



Infrastructure NSW

Powerhouse Precinct Parramatta

Powerhouse SSDA report – ESD

PHM-ARP-REP-ESD-0004

Issue 05 | 15 September 2020

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 273467


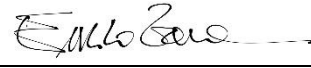

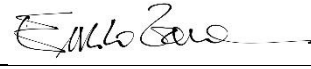
Arup Australia Services Pty Ltd ABN 36 625 911 686

Arup
Level 5
151 Clarence Street
Sydney NSW 2000
Australia
www.arup.com

ARUP








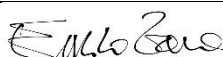
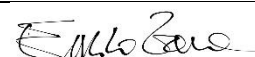
Document verification

ARUP

Job title		Powerhouse Precinct Parramatta		Job number 273467	
Document title		Powerhouse SSDA report – ESD		File reference	
Document ref		PHM-ARP-REP-ESD-0004			
Revision	Date	Filename	Arup Report template_ESD.docx		
Draft 1	12 Mar 2020	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Enda Seyama-Heneghan	Daniel Harris	Peter MacDonald
		Signature			
Draft 2	15 April 2020	Filename			
		Description	Updated based on the feedback received from INSW		
			Prepared by	Checked by	Approved by
		Name	Enda Seyama-Heneghan/ Daniel Harris	Alexander Hespe	Enrico Zara
		Signature			
Issue 01	17 April 2020	Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name	Enda Seyama-Heneghan/ Daniel Harris	Alexander Hespe	Enrico Zara
		Signature			
Issue 02	22 Apr 2020	Filename	Arup Report template_ESD_v5.docx		
		Description	Updated based on comments received		
			Prepared by	Checked by	Approved by
		Name	Enda Seyama-Heneghan/Daniel Harris	Alexander Hespe	Enrico Zara
		Signature			
<p align="center">Issue Document verification with document</p> <div style="text-align: right;"> <input checked="" type="checkbox"/> </div>					

Document Verification

Page 2 of 2

Job title		Powerhouse Precinct Parramatta		Job number		273467	
Document title		Powerhouse SSDA report – ESD				File reference	
Document ref		PHM-ARP-REP-ESD-0004					
Revision	Date	Filename	Arup Report template_ESD_v6.docx				
Draft 03	21 Aug 2020	Description	Updated based one DPIE feedback				
			Prepared by	Checked by	Approved by		
		Name	Daniel Harris	Enrico Zara	Enrico Zara		
		Signature					
Issue 4	1 Sep. 20	Filename	Arup Report template_ESD_v7.docx				
		Description	minor update				
			Prepared by	Checked by	Approved by		
		Name	Daniel Harris	Enrico Zara	Enrico Zara		
		Signature					
Issue 5	15 Sept 2020	Filename	Arup Report template_ESD_Willow Grove.docx				
		Description	Update to retain Willow Grove				
			Prepared by	Checked by	Approved by		
		Name	Daniel Harris	Enrico Zara	Enrico Zara		
		Signature					
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
		Name					
		Signature					
<div style="text-align: right;"> Issue Document Verification with Document <input checked="" type="checkbox"/> </div>							

Contents

	Page
1 Introduction	1
2 Background	1
3 Site Description	2
4 Overview of Proposed Development	4
5 Assessment Requirements	5
5.1 Section J Compliance – NCC 2019	6
6 Overall ESD Strategy	7
7 Green Star Rating	8
8 ESD Initiatives	8
8.1 Building Envelope	9
8.2 Energy	9
8.3 Materials	10
8.4 Water	11
8.5 Transport	12
8.6 Resilience	12
8.7 Waste	13
9 Conclusion	14
10 Mitigation Measures	15

1 Introduction

This report supports a State Significant Development (SSD) Development Application (DA) for the development of the Powerhouse Parramatta at 34-54 & 30B Phillip Street and 338 Church Street, Parramatta. The Powerhouse Parramatta is a museum (information and education facility) that has a capital investment value in excess of \$30 million and as such the DA is submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

This report has been updated to incorporate comments received as part of the public exhibition of the EIS and original ESD Statement lodged as an appendix to that EIS.

Infrastructure NSW is the proponent of the DA.

2 Background

The Powerhouse is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill. The Powerhouse has occupied the Ultimo site since 1988.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's *A Plan for Growing Sydney* as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the *Greater Sydney Region Plan*.

Powerhouse Parramatta will be the first State cultural institution to be located in Western Sydney – the geographical heart of Sydney. In December 2019, the Government announced the winning design, by Moreau Kusunoki and Genton, for the Powerhouse Parramatta from an international design competition.

Powerhouse Parramatta will establish a new paradigm for museums through the creation of an institution that is innately flexible. It will become a national and international destination renowned for its distinctive programs driven by original research and inspired by its expansive collections. It will be a place of collaboration, a mirror of its communities forever embedded in the contemporary identity of Greater Sydney and NSW.

3 Site Description

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site boundary is identified in Figure 1 & 2. The site excludes the GE Office Building at 32 Phillip Street.

The site is currently occupied by a number of buildings and structures, including:

- Riverbank Car Park – a four-level public car park
- Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s
- St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s
- 36 Phillip Street – a two-storey building comprising retail and business premises
- 40 Phillip Street – a two-storey building comprising retail and business premises
- 42 Phillip Street – a substation building set back from the street

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.



Figure 1 Aerial photograph of the site and its context Source: Mark Merton Photography



Figure 2 Site boundary, key existing features, and immediate local context

4 Overview of Proposed Development

The Powerhouse was established in 1879, and Powerhouse Parramatta will radically return to its origins through the creation of seven presentation spaces of extraordinary scale that will enable the delivery of an ambitious, constantly changing program that provides new levels of access to Powerhouse Collection. The Powerhouse will set a new international benchmark in experiential learning through the creation of an immensely scaled 360-degree digital space, unique to Australia.

Powerhouse Parramatta will reflect the communities and cultures of one of Australia's fastest growing regions. It will hold First Nations culture at its core and set a new national benchmark in culturally diverse programming. The Powerhouse will be highly connected through multiple transport links, and integrate into the fine grain of the city.

Powerhouse Parramatta will be an active working precinct and include the Powerlab, which will enable researchers, scientists, artists and students from across regional NSW, Australia and around the world to collaborate and participate in Powerhouse programs. The Powerlab will feature digital studios to support music and screen industries alongside co-working spaces, life-long learning and community spaces. Integrated into the Powerlab will be a research kitchen and library that will support a NSW industry development program including archives and oral histories.

This application will deliver an iconic cultural institution for Parramatta in the heart of Sydney's Central City. The SSD DA seeks consent for the delivery of the Powerhouse Parramatta as a single stage, comprising:

- Site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- Demolition of existing buildings including the existing Riverbank Car Park and 'Willow Grove' (with Willow Grove to be relocated to another site);
- Construction of the Powerhouse Parramatta, including:
 - Seven major public presentation spaces for the exhibition of Powerhouse Collection;
 - Front and back-of-house spaces;
 - Studio, co-working and collaboration spaces comprising the 'Powerlab', supported by 30 residences (serviced apartments) for scientists, researchers, students and artists, and 60 dormitory beds for school students;
 - Education and community spaces for staff, researchers and the Powerlab residents, the community, and education and commercial hirers;
 - Commercial kitchen comprising the 'Powerlab Kitchen' used for cultural food programs, research, education and events;

- Film, photography, and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
- Public facing research library and archive for community, industry, students and researchers to access materials; and
- A mix of retail spaces including food and drink tenancies with outdoor dining.
- Operation and use of the Powerhouse Parramatta including use of the public domain provided on the site to support programs and functions;
- Maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Lane and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;
- Public domain within the site including new public open space areas, landscaping and tree planting across the site; and
- Building identification signage.

The project does not seek consent for the carrying out of works outside of the site boundary, and in particular does not involve any alterations to the existing edge of the formed concrete edge of the Parramatta River or to the waterway itself.

5 Assessment Requirements

The Department of Planning, Industry and Environment have issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as follows:

SEAR	Where Addressed
<p>10. Ecologically Sustainable Development (ESD)</p> <p>The EIS shall:</p> <ul style="list-style-type: none"> • identify how principles (as defined in Clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design, construction and ongoing operation phases of the development, and include innovative and best practice proposals for environmental building performance 	<i>Section 8</i>
<ul style="list-style-type: none"> • include a framework for how the proposal will be designed to consider and reflect best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design and technology (including water sensitive urban design) and use of renewable energy 	<i>Section 6</i>

<ul style="list-style-type: none"> • use the climate change projections developed by CSIRO for the Sydney Metropolitan area to inform the building design and asset life of the project and address strategies to mitigate climate change impacts including: <ul style="list-style-type: none"> ○ increased frequency of extreme heat days ○ extended heatwave events ○ more extreme (intense) rainfall events ○ gustier wind conditions. 	<i>Section 8.6</i>
<ul style="list-style-type: none"> • demonstrate strategies to minimise climate change drivers (including renewable energy use, reduced urban heat island and water sensitive urban design) 	<i>Section 6, 8.2, 8.4, 8.6</i>
<ul style="list-style-type: none"> • address how the proposal will support the City's long-term strategy to improve water quality and public engagement with the Parramatta River 	<i>Refer to EIS</i>

Table 1 Assessment Requirements

5.1 Section J Compliance – NCC 2019

The building is seeking compliance with the National Construction Code (NCC) Volume 1, 2019. Section J of the NCC outlines performance requirements so that the building and its services facilitate the efficient use of energy.

During the detailed design stage the architectural design will be assessed to develop thermal requirements for all the aspects of the buildings envelope, such as glazing performance, opaque walls, shading, roofs and floors.

6 Overall ESD Strategy

The unique design and diverse function of the project building create challenges when applying standardised sustainability frameworks that are more commonly used in commercial developments. As such, the ESD strategy will address specific considerations and opportunities of this project, which will ensure the high sustainability aspirations are met.

To address the SEARS, the project plans to achieve a Green Star Design & As Built rating of 5 stars, which is considered Australian Excellence as defined by the Green Building Council of Australia (GBCA). Innovative proposals, as requested in the SEARS, included in the current design and operation of the building which exceed the NCC2019 provisions include; mixed mode operation of circulation areas, extensive climate change adaptation strategies, large landscaped areas, and design guided by life cycle assessment of material impacts. These features also align with the Greater Sydney Regional Plan objectives for landscape, efficiency and resilience.

The building's design will consider the opportunities for incorporating a high-performance building envelope as well as high efficiency systems to reduce energy use and greenhouse gas emissions. These design considerations work towards the implementation of the project's Zero Carbon Transition Plan (ZCTP), as well as aligning with national and international policies and guidelines.

As the building will accommodate large volumes of the general public, its design should ensure a superior indoor environment for its occupants. This will be achieved through analysing opportunities for high-performance building envelope and adaptable air conditioning systems.

Buildings contribute 40% of energy-related CO₂ emissions annually, therefore there is an urgent need to further reduce their environmental impact in coming years. This involves ensuring flexibility in the building design to accommodate mechanical systems and fit-outs that feature energy efficient technologies and are adaptable to multiple uses. As this building is intended to have a long design life, its resilience against climate change is a crucial consideration.

This document will outline the ESD strategies that will be considered within the building's design. The following areas will be the focus of the design team:

- Energy – Incorporate energy efficient designs and technological strategies to reduce energy use and greenhouse gas emissions.
- Materials – Minimise waste directed to landfill through better efforts of waste separation, encourage recycling and reuse of materials. Use low environmental impact materials in the building design.
- Water – Reduce consumption of potable water and install water efficient systems. Consider water reuse and treatment technologies.
- Climate Resilience– Design considering the building's urban heat impact and future-proof against climate change.
- Visitor/community experience – Maximise the building's indoor environmental quality to ensure occupant comfort, considering thermal

comfort, visual comfort, and indoor air quality. Include socially sustainable initiatives in the building design and operations.

- Transport – Encourage sustainable transport options to and from the site.
- Environmental benchmarking – aiming at achieving a Green Star rating

7 Green Star Rating

The Green Building Council of Australia (GBCA) has recently developed the Green Star for New Buildings rating tool, which is currently in trial phase. This new tool includes targets that directly address the UN Sustainable Development Goals and encourages ambitious building design to significantly reduce the impact the built environment has on aggravating climate change. As this new tool is still in development, there is potential for it to be customised to more appropriately assess and guide this unique project.

The project has been accepted by the GBCA to register under the new tool as part of the early access programme as well the project will target a Green Star 5 star minimum rating using the current Green Star Design & As Built v1.3 rating tool. The current tool is well understood by the design team, and involves specific targets that focus on a wide range of categories in the building design.

The project will be registered to be under the Green Star Design & As Built v1.3 rating tool and work towards rating using the New Buildings tool being released imminently. Formal certification will be achieved after completion of construction.

8 ESD Initiatives

With the aim of leading practice in sustainability targets, the project design will integrate the principles of ecologically sustainable development, as defined in Clause 7(4) of Schedule 2 of the Regulation (Environmental Planning and Assessment Regulation 2000, 2014). These principles involve:

- Preventing damage to the environment;
- Ensuring inter-generational equity;
- Conserving biological diversity and ecological integrity; and
- Including environmental impact in the valuation of assets and services.

Applying these principles to the context of the proposed building, the design team will focus on the following strategies:

- Energy efficient systems and building design
- Water strategies to minimize potable water consumption and address stormwater management
- Encouraging sustainable transport modes
- Climate change resilience
- Efficient waste management
- Environmental benchmarking – achieving a Green Star rating

8.1 Building Envelope

The role of the envelope is to block solar gains from penetrating the building fabric in summer while optimising daylight levels and minimising glare. The glazing performance and shading configuration for each orientation will be optimised to ensure that thermal comfort is achieved, and solar gains are adequate for the efficient operation of the mechanical system.

The proposed façade arrangement will minimise solar heat gains to reduce the peak load and annual energy use imposed on the mechanical system, while also addressing the NCC 2019 Section J requirements. Possible design options to address these include:

- High performance glass
- External shading
- Internal shading
- Opaque façades

8.2 Energy

It is essential to ensure the development is designed and built to minimise energy consumption and reduce greenhouse gas emission to the atmosphere. Strategies being reviewed to achieve this level of performance include:

- A high-performance façade design to reduce solar gain to perimeter areas for all buildings.
- The use of high efficiency mechanical systems to provide cooling effectively.
- The building will target a 30% reduction in operational energy
- High efficiency chillers performing better than the Minimum Energy Performance Requirements (MEPS).
- Use of renewable energy and low carbon technology to offset greenhouse gas emissions.
- Sustainable materials and products with low embodied carbon and efficiency measures used.
- Fully electric building operations, with a small allowance of gas for cooking.
- Landscape and building design to reduce local urban heat island effect.

8.2.1 Mechanical System

In design, emphasis will be placed on providing an appropriate level of system resilience and quality to ensure efficient operation of the buildings. The integration between the selected mechanical system and the façade performance play a fundamental role in delivering high levels of thermal comfort to occupants while optimising energy consumption through building operations.

The building's unique requirements for stewardship of art demands strict indoor environment quality. This will be another consideration when designing the HVAC systems within the building.

8.2.2 Renewable Energy

The project's developed ZCTP will call for all building operations to be powered by renewable energy within a designated timeframe. This also aligns with requirements for the desired Green Star rating.

The area used for PV is maximised to cover all available roof area that is not otherwise provided as landscaped, publicly accessible area. Area not available to PV generally are above building services plant that have ventilation requirements, e.g. cooling towers. Additional off-site renewable energy is proposed to offset carbon beyond what is already achieved through efficiency and on-site renewables.

8.3 Materials

As buildings become more efficient and the energy that they use comes from an increasingly decarbonised grid, the upfront carbon becomes a larger factor in buildings overall carbon footprint. It is estimated to be responsible for half of the entire carbon footprint of new developments between now and 2050.

The following measures have been considered:

- The building will target a 20% lower upfront carbon footprint against a standard practice building of the same design intent.
- Parametric optimisation of exoskeleton to dematerialise steel use
- The building will investigate the use of green concrete with high cement replacement, such as recycled fly ash.
- Carbon Neutral construction site purchasing renewable energy
- Dematerialise (materials serve a dual purpose) – precast concrete is structural plus acts as internal wall finish
- Use of recycled materials in acoustic layers, underlays, partitions
- High recycled content lightweight concrete for non load bearing walls
- PVC will be minimised, and where used will be best practice PVC as defined by the GBCA.
- All timber will be FSC Certified (or equivalent) as part of the Green Star pathway

8.4 Water

Water related strategies have been considered as key to minimising environmental impact of the proposed building. Examples are as detailed in the following subsections.

8.4.1 Building Water Strategy

The building design will also consider the efficient use of water through the following strategies.

- Dual reticulation is provided as part of the current building design to provide non-potable water supply for toilet flushing and irrigation.
- Water efficient fixtures and fittings must be used throughout and will exceed the following WELS ratings
 - 4 star for toilets,
 - 6 star for urinals,
 - 6 Star for tapware and
 - 3 star (less than 7.5L/min) for showers
- A rainwater harvesting system will be used in toilet flushing and to supplement HVAC cooling tower demands
- Minimisation of cooling towers use by also using air cooled chillers
- it is understood that there are future plans for provision of recycled water mains to the Parramatta CBD – the facility will be enabled to take advantage of this.
- BMS connected water meters with leak detection systems
- Permeable outdoor finishes to reduce run off and erosion
- The building will target a 20% reduction in potable water use, when compared to a standard practice building

8.4.2 Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design encompasses all aspects of urban water cycle management, including water supply, wastewater, and stormwater management. WSUD is intended to minimise the impacts of development upon the water cycle and achieve more sustainable forms of urban development.

This will involve the consideration and potentially a combination of one or more elements, such as:

- Bio-swales
- Rain gardens
- Rainwater harvesting tanks
- Proprietary treatment tanks
- Gross pollutant traps

8.5 Transport

The use of motorised transport (both private and commercial) has been a major contribution to environmental pollution and the excessive consumption of natural resources.

The development has the opportunity to create an environment where pedestrian access is prioritised and the use of sustainable modes of transport is stimulated by, for example:

- Encouraging walking and cycling by ensuring provision of bicycle facilities for building users and end of trip facilities for regular occupants
- Site near public transport networks including trains, buses and major transport focal points with clear sign posting and links to public transport locations
- No on-site car parking
- Universal design – design for accessibility – accessible and attractive to all

8.6 Resilience

As the effects of climate change accelerate, there is greater need for buildings with long design life to be adaptable to these impacts on the local environment. A thorough understanding should be developed by the design team to understand potential climate-related risks. These may include:

- Damage or failure of building and system components
- Reduced operational capacity
- Hazardous conditions to surrounding areas (e.g. affecting access and egress)

To capture this information and guide design, a Climate Change Adaptation and Resilience Plan will be produced.

These assessments will be made with reference to the climate change projections developed by CSIRO for the Sydney Metropolitan area. Strategies will be developed that ensure resilience to such impacts and will be incorporated to building and systems design. Key climate change considerations include:

- Extreme heat waves
- Increased frequency of heat days
- Extreme flooding
- Harsh wind conditions

This pre-screening process is also a requirement towards achieving a high Green Star rating using the new Green Star for New Buildings rating tool.

8.7 Waste

The project design will encourage improved waste management initiatives during construction and operation, with a focus on encouraging increased rates of recycling. An effective operational waste management plan will be developed, considering best practice methods for source separation.

With the City of Parramatta targeting to increase diversion of waste from landfill by 85% by 2038 (Waste Avoidance and Resource Recovery Strategy 2019-2023, 2019), the waste management efforts in the development must be stringent.

The following measures have been considered:

- Diverting at least 90% of its construction and demolition waste from landfill
- Outsource organic waste recycling service
- Ban on single use items
- Modular design and offsite construction

9 Conclusion

An ESD strategy has been developed to align with the SEARs assessment, while also complying with NCC 2019 Section J requirements.

The project's commitment to achieving a Green Star rating will provide a clear framework on which best practice sustainable building principles can be applied to the construction and operations of the building. The strategy will ensure the building is high-performing environmentally, reduces local ecological impact, minimises energy use and greenhouse gas emissions, and implements climate resilience measures.

These strategies will be realised through focused ESD initiatives involving building design that considers optimised building envelope, renewable energy generation, waste management, and climate change projections. In addition, the initiatives will design for sustainable operations, such as efficient mechanical systems, reduced potable water usage, and sustainable modes of transport.

10 Mitigation Measures

Proposed Measure	Timing
Develop ESD strategy throughout the design development process including ongoing consultation with Green Building Council of Australia.	Ongoing

Table 2 – Mitigation Measures