Ecologically Sustainable Development Report SICEEP SSDA 1 Application (Convention, Exhibition and Entertainment Precinct)

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Prepared for

Darling Harbour Live

Prepared by

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Executive Summary

This Ecological Sustainable Development (ESD) report supports a State Significant Development Application (SSD 12_5752) submitted to the Minister for Planning and Infrastructure pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Darling Harbour Live has a vision for the PPP facilities which integrate exceptional environmental and social infrastructure into a new, world class civic, entertainment, convention and exhibition precinct. The key initiatives proposed by Darling Harbour Live to achieve this vision include:

- **Solar energy proposal** – Darling Harbour Live will Partner with the local community to fund Australia's largest CBD Rooftop Solar Array at 400kW, enough to power up to 100 homes, and generate Green Power that can be sold to event organisers to offset their carbon footprint;
- **Centralised thermal plant** – Centralised systems for heating and chilling of water to serve several buildings – meaning better management and maintenance of systems;
- **Rainwater harvesting** – Rainwater will be stored on site for use in the facilities, water features and public open space;
- **Reuse and Recycling** – Target 90% of construction waste to be re-used or recycled; 70% of event waste diverted from landfill;
- **Gold LEED rating** – The US Green Building Council's Leadership in Energy and Environmental Design (LEED) rating tool will be used to benchmark the international best practice design and operation of the ICC;
- **Green Star rating** – Darling Harbour Live will work with the Green Building Council of Australia to achieve a Green Star Performance rating for the ICC; and
- **Gold Earth Check rating** – Darling Harbour Live will obtain a Gold Earth Check rating for the ICC. Earth Check is an internationally recognised environmental management and certification program for projects involved in the travel and tourism industry.

A number of precinct initiatives will be delivered to benefit all users in the precinct including:

- **Enhanced connections and public transport links -** The master plan design for the precinct lays out a far more connected and enhanced navigation through the site;
- **Electric car share network –**By partnering with GoGet, Darling Harbour Live will establish Australia's first Electric Car Share Network for use by the community within the precinct and beyond;
- **Passive signage** –indicating the sustainability attributes of key items; and
- **Dynamic informatics systems and technology -** Public broadcast information, web based and mobile phone applications that provide detailed information about the sustainability credentials of the precinct.

In addition to the above, the following aspirational whole of precinct initiatives are being investigated:

- **Recycled water -** Darling Harbour Live is in the unique position to facilitate a potential option of bringing recycled water produced at the nearby Barangaroo South Treatment plant to the Facilities and PDA buildings. The commercial feasibility of this option is currently being investigated; and
- **Precinct thermal plant** - Beyond the centralised thermal plant for the Facilities, there are also opportunities to expand the thermal plant into the PDA components of the precinct and potentially beyond the precinct to interface with the City of Sydney's planned tri-generation master plan.

1.0 Introduction

This report supports a State Significant Development Application (SSD 12_5752) submitted to the Minister for Planning and Infrastructure pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Application seeks approval for construction of the Public Private Partnership (PPP) component of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) Project at Darling Harbour.

The SICEEP Project will deliver Australia's global city with world class convention, exhibition and entertainment facilities that can compete effectively in the national and international events markets. The SICEEP Project importantly forms a critical element of the NSW Government's aspiration to "make NSW number one again".

1.1 Overview of Proposed Development

The proposed development involves construction of the PPP component of the SICEEP Project, comprising new, integrated and world-class convention, exhibition and entertainment facilities with associated retail and public domain upgrades.

The application more specifically seeks approval for the following development:

- Demolition of existing improvements on the site, including existing Sydney Convention Centre (part) and Sydney Exhibition Centre;
- Associated tree removal and replanting;
- Construction of a new, integrated and world-class Convention, Exhibition and Entertainment Centre;
- Public domain improvements, including:
    - reinvigorating and expanding Tumbalong Park;
    - provision (part) of a new active north-south pedestrian connection (known as the Boulevard);
    - provision of new east-west connections, including Harbourside Place and Tumbalong Place;
    - Provision of a pedestrian bridge link from Quarry Street;
    - Retention of the tidal cascade water feature;
    - Reconfiguration and upgrade of Darling Drive (part);
    - Provision of a new square adjoining the Chinese Garden;
    - Provision of a new open space 'event deck' (connected with the Exhibition Centre);
    - Integrated art, play zones, water play and recreation areas;
    - Provision of retail kiosks;
- Provision of ground level parking within the Exhibition and Entertainment Centre facilities;
- Ground and elevated loading docks (accessed off Darling Drive) for Convention, Exhibition and Entertainment Centre facilities;
- Two vehicle drop off points along Darling Drive;
- Provision of signage; and
- Extension and augmentation of physical infrastructure / utilities as required.

1.2 Background

The existing convention, exhibition and entertainment centre facilities at Darling Harbour were constructed in the 1980s and have provided an excellent service for Sydney and NSW.

The facilities however have limitations in their ability to service the contemporary exhibition and convention industry which has led to a loss in events being held in Sydney.

The NSW Government considers that a precinct-wide renewal and expansion is necessary and is accordingly committed to Sydney reclaiming its position on centre stage for hosting world-class events with the creation of the SICEEP Project.

Following an extensive and rigorous Expressions of Interest and Request for Proposals process, Darling Harbour Live (formerly known as 'Destination Sydney'- a consortium comprising AEG Ogden, Lend Lease, Capella Capital and Spotless) was announced by the NSW Government in December 2012 as the preferred proponent to transform Darling Harbour and create the new Sydney International Convention, Exhibition and Entertainment Precinct.

Key features of the Darling Harbour Live Preferred Master Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
    - Up to 40,000m2 exhibition space;
    - Over 8,000m2 of meeting rooms space, across 40 rooms;
    - Overall convention space capacity for more than 12,000 people;
    - A ballroom capable of accommodating 2,000 people;
    - A premium, red-carpet entertainment facility with a capacity of 8,000 persons;
- Providing up to 900 hotel rooms in a hotel complex at the northern end of the Precinct;
- A vibrant and authentic new neighbourhood at the southern end of the precinct, called 'The Haymarket', home to an IQ Hub focused on the creative industries and high-tech businesses, apartments, student accommodation, shops, cafes and restaurants;
- Renewed and upgraded public domain and space for up to 25,000 people at an expanded Tumbalong Park; and
- Improved pedestrian connections linking to the proposed Ultimo Pedestrian Network drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

1.3 Site Description

The SICEEP Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the Light Rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south.

The SICEEP Site has been divided into three distinct redevelopment areas (from north to south) – Bayside, Darling Central and The Haymarket. The PPP Application Site area is located within Bayside and Darling Central as shown in Figure 1.

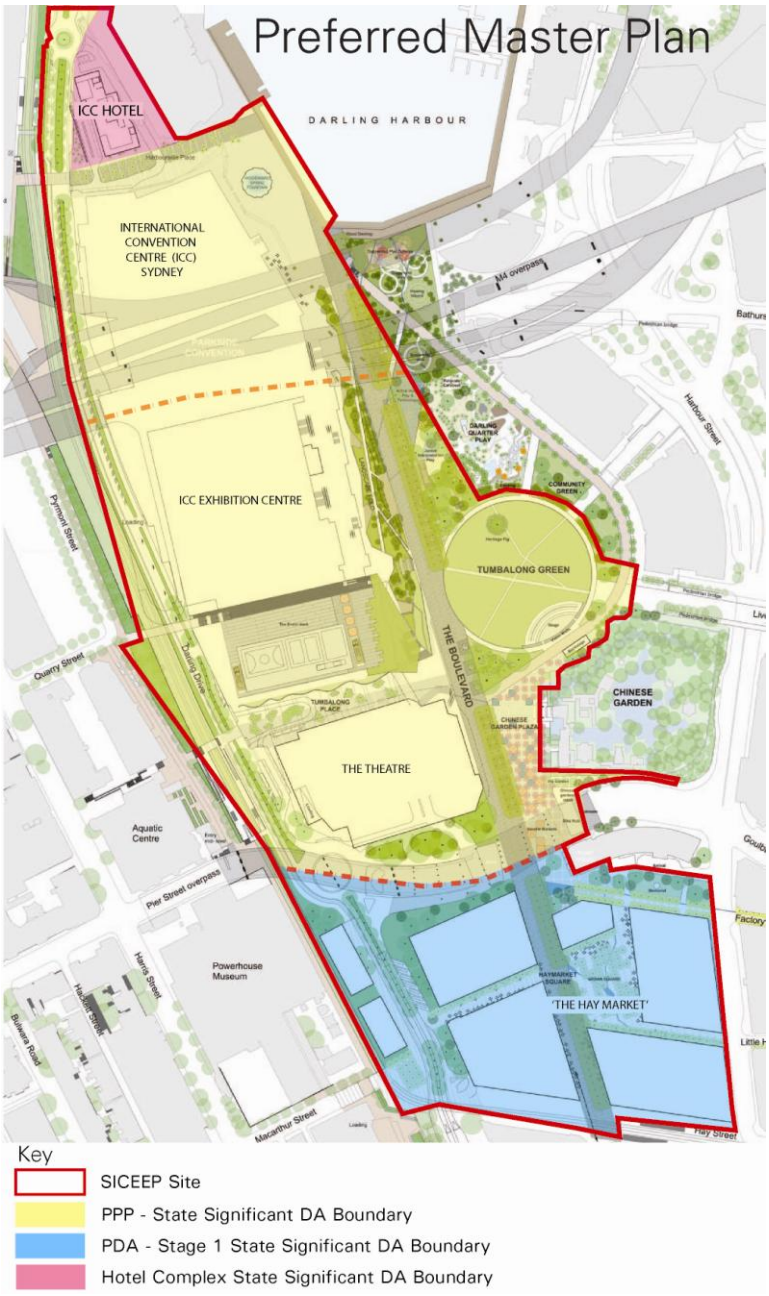
1.4 Planning Approvals Strategy

In response to separate contractual agreements with the NSW Government and staging requirements, Darling Harbour Live is proposing to submit a number of separate development applications for key elements of the overall Project.

This Application involves the PPP component of the SICEEP Project, comprising the convention centre, exhibition centre, entertainment facility, and associated public domain upgrades.

Development of The Haymarket is to be staged and accordingly a staged development application is to be lodged. Detailed development applications will follow seeking approval for specific aspects of The Haymarket.

A separate development application will also be submitted for the Hotel Complex.



2.0 Precinct Wide ESD Approach

Darling Harbour Live has undertaken an integrated approach to the Ecological Sustainable Design of the SICEEP. The redevelopment of the precinct offers an exciting opportunity to activate an important area of Sydney, to improve connections to, from and through the site and integrate innovative technologies that deliver sustainable outcomes.

In addition to the building based initiatives, a number of whole of precinct initiatives will be delivered to benefit the community including:

- **Enhanced Connections and public transport links -** The master plan design for the precinct lays out a far more connected and enhanced navigation through the site; enticing the local community as well as visitors through improved walkability and innovative interactive way finding, making public transport the easy and obvious choice for people with real-time connection information providing affordable, green and safe travel options;
- **Electric Car Share Network –** Electric vehicles reduce carbon emissions and local air pollution. Car Share networks reduce the cost of car ownership and minimise embodied carbon. Darling Harbour Live is partnering with GoGet to establish Australia's first Electric Car Share Network for use by the community within the precinct and beyond;
- **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;
    - Heritage and Indigenous references to the precinct's past;
- **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;
    - Digital pods in the public domain that offer Wi-Fi hotspots;
    - Interactive signage and lighting, in combination with augmented visuals on smart devices, to highlight physical building elements; and
    - Interactive screens that direct users to the nearest public transport node to take them to their destination – not just time until the next train but time until *"their"* next train. The screens could also present brief sustainability statistics for the Facilities/Precinct such as energy or water consumption and waste generated in real time or for a given period.

In addition to the above, the following aspirational initiatives are being investigated:

- **Recycled Water -** Darling Harbour Live is in the unique position to facilitate a potential option of bringing recycled water produced at the nearby Barangaroo South Treatment plant to the Facilities and PDA buildings. This represents a strategic opportunity to interconnect and build on the success of decentralised infrastructure which minimises the provision and operation of duplicate systems. The commercial and physical feasibility of this option is currently being investigated; and
- **Precinct thermal plant** - Beyond the centralised thermal plant for the Facilities, there are also opportunities to expand the thermal plant into the PDA components of the precinct and potentially beyond the precinct to interface with the City of Sydney's planned tri-generation master plan. Appropriate locations for a district thermal plant are currently being investigated outside of/at the perimeter of the 25 year PPP portion so that a long term supply can be assured for neighbouring users.

3.0 PPP Facilities and Public Domain Initiatives

This Section of the report addresses SICEEP PPP works, comprising the convention centre, exhibition centre, entertainment facility, and associated public domain upgrades. The ESD initiatives are outlined under the following sub headings:

- Management;
- Energy;
- Water;
- Materials and Waste;
- Transport;
- Biodiversity; and
- Health and Wellbeing.

3.1 Management

Darling Harbour Live will employ management and governance strategies to guide the design and operation of the SICEEP towards the sustainable vision for the project.

3.1.1 Governance

Darling Harbour Live has and will continue to consult with the local community and key stakeholders such as City of Sydney and Sydney Harbour Foreshore Authority to develop a world class sustainability solution. Collaboration with the neighbouring community will be fostered through existing business and residential forums. Through these forums Darling Harbour Live will be able to consult with stakeholders, inform the community about upcoming events and how they may be affected throughout the operational phase.

Darling Harbour Live has developed KPIs for the SICEEP to assess sustainability performance during development, operational phases and throughout the procurement of key materials and supplies in the supply chain. The KPIs are based on targets in the following categories:

- Energy use in delivery and operation;
- Water use in delivery and operation;
- Supplier Engagement and Waste Management in delivery and operation;
- Transport modal splits in operation; and
- Health and Wellbeing (Indoor Environment Quality) in operation.

An Expert Sustainability Certifier (ESC) will be employed as an independent point of verification and review to demonstrate that the Facilities achieve the performance goals over the term of the PPP.

3.1.1.1 Design Development and Construction

During the Development phase, Darling Harbour Live will undertake the following actions:

- Engage an independent Expert Sustainability Certifier (ESC);
- Undertake a collaborative and interactive design process with regular sustainability workshops and appropriate stakeholder input;
- Regularly assess the design against the targets and strategies identified;
- Undertake building energy simulation (BCA verification method or similar) to determine quantified building performance targets for comparison during the operational phase building monitoring;
- Develop an implementation strategy for achieving transition between project phases and project packages;
- Train all contractors and subcontractors in the application of the Sustainability Plan;

- Apply a 'Minimum Site Sustainability Standard' checklist rating system that identifies minimum site accommodation sustainability practices;
- Darling Harbour Live will employ its AS/NZS 14001:2004 accredited Environmental Management System;
- Monitor and report against Energy, Water, Waste and Material targets during construction phase;
- Undertake commissioning with witnessing by the required ESC;
- Provide training and instruct operational staff for the Facilities in the application of the Sustainability Plan; and
- Prepare tenant, operator, supply chain, event, delegate and public domain guides.

3.1.1.2 Operating Phase

During the Operating phase, Darling Harbour Live will undertake the following actions:

- Identifying performance against the Sustainability Plan for staff information;
- Make user guides available to operators, tenants, suppliers, event organisers, delegates and public domain stakeholders;
- Establish a dedicated group of staff to champion the sustainability initiatives within the Facilities;
- Monitor, report and respond to the Energy, Water, Waste and Material targets for the Facilities;
- Implement the EMS and EMP for the Facilities; and
- Review and update the Sustainability Plan at the following times:
    - One Year after commencement of the Operating phase;
    - If there is any significant change in market and/or operating conditions; and
    - A minimum every 5 years.

3.1.2 Industry Ratings

Darling Harbour Live will demonstrate world class sustainable performance through the following Industry Ratings:

- A Gold rating in the US Green Building Council's Leadership in Energy and Environmental Design (LEED) for International benchmarking and recognition of the ICC;
- Commitment to work with the Green Building Council of Australia to achieve a Green Star Performance Rating for National benchmarking and recognition for the ICC; and
- A Gold Earth Check rating for the ICC.

3.2 Energy

3.2.1 Energy Strategy

Darling Harbour Live is committed to minimising energy use and generating clean energy through a number of strategic initiatives. Key to this commitment is the delivery of:

- Energy efficient plant and demand reduction controls within the Facilities;
- Central Thermal Energy Plant for the Facilities with an option to extend that network across the whole precinct; and
- Community Funded 400kW Solar Array on the roof of the Facilities, creating Australia's largest CBD array (According to Table 14 of the Clean Energy Australia Report 2011).

3.2.2 Energy Demand Reduction

3.2.2.1 Maximise Use of Passive Design

The building glazing and fabric will be designed to reduce energy losses/gains whilst providing users with a connection to the Harbour and public domain. This will be balanced with the opportunity to provide pre-function

areas with natural light. The meeting rooms located on the building perimeter utilise glazing to allow natural day lighting.

3.2.2.2 Minimise Urban Heat Island Effect

The master plan provides an increased soft scape area compared to the existing site which will increase the area available for evapo-transpiration, which provides cooling and treats stormwater runoff. Lighter reflective materials have been selected where appropriate to reflect heat rather than retaining it.

3.2.3 Lighting

Lighting fixtures and sources have been designed to meet the required light levels using energy efficiency light sources. LED lighting will be employed where whole of life modelling demonstrates value for money for the Foyer/Concourse/Pre-function spaces.

Where natural lighting is promoted at the building façades, energy savings will be achieved through the use of photo electric sensors. A lighting control system will assist minimum levels of artificial light to be used whilst achieving the design criteria. In smaller rooms motion controls and timers are installed to reduce lighting energy consumption.

3.2.4 Central Thermal Plant (CTP)

The Facilities will utilise a central thermal plant that will consist of high efficiency chiller arrangement consisting of centrifugal chillers operating in sets of series counter flow chillers. These chillers will serve chilled water to the various Facilities through a primary and secondary pumping arrangement.

The benefit of the central thermal energy plant is that it allows the load profiles of each of the main Facilities to be served by a single plant ensuring peak operating efficiencies can be achieved.

3.2.5 Building Services

The building services solution proposed for the Facilities are highly flexible, quick to respond and simple enough to be easily understood and maintained by the Facility Management. The key systems elements and their associated benefits are outlined in the following table;

Element	Benefits
Zoning	Front of house and back of house areas are provided with independent air handling plant. Systems have been further zoned to allow operational flexibility to ensure that only areas that are in occupancy / function are air conditioned.
Variable Air Volume (VAV)	Due to the Facilities range of use options and changing occupancy profiles, variable air volume (VAV) systems have been selected for their ability to respond to changing demands quickly and with reduced operational energy consumption. The individual conference or meeting spaces will also have varying loads due to changing occupant patterns.
Variable Speed Drives (VSD)	Variable Speed Drives have been selected to control fans and pump motors. Because the building loads vary due to varying occupancy, or solar load, the cooling and heating load will vary. VSD's have been provided to allow pumps and fans to match the heating and cooling load required.
Air Handling Unit Coil Bypass	A coil bypass system is provided for appropriate AHU's to reduce fan static pressure demonstrating a reduction in air handling unit fan energy consumption.
Displacement Ventilation with Heat Pipe (heat recovery)	Displacement ventilation with heat pipe (passive heat recovery) is provided in the ICC Theatres and The Entertainment Theatre, maximising air quality through increased air change effectiveness whilst reducing heating energy consumption in these spaces.
Economy Cycle	The incorporation of an economy cycle in the Sydney climate will provide significant energy and cost savings in chiller operation, particularly in the Sydney climate. The use of 100% outdoor air when the ambient conditions are acceptable provides free cooling and improves internal indoor air quality levels. An outside air economiser cycle has been incorporated into all air handling units and is anticipated to be used for between 30% and

	50% of the year depending on the system.
Solar Hot Water	The ICC will include a solar hot water system that will provide pre-heat to the domestic hot water supply.
Chillers	The central chiller plant is a water cooled system comprising a combination of low load and high capacity centrifugal chillers. To optimise the overall system efficiency, variable speed chillers are utilised and configured in series with counter flow condenser water arrangement. This allows very high system efficiency at all part load conditions. The chillers are capable of operating at variable flow to allow the chilled water production to match the demand in the field with minimal pumping energy

3.2.6 Sensors, Controls and Metering

Lighting, HVAC, refrigeration, and ancillary equipment will be controlled by efficient building automation systems. Management and staff from the Facility Management team are trained to ensure that these systems are operated at minimum levels to maintain essential services when the spaces are not occupied. Event schedules are used to coordinate controls to avoid unnecessary energy consumption in unoccupied spaces.

The sensors and controls connected to the Building Management System (BMS) and lighting control system will:

- Incorporate controls for motion detection, daylight harvesting and zoning control of all lighting;
- Include a simple graphical user interface for control of interior and exterior lighting and HVAC;
- Allow for parts of the Facilities to be easily shut down when not in use;
- Provide a function that enables the maintenance of equipment to be easily scheduled and with a troubleshooting interface that can be used in fault finding; and
- BMS controls will be systematically commissioned during installation and tuned during the technical testing and operation stage to deliver the design intent and achieve the targeted energy outcomes.

From an energy monitoring perspective, the facilities will provide a metering and monitoring system that:

- Provides real time monitoring of substantive (>50kVA) energy uses;
- Uses smart metering;
- Includes thermal energy metering to evaluate major space heating and cooling use;
- Allows metering of event spaces to allow delegates to monitor and potentially offset the carbon of their energy use with purchase of Green Power from the on-site solar array. Opportunities to reward Hirers for events with low energy usage will be considered in business planning;
- Is clearly presented with system schematics used to show the hierarchy of energy flows; and
- Is structured to allow clear reporting and in accordance with the accuracy and verification requirements of the current NABERs Rules.

3.2.7 Reduce Energy Use During Construction Activities

Construction contractors will employ a holistic set of minimum environmental standards for site accommodation and operate with a sustainability focus in all activities. Some of the energy initiatives that will be employed during construction include:

- Passive design of site accommodation including solar shading, thermal insulation and controlled daylight penetration (where appropriate for a reasonably temporary facility);
- Highly efficient AC;
- Energy efficient lighting systems with automated controls;
- Cyclist facilities and proximity to public transport will reduce private vehicle use; and
- Selection of fuel efficient construction equipment.

3.2.8 Renewable Energy Technologies

3.2.8.1 In Construction

Options to use low carbon or zero emission technologies for construction activities are not presently cost effective however biofuels and Solar PV costs are rapidly dropping. At the commencement of the development phase Darling Harbour Live will reinvestigate opportunities to supplement power consumption with renewable sources of energy. Strategies to achieve this target may include building integrated PV systems that can be installed on top of and offset the energy used within a site shed or purchasing Green Power.

3.2.8.2 In Operation

Darling Harbour Live has partnered with a renewable energy provider to enable the delivery of a 400kW Solar Array on the roof of the Facilities funded by community investment.

The design of the Facilities lends itself perfectly to the provision of a solar array with large roofs facing due north with little overshadowing. The solar array will generate enough renewable energy per year to power the equivalent of approximately 100 homes and Darling Harbour Live will use this energy to power the constant base load demands of car park lighting, wayfinding/display energy, freezers/ cool rooms, minimum lighting and ventilation. As the solar array will be generating certified Green Power, the energy can be sold directly to clients of the core Facilities who wish to offset the carbon associated with their events.

3.2.8.3 Delegate Carbon Offsets

A carbon calculator will be made available for delegates to estimate their predicted carbon emissions prior to events. The facility metering strategy and associate online carbon calculator will allow delegates to monitor their energy use and neutralise their energy consumption by purchasing green power from the Solar Array. This will be a unique offer for an Australian convention, exhibition or entertainment facility and could be a drawcard for national and international events.

3.3 Water

3.3.1 Water Strategy

Darling Harbour Live is committed to minimising potable water consumption and wastewater discharge for the precinct through a number of strategic initiatives, including:

- Water efficient fittings and fixtures to minimise water demand; and
- Rainwater harvesting off the vast roof area of the facility.

3.3.2 Water Demand Reduction

3.3.2.1 Fixtures, Fittings and Systems

The strategies to reduce water demand will include:

- Provision of low flow urinals;
- Provision of low flow fitting equivalent to min WELS 3 Star and above toilets and fixtures;
- Provision of sensor and timer controls and trigger hoses to limit the possibility of wasting water;
- Provision of water efficient kitchen appliances; and
- Capture and re-use fire system test water.

3.3.2.2 Metering and Controls

The metering and controls strategies to reduce water demand will include:

- Real time sub metering to water consuming plant and building areas (cooling towers, catering facilities etc.);
- Integration of sub meters into the BMS or meter monitoring system, with information clearly presented with system schematics used to show the hierarchy of water flows;
- Functionality for detecting leaks and the ability to track against appropriate targets;

- A clear reporting structure with metering in accordance with the accuracy and verification requirements of the current NABERs Rules where possible; and
- Automatic controls such as moisture controls and time clocks to be implemented for irrigation.

3.3.2.3 Landscaping and Stormwater

Some of the proposed irrigation strategies to reduce water demand include:

- Drought tolerant plant species;
- Mulching of landscaping to minimise evaporation;
- Nil irrigation to planting areas incorporating drought tolerant species; and
- 100% harvested irrigation water to be provided to turf areas (sub soil irrigation), consideration may be given to supplementing sub soil irrigation systems with recycled water subject to water quality analysis (e.g. dissolved salts and/or pH level).

The site currently directs high volumes of stormwater and run-off across impermeable rooftops and pavements which pollute Darling Harbour waters. The Master Plan provides increased soft scaping areas compared to the existing site. This will reduce the quantity of overland flow and pollutants entering the harbour and travelling downstream. The rainwater harvesting and reuse from the large roof areas will also manage stormwater flows.

Water Sensitive Urban Design strategies have been employed in the public domain to optimise water efficiency, including:

- Swales & rain gardens to detain flows off hard surfaces and capture heavy litter and pollutants;
- Permeable paving in select locations and reduced overall hardscape; and
- Construction initiatives that prevent watercourse pollution. Water flow through the site will be regularly monitored for potential pollutants during the delivery phase.

3.3.2.4 Water Harvesting

Rainwater is the highest quality alternative water source to potable water and can be used with minimal filtration and treatment.

Rainwater collection tanks will capture rainwater from the roofs of the Facilities once operational for use in toilet flushing, landscape irrigation, public domain water features.

3.3.3 Construction Water Reduction

Water reduction and harvesting initiatives will be employed during construction including:

- Selecting construction equipment taking into account water efficiency and construction methods. The site facilities themselves will incorporate water efficient fixtures, fittings and controls;
- Design decisions will consider construction techniques that will where possible reduce or eliminate water use; and
- Rain water from sheds will be captured and reused on site for dust suppression etc.

3.4 Materials and Waste

3.4.1 Materials and Waste Strategy

Darling Harbour Live will deliver an integrated materials selection and waste management strategy that addresses the impacts of materials and waste in both construction and operational phases.

Key initiatives that will deliver materials and waste benefits include:

- Reuse of existing structure for the new Facilities and recycling of demolition materials for fill material which will save at least 13,800 tonnes of embodied carbon in avoided materials;
- 90% of Construction waste diverted from landfill; and
- Operational waste management practices that will see at least 75% of waste recycled, with 90% of organic waste diverted from landfill.

3.4.2 Design and Construction

The careful integration of the existing Parkside Convention Centre and Exhibition centre car park structures into the new Facilities provides reuse of over 23,500m3 of reinforced concrete. This will save approximately 13,800 tonnes of embodied carbon, or approximately 10% of the overall carbon embodied in the project.

High value materials such as steel and glass, recovered from the demolition of the existing Facilities, can be readily recycled by manufacturers for use in new building materials. Steel is one of the most highly recyclable materials available and it is highly likely that the steel from the Convention Centre will end up redeployed in another building project in some other form.

Other materials such as paving, street furniture and landscaping plants and timbers may be able to be reused. Darling Harbour Live will encourage interested parties to take these materials for beneficial reuse in other projects.

Where appropriate, the new Facilities will be designed for disassembly and maximum recovery of materials at end of life. These initiatives will be supported by deconstruction plans and resilient product labelling.

Materials with recycled and recyclable content will be utilised wherever possible without any compromise to fit-for-purpose performance such as longevity or visual quality. Examples include:

- the use of recycled PET bulk thermal insulation material;
- flyash and aggregate in concrete;
- recycled steel materials; and
- All timber from reused, recycled or environmentally certified sources.

During construction the site team will establish a detailed waste management plan that will include a combination of reusing materials on site where possible and off-site sorting of remaining demolition and construction waste, with the overall aim of recycling or reusing at least 90%.

3.4.3 Operational Phase

Darling Harbour Live will use its reporting system “ECOMETRICS” to measure monthly generation of waste streams (as below) reporting total solid waste and solid waste diverted from landfill per attendee. Using this data Darling Harbour Live will assist Hirers to calculate waste outputs for events, and proactively engage with employees and clients in informed discussions about practical measures to reduce operational wastes going to landfill. Opportunities to reward Hirers for events with low waste or high waste diversion are considered in business planning.

A minimum of 75% diversion of operational waste from landfill will be targeted through proven waste diversion measures and dematerialisation efforts.

Wherever possible the assessment of the materials will reference appropriate third party endorsement and certification such as Green Tag, FSC, Good Environmental Choice Australia. Suppliers will be encouraged and appropriately assisted in achieving independent certification of their products. Environmental Product Declarations (EPDs), which are common in Europe and becoming increasingly popular in Australia, are a good example of where standardised LCA approach can be effectively employed to show robust product sustainability differentiation. Over time, a potential KPI for the Sustainable Procurement Strategy could be to increase the percentage of products covered under third party certification and EPDs.

3.5 Transport

Darling Harbour Live recognises the importance of providing transport options that provide residents, visitors and delegates with an environmentally friendly and convenient travel experience. The PPP public domain Works have been designed to integrate and connect with the whole of precinct master plan. The following outlines how the PPP public domain works will contribute to a highly connected and sustainably accessible precinct.

3.5.1 Maximise Attractiveness of Walking

The City of Sydney has set a target that by 2030, at least 50 per cent of City trips will be made by pedestrian movement. The existing site is constrained by poor visual linkages and impaired user orientation which limits their safety.

The PPP public domain has incorporated the following strategies which will maximise the attractiveness of walking:

- Providing continuous and universal access throughout the public domain;
- Improved linkages to the wider precinct paths that take into account issues of safety and are clearly legible;
- Improved sight lines within the precinct; and
- Providing active building frontages adjacent to the public access ways.

One measure of the successful delivery of this strategy will be the extent of activation of the space, which can be readily identified through visual surveying. Darling Harbour Live will monitor the pedestrian traffic into and out of the precinct before construction commences and annually for up to 5 years once the development is delivered. Targets for continuous improvement will be established with the aim to ensure the precinct is alive with more and more visitors and local residents each year.

3.5.2 Maximise Attractiveness of Public Transport

The precinct is serviced by multiple transport options which will be integrated into the whole of precinct transport plan.

The PPP public domain works will deliver the following initiatives to strengthen the whole of precinct linkages and maximise public transport attractiveness:

- Clear and intuitive connections of the public domain path networks with existing paths networks that access public transport nodes such as the ferry wharfs on Darling Harbour, bus stops on Harris Street and Harbour Street and the light rail on Darling Drive and Hay Street;
- Use of the way finding passive signage, dynamic and infrastructure based technology to provide real-time and static signage for public transport information. Visitors shall be able to quickly identify tailored and specific public transport options including visibility of the time of their next train or ferry and how long will it take them to get to the stop by foot;
- Improved connection between Darling Drive and the precinct and in particular engaging more strongly with the Metro Light Rail which was only recently integrated into the larger NSW public transport system; and
- Darling Harbour Live will develop a Green Travel Plan that encourages walking or cycling, use of public transport and car sharing.

To estimate the effectiveness of public transport Darling Harbour Live will conduct transport surveys within the Facilities annually for the first 5 years for the ten largest events and use public transport wayfinding infrastructure to measure the number of public transport requests that are fielded. This will assist in providing an approximation for public transport usage whereby the carbon savings associated with the use of public transport will be calculated from these sources and reported annually.

3.5.3 Cyclist Facilities

Darling Harbour Live supports the City of Sydney's cycling initiatives and considers cycling as an important event transport mode and aim to increase cycling in the precinct.

The SICEEP will deliver the following initiatives to strengthen the whole of precinct linkages and maximise cycling opportunities:

- Providing staff and visitor secure cycle storage areas, lockers, showers and change rooms within the facilities;
- Providing valet bicycle parking for events with appropriate demand;
- Provision of cyclist parking racks distributed within the public domain;
- Promoting cycling and signposted bicycle friendly routes in line with City of Sydney's Cycle Strategy and Action Plan 2007-2017; and

- Provision of safe cyclist routes within the precinct and connections to existing routes. Darling Drive will be promoted as the primary cyclist route with an appropriate east west link from Pyrmont/Ultimo to Liverpool St to reduce any risk of pedestrian and cyclist collision.

In conjunction with visual surveys of pedestrian activity, Darling Harbour Live will monitor the cycle traffic into and out of the precinct before construction commences and annually for the first 5 years once the development is delivered. Targets for continuous improvement will be established with the aim to ensure the precinct is alive with more and more cyclists each year.

3.5.4 Car Park Design

By considering historical parking data patterns for the current facilities and making use of the proposed functional diversity over the revitalised precinct, Darling Harbour Live's design across the whole SICEEP precinct will reduce car parking numbers to 2,280 spaces in comparison to the existing provision of 2,800 spaces serving the existing entertainment and exhibition centres. This reduction of nearly 20% of parking availability is expected to have flow on benefits to improving local air quality and reducing vehicle carbon emissions for the wider community.

The overall design approach is contingent on enhanced connectivity and access to other modes of transport within the Precinct, providing more transport options for visitors to the Project Site. On this note, it is anticipated that the proposed development will not impact significantly on the surrounding network.

The PPP Facilities car park strategies include:

- Designated car parking spaces for small cars, carpooling, electrical vehicles and hybrid cars;
- 20 Electric vehicle charging points provided initially within the PPP parking facility with future-ready electrical services provisions to increase the provision to 75 cars at a later date (approximately 5% of total parking provisions), depending on EV market penetration in 2016;
- A number of allocated spaces to support the Third-party operated Car Share spaces distributed through the precinct for use by residents and exhibitors. The number of spaces provided will be based on the commercial viability. This will be negotiated with the State during the development term; and
- Incentives for hirers or patrons, and rewards for employees, who use cycles, public transport, carpooling, hybrid, electric or alternate fuel vehicles. These incentives and rewards might be interest-free loans for staff to purchase bikes or annual train tickets, they could be reduced parking costs for EV drivers or they might be a free coffee if you ride in to work or an event.

3.6 Biodiversity

Although Darling Harbour is predominately an urban environment, the PPP public domain works have identified the following opportunities to positively impact the biodiversity of the site and its surrounds:

- Vegetation:
    - Use of native plant species where possible with regard to longevity, maintenance, public amenity and water requirements;
    - Nil irrigation to planting beds (excluding turf areas); and
    - Increased public domain softscaping compared to existing site.
- Water sensitive urban design measures to reduce the impact of storm water overland flow on Darling Harbour including:
    - Gross Pollutant traps;
    - Swales;
    - Permeable paving in selected areas; and
    - Reduced hard scaping compared to existing site.
- Operational impacts:
    - Selection of detergents and cleaning products with regard to environmental impact.

3.7 Health and Wellbeing

Darling Harbour Live will promote the health and wellbeing of the community that live, work and play within the SICEEP and its surrounds through the following broad Initiatives:

- Healthy indoor conditions that support optimum cognitive function and wellbeing;
- An interactive place to experience Sydney's renowned liveability; and
- Regenerative opportunities for the wider community.

To maximise indoor environmental quality within the Facilities the design will incorporate air quality controls, maximise daylight and access to views. Visitors assembled in the lobby and pre-function areas, as well as those in selected meeting rooms, will enjoy views through the eastern façade toward Tumbalong Park into Darling Harbour and the CBD beyond the precinct.

The selection of façade glazing with high levels of visual light transmission will provide high levels of daylight into the lobby and pre-function meeting rooms while solar shading will exclude uncomfortable direct sunlight in summer.

However it is the emphasis to improving indoor air quality to the various function spaces that will be most noticed by visitors and staff. Strategies to improve indoor air quality will include:

- Displacement ventilation to the main Plenary spaces and Theatre;
- Carbon dioxide monitoring and control of outdoor air levels;
- Selection of Low Volatile Organic Content (VOC) criteria and standards for internal paints, adhesives, sealants, fixtures and fittings, floor coverings and cleaning products;
- Use of low irritant materials and cleaning products and chemicals;
- Timber products selected to contain low levels of formaldehyde;
- Thermal comfort monitoring and independent control for occupants in their local environment (small meeting rooms etc); and
- Low glare luminaires, glare reduction devices and balanced luminance distribution between floor, wall and ceilings to create a visually comfortable environment.

In order to minimise wider impacts and create regenerative opportunities for the Facilities, Darling Harbour Live will:

- Use only refrigerants with zero Ozone Depleting Potential (ODP) target refrigerants that also have low Global Warming Potential (GWP). Incorporate technology to reduce refrigerant leaks;
- Select thermal and acoustic insulation products with low ODP and an accredited EMS; and
- Select PVC products in line with the GBCA best practice guidelines.

4.0 Conclusion

Darling Harbour Live has developed an integrated sustainable design, construction, operation and management strategy for the SICEEP.

Darling Harbour Live will employ measures to actively reduce environmental impacts during the construction of the SICEEP and commit to energy, water, waste and material targets during its operation. The SICEEP commitments will be verified by an independent expert sustainability certifier and the ICC will target an internationally recognised Gold LEED rating.

The SICEEP will be managed to reduce GHG emissions, potable water demand and environmental impacts through its operations. Visitors will be encouraged to reduce their environmental impact by purchasing green power, traveling sustainably and selecting sustainable delegate materials.

The key SICEEP initiatives proposed by Darling Harbour Live include:

- **Solar energy proposal** – Darling Harbour Live will Partner with the local community to fund Australia's largest CBD Rooftop Solar Array at 400kW, enough to power up to 100 homes, and generate Green Power that can be sold to event organisers to offset their carbon footprint;
- **Centralised thermal plant** – Centralised systems for heating and chilling of water to serve several buildings – meaning better management and maintenance of systems;
- **Rainwater harvesting** – Rainwater will be stored on site for use in the facilities, water features and public open space;
- **Reuse and Recycling** – Target 90% of construction waste to be re-used or recycled; 70% of event waste diverted from landfill;
- **Gold LEED rating** – The US Green Building Council's Leadership in Energy and Environmental Design (LEED) rating tool will be used to benchmark the international best practice design and operation of the ICC;
- **Green Star rating** – Darling Harbour Live will work with the Green Building Council of Australia to achieve a Green Star Performance rating for the ICC;
- **Gold Earth Check rating** – Darling Harbour Live will obtain a Gold Earth Check rating for the ICC. Earth Check is an internationally recognised environmental management and certification program for projects involved in the travel and tourism industry;
- **Enhanced connections and public transport links -** The master plan design for the precinct lays out a far more connected and enhanced navigation through the site;
- **Electric car share network –**By partnering with GoGet, Darling Harbour Live will establish Australia's first Electric Car Share Network for use by the community within the precinct and beyond;
- **Passive signage** –indicating the sustainability attributes of key items; and
- **Dynamic informatics systems and technology -** Public broadcast information, web based and mobile phone applications that provide detailed information about the sustainability credentials of the precinct.

The strategies in this report outline Darling Harbour Live's commitment to deliver Australia's global city with world class convention, exhibition and entertainment facilities that can compete effectively in the national and international events markets.