within the nominated area. Enclosed space is defined as meeting rooms, private offices, classrooms, and any other similar space where it is expected that noise should not carry over from one space to the next. There are two methods for demonstrating compliance with this criterion:

- The partition between the spaces should be constructed to achieve a weighted sound reduction index (Rw) of:
    - At least 45; for all partitions which are fixed without a door and/or glazed partitions without a door.

- At least 35; for all partition types that contain a door.

- The sound insulation between enclosed spaces complies with $D_w + LA_{eq}T > 75$ where D_w is the weighted sound level difference measured between the two spaces and $LA_{eq}T$ is the indoor ambient noise level in the space adjacent to the enclosed space.

11.3.6 Minimum Lighting Comfort

To qualify for points under Lighting Comfort, project teams must demonstrate that all lights in the nominated area are flicker free and accurately address the perception of colour in the space. Flicker-free lighting refers to luminaires that have either:

- A minimum Class A1 & A2 ballast for all fluorescent lighting;
- Electronic ballasts for all High Density Discharge (HDI) lighting;
- Electronic drivers that feature 12-bit or greater resolution for all Light Emitting Diode (LED) lighting; or
- High frequency ballasts for all other lighting types.

11.3.7 General Illuminance and Glare Reduction

One (1) point is awarded where project teams can demonstrate that, for living spaces, kitchens, bathrooms and bedrooms, lighting levels comply with best practice guidelines and glare is eliminated in accordance with the following:

- The lighting design includes or permits general fixed lighting that provides good maintained illuminance values for the entire room; and
- The installed fittings all have a rated colour variation not exceeding 3 MacAdam Ellipses (decorative fittings being exempt).

11.3.8 Surface Illuminance

One (1) point is awarded where project teams can demonstrate that a combination of lighting and surfaces improve uniformity of lighting to give visual interest in the nominated area. For residential spaces, at least one (1) wall in each living space, kitchen and bedroom is to be provided with at least one (1) specific wall-washing or wall-mounted fitting.

11.3.9 Localised Lighting Control

One (1) point is awarded where project teams can demonstrate that for 95% of the nominated area, occupants have the ability to control the lighting levels in their immediate environment. This includes turning lights on and off and adjusting their light levels. For residential spaces, this credit can be achieved through the provision of sufficient power outlets for future task lights / lamps around the predicted furniture layouts used in the space. In addition, appropriate task lighting must be provided for kitchens, bathrooms and services areas.

11.3.10 Glare Reduction

To qualify for points in the Visual Comfort section, project teams must demonstrate that glare from sunlight through all viewing façades in the nominated area is reduced through a combination of blinds, screens, fixed devices, or other means.

11.3.11 Views

One (1) point is available where project teams can demonstrate that at least 60% of the nominated area has a clear line of sight to a high quality internal or external view. All floor areas within 8m from a compliant window, atrium, or view can be considered to meet this credit criterion.

11.3.12 Paints, Adhesives, Sealants and Carpets

One (1) point is available where at least 95% of all internally applied paints, adhesives, sealants and carpets meet stipulated 'Total VOC Limits' (TVOC), or, where no paints, adhesives, sealants or carpets are used in the building.

Maximum TVOC limits for paints, adhesives and sealants are detailed in the Table 3 below:

Table 3: Maximum TVOC Limits for Paints, Adhesives and Sealants

Product Category	**Max TVOC content in grams per litre (g/L) of ready to use product**
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

The products used must be certified under a recognised Product Certification Scheme (listed on the GBCA website http://new.gbca.org.au/product-certification-schemes/) or other recognised standards. The certificate must be current at the time of project registration or submission and list the relevant product name and model.

11.3.13 Engineered Wood Products

One point is available where at least 95% of all engineered wood products including: particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels meet stipulated formaldehyde limits or no new engineered wood products are used in the building.

All engineered wood products used in the building will meet the relevant limits specified in Table 4 as per the specified test protocol, or have product specific evidence that it contains no formaldehyde.

Table 4 Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	**Emission Limit/Unit of Measurement**
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr*
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m²hr (at 3 days)
ASTM D6007	≤0.12mg/m³**
ASTM E1333	≤0.12mg/m³***
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m²hr

*mg/m²hr may also be represented as mg/m²/hr.

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

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

11.3.14 Thermal Comfort

One (1) point is awarded where project teams demonstrate that, for the nominated area, a high degree of thermal comfort is provided. For residential spaces, this point is achieved through the achievement of an average NatHERS rating of 7 Stars or greater across the development.

11.4 Energy

Through the 'Energy' category, Green Star - Design & As-Built v1.2 aims to facilitate reductions in greenhouse gas emissions by facilitating efficient energy usage and encouraging the utilisation of energy generated by low-emission sources.

11.4.1 Greenhouse Gas Emissions – Conditional Requirement

Project teams must demonstrate that the operational greenhouse gas (GHG) emissions from the Proposed Building are less than those of the equivalent Benchmark Building.

The Benchmark Building represents a 10% improvement on the Reference Building. The Reference Building is a building which achieves minimal compliance with the NCC Section J DTS provisions.

11.4.2 Greenhouse Gas Emissions – Comparison to a Reference Building Pathway

Up to 20 points are available where it is demonstrated that there is a specified reduction in the predicted energy consumption and GHG emissions of the Proposed Building from the Benchmark Building.

Points are awarded based both on improvements to the building's façade, and on the project's predicted ability to reduce its energy consumption and emissions towards 'net zero'.

Prediction of the building performance against this benchmark is assessed using building performance modelling that assesses potential energy use for building services systems including:

- Mechanical Services
- Electrical Services
- Communications, AV and security systems
- Hydraulic Services
- Vertical Transportation Systems

The project will be targeting 10.4 points which correlates to a 20% reduction in energy consumption and 40% reduction in greenhouse gas emissions from the Benchmark Building.

11.4.3 Peak Electricity Demand Reduction – On-site Energy Generation

One (1) point is awarded where it is demonstrated that the use of on-site renewable energy or on-site generation sources reduces the peak electricity demand by at least 15%.

Peak electricity demand must be calculated in line with the below requirements:

- In accordance with AS/NZS 3000:2007 (or as subsequently amended);
- As the absolute design capacity of the system, after the application of diversity factors, but prior to the application of contingency factors as required for utility agreements (the value is likely to be about 30% less than that for the utility agreement); and
- To include all building end-use loads, except process loads, in the peak demand assessment.

For mixed-mode ventilated buildings, peak demand will be calculated in the mechanically ventilated mode. Overall the installation of more efficient systems and a rooftop solar array should allow this to be achieved.

11.5 Transport

Sustainable transport criteria aims to provide design and operational measures that reduce the carbon emissions arising from occupant travel to and from the project, when compared to a benchmark building. In addition it also promotes the health and fitness of commuters, and the increased liveability of the location.

11.5.1 Access by Public Transport

Up to three (3) points are awarded based on the accessibility of the site by public transport. The points score is determined by the GBCA's *Access by Public Transport Calculator*. Points are awarded based on the percentage of people within the Greater Capital City Statistical Area (GCCSA) that can access the site by public transport within 45 minutes during peak hour. Based on this calculation method, the Leichhardt location qualifies for all three points.

11.5.2 Reduced Car Parking Provision

Up to one (1) point is awarded where there is a reduction of car parking spaces for the proposed building, when compared to the maximum local planning allowance.

Where no carparks are provided, 1 point is awarded unless this has been enforced by planning requirements, where it becomes Not Applicable.

11.5.3 Low Emission Vehicle Infrastructure

One (1) point is awarded where parking spaces and/or dedicated infrastructure is provided to support the uptake of low-emission vehicles. To qualify, the low-emission vehicle infrastructure must meet one of the following:

- 15% of parking is dedicated to fuel-efficient vehicles, with a maximum of 5% motorcycle parking: or
- 5% of parking is dedicated to electric vehicles and charging infrastructure is provided to each space; or
- For the residential elements, dedicated car share spaces and vehicles are provided at the rate of 1 per 70 building occupants.

11.5.4 Active Transport Facilities

One (1) point is awarded where bicycle parking and associated facilities are provided to a proportion of the building's regular occupants and visitors. To qualify, residential developments with greater than 100 units must provide 79 secure bicycle parking spaces plus 1 secure bicycle parking space for every 2.5 units over 100.

11.5.5 Walkable Neighbourhoods

One (1) point is awarded where the project achieves a Walk Score of least 80, as determined by the website www.walkscore.com, using the 'street smart' method of calculation.

11.6 Water

11.6.1 Potable Water – Prescriptive Pathway

Up to 6 points out of 12 are available where it is demonstrated that the building's potable water consumption has been reduced through best practice water saving design features.

11.6.2 Sanitary Fixture Efficiency

One point is awarded where all fixtures are within one star of the WELS rating stated in Table 5.

Table 5: Nominated Fixture WELS Rating

Fixture / Equipment Type	WELS Rating
Taps	6 Star
Urinals	6 Star
Toilet	5 Star
Showers	3 Star (> 4.5 but <= 6.0)
Clothes Washing Machines	5 Star
Dishwashers	6 Star

11.6.3 Heat Rejection

Two (2) points are awarded where no water is used for heat rejection. To comply, the project must be either naturally ventilated (allowing for the use of ceiling fans or similar) or the HVAC system must not use water for heat rejection.

11.6.4 Landscape Irrigation

One (1) point is awarded where either drip irrigation with moisture sensor override is installed, or where no potable water is used for irrigation.

The landscaping and associated systems must be designed to reduce the consumption of potable water required for irrigation through the installation of subsoil drip irrigation and moisture sensor controls.

11.6.5 Fire System Test Water

One (1) point is awarded when one of the following conditions is met:

- The fire protection system does not expel water for testing; or
- The fire protection system includes temporary storage for 80% of the routine fire protection system test water and maintenance drain-downs for reuse on-site calculated on the basis that any single zone is drained down annually.

11.7 Materials

The aim of the materials credits is to reward projects that include building materials that are responsibly sourced or have a sustainable supply chain.

11.7.1 Lifecycle Assessment

Up to six (6) points are available where a whole-of-building, whole-of-life (cradle-to-grave) life cycle assessment (LCA) is conducted for the project and a reference building. Points are awarded based on the extent of environmental impact reduction achieved for nominated environmental impact categories, when compared to a reference building.

Up to four (4) additional points are available where the LCA is used to inform the building's design process or as built outcome. Any combination of the below four initiatives may be targeted:

- Additional life cycle impact reporting;
- Material selection improvement;
- Construction process improvement; or
- LCA Design Review.

Up to seven (7) points are available in this credit. Ten points are presented, however a maximum of seven points may be awarded. Project teams should select those initiatives most relevant to the sustainability outcome of their project.

11.7.2 Structural and Reinforcing Steel

One (1) point is awarded where project teams can demonstrate that 95% (by mass) of the building's steel is sourced from a Responsible Steel Maker, and:

- For steel framed buildings, at least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI); or
- For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processes in its manufacture.

Steel manufacturers can be considered a sustainable source when they currently have a valid ISO 14001 Environmental Management System in place, and they are a member of the World Steel Association's Climate Action Programme.

Steel Fabricators are considered sustainable if they can prove they are a current member of the ASI's Environmental Sustainability Charter Group.

11.7.3 Timber Products

One (1) point is awarded where project teams can demonstrate that, at least 95% (by cost) of all timber used in the building and construction works is either:

- Certified by a forest certification scheme that is deemed to satisfy the minimum requirements of the GBCA's 'Essential Criteria'; or
- From a reused source.

A combination of both initiatives may be used to achieve 95% compliance. This must be clearly demonstrated within the timber schedule in the Submission Template.

11.7.4 Permanent Formwork, Pipes, Flooring, Blinds and Cables

One point is available where 90% (by cost) of all cables, pipes, flooring and blinds in a project either:

- Do not contain PVC and have an Environmental Product Declaration (EPD); or
- Meet the GBCA's 'Best Practice Guidelines' for PVC.

11.7.5 Construction and Demolition Waste

One (1) point is awarded where the project team can demonstrate that at least 90% of the waste generated during construction and demolition has been diverted from landfill. Waste shall be reported in kilograms.

11.8 Land Use and Ecology

The Green Star - Design & As Built 'Land Use & Ecology' category aims to reduce the negative impacts on sites' ecological value as a result of urban development and reward projects that minimise harm and enhance the quality of local ecology.

11.8.1 Endangered, Threatened or Vulnerable Species and Communities

It is a minimum requirement of this credit that a check is carried out to ensure that the site does not contain 'critically endangered, endangered, or vulnerable species or ecological communities' as defined in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

11.8.2 Sustainable Sites - Conditional Requirement

To be eligible for points under the Sustainable Sites credit, all of the following conditions must be satisfied:

- The project is not on land containing old-growth forest.
- The project is not on prime agricultural land.
- The project does not impact on any wetland listed as being of 'High National Importance', unless specified Wetland Protection Measures are in place.
- The project does not have a significant impact on 'Matters of National Significance' listed under the Environmental Protection and Biodiversity Conservation Act (1999).

11.8.3 Reuse of Land

One (1) point is awarded where either of the following conditions is met:

- 75% of the site was 'previously developed land' at the date of site purchase; or
- The project is a building extension, and 75% of the extension (including landscaping) falls within an area of the site that was 'previously developed land' at the project's Green Star registration date.

11.8.4 Heat Island Effect

One (1) point is awarded where, when assessed in plan view, at least 75% of the whole site area comprises of one or a combination of the following:

- Vegetation;
- Green roofs;
- Roofing materials, including shading structures, having the following:
    - For roof pitched <15°– a three year SRI of minimum 64; or
    - For roof pitched >15°– a three year SRI of minimum 34.
- Only where the three year Solar Reflectance Index (SRI) for products is not available, use the following:
    - For roof pitched <15° – an initial SRI of minimum 82; or
    - For roof pitched >15° – an initial SRI of minimum 39.
- Unshaded hard-scaping elements with a three year SRI of minimum 34 or an initial SRI of minimum 39;

- Hardscaping elements shaded by overhanging vegetation or roof structures, including solar hot water panels and photovoltaic panels;
- Water bodies and/or water courses; or
- Areas directly to the south of vertical building elements, including green walls and areas shaded by these elements at the summer solstice.

11.9 Emissions

The Green Star - Design & As Built 'Emissions' category aims to assess the environmental impacts of 'point source' pollution generated by projects. Negative impacts commonly associated with buildings include damage to the environment through refrigerant leaks or disturbances to native animals and their migratory patterns as a result of light pollution.

11.9.1 Stormwater Peak Discharge

One (1) point is available where the post-development peak event discharge from the site does not exceed the pre-development peak event discharge using the design Average Recurrence Interval (ARI).

11.9.2 Stormwater Pollution Targets

One (1) point is available if the Reduced Peak Discharge criterion is achieved and if it can be demonstrated that all stormwater discharged from the site meets the pollution reduction targets in Table 8.

Table 6: Minimum Pollution Reduction Targets

Pollutant	Reduction Target (% of the Typical Urban Annual Load)
Total Suspended Solids (TSS)	80%
Gross Pollutants	85%
Total Nitrogen (TN)	30%
Total Phosphorus (TP)	30%
Total Petroleum Hydrocarbons	60%
Free Oils	90%

11.9.3 Light Pollution to Neighbouring Bodies

To qualify for points under this credit project teams must demonstrate that all outdoor lighting on the project complies with AS 4282:1997. The conditions shall be applied to all inhabited boundaries, apart from boundaries with roads.

11.9.4 Light Pollution to Night Sky

One point is awarded where it can be demonstrated that one of the following specified reductions in light pollution has been achieved by the project:

- Control of upward light output ratio (ULOR) by demonstrating that no external luminaire on the project has a ULOR that exceeds 5%, relative to its actual mounted orientation; or
- Control of direct luminance- demonstrate that direct illuminance from external luminaries on the project produces a maximum initial point illuminance value no greater than:
    - 0.5 Lux to the site boundary, and
    - 0.1 Lux to 4.5 meters beyond the site into the night sky.

11.9.5 Legionella Impacts from Cooling Systems

One (1) point is awarded where it can be demonstrated that impacts associated with harmful microbes in building cooling systems are minimised through one of the following:

- Naturally ventilated buildings; or
- Waterless heat-rejection systems.

11.10 Innovation

11.10.1 Market Transformation

This credit recognises projects that have undertaken sustainability initiatives that substantially contribute to the broader market transformation towards sustainable development in Australia or in the world. Points will be awarded for projects that:

- Increase the knowledge and capacity of the building industry.
- Increase the knowledge of sustainable practices in regional areas.
- Change the regulatory environment.
- Use technologies or strategies which, if adopted widely, would lead to a significant reduction of impacts in the built environment.

The projects implementation programs to support affordable housing will help to contribute to changes in the social sustainability practices of industry additionally through providing incentives to improve public transport participation the project will help to support changes in the way that residents approach travel.

11.10.2 Improving on Green Star Benchmarks

Points for this Innovation credit are awarded where the project can demonstrate a substantial improvement to a specific benchmark addressed by Green Star – Design & As-Built v1.2 which the project is already targeting.

11.10.2.1 Stormwater

Up to two (2) points are awarded where projects can demonstrate achieving the Pollution Reduction Targets from Table 9 when compared to untreated run-off.

Table 7: Pollution Reduction Targets - Improving on Green Star Benchmarks

Pollutant	Reduction Target (% of the Typical Urban Annual Load)
Total Suspended Solids (TSS)	90%
Gross Pollutants	95%
Total Nitrogen (TN)	60%
Total Phosphorus (TP)	70%
Total Petroleum Hydrocarbons	90%
Free Oils	98%

Through the investigation of utility sharing with Lambert Park in the surrounding area the project could achieve the above targets and help to contribute to a better water usage outcome for nearby recreational facilities.

11.10.3 Innovation Challenge

For this credit, projects must address an issue that is not included within the Green Star – Design & As-Built v1.2 rating tool. A range of Innovation Challenges have been developed by the GBCA to challenge owners, developers, tenants and project teams to create even more sustainable projects.

11.10.3.1 Financial Transparency

One (1) point is awarded where owners, developers and operators disclose the costs of sustainable building practices in order to promote uptake by future projects. The project team must:

- Agree to complete the 'Financial Transparency Disclosure Template' that comprehensively itemises design, construction, documentation and project costs.
- Provide this information in Excel format at the time of the projects Green Star submission.
- Agree to participate in the yearly GBCA report, using autotomized data provided by project teams.

Appendix 1 Green Star Scorecard and Responsibilities Matrix

11.10.4 Global Sustainability

11.10.4.1 Local Food Production

One (1) point is awarded where productive landscape is integrated within the landscape objectives for the project site in accordance with the below

11.10.4.1.1 Location of Productive Landscape

There must be access to some form of productive landscape, for example a Community Food Garden (see Guidance), within an 800m radius of all residential dwellings on the project site.

Compliance with this requirement may be achieved through access to or the provision of one or more community food gardens. Where compliance is being claimed through access to an existing community food garden it must be demonstrated that the existing garden has the capacity to accommodate the residential occupants of the project site.

11.10.4.1.2 Provision of Productive Landscape

The provision of productive landscape within the project site, combined with any existing eligible community food gardens, must result in no less than 100sqm of productive landscape being accessible, per 1000 residential occupants of the project.

In order to determine the amount of productive landscape that must be provided within the project site project teams must determine the amount of eligible existing productive landscape/ community food gardens that will be available to the residential occupants.

11.10.4.1.3 Governance and Management

The project team must be able to demonstrate that there is a governance and management structure in place, for the productive landscape(s) within the project site, which at least addresses the following issues:

a. How the productive landscape / community food garden will be managed and funded;
b. How the project occupants using the productive landscape / community food garden will be trained and educated; and
c. What facilities will be provided in the productive landscape / community food garden?

The project team can demonstrate compliance with these governance and management requirements by designing all productive landscape and community food gardens in accordance with the document 'Getting Started in Community Gardening' published by the City of Sydney. Submitting the checklist on pages 7 to 9 of the City of Sydney documents will demonstrate that questions about governance and management structure raised above have been addressed.

11.10.4.2 Beauty in Design – Public Art Strategy

This credit relates to the creation of a physical space in which integrates aesthetically pleasing elements into a space to help building occupants derive a measure of comfort or joy from their surroundings. The incorporation of design elements and artwork to a space can create a calming environment able to improve occupant mood.

The project contains features intended for all of the following:

a. Human delight.
b. Celebration of culture.
c. Celebration of spirit.
d. Celebration of place.
e. Meaningful integration of public art.

Under Green Star one point would be awarded through the incorporation of a public art scheme in line with this credit from the WELL Building Standard.

12. CONCLUSION

The new development at Lords Road, Leichhardt will incorporate a number of key initiatives to reduce the impact on the environment, and enhance the liveability of the precinct. Through the application of the credits detailed in section 10 the project will be also able to demonstrate its sustainability credentials through targeting a 5 Star Australian Excellence Green Star rating.

Future detailed design stages of the development will explore integrating core sustainability principles, and providing further detail to the projects implementation of best practice sustainability.