Sustainability Report for Campbell Stores

Report

PREPARED BY:
Northrop Consulting Engineers
Level 11 345 George Street,
SYDNEY NSW 2000

PREPARED FOR:
Altus Page Kirkland
1 Market Street
SYDNEY NSW 2000

REVISIONS SCHEDULE

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Report Author:

Ian Van Eerden
Sustainability Engineer

Reviewed by:

Amir Girgis
Sustainability Manager

EXECUTIVE SUMMARY

The intent of this report is to outline the sustainability strategy adopted for the Campbell Stores refurbishment project, and highlight the sustainability initiatives to be implemented within the development.

Campbell Stores will be targeting the following sustainability objectives:

- Building Code of Australia – compliance with the requirements of Section J Energy Efficiency (mandatory); and,
- Sustainability initiatives designed to improve the environmental performance of the buildings.

Sustainability initiatives proposed for the building include, but are not limited to:

- Space efficient building floor plates;
- Energy efficient heating, ventilation and air conditioning including natural ventilation to open spaces;
- Water efficient building services;
- Reuse of the exiting building with minimal demolition works;
- Responsible selection of materials;
- Waste minimisation strategies;
- Integration of a range of transport options; and
- Improved pedestrian access to the harbour.

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1 INTRODUCTION

1.1 GENERAL

The intent of this report is to outline the sustainability strategy adopted for Campbell Stores and demonstrate the sustainability initiatives being considered by the development.

1.2 PROJECT DESCRIPTION

The Campbell Stores development incorporates the refurbishment and renewal of 11 heritage storage bays to accommodate restaurant facilities and improve the connection between Hickson road and the harbour through the addition of new though fares and a new covered, outdoor dining area at the northern end of the building. The project will provide a high quality dining and retail location, activating the surrounding area of the Rocks.

Figure 1: Render of the proposed exteriors building upgrades

1.3 SUSTAINABILITY OBJECTIVES

Campbell Stores will be targeting the following sustainability objectives:

- Building Code of Australia – compliance with the requirements of Section J Energy Efficiency (mandatory); and,
- Sustainability initiatives to improve the environmental performance of the buildings.

1.4 LIMITATIONS OF THE REPORT

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.

2 PROPOSED INITIATIVES

2.1 BCA SECTION J – JV3 COMPLIANCE APPROACH

2.1.1 Overview

The facility is a mix of BCA Class 6a Restaurants and café facilities and is in Climate Zone 5.

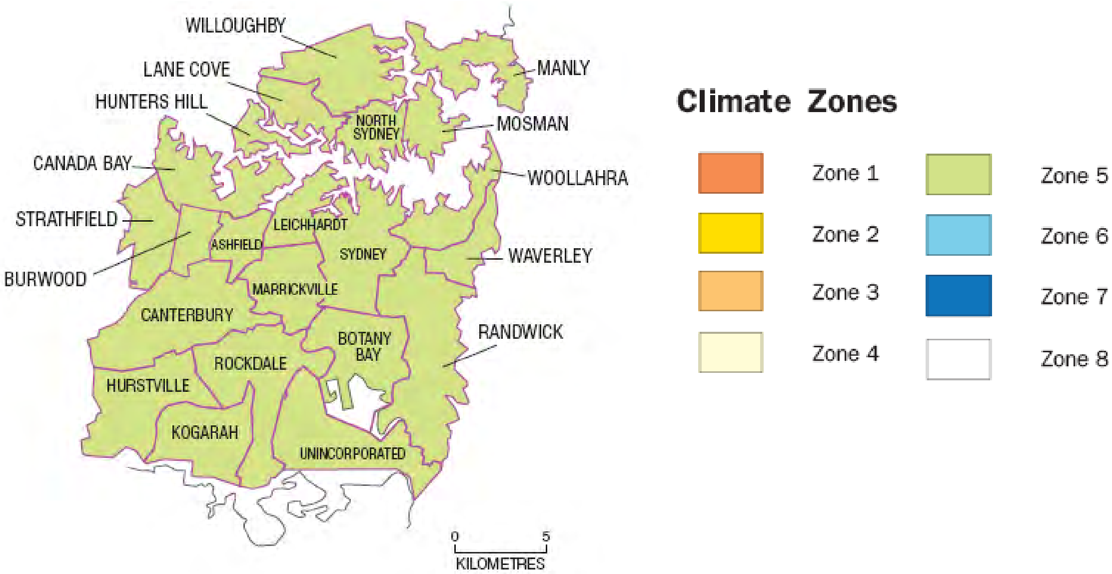


Figure 2: Map of the BCA Climate Zones for Sydney Urban

There are two methods of achieving BCA section J compliance. The building can be assessed against the Deemed-to-Satisfy (DTS) provisions; or JV3 performance based solution.

The project has opted to demonstrate compliance via a JV3 solution to allow it to conform to the heritage protection requirements for the site and account for the high levels of glazing on some facades.

The BCA JV3 alternative performance based solution requires two stages of computer thermal energy modelling to determine the annual energy use of the proposed building;

Model 1 - being the target reference building with DTS fabric and services;

Model 2 - the second model is run with proposed fabric, recommendation from the Architect and DTS compliant building services.

In order to achieve compliance, the modelling has demonstrated that the annual energy consumption of model 2 is equal to or less than model 1 – reference building.

This report highlights the building fabric requirements required to achieve compliance with Section J of the BCA however should be read in conjunction with Northrop's Section J Alternate Compliance report.

2.1.2 Simulation Software

The dynamic thermal modelling software used for simulation is a full dynamic energy simulation software package called Design Builder, which operates using the Energy Plus calculation engine. It has been verified against ANSI/ASHRAE Standard 140-2007, equivalent to BESTEST validation test.

2.1.3 Weather Data

The weather data used for the simulation is an ACADS-BSG nominated Australia Representative Meteorological Year climate file from the Sydney weather station. This weather data file contained hourly information for dry bulb temperature, relative humidity, humidity, wind speed, wind direction, radiation and cloud cover for a whole year.

The design conditions have been simulated as following;

Summer: 32.1ºC Dry Bulb 23.4ºC Wet bulb

Winter: 7.12ºC Dry bulb

The proposed building fabric materials have been input into the model, as per the DTS assessment. The tables below summarises building fabric inputs for both model 1 & model 2 for each of the proposed buildings. However this report should be read in conjunction with the JV3 modelling reports for each of the proposed buildings.

Building fabric requirements

The building is made up of 11 heritage bays which form area that is required to demonstrate compliance with section J to the certifying authority. In order to achieve compliance improved roof insulation values are required. This helps offset lower performing clear glazing, which is desired for heritage reasons. The fabric requirements for Bays 1-11 are as follows;

Table 1: *Building fabric requirements for Bays 1-11*

Element	Model 1 – DTS Compliant reference building	Model 2 – Proposed fabric & DTS Compliant services
Roof	R-value 0.8 *No additional insulation is required under the DTS solution as the heritage roof is being retained.*	*R-value 2.9* *R2.1 of additional insulation is required above that of the retained heritage roof.*
Glazing	*Various – DTS compliant facade*	***U-value 6.121 SHGC 0.81***

Table 2: *Energy Consumption of Reference Building and Proposed Building- Bays 1-11*

Building Model	Annual Energy Consumption (kWh)
Model 1 - Reference Building	1,612,829.95
Model 2 - Proposed Building	1,605,730.61

2.2 OTHER PASSIVE DESIGN INITIATIVES

Passive design is a key element when designing low energy buildings. Passive design reduces the need for auxiliary heating or cooling by taking advantage of varying climate to achieve thermal comfort. The following initiatives will play a significant role in ensuring that the building's annual energy performance is lower that the set thresholds.

Key considerations include thermal performance of envelope, glazing selection and extent, external shading, daylight direction devices, surface properties and possible natural ventilation openings.

2.2.1 Natural Ventilation of Circulation Spaces

The Building Design incorporates new connections between Hickson Road and the Harbour foreshore. These enclosed areas will be naturally ventilated exploiting the ground height difference on either side of the building air will be drawn up through the building from the harbour cooling the walkway space. Central circulation spaces incorporating bathrooms and lift lobby areas will also incorporate natural ventilation with a thermal chimney design drawing air up through the space.

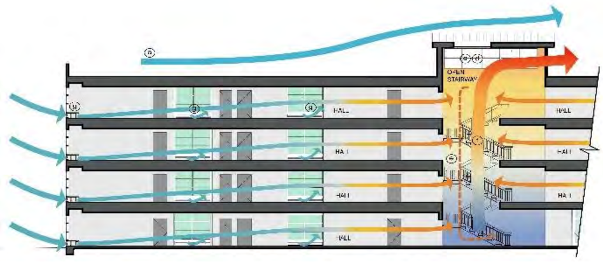


Figure 1: *Air is drawn through the space and vented at the top of the naturally ventilated bays*

2.2.2 Building Orientation

The Building is oriented in a north east to south west orientation which allows the effective control of morning heat gain into the building. This can either be captured through north easterly glazing to pre-warm the space for lunch and evening operations though winter or purged from the building prior to lunchtime operations in summer. This set up allows the efficient use of solar heat load to reduce the HVAC system energy use.

2.2.3 Shading devices

Rain covers provide building shading to the ground floor of bays 1-11 and help to minimise solar heat gain into the lower floors of Bays 1-11. These areas are conditioned throughout the afternoon and the reduction of solar heat gain helps to minimise the HVAC systems energy consumption.

Shaded outdoor areas are also being provided to the north of the site which will help to ensure comfort in this area and activate the space to provide new alfresco dining options.

Figure 2 *Shading will be provided to improve solar heat gains and improve comfort around the building.*

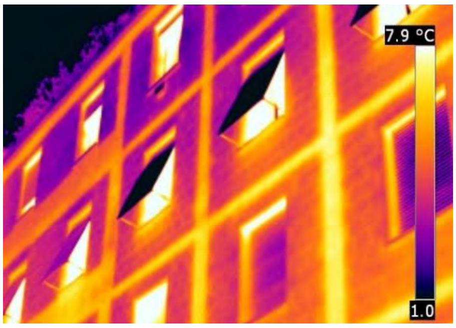
2.2.4 Shading from adjacent structures and trees

Significant protection from solar gains is provided to the west and north of the buildings with adjacent structures and the Harbour Bridge providing shading to these areas. A large Morten Bay fig to the front of the Bay 12 outdoor area also provides protection for this space.

2.2.5 Thermal Bridging elimination

Heat will flow the easiest path from the heated space to the outside - the path with the least resistance. Several components in the building envelope usually act as a thermal bridge, a conduit for heat to leak through the walls, roofs, floors and windows internally and externally.

This results in additional energy consumed by the HVAC system to compensate for heat gains and losses and achieve comfort. Thermal Bridging could account for up to 10% of total energy consumption.



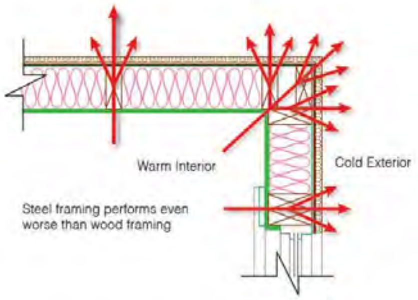


Figure 3 Typical thermal bridge heat losses

Thermal separation eliminating thermal bridging is recommended for the following components;

- Foundation wall transitions;
- Metal panel wall support connections;
- Parapet conditions;
- Roof to wall transitions;
- Window wall transitions;
- Window frames;
- Curtain wall support connections; and
- Transitions between new and existing construction

2.2.6 Building Sealing

Air leaks is usually present in two scenarios, direct and indirect.

- Direct leaks are the most obvious, such as undercuts that allow outside air to come directly under the sill or around the frame.
- Indirect leaks are more difficult to identify but represent most of the air leakage in a typical building. Indirect leaks occur where air penetrates the exterior at one location and the interior at another.

Extensive building sealing will be undertaken as part of the building remediation works which will help to eliminate heat losses in the space. This is recommended to be undertaken on the interior and exterior of the building during construction works, using expanding foam or the like.


Figure 4 interior and exterior building sealing

2.3 ACTIVE SYSTEMS

2.3.1 Gas Fired Variable Refrigerant Flow Air-conditioning

Though the use of a gas fired Variable Refrigerant Flow (VRF) air-conditioning system the project is able to condition the space effectively and accommodate significant variation in occupant loads across the day. Active control systems will work to maintain the space at the outer limits of the thermal dead band accounting for predicted demand increases with restaurant opening hours.

Furthermore the use of a gas fired system reduces the need for augmentation to the grid to accommodate an expansion of the sites electricity needs.

2.3.2 Lighting Controls

The provision of timer controls for lighting will ensure that lights are turned off when the spaces are not occupied and avoid wasted energy associated with lighting unoccupied spaces.

2.3.3 HVAC System Controls

While other HVAC systems operate on a more rigid full-on or full-off schedule, Variable Refrigerant Flow (VRF) systems deliver refrigerant at variable rates and exact amounts to spaces that need it, meeting the heating and cooling needs of the building with increased precision and efficiency.

The use of an effective controls system with the VRF system will allow the adjustment of the heating and cooling requirements of each space and allow the system to operate at reduced speeds, saving energy. The use of smaller systems coupled with controls sensors in each space means that differ space requirements can be accommodated with areas avoiding over cooling or heating.

2.3.4 Economy cycle - free cooling mode

Economy cycles rely on utilising cool outside air as a means of cooling the indoor space. This is achieved when outside air temperature and relative humidity is lower than return air/ recirculated air temperature.

Economy cycles should not be limited to operation when outside air temperature matched off-coil supply air conditions, but can also be optimised by mixing larger outside air ratios with return air to reduce artificial cooling of return air.

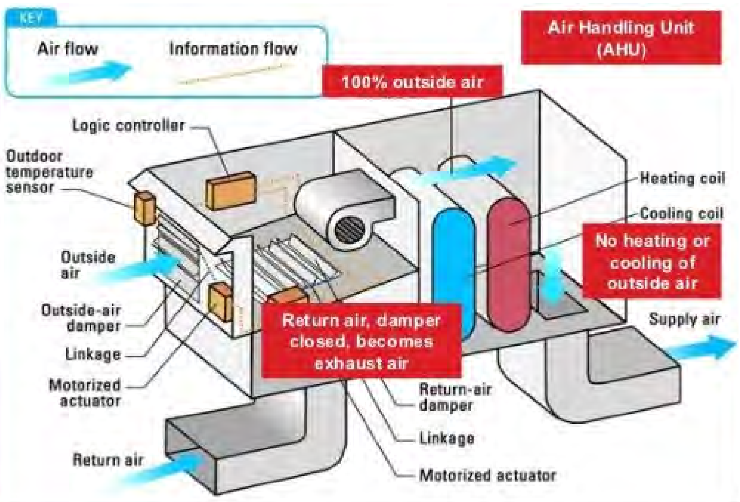


Figure 5 Typical AHU with economy cycle provisions

2.3.5 Energy Recovery Ventilation

Energy Recovery Ventilation (ERV) is the process of reclaiming the energy contained in return air being discharged, and using it to pre-condition fresh outside air.

The process results in reduction of energy consumed in conditioning outside air as well as maintaining a better indoor environment quality by providing opportunities for larger fresh air supply rates.

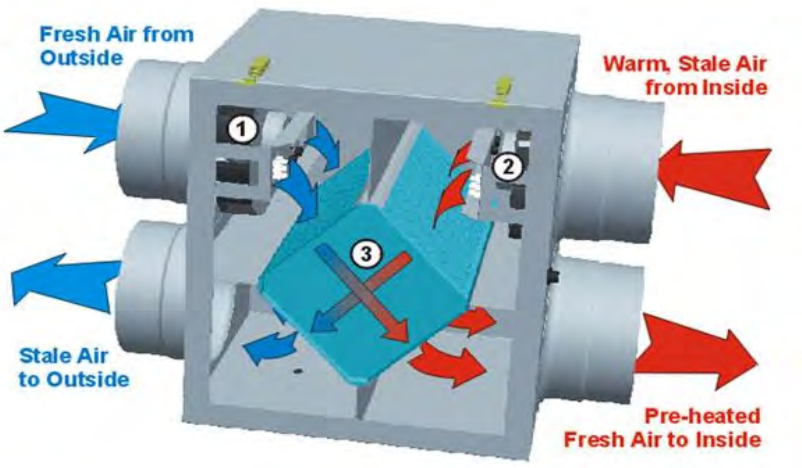


Figure 6 Heat Recovery ventilator

2.3.6 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.

MEPS are mandatory for a range of products 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 7 Typical Energy rating labels

MEPS will be specified for the following;

- Domestic hot water units – minimum 5 Stars; and
- White goods – Minimum 5 stars.

2.3.7 Energy Efficient Lighting

The LED lighting technology today offers a range of suitable applications that maximises efficiency. LED Lamps offer a number of advantages over other lighting technologies being energy efficient, cost effective and robust. While LED lighting is significantly more capital intensive, the life expectancy and energy efficiency of the fitting result in a simple payback of less than 1 year.

Figure 8 Sample LED light fittings

2.3.8 Fire Stairs - Occupancy Sensors & Dimming Control

Emergency luminaires within the fire stairs can be fitted with self-contained high performance stand-by/emergency multi-function LED type luminaires, controlled with integral motion sensors.

Luminaries operate on two separate circuits. When the fire stairs are unoccupied, the light goes on stand-by mode circuit, delivering around 20% of its brightness. When movement is detected within 8m, the light’s second circuit is switched ON, delivering full lumen output for an adjustable set period of time, up to 15 minutes.

Figure 9 Emergency lights in standby & occupancy modes

2.3.1 Electrical Demand Reductions

Staggering the activation of major plant equipment will reduce peak electrical demand by avoiding fans, pumps and compressors ramping up simultaneously. This will reduce peak demand on the grid and reduce energy demand costs.

2.3.1 Energy, Water and Gas Metering

Metering should be provided to allow each tenant to monitor their energy and water usage. This will allow tenants to set targets for consumption and monitor energy improvements resulting from behavioural or equipment changes.

Effective energy and water monitoring systems will also provide tenants with information to better analyse their energy consumption identifying underperforming systems and enabling them to compare performance at different sites. Through providing this data Campbell Stores will make energy consumption visible and assist with energy reporting.

Figure 10 Metering will assist with building management and reporting

2.4 ALTERNATIVES ENERGY SOURCES

2.4.1 Photovoltaic (PV)

With decreasing capital and installation costs, photovoltaic arrays can provide on-site generation with a competitive pay back rate. Photovoltaic arrays are also flexible and modular which allows them to be integrated as a secondary function of a space. The right design could allow a photovoltaic array to provide shade to an open and public space.

Figure 11 PV on roof structure

The feasibility of photovoltaic energy generation will be further assessed at the detailed design stage. The PV plant would have a 5-8 year payback period and deployment may be restricted due to the heritage constraints of the site. Rooftop PV on the new alfresco shading structure may be feasible.

2.4.2 Solar Hot water

Solar thermal domestic hot water generation consists of solar hot water package system complete with gas fired / electrical continuous flow boost. Solar thermal hot water generation has low installation costs and provides a very short payback. Solar hot water could provide 20-50% of the hot water demand.

The actual contribution from solar would need to be determined based on demand profiles, storage size and collector efficiency. The feasibility of solar hot water will be further assessed at the detailed design stage as deployment may be effected by the sites heritage constraints.

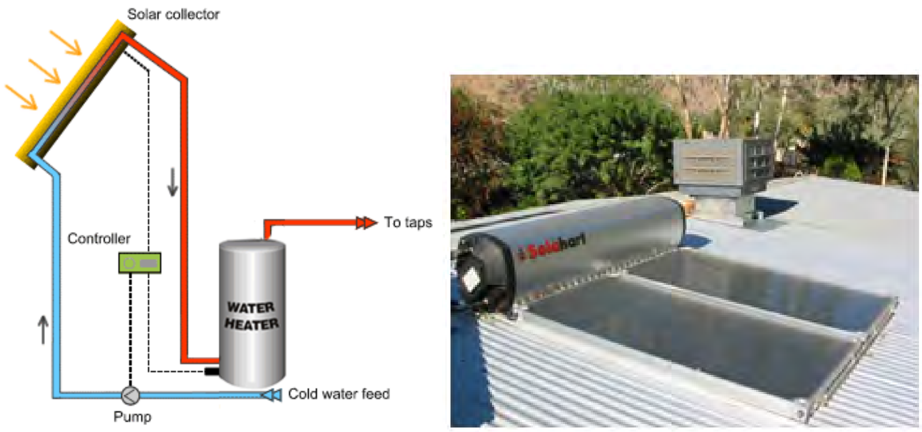


Figure 12 Solar hot water system

2.5 WATER EFFICIENCY

2.5.1 Water efficient fixtures and fittings

Water Efficient fixtures and fitting will reduce the water consumption of the site. As an indication, the following should be targeted:

- Wash hand basin taps 6 star WELS
- General taps 6 star WELS
- Toilets dual flush 4 star WELS
- Urinals 0.8 L per flush 6 star WELS
- Shower heads 7-9 L per minutes 3WELS
- Rainwater collection and ruse for Landscape irrigation and toilet flushing
- Fire testing water re-diverted to storage tank.

2.5.2 Water Harvesting and Reuse

Roof collection and tank storage – it should be noted that the roof area is quite small however collected water should be sufficient for the provision of irrigation to the planter boxes separating the alfresco area from walkways. Water harvesting opportunities should be examined further as part of the projects detailed design.

2.6 Indoor Environment Quality

The idea of improving indoor environment quality is to ensure that building occupants are comfortable within a space and reduce exposure to internal pollutants. Through the provision of sufficient outside air, sufficient lighting levels and good visual access to outside the project should achieve good indoor environment quality. However additional initiatives for consideration include the selection of;

- Low VOC paints, flooring, sealants and adhesives; and
- Formaldehyde free engineered wood products.

2.6.1 Natural lighting – Light Shelving

Effective use of daylight in buildings has been shown to reduce building energy consumption and improve the occupants' sense of well-being. The controlled transmission of natural light into a building will reduce the reliance on artificial lighting for much of the year, whilst still achieving acceptable illumination.

While the current design of the envelope aims to open the buildings to more natural light where possible, this can also be maximised utilising high reflectance finishes and light shelfing.


Figure 13 Example of natural light shelving

2.7 Sustainable Transport

With ready access to Circular Quay and Wynyard train stations the site provides good connection to Sydney's public transportation systems.

2.7.1 Walkability

Walk Score is a number between 0 and 100 that measures the walkability of any address. It is indicative of the number and type of existing amenities located nearby to Campbell Stores. The project achieves a walk score of 98, a 'Walker's Paradise', in accordance with the website www.walkscore.com using their street smart method of calculation. For the purposes of this calculation at this stage, the address of the site has been taken as 7-27 Circular Quay West, the Rocks (the area in front of the project site). Additionally with ongoing development of the area, further amenities will be provided within close proximity of the development into the future.

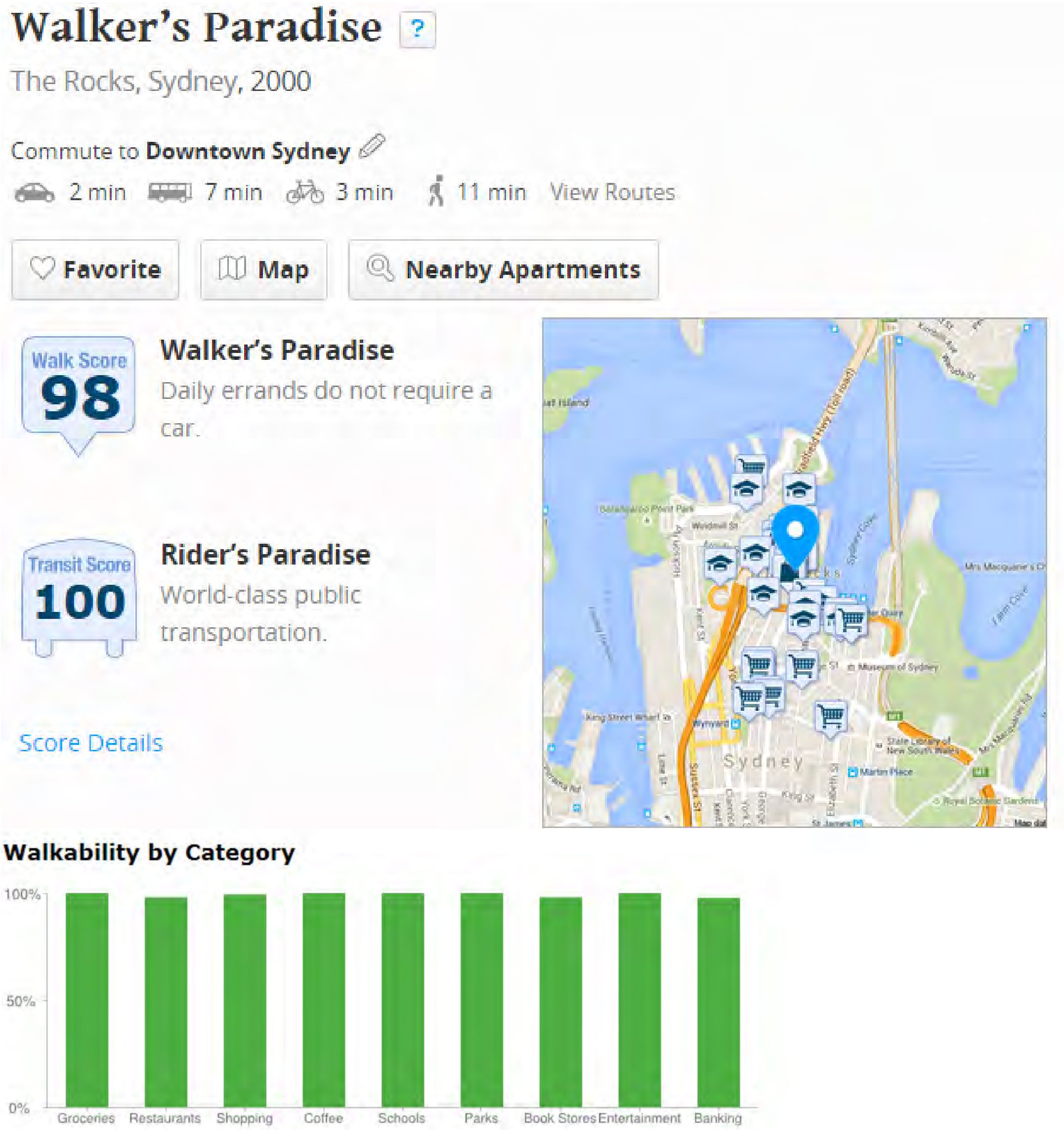


Figure 14. Street Smart Walk Score Results

2.7.1 Way finding

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.

The figure below highlights some key principles for way finding design;

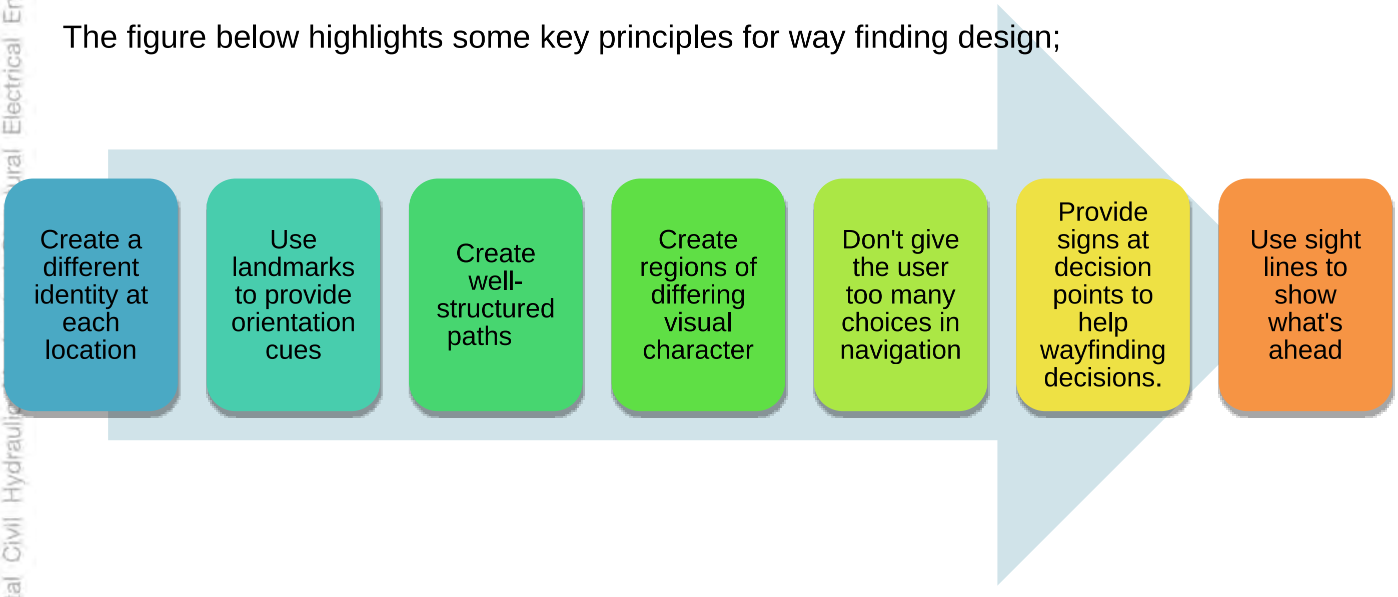


Figure 15 Way Finding design principles

2.8 Waste Reduction and management

The provision of separated waste and recycling streams allows for more effective recycling of the projects operation waste. Providing separate bins for cardboard/paper waste, glass, food wastes, comingled recycling and general waste will improve the buildings operational efficiency and result in significant environmental benefits. Some additional waste management measures are detailed below;

2.8.1 Onsite Composting

The environmental impacts of food waste is significant. It impacts extend from the wasteful use of chemicals such as fertilizers and pesticides, unnecessary transport costs and the creation of methane, a potent greenhouse gas through its decomposition. The provision of a food waste recycling and dehydration machine, such as a Hungry Giant (http://www.hungrygiantrecycling.com/hungry.php) will provide an onsite composting system. This will minimize the costs and environmental impact of food waste disposal as well are reducing truck traffic in the vicinity of the project on an ongoing basis.

2.8.2 Glass disposal

Restaurant facilities traditionally produce a large amount of glass waste which often results in significant waste storage requirements, noise issues at collection times, safety issues and a requirement for more regular truck movements for waste collection.

The installation of a bottle crusher to the project will improve waste efficiency, by reducing the space required for storage and minimise the number of truck movements in the local area for waste collection. Also by securing the crushed waste in a secured bin this process will reduce staff exposure to broken glass and improve site safety.

There is also potential for a recycling partnership where glass can be repurposed or recycled through partnerships with cultural or civic bodies such as the MCA.

2.9 Materials Reuse and Embodied Energy

By reusing an existing structure the project is minimizing construction and demolition waste and relifing and existing structure. The selection of Finishes, fixtures and fittings for the project should consider the product longevity and strive for a product life of greater than 10 years in order to minimise the need to refit the premises and to minimise waste for the ongoing operation of the building. The new structure at the northern end of the site should consider materials selection as part of the detailed design, giving preference to recycled, reused and low embodied energy materials.

2.10 Precinct Sustainability Initiatives

Northrop Also suggests an integrated approach to sustainability for the project to provide a stronger connection between the building and its surrounds. In addition to the building specific initiatives, a number of precinct initiatives will be delivered to benefit the community including:

2.10.1 Enhanced Connections and Public Transport Links

The project acts to connect and enhanced navigation through the local area, providing additional pedestrian links between Hickson Road and the harbour foreshore; enticing the local community as well as visitors through improved walkability and innovative interactive way finding.

2.10.2 Car Share Network

Car Share networks reduce the cost of car ownership and minimise embodied carbon. Electric vehicles reduce carbon emissions and local air pollution. Partnering with a company like GoGet a car share facility has been provided at the western end of the site helping to reduce local congestion and improve car access to the site.

2.10.3 Passive Signage

Simple material that indicates the sustainability attributes of key items. This could include:

- Labelling of key materials that indicate what it is, where it is from, how much embodied carbon it contains and how it may be recycled – "This bench is made from plantation spotted gum from North Queensland and has absorbed 100kgs of carbon dioxide from the atmosphere";
- Design attributes that support sustainable outcomes – "this landscaped area treats stormwater runoff to reduce pollution into the harbour";
- Directional information such as links to public transport; and,
- Heritage and Indigenous references to the buildings past.

2.10.4 Dynamic Informatics Systems and Technology

Online and mobile phone applications that provide more detailed information about the sustainability credentials of the precinct that can be automatically activated by proximity or scanning QR codes with a smartphone; and,

Interactive signage and lighting, in combination with augmented visuals on smart devices, to highlight physical building elements.