

SUSTAINABILITY STATEMENT AND SOLAR ARRAY REPORT

Prepared for Karimbla Construction Services (NSW) Pty Ltd

To be built at 167 Northumberland Street, Liverpool NSW 2170

Issue	File Ref.	Description	Author	Date
A	Po00020744-1	Sustainability Statement and Solar array Design	TC	4 March 2021
B	Po00020744-1	Revised development description and new plan set	TC	10 May 2021



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1 Introduction

Efficient Living has been engaged to prepare an Ecologically Sustainable Design (ESD) Report to accompany a Development Application (DA) for a mixed use redevelopment of 167 Northumberland Street, Liverpool.

The Concept is the vision of PTW Architects and will be constructed by Karimbla Construction Services.

Liverpool City Council has re-zoned the City Centre to allow a modern, vibrant, 18-hour economy to flourish and reinvigorate the CBD uses. The city is well positioned near Western Sydney Airport making it the ideal location for Sydney's third CBD.

The Development proposal is within Liverpool City Councils 'City Centre' and is zoned B4 – Mixed use.

Objectives of the B4 zone include;

- To provide a mixture of compatible land uses.
- To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling.
- To allow for residential and other accommodation in the Liverpool city centre, while maintaining active retail, business or other non-residential uses at street level.
- To facilitate a high standard of urban design, convenient urban living and exceptional public amenity.

The Concept Development application is required to demonstrate objectives and controls outlined within the following Development Control Plan (DCP):

- Liverpool Development Control Plan (2008):
- Development in Liverpool City Centre, Part 4. Rev 17 April 2019.
- Development in Business Areas, Part 6. Rev 25 July 2014.

The purpose of this report is to ensure compliance with; **Section 5. Environmental Management**

This section discusses energy efficiency requirements of buildings, water use and conservation, wind, noise and solar impacts and waste management.

To satisfy the aims and zoning objectives of the Liverpool LEP 2008, controls in this section aim to:

- Facilitate the development of building design excellence appropriate to a regional city.
- Ensure environmental impacts of new development are managed in a sustainable and economical way.
- Provide an adequate and renewable supply of resources.
- Ensure application, where appropriate, of the BASIX or Australian Greenhouse Ratings (AGR) certification systems.

The following table outlines the ESD controls within the applicable DCP's and demonstrates compliance with the environmental controls outlined below.

Section 5.1. Energy Efficiency and Conservation Controls	Design Response
Residential New dwellings, including dwellings within a mixed use building and serviced apartments intended or capable of being strata titled, are to demonstrate compliance with State Environmental Planning Policy – Building Sustainability Index (BASIX). A complying BASIX report needs to be submitted.	Not applicable – Serviced apartments will not be strata subdivided individually.
Non-Residential All Class 5 to 9 non-residential development is to comply with the Building Code of Australia energy efficiency provisions.	All class 3 dwellings, retail, office, childcare and air-conditioned entry lobbies will be subject to assessment against NCC Section J 2019. NCC Section J 2016 JV3 Alternate Solution Assessment, Issue A dated 29/04/2020 was submitted with application.
Improve the control of mechanical space heating and cooling by designing heating/cooling systems to target only those spaces which require heating or cooling, not the whole building.	All un-habitable and circulation spaces (entry lobby excluded) will be provided with a supply air source only.
Improve the efficiency of hot water systems by: <ul style="list-style-type: none"> - insulating hot water systems and associated plumbing, and - installing water saving devices, such as flow regulators, 3 star rated shower heads, dual flush toilets and tap aerators. 	Project inclusions; 4 star taps and toilets, mid-flow showers. A minimum of R1.0 insulation to all hot water pipes.
Reduce reliance on artificial lighting, and design lighting systems to target only those spaces that require lighting at any particular 'off-peak' time, not the whole building.	Inclusions; Energy controlling key cards to apartments, day light sensors, motion sensors and zoned switching to reduce lighting power.
Provide an Energy Efficiency Report from a suitably qualified consultant to accompany any development application for new commercial office development. The report is to demonstrate that the building can achieve no less than 4 stars under the Australian Building Greenhouse Rating Scheme.	Australian Building Greenhouse Rating Scheme refers to the performance of Offices. There are commercial offices spaces located on levels 1 & 2. These will be occupied by others and will be subject to a tenancy fitout application.
Section 5.2. Water Conservation Controls	Design Response
Residential New dwellings, including dwellings within a mixed use building and serviced apartments intended or capable of being strata titled, are to demonstrate compliance with State Environmental Planning Policy – Building Sustainability Index (BASIX).	This is not a BASIX applicable building but as detailed in this report water savings initiatives area proposed that will exceed the BASIX 40% water savings target.

Non-Residential A comprehensive Water Management Plan is to be submitted with all non-residential development to address the following criteria;	Suitable water savings strategies listed in this report.
Install water fixtures (shower heads, taps, toilets, urinals, etc.) with minimum WELS 3 Star performance.	Water fixtures and fittings will exceed this requirement. Ratings will be as listed in the body of this report.
Install appliances (dishwashers, clothes washers etc.) with minimum WELS 3 Star rating with respect to water use efficiency. Demonstrate, if necessary, how these requirements will be achieved for replacement appliances, appliances not installed at construction, or bought in by occupants following construction.	Dishwashers and clothes washers with 3 stars or greater will be installed in all base building areas and apartments. Minimum performance ratings will be a contract obligation for future owners and tenants of any commercial spaces.
Stormwater runoff control, capture and reuse, including water quality management in accordance with Council guidelines.	Yes, see civil report.
Select water efficient plants and/or, indigenous vegetation for landscape in accordance with Council's recommendations.	The podium planting is subject to the day care centres development application.
Use non-potable water for watering gardens and landscape features.	No landscaped area outside of the day care centre.
For development of more than \$1 million construction cost, separate pipe-work for the utilisation of recycled stormwater for non-potable purposes should be considered.	Clause 11 prevents stormwater reuse outside of a landscape capacity. The only landscaping is in the child care courtyards which represents an OH&S risk. As such recycled stormwater reuse is not proposed.
Operating details for swimming pools and water features including filling, draining and maintenance activities. Pool covers are to be included in the design and operational aspects of swimming pool installations.	Pool cover to be provided. Operational manuals to be developed prior to issue of an Occupation Certificate.
Alternatives to the above water savings methods can be presented to Council and they will be assessed on merit.	The above inclusions will exceed the BASIX 40% water savings target.

Any development that contains a rainwater tank is to satisfy the following criteria:

- rain water is to be sourced only from roof structures via a tank storage system. The tank capacity, or combined tank capacity, is to be minimum 5,000L (10,000L preferred),
- tanks may be connected to toilets and garden/outdoor taps (the common tanks in residential flat buildings are to be connected to common outdoor taps only),
- tanks may be connected to laundry taps with suitable filters,
- the system is to be fitted with an effective first flush device for removing roof surface contamination,
- tanks are to be connected to main water to top them up during times of low rainfall with supplemental inflow not taking place until the tank is 80% empty.

This development application does not have any onsite landscaped areas. As such a rain water tank is not proposed.

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1.2.1 Aim of Report

This report identifies the design initiatives that reduce the environmental impact of 167 Northumberland Street, Liverpool in line with the applicable DCP.

2 Building Description

2.1 Development consent is sought for a new mixed use development.



Construction of a 32 storey building comprising a 4 storey podium and 28 storey tower;

Gross Floor Area (GFA) of 15,650m² (FSR 10:1) comprising:

- 12,078m² (163 unit) serviced apartments,
- 2,319sqm commercial,
- 442sqm indoor recreation;
- 282sqm retail; and
- 1,087m² of childcare centre (528sqm internal, 559sqm external GFA)

94 vehicle spaces within three basement levels; Vehicular access from Laurantus Service way; and

Public domain works.

NCC Climate Zone

The proposal is located within NCC Climate Zone 6.

Building Classes

- Class 3: Serviced Apartments and Lobbies
- Class 9b: Pool and Childcare
- Class 5: Commercial Spaces
- Class 6: Ground floor retail
- Class 7a: Carpark

Note: The day care centre, retail and commercial tenancies will be delivered cold shell and fit out will be the responsibilities of future occupants. As such this ESD report focuses on the buildings external shell, serviced apartment and common areas.

3 Energy

3.1 Façade

Thermal comfort modelling has been carried out in Design Builder software. The simulation exercise allows the façade performance to be optimised. Below are the minimum glazing and insulation performance requirements.

Proposed Building Glazing Performance Requirements

Level	Orientation	Maximum Total System U-Value	Maximum Total System SHGC
All levels	All	4.50	0.30

Proposed window values (Frame & Glass)

Roof Light Performance Requirements

Fabric Element	Location	Maximum Total System U-Value	Maximum Total System SHGC	Skylight shaft Insulation
Roof Light	Pool	3.40	0.34	R2.80

Proposed Building Fabric Performance Requirements

Fabric Element	Required Total System R-Value	Notes
External Walls	R2.80	See body of the report
Internal Walls	R1.80	See body of the report
External Floors	Nil	External floor insulations have been removed in the JV3 modelling
Roofs	R3.20	Solar absorbance (Default)
Floors to Unconditioned Spaces	Nil	Floors/ceilings insulations have been removed in the JV3 modelling

3.2 Passive Design Principles

This site faces East/West to the street and service lane at the rear. The building envelope situates the tower 12m back from the northern boundary. This allows a 24m separation from the neighbouring building to the north. The slender design of the tower minimises the overshadowing. Reducing the size of the floor plate and increasing the building height allows each apartment greater access to the building façade, increasing solar access and daylight.

Aspects of passive design implemented in the design include;

- Heavy thermal mass walls, floors and ceilings reducing peak loads;
- Use of insulated colour backed glass to reduce the amount of vision glazing;
- Covered balconies to all dwellings;
- The majority of dwellings have façade access to multiple orientations, improving cross ventilation;
- Vertical shading fins featured throughout;
- Vertical external shading screens in select locations;
- Extensive use of horizontal shading hoods;
- Deep overhangs to the childcare glazing;
- Awnings over the Northumberland street retail façade and class 3 entry lobby;
- High levels insulation and window performance throughout the entire external envelope.

Due to the above, passive design initiatives there will a reduced need for mechanical heating and cooling.

3.4 Air Conditioning

Air conditioning systems represent one of the highest single energy users in serviced apartments.

Efficient VRF systems will be selected and are centrally located. VRF systems will be integrated with heat recovery technology, allowing further efficiencies to be realised.

A BMS will ensure all components are operating at their optimum efficiency, raising alarms if there are any equipment items operating outside of their typical parameters.

Serviced Apartments will be equipped with HVAC interlock. A key card system will be implemented disabling lighting and HVAC when rooms are unoccupied.

3.5 Lighting

Lighting can use over 20% of a buildings electricity consumption, therefore efficient luminaires and lighting control systems are critical in order to optimise a buildings energy efficiency. The following measures are being implemented in design:

- LED lighting incorporated throughout development;
- Daylight control, motion sensors and zoned switching.

NCC lighting calculations indicate Meriton's selected light fittings and layouts will use considerably less watts / per / m² than the maximum allowable amount in the relevant building codes.

3.6 Appliances

Below is the minimum level of energy efficiency targeted for each appliance in the development;

Serviced Apartments	Energy Star Rating
Dishwashers	3.5 Stars
Clothes washing machines	3.5 Stars
Clothes Dryers	2 Stars
Air-conditioners	EER / COP of 4.4 +
Fridges	3.5 Stars
Common areas	
Mechanical ventilation to car park	Variable Speed Drive and carbon monoxide monitor
Hot water heating	Gas central system with minimum R1.0 insulation to ring main
Pool heating	Electric heat pump
Pool cover	Yes

3.7 Pool and Spa Heating

There is a pool and spa located indoors on level 2. The eastern façade features double height glazing to maximise natural light. An expansive void runs the length of the pool area with feature skylights.

These facilities will include a pool and spa cover in line with Liverpool Council DCP and NCC Section J. The pool will also have a highly efficient electric heat pump heating system.

3.8 Energy Metering

The building will have energy metering facilities to allow the building manager to monitor and optimise the buildings energy use. The facilities will individually record the energy consumption of the air-conditioning, lighting, appliance power, central hot water supply and the lifts.

3.8 NABERS

Liverpool City Council DCP requires a 4 star energy efficiency rating under the Australian Building Greenhouse Rating Scheme (ABGRS). ABGRS is also known as NABERS Office Energy.

There are substantial areas allocated to commercial office space on levels 1 and 2. Meriton will be responsible for the façade performance ensuring glazing and insulation levels are suitable to support NABERS aspirations. The fit out of this space will be the responsibility of the future tenants. Once the final mechanical specifications and occupancy use is known NABERS calculations can be done to ensure a 4 star performance level. This will be subject to a separate development application for the tenancy fit out.

3.9 Renewables

Solar Energy

A renewable energy feasibility study has been carried out and 4 locations have been identified to accommodate a 50 – 60 panel Photovoltaic installation.

The energy generated from these solar systems will be used to reduce the common area lighting, ventilation and lift power.

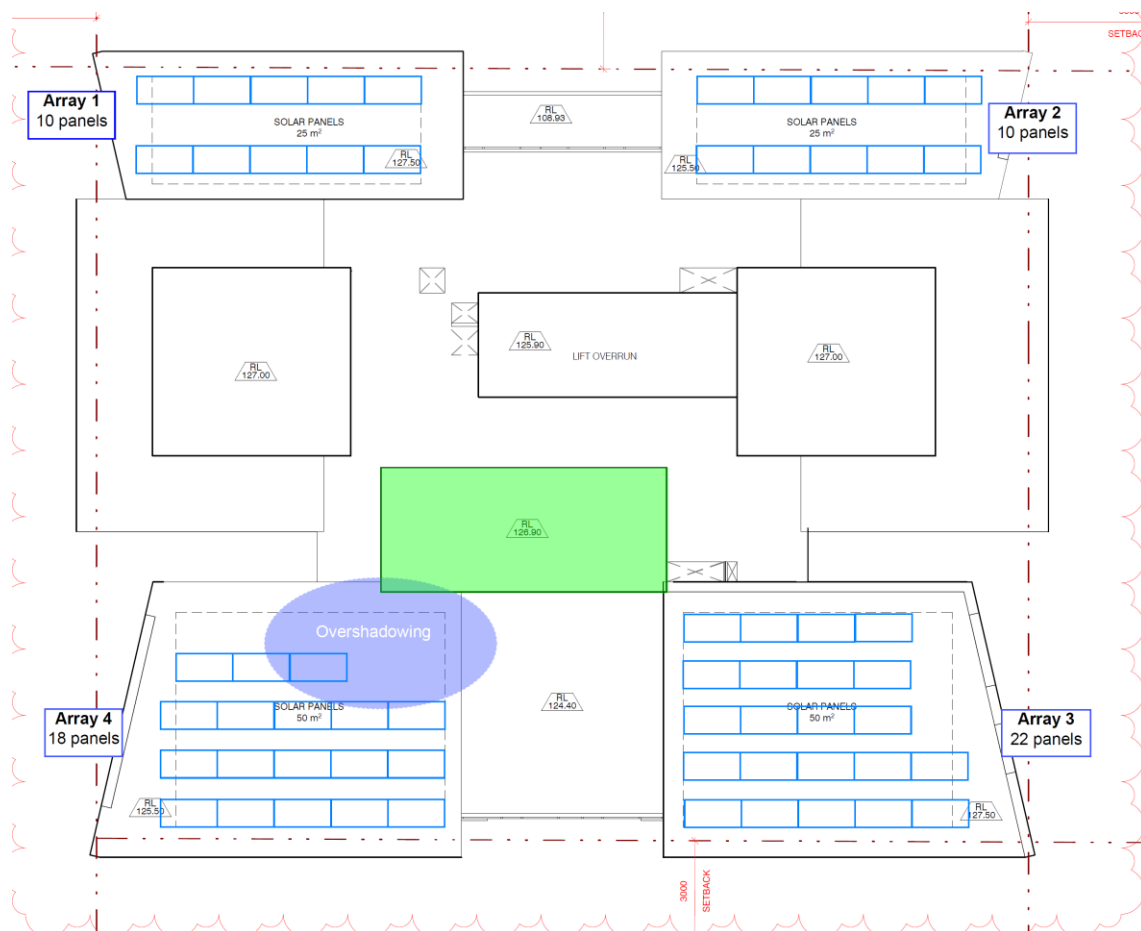
This will represent a substantial savings on mains electricity.



Preliminary analysis of the roof areas of the building indicates feasible installation of the PV system in 4 arrays of 10-20 panels. The buildings flat roof and orientations allow for north facing tilted arrays which provide ideal conditions for such a system. The PV panels can be installed on the flat roof podiums using 10-15 degree mounting systems to increase the total number of panels that can be used and reduce the spacing needed between rows. While a 31 degree tilt angle is optimal in Sydney it requires a large gap between rows to prevent self-shading, the 10-15 degree mounting angle will only result in minimal production loss of around 5% but will allow more panels to be installed.

The 10-15 degree tilting angle also allows for rain to clean the panels reducing efficiency losses from dust and dirt accumulation, this further reduces the need for maintenance of the arrays.

The location chosen for the 4 arrays are seen in the figure below. The 4 locations allow for minimal or no overshadowing from surrounding structures. Arrays 1 and 2 have no obstructions to the north, array 3 is located on the south east corner with some structures to the north / west, however, the roof podium the array is situated on is higher than surrounding podiums preventing overshadowing on the panels. Array 4 is slightly overshadowed by the fire stairs marked in green and as such the array is shifted away from the areas which are shaded.



Based on the roof area and array tilt angle and spacing requirement it is estimated that 50-60 panels can be installed. This corresponds to a total system rating of 16kW-21kW depending on the panel rating (typical panels have ratings between 270-360 Watts).

Preliminary production of such a system is presented in the table below based on a 16.2kW sized system at 15-degree tilt angle.

PVWatts: Monthly PV Performance Data

Weather data:	MASCOT-SYDNEY AIRPORT, AUSTRALIA
Lat (deg S):	33.93
Long (deg E):	151.17
DC System Size (kW):	16.2
Module Type:	Standard (Approximate Nominal Efficiency 15%)
Array Type:	Fixed (open rack)
Array Tilt (deg):	15
Array Azimuth (deg):	352
System Losses:	16.73
Invert Efficiency:	96
DC to AC Size Ratio:	1.2
Capacity Factor (%)	15.1

Month	AC System Output(kWh)	Solar Radiation (kWh/m ² /day)	Plane of Array Irradiance (W/m ²)	DC array Output (kWh)
1	2293.09	6.24	193.46	2397.61
2	1957.149	5.91	165.64	2046.96
3	1732.83	4.68	145.11	1813.46
4	1534.977	4.19	125.73	1604.97
5	1173.782	3.07	95.35	1232.40
6	1177.904	3.14	94.40	1233.9
7	1264.971	3.26	101.11	1325.04
8	1557.092	4.04	125.26	1628.33
9	1932.988	5.24	157.22	2019.48
10	2246.888	5.98	185.38	2346.65
11	2223.037	6.15	184.53	2324.40
12	2352.85	6.29	195.14	2461.39
Total	21447.56	58.22	1768.38	22434.64

4 Indoor Environmental Quality

4.1 Air Quality

The following measures will improve internal air quality:

- Paints will contain low VOC levels.
- Openable doors to highly shaded balconies, which can be opened at favourable times throughout the year provide a well ventilated internal living environment.
- All exhaust fans to wet areas and the kitchen range hood will be externally ducted to the façade.

4.2 Daylight

The following measures will be implemented to improve internal daylight levels:

- Light internal colour schemes to maximise daylight penetration;
- Glass selection with optimised Visual Light Transmittance (VLT).
- Large window sizes have been maintained to maximise natural light and give the occupants a greater sense of space and connection to the outside world. Meriton choose to invest in high performance glazing to meet the thermal comfort obligations and still maintain large windows that promote a greater sense of wellbeing and opulence.

4.3 Noise

An assessment of the projects acoustic requirements will be carried out for the development in accordance with Australian Standard AS2107:2016, considering external noise intrusion, noise separation between spaces, as well as noise from building services.

A good level of acoustic amenity will be embedded in design in order to ensure a comfortable internal environment, reducing negative impacts associated with noise pollution.

5 Water

Liverpool council DCP places a high priority on recycled water reuse for garden watering. Due to the infill nature of this site, however, there is very little landscaped area. The only place suitable for outdoor taps with recycled water are in the day care centre which represent OH&S issues.

Water savings will be managed in the specification of efficient fixtures, fittings and white goods. These water saving initiatives reduce the pressure on the local infrastructure and protect the development from future water shortages resulting from climate change.

5.1 Fixtures and Fittings

Below is the minimum level of energy efficiency targeted for each appliance in the development;

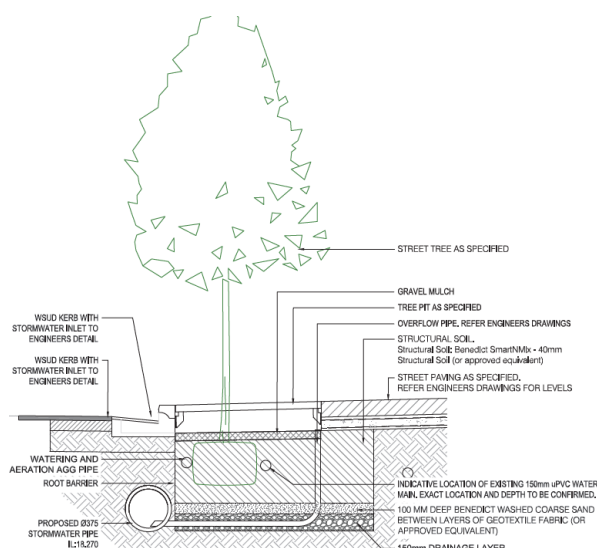
Fixture Type	WELS Rating
Taps	4 stars
Urinals	4 stars
Toilet	4 stars
Shower	6L - 7.5L/min
Dishwashers	3.5 stars
Clothes washers	3.5 stars

5.2 Stormwater Management

An on-site detention (OSD) tank strategy will be developed in accordance with local council requirements. The OSD tanks will incorporate flow control measures to ensure peak flows generated under proposed conditions do not exceed flows generated under pre-developed conditions, in accordance with Sydney Water's requirements.

Overflows from hardscaped areas will be filtered and temporarily detained in OSD systems before slowly releasing back to community storm water systems.

It is considered that storm water runoff is to be treated using appropriate devices and filtration systems to improve storm water quality.



TECHNICAL DETAIL

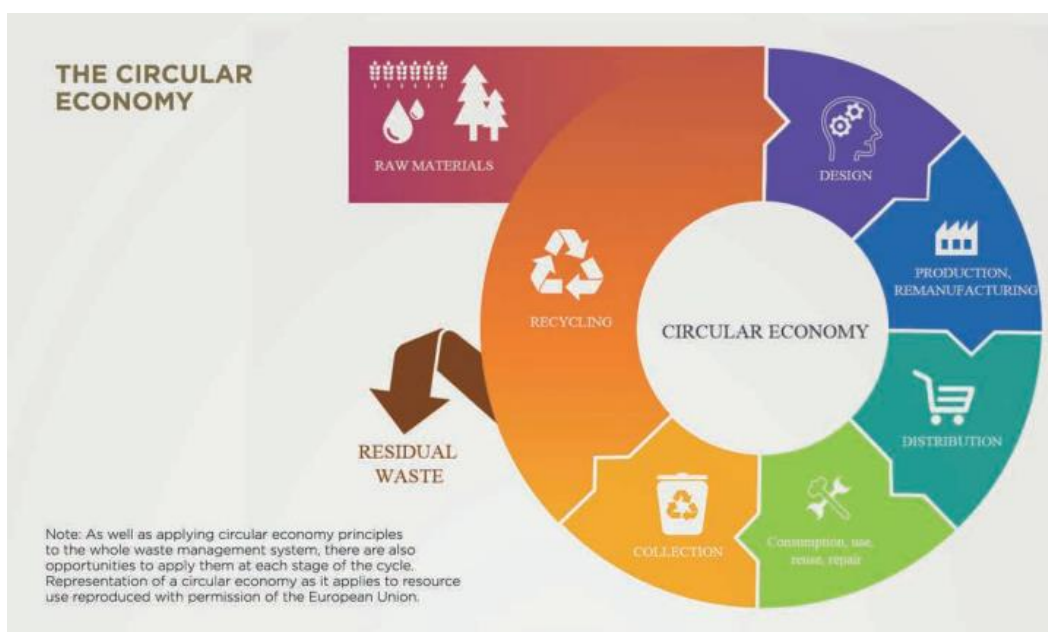
6 Waste and Recycling:

6.1 Demolition and Construction waste

Meriton have engaged Bingo Industries for the building demolition and waste resource recovery solutions on this site.

Bingo Industries have a 'Waste Free Australia' objective and they support a circular economy by turning waste into recycled products.

Meriton can commit to a 90% target recycling construction waste. Meriton and Bingo Industries are currently achieving in excess of 94% for a current construction site at 180 George Street, Parramatta.



6.2 Durability and Longevity

The average life span of a strata building far exceeds that of a single residential home. Merton always build with the same tried and tested construction methods and building inclusions because they are high quality, durable and low maintenance.

6.3 Reduced Consumerism

The environmental footprint of people living in a unit over a suburban home is significantly reduced, due to; lower heating and cooling energy loads, greater reliance on public transport, smaller spaces to furnish and less room to store clothes and goods. This often leads to the occupant buying less and investing in better quality.

6.4 Ongoing waste management

External waste consultants have been engaged, and therefore will be addressing applicable DCP requirements. In summary the following initiatives are provided for the operational waste management throughout the development:

- Signage to educate occupants on correct waste disposal practices;
- Recycling bins will be provided on each level, with general waste chutes provided;
- Quantities of bins provided are in line with waste consultant estimations;
- Food retail tenants will responsibly dispose of cardboard and oils used for cooking;
- A suitable storage area will be provided for chemicals, pesticides and cleaning products;
- A dedicated commercial bin store room has been located on the ground floor.

7 Transport

7.1 Public Transport

The site is well served by public transport, with Liverpool Station and several bus stops located within 800m (less than 10 minutes' walk).

Liverpool Station services the area and is located within eight minutes' walk of the site. Sydney Trains operate 10 train services per hour each way on the T2, T3 and T5 Line, which operates between Liverpool to Central and Parramatta/Blacktown directly. Pedestrian access to the station is provided to both sides of Northumberland Street.

There are a number of bus routes with regular services operated by Sydney Buses on nearby roads.

7.3 Push Bikes

39 spaces provided, compliant. This area is well serviced by walking and bike paths, which promotes active and healthy lifestyles. Councils DCP has a high target for bike parking allocation which has been achieved with this development proposal.

To further reduce transport emissions, an end of trip facility has been provided for the hotel staff, including bicycle parking spaces, showers and lockers to promote cycling to work.

8 Conclusion

The proposed development embraces many ideals targeted by Liverpool council DCP. Including activating the city centre and bringing a range of retail, office and accommodation to accessible locations so as to maximise public transport patronage and encourage walking and cycling. The latest technologies will be embraced to reduce carbon footprints and water savings devices throughout.

It will be a landmark building in Liverpool's city centre to be enjoyed by the wider community.