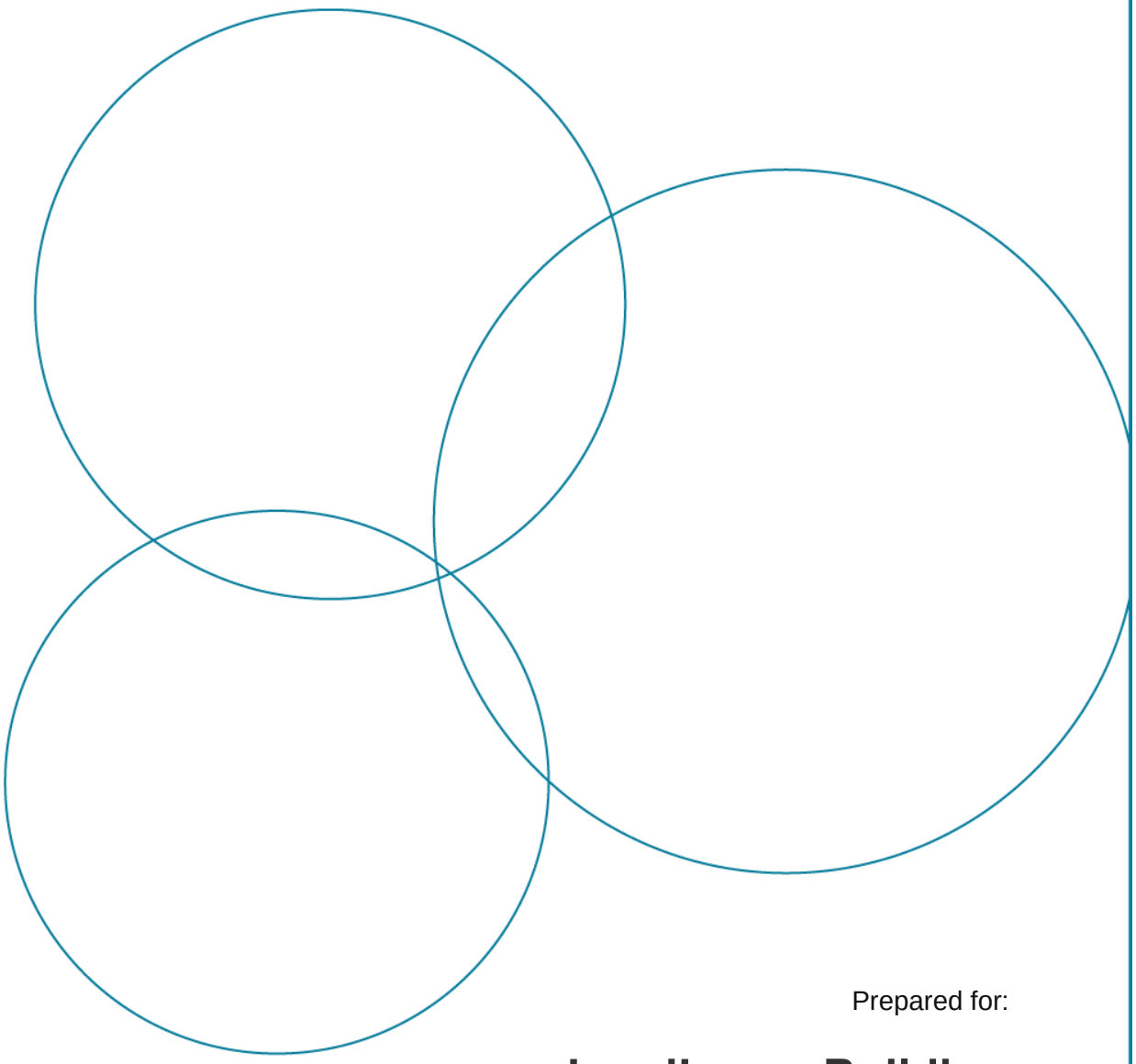
October 2015

Ecologically Sustainable Design Report

LendLease Circular Quay



Prepared for:

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Draft	Client issue	19/11/2013
A	For LLd issue	21/11/2013
B	Review for Development issue	25/11/2013
C	Final	29/11/2013
D	Minor Modifications	
E	Updated LLCQ Site details	16/10/2015

Contents

Executive Summary

This report has been prepared for LendLease Building P/L (LendLease) to outline the key Ecologically Sustainable Design (ESD) initiatives for the proposed LendLease Circular Quay (LLCQ) development located at located at 174-182 George Street and 33-35 Pitt Street, Sydney.

The LLCQ development site is generally located between George Street, Underwood Street, Pitt Street and Rugby Place and will encompass commercial office, retail and public open space.

LendLease Development Pty Limited is the Proponent.

The proposed LLCQ development is being designed to exceed minimum requirements in terms of Ecologically Sustainable Design (ESD), and will achieve the following green building ratings:

- 5 star Green Star – As Built Office (v3) rating; and
- a minimum 5 Star base building rating in operation under the NABERS Energy scheme,
- a minimum 4 Star base building rating in operation under the NABERS Water scheme,

In addition, the development will aspire towards a 6 star Green Star – Office (v3) rating. It is noted that a new version of the Green Star tool, “Design and As-Built” has been released since the initial publishing of this analysis and report, it is expected that any rating will be upgraded to the most recent version of the relevant rating tool.

The Green Star rating scheme awards an environmental performance rating based on a range of environmental indicators, including management, indoor environmental quality, energy, transport, water, ecology, materials and emissions to land, water and air.

NABERS is an operational based environmental assessment scheme which is utilised by industry to benchmark the environmental performance of buildings. NABERS in this project refers to the operational energy efficiency of the building.

In order to achieve these high level commitments, key strategies will be considered to cover a broad range of environmental performance criteria which may include:

- Energy conservation through initiatives such as high efficiency variable air volume air-conditioning, low energy lighting design and sophisticated building controls.
- A performance facade system to reject excess heat gains, and provide good daylight and minimal glare.
- Mains potable water conservation through high-efficiency fittings and fixtures, efficient cooling tower performance, and rainwater capture and storage for reuse.
- Provision of a high quality indoor environmental quality for occupants including a thermally comfortable environment with good air quality and low levels of indoor pollutants.
- Environmentally responsible material selection with the aim of reducing the embodied energy of materials through improved design and selection.
- Close proximity to a variety of different well serviced public transportation hubs to encourage building occupants to reduce their use of private vehicles.
- Provision of cyclist of pedestrian facilities including bicycle racks, lockers, showers and changing areas to facilitate zero carbon forms of transport.

- Activation of the ground plane with the adaptive reuse of buildings and new open space, thereby minimising the ecological impact of the development whilst aiding public use of the built environment.
- Provision of a building designed to provide a comfortable and healthy working environment with good levels of daylight, glare reduction, thermally comfortable air conditioning and a space with low levels indoor pollutants including volatile organic compounds and formaldehyde.

1 Introduction

This report outlines the key Ecologically Sustainable Design (ESD) initiatives for the proposed LLCQ development. LendLease is committed to achieving a high level of environmental performance as part of the proposal. The scope and systems described within this report cater for these performance requirements and will be further developed through the design development and detailed design phases.

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- 5 star Green Star – As Built Office (v3) rating; and
- a minimum 5 Star base building rating in operation under the NABERS Energy scheme,
- a minimum 4 Star base building rating in operation under the NABERS Water scheme,

In addition, the development will aspire towards a 6 star Green Star – Office (v3) rating. It is noted that a new version of the Green Star tool, "Design and As-Built" has been released since the initial publishing of this analysis and report, it is expected that any rating will be upgraded to the most recent version of the relevant rating tool.

The project is also required to comply with the Building Code of Australia Section J for Energy Efficiency.

This report has been developed in three key sections as noted below. Each section will focus on a key aspect of the ESD performance of the development and will provide an insight as to how these items will be addressed throughout the design process.

- Resource Consumption - this section of the report provides information into the methodologies to be investigated to ensure that energy, water and materials consumption is minimised throughout construction, operation and demolition.
- Creating Spaces for People - this section of the report outlines how the internal spaces will be optimised for occupant health, well being and comfort.
- Codes and Ratings - an outline of how the building will comply with relevant voluntary and mandatory codes and rating schemes will be outlined.

This assessment report has been prepared to respond to a commission with LendLease Building.

1.1 The LLCQ Site

Land to which the proposal relates:

Informal title	Address	Lot and DP	Ownership
The Pitt Street property	33-35 Pitt Street	Lot 7 DP 629694	LendLease (Circular Quay) P/L
The George Street Property	182 George Street	Lot 182 DP 606865	LendLease (Circular Quay) P/L
Jacksons on George	174-176A George Street	Lot 181 DP 606865	LendLease Development P/L

Informal title	Address	Lot and DP	Ownership
Mirvac Triangle	Part of 200 George Street development site	Lot 1 in DP 69466 and Lot 4 in DP 57434 The part of the above Lots to which the PP relates is referred to as Lot 2 in the draft plan of subdivision Nov 13, 2012 (Issue 7) contained in the executed VPA between the City of Sydney and Mirvac	Mirvac owns the land. Mirvac will transfer the new Lot 2 to the City of Sydney who will then transfer to LL in return for an equivalent area of completed public realm
Crane Lane including walkway (aerial bridge)	Crane Lane extending east from George St, then north to Rugby Place	Lot 1 and 2 in DP 880891. Lot 1 is in stratum above Lot 2.	City of Sydney
Rugby Club (Optional Site)	Rugby Place	Lot 180 DP 606866	Wanda 'One' Sydney P/L

1.2 LLCQ Proposal

The LLCQ development proposal contemplates:

- Demolition of existing commercial office buildings at both 182 George Street and 33-35 Pitt Street (and possible Rugby Club) including the removal and disposal of hazardous materials (where relevant).
- The retention and partial refurbishment of Jacksons on George,
- The retention and partial refurbishment of Rugby Club (optional site),
- Site preparatory works including (where relevant):
  - the erection of hoardings and overhead protection structures;
  - remediation of contamination;
  - undertaking of archaeological investigation and protection works; and
  - augmentation and diversion of existing infrastructure services.
- The erection of a commercial office tower up to 248m in height and up to circa 70,000 sq m of GFA.
- Delivery of new public realm consisting of a public plaza on George Street and new interconnecting laneway extensions between Underwood Street and Rugby Place.
- The construction of shared laneway and plaza retail for the purpose of activating the new public realm.
- Internal traffic amendments to Rugby Place.

2 Resource Consumption

Buildings consume considerable natural resources in their construction, operation and demolition. This section of the report will provide details as to the potential impacts caused by the building and how these impacts have been reduced when compared to typical buildings of this nature. The building will aim to reduce the total embodied energy and carbon considered in the construction and then aim to maximise the operational efficiency of the buildings services to provide and enhance tenant provisions for the minimum amount of energy and water. Furthermore, methods for maintaining operational efficiency over the life of the building will be investigated to ensure that the benefits are maximised over the life of the building.

2.1 Energy Reduction Strategies

A substantial part of Australia's employment and economic activity is centred on construction and occupation of commercial buildings such as offices, shops and restaurants. Commercial buildings are responsible for approximately 10 per cent of Australia's greenhouse gas emissions and those emissions have grown by 87 per cent between 1990 and 2006.

Improving the energy efficiency of commercial buildings has the potential to deliver savings on energy bills and building maintenance costs, happier and more productive workers and increased building value.

This section sets out possible strategies to reduce the buildings energy demand and greenhouse gas emissions.

2.1.1 Passive Design

Prior to the application of artificial air conditioning and lighting system, passive design elements will be considered to improve comfort and reduce the energy consumption.

Passive design initiatives include such items as:

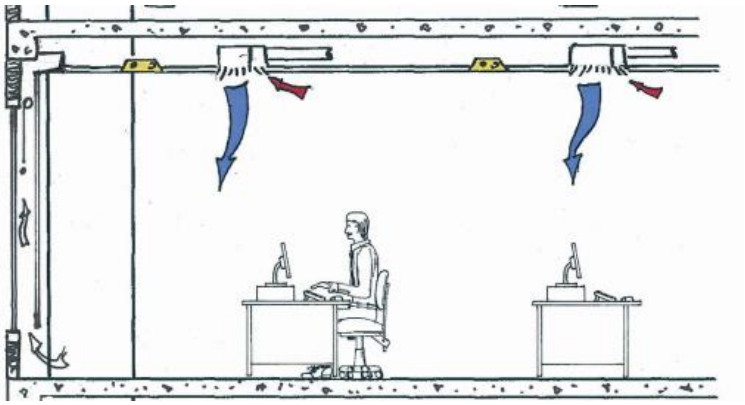
- Building orientation;
- Building location to take advantage of shading from adjacent buildings;
- Fixed external shading;
- Careful consideration of glazing to maximise day lighting and minimise heat loads;
- Building fabric insulation and thermal mass.

2.1.2 Air Conditioning Systems

The building air conditioning system will seek to incorporate high volumes of outside air to promote a healthy indoor environment whilst maintaining high levels of energy efficiency. This may be achieved by utilising a water, air based or hybrid system. A life cycle analysis will be used to inform the final system selection through the design development phase for the project.

A potential system may be a hybrid system combining a low temperature variable air volume (VAV) system in the centre zone and a water based system on the perimeter. A VAV system provides conditioned air through overhead supply ducts. The quantity of air is modulated to maintain comfort conditions in the space.

The primary benefit of a system of this type is the simplicity of the system whereby comfort is maintained in many zones which are operating differently.



The system could also incorporate CO_2 monitoring and control to modulate the amount of outside air based on the number of people in the space. In addition an economy cycle could be included utilising high levels of outside air when the ambient conditions are favourable rather than conditioning the air. This strategy is expected to reduce the annual heating and cooling loads in the Sydney region by up to 40%, saving significant energy and carbon emissions.

Each air handling unit could be provided with chilled and hot water from a central system. The chiller plant room may be located within the roof level plant room, and the central hot water and heat rejection plant to be located at roof level.

2.1.3 Lighting Systems

The proposed lighting systems will provide adequate illumination to allow building users to function whilst minimising the energy consumption. The buildings commercial, retail and car parks will be lit by efficient T5 fluorescent lamps or equivalent whilst all back of house spaces will be lit by efficient luminaires. In association with the efficient lighting controls system will be installed to ensure that minimal energy is wasted.

2.1.4 Vertical Transportation

Vertical transportation within the building will be split to service the high-rise, mid-rise and low-rise sections of the building separately, this will provide enhanced trip time reductions and will increase the efficiency of the vertical transportation systems. In addition to the inherent benefits of the lift planning and design the energy consumption of the vertical transportation systems will be reduced by using controls and efficient drives.

2.1.5 Ancillary Systems

All ancillary systems in the development are proposed to be controlled via smart controls to either switch-off or reduce the impact of ancillary lighting, pumping and ventilations systems. The controls will be based on demand (such as carbon monoxide in the car park) or occupancy (such as back of house areas).

2.1.6 Energy Monitoring and Metering

All major aspects of the building will have a real time energy monitoring system to enable the facilities management to investigate the buildings energy consumption in real time to provide enhanced building tuning and long term operational efficiency.

In addition the commercial and retail section of the building will be monitored to ensure all future sustainability rating tools can be applied.

2.2 Potable Water Reduction Strategies

Potable water use in commercial and retail buildings accounts for approximately 35% of all water used in Sydney's businesses. Reducing potable water consumption provides benefits such as, reduced utility bills and preservation of future water supply.

Organisations that adopt strategies to reduce water consumption also portray an image of innovation and awareness to both clients and staff. Incorporating pioneering initiatives often leads to improved communication, management and collaboration throughout an organisation.

This section sets out possible strategies to minimise potable water by building occupants and the operation of building services.

2.2.1 Amenities

Occupant consumption is a major contributor to potable water usage. The low flow fitting will be considered for toilets, urinals, taps and showers to ensure the efficient use of potable water by building occupants.

2.2.2 Fire Systems

Water from fire system testing procedures can be re-used within the building to offset water consumption. The fire sprinkler system is to be designed so that all test and drain down water is harvested to a storage tank in the basement. This could be a sectional water tank in combination with the rain water storage system. The test and drain down water is to be treated and re-used within the development for non-potable water services.

2.2.3 Water Metering and Leak Detection

A system that both monitors and manages water consumption is to be installed. Water metering will be provided to all major water uses within the building, with connections to the BMS ensuring immediate and effective monitoring of water consumption and leakages for simple rectification.

2.3 Building Materials Resource Minimisation

2.3.1 Sustainable Building Products

The following initiatives will be followed with regards to building products:

- Ecologically sensitive products, such as scarce minerals and old-growth forest, will be avoided;
- Preference will be given to materials with a high recycled content and preferred source, including:
    - Where timber is used, it will preferentially be sourced from reclaimed or certified sustainable growth stock. As a minimum, at least 95% of timber must be sourced from either re-used, post-consumer recycled, FSC or AFS certified timber.
    - A proportion of portland cement will be replaced with fly ash or other industrial waste products, and recycled aggregate will be used.
    - Wherever feasible, PVC and steel will be sourced from sources capable of achieving the Green Star applicable credits.

2.3.2 Embodied Carbon

Embodied carbon comprises a major proportion of the total carbon footprint of a building. The following items will be considered throughout the design development to reduce the carbon footprint:

- Sub-structure - Maximise recycled content of materials in structural components.
- Super-Structure - Maximise recycled content in concrete and formwork.
- Envelope - Adopt a lightweight approach to reduce mass and carbon content;
- Internal Walls – Minimise the use of internal walls and utilise lightweight walls with recycled content where possible.
- Internal Finishes - Consider recycled content for all finishes and minimise the use of natural heavyweight finishes.
- Services - Minimise high carbon intensity metals, extent of electrical cabling and ductwork, pipework and plant.

2.3.3 Emissions & Toxicity

The development will aim to specify materials with a low emissions content including low-VOC and low formaldehyde content, in order to avoid contaminating the indoor air.

Where alternative materials are available at comparable quality, performance and cost, materials with high toxicity in their manufacture, usage or disposal will be avoided.

2.3.4 Ozone Depleting Materials

Thermal insulation products which have a zero ozone depletion potential in their manufacture and composition will be preferred; this will reduce the impacts of insulation on the atmosphere.

Air conditioning refrigerants will be selected to have an ozone depletion potential of zero. Additionally the implementation of integrated refrigerant leak detection will be investigated to allow for early identification of leaks to avoid refrigerants leaking into the atmosphere.

2.3.5 Waste Management

A dedicated storage area will be provided for the separation and storage of recyclable waste during operation, allowing for waste streams to be separated.

Throughout project design, operation and construction, principles of resource recovery will be applied, so that materials and products are recovered and reused where possible, reducing landfill and saving money.

2.4 Transportation

Transportation to and from work, as well as travel within the working day has an environmental impact which is to be considered and minimised.

The development provides multiple opportunities to shift the mode of transportation for workers and visitors to more sustainable means. The proximity of the building to major public transportation/interchange hubs will encourage light rail, train, bus and ferry travel. In addition the provision of showers, lockers and bicycle racks will encourage cyclists, runners and walkers to travel by carbon neutral modes.

George Street is currently a major bus route, and the site is close to Circular Quay railway station. Existing transport interchange facilities are located at:

- Circular Quay
- Wynyard
- Martin Place

Major public transport projects are also proposed in the immediate proximity of the LLCQ development including:

- CBD and South East Light Rail along George Street with a station at Circular Quay
- CBD Rail Link (CBDRL) and the proposed Macquarie Place Station.

The proposed projects will further enhance opportunities to shift the mode of transportation for workers and visitors to more sustainable means

LLCQ's proximity to existing and proposed major public transport infrastructure will deliver on key transport initiatives outlined in NSW 2021 State Plan (Department of Premier and Cabinet), Sustainable Sydney 2030 (City of Sydney) and Sydney City Centre Access Strategy (Transport for NSW)

2.5 Adaptive Reuse

The LLCQ redevelopment scheme proposes adaptive reuse of the existing Jacksons on George Hotel and Rugby Club (optional site). It is proposed that the existing land uses will be retained within existing premises and adapted to respond to and activate the proposed surrounding public plaza and integrated lane way network.

These existing premises will help cultivate and activate a place commensurate with the visions described in Sustainable Sydney 2030 (City of Sydney) and AMP Circular Quay Precinct Master Plan Urban design Report (Hassell and AMP)

3 Creating Spaces for People

With the development aiming to create a working environment for approximately 3,500 office works it is essential that the building provides a comfortable and healthy environment for everyone. The development is investigating several initiatives to enhance the indoor environment through a multitude of different technologies and design features.

3.1 Daylight Improvement

Appropriate day lighting is essential for users' wellbeing and connection to the outdoors, and for energy efficiency. However excessive daylight can cause glare which is a major IEQ concerns and should be avoided. The building will be aiming to achieve good levels of daylight whilst minimising discomfort glare.

The following design opportunities will be considered throughout the detailed design process to maximise the daylighting potential:

- Glass selection: given the extent of proposed glazing, glass with a moderate VLT (0.4-0.6) should allow sufficient daylight to penetrate the space. Glass with a reflective coating will reduce glare.
- As part of any future fitouts, an open plan layout will allow deep daylight penetration. Limit enclosed spaces and high partitions (greater than one meter) near windows and open plan. Where possible glass partitions will be used in place of solid walls.
- Light internal colours improve daylight penetration.

3.2 Connection to the Outdoors

Whilst it is difficult to achieve connection to the outdoors in a multistorey building in a city there are significant health benefits associated with providing access to views. There is increasing evidence that suggests improved access to external views can reduce health problems associated with working inside a commercial office building. Symptoms including eye strain and headaches are attributed to extended periods of time spent reading paperwork or in front of computer monitors. To combat these problems, occupants are encouraged to refocus their vision periodically throughout the day to the outdoor environment. As such, it is recommended that new office developments provide occupants with access to external views to improve occupant health and well being.

3.3 Artificial Lighting

It is important that the right amount of light is delivered for building users to comfortably achieve their specific tasks. The spaces will be flexible and adaptable, and the lighting design must be too.

The artificial lighting system should deliver uniform light levels within individual spaces, be integrated with the daylight design, be energy efficient, and allow users a high degree of control.

3.4 Controlling Indoor Pollutants

The key indoor pollutants are carbon dioxide, formaldehyde and volatile organic compounds.

Carbon dioxide is the main indoor pollutants emitted by humans and correlates with human metabolic activity. Carbon dioxide at levels that are unusually high indoors may cause occupants to grow drowsy, get headaches, or function at lower activity levels.

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short and long term adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted by a wide array of products numbering in the thousands (typically paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers).

The design will investigate many items to improve the indoor air quality:

- CO_2 levels will be monitored and limited to 720ppm, at which point outside air levels will be increased.
- All materials installed in the building will be reviewed for formaldehyde and VOC emissions.
- Provide a dedicated general exhaust system for pollution-generating spaces to be used by future Fitout designs.

3.5 Thermal Comfort

People's perception and idea of thermal comfort varies significantly, targeting a predicted mean vote (PMV) between -0.5 and +0.5 based on ISO 7730 will help ensure the majority of people (90%) are neither too hot nor too cold. The following initiatives will be included in the building:

- Overhead fully variable supply air system with provides exceptional thermal comfort and can modulate to a number of zones.
- Facade design and glass selection is very important; heat gains and losses must be moderated and thermal bridging should be avoided.
- The facade should be well sealed to avoid draughts and air leakage.

3.6 Acoustics

The office will be designed to be neither too quiet nor too noisy so that a level of privacy can be maintained and users are not distracted from their tasks.

The development will aim for a design where:

- The sound level does not exceed 40dB(A)LAeq within open plan office spaces.
- Reverberation times (T60) no more than 0.8 and 0.6 are achieved for open plan offices.

3.7 Activated Public Realm

The public plaza and laneway network proposed as part of the LLCQ development scheme responds directly to the strategic objectives of the City's APDG Block

In 2008, CoS recognised that there were barriers imposed under the standard planning controls that prevented the floor space potential in some key City areas from being fully realised. In addition, the public amenity associated with buildings in these areas designed in accordance with the standard planning controls was considered to be highly compromised.

The first of these groups of sites was the APDG Block. A 2009 UD study contained four options for improving planning outcomes in the APDG Block. The preferred option was the 'internal square', because "it offered the most significant improvements to built form outcomes, opportunity for a new square with a connected, activated laneway network, and minimal lot amalgamation between land owners" (*Agenda Item 4, Central Sydney Planning Committee, 28 May 2009, at paragraph [13]*).

The study resulted in amendments being made to the then applicable Sydney LEP 2005 and DCP 1996. Further revisions to the APDG Block-specific LEP and DCP provisions occurred with the commencement of the SLEP and SDCP. These provisions operate as alternative development controls where additional height is only offered in exchange for public domain improvements.

Key benefits sought to be realised under the APDG Block planning controls are:

(a) a 'connected and active laneway network'; and

(b) larger and more appropriately located public areas.

The proposed LLCQ development achieves and improves upon the benefits envisaged by Council, as detailed in the Urban Design and Planning Justification Reports accompanying the planning proposal submission.

3.8 Interpretation and Public Art

Interpretation and Public Art proposed within LLCQ could reflect themes associated with the original Indigenous occupation of the land through to early European settlement, themes associated with the original landform and landscape including Tank Street and Sydney Harbour. A detailed Public Art Strategy is to be prepared and adopted by Council.

Interpretation and Public Art at LLCQ will respond appropriately to aspirations described in NSW 2021 State Plan (Department of Premier and Cabinet), Sustainable Sydney 2030 (City of Sydney) and the City's public art policy and strategy.

4 Codes and Ratings

The building will be subject to numerous voluntary and mandatory building codes and metrics to measure the performance of the rating. This section of the report will outline the main codes and ratings and identify the projects response.

4.1 Building Codes of Australia - Section J

The development is required to comply with the BCA Section J for Energy Efficiency. BCA Section J covers items including:

- Building fabric.
- External glazing.
- Building sealing.
- Air movement.
- Air conditioning.
- Artificial lighting and power.
- Hot water supply.
- Access to maintenance.

The building is being design with a high-performance facade and high-efficiency HVAC and electrical services. In order to take into account the complexities of the facade and building design, an alternative verification model will be undertaken during design development.

4.2 NABERS Energy and Water

The National Australian Building Environmental Rating Scheme (NABERS) is a suite of tools designed to allow for buildings of a similar type to be rated in terms of its operational sustainability. The NABERS suite includes energy, water, waste and indoor environment quality.

The NABERS Energy tool is a rating of the performance levels of a building in relation to CO_2 emissions per m² per year. Emission are normalised for Net Lettable Area, occupancy hours and location, and then used to calculate a star rating. Six stars is currently the highest available rating, and represents exceptional building energy performance.

The NABERS Water tool is a rating of the performance levels of a building in relation to total potable water consumption per year. Emission are normalised for Net Lettable Area, occupancy hours and location, and then used to calculate a star rating. Six stars is currently the highest available rating, and represents exceptional building energy performance.

What do the star ratings mean?

- **6 stars - Market leading performance -** You have achieved the highest possible rating. Your rating indicates you have combined superior equipment selection, operation and management to demonstrate your commitment to energy/water conservation.
- **5 stars - Excellent performance -** This rating represents outstanding performance in the current market and ranks the building in approximately the top 20%. Your building demonstrates strong performance, reflecting good equipment and management practices.

- **4 Stars - Above average performance -** This rating represents above average performance. Your building probably has some energy/water efficient equipment and management practices and reflects an awareness of the importance of conserving water. Some improvements may still be possible.
- **2.5 – 3 Stars - Average performance -** This rating represents average building performance. Your building possibly has some elements of energy/water efficiency in place. There is still scope for significant improvement, and changes will have a notable impact on this building's energy/water use.
- **2 Stars - Below average performance -** This rating represents below average building performance. Your building is unnecessarily wasting energy/water. Changes to water efficiency will have a significant impact on water usage.
- **1 Star - Poor performance -** This is a poor rating, indicative of poor energy/water management and/or outdated equipment. Your building is using a lot of unnecessary energy/water. There are changes that can be implemented to reduce energy/water consumption, reduce operating costs and reduce the burden on resources.
- **0 Stars - Very poor performance -** Your building has poor energy/water efficiency and lies outside the rating scale. It is very likely that energy/water is being wasted and there will be a range of simple improvements that could bring your water use within the rating scale. This will reduce your operating costs and reduce the burden on resources.

4.2.1 NABERS Energy Results

The energy simulation will be performed using NABERS profiles in accordance with "NABERS Energy Guide to Building Energy Estimation" and includes energy consumption attributed to the commercial space and the associated areas including car park and back of house areas.

Based on the size, location, expected operation and predicted energy consumption of the building the expected NABERS Energy base building rating is 5.0 stars. A 5.0 star performance is equivalent to market leading performance in the Australian market. Further analysis will be performed on the HVAC and trigeneration system design to reduce the installed plant capacity and further improve associated energy consumption.

4.2.2 NABERS Water Results

Based on the predicted water consumption of the commercial areas of the building and the associated rainwater and reuse the expected NABERS Water rating is 3.0 stars. A 3 star performance is equivalent to average in the Australian market. A higher NABERS Water rating would be possible however a preference for lower energy consumption and quality indoor environment has been included. Further analysis will be performed on the water consuming systems to further reduce the potable water demand.

4.3 Green Star

The proposed development is committed to achieving a 5 star Green Star v3 rating for design, which is considered 'Australian Excellence'.

Green Star is a comprehensive sustainability design tool which assesses the environmental impact of a building over a range of environmental indicators, from management and ecology to energy and water use, material selection and waste production. Categories are weighted according to their perceived environmental importance, which varies between building sectors and across States.

Points are awarded in the following categories:

- Management
- Indoor Environmental Quality
- Energy Conservation
- Transport
- Water Conservation
- Ecology
- Materials
- Emissions
- Innovation

A 5 star Green Star rating requires a total of 60 weighted credit points to be achieved in the aforementioned categories.

It is noted that a new version of the Green Star tool, “Design and As-Built” has been released since the initial publishing of this analysis and report, it is expected that any rating will be upgraded to the most recent version of the relevant rating tool.

A preliminary Green Star assessment has been undertaken and with the project yet to undergo design development and detailed design, it is expected the points targeted may vary from that shown below.

Sufficient weighted credits have been targeted to achieve this rating, with additional points identified for further development during the detailed design stage. Based on the proposed design response the predicted performance in each respective environmental category is graphically depicted in the figure below.

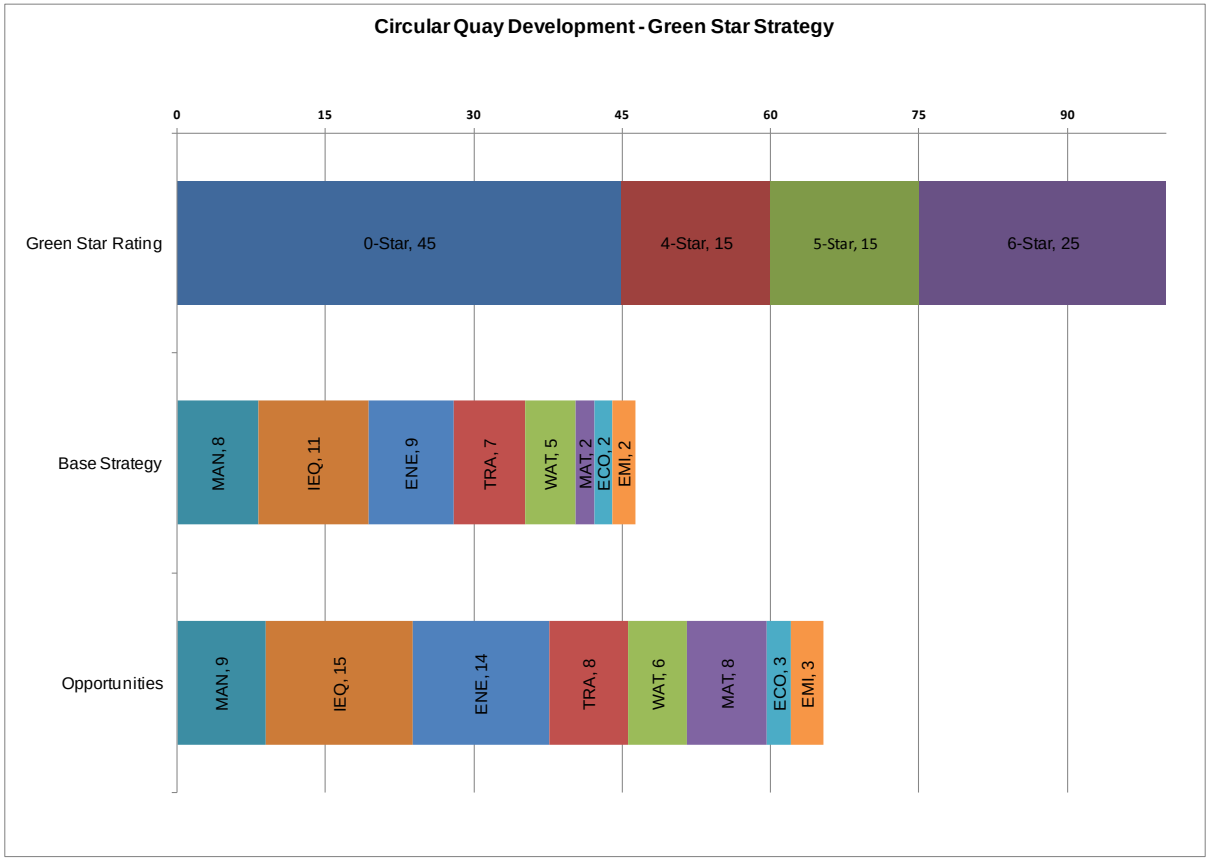


Figure 1: Green Star total points targeted

The table above shows a preliminary target of 65 points for the development which does not include the potential additional points awarded for innovative solutions. A minimum overall weighted score of 60 points is necessary to achieve 5 stars.

Although some points may vary during the detailed design process, a minimum 5 Green Star Office rating will be targeted. A schedule of the currently targeted credits are shown below:

Management

- A Green Star Accredit Professional will be involved to guide the process.
- The building finalisation will include a detailed commissioing and tuning process led by an Independant Commissioning Agent.
- The development will be developed with an ISO14001 Environmental Management System and aim to recycle over 80% of construction waste.
- A building users guide will be developed to teach the occupants about the efficient operation of the building.

Indoor Environment Quality

- Additional fresh air will be provided to enhance user comfort and health. The total air supply system will be controlled to ensure the air is mixed to benefit all occupants with even further levels of fresh air being provided by the use of a CO_2 monitoring and control system.
- Daylight will be promoted into the space with appropriate facade design. Discomfort glare will be reduced via the use of operable blinds. The facade will be designed to maximise the external views to aid occupant visual comfort.
- Articifical lighting will be designed to maintain a uniform lighting level which will incorporate high frequency electronic ballasts to reduce flicker.
- Potentially harmful materials like formaldehyde and VOCs will be minimised through the selection of appropriate materials.
- Internal noise levels will be minimised by the selection of appropriate building materials and installation of services.
- A dedicate tenant exhaust riser will be provided to encourage tenants to exhaust pollution caused by photocopying and printing facilities.

Energy

- Energy saving strategies will be incorporated into the facade design, mechanical and electrical systems to achieve high energy efficiency.
- Electrical systems will include sub-meters and a monitoring system to encourage efficient operation into the future.
- Lighting energy will be minimised through the use of small and flexible lighting zones and efficient fixtures and fittings.

Transport

- The building has be positioned to benefit from the multiple transportation hubs in the area.
- Car parking quantities will be reduced and benefits for low emissions vehicles will be provided.
- Cyclist facilities such as bike racks, lockers and showers will be provided to encourage zero emissions transportation options.

Water

- Potable water consumption will be minimised through the selection of low flow fittings.
- Fire systems will capture the test water for reuse.
- Landscaping will utilise rain water for any irrigation.

Materials

- Provisions will be provided for to encourage recycling of operation waste.
- Concrete and steel will be selected for high recycled content, greatly impacting the carbon footprint of the development.
- Timber will be selected to be from sustainable sources.
- PVC will be avoided where possible and from suitable sources where it must be used.
- The buildings facade will be designed for disassembly.

Land Use and Ecology

- The building will be located on site which was already built on, reducing the ecological impact.

Emissions

- Refrigerant emissions for air conditioning plant will be selected to minimise the ozone depletion potential and a monitoring system will be installed to detect leaks.
- Stormwater and waste water will be minimised and appropriately treated.
- External lighting will be designed to minimise light pollution.
- Thermal insulation will be selected to minimise the ozone depletion potential.

Throughout the project, appropriate documentation will be collected to demonstrate that the chosen sustainability initiatives are incorporated into the design of the building.

5 Conclusion

The proposed LLCQ development is being designed to exceed minimum requirements in terms of Ecologically Sustainable Design (ESD), and will achieve the following green building ratings:

- 5 star Green Star – As Built Office (v3) rating; and
- a minimum 5 Star base building rating in operation under the NABERS Energy scheme,
- a minimum 4 Star base building rating in operation under the NABERS Water scheme,

In addition, the development will aspire towards a 6 star Green Star – Office (v3) rating.

Our conclusion is that the project presented in the proposed LLCQ development can be designed and constructed utilising industry standard and proven design and construction techniques to achieve and exceed the 5 star ratings described above.

These sustainability features address the key environmental issues for developments, including:

- Resource Consumption - energy, water and materials consumption is to be minimised throughout construction, operation and demolition.
- Creating Spaces for People - internal spaces will be optimised for occupant health, well being and comfort.
- Codes and Ratings - the building will comply with relevant voluntary and mandatory codes and rating schemes.