



State Significant Development Environmental Impact Statement

Barangaroo Public Domain (SSD 16_7944)

Hickson Park, Watermans Quay, Barangaroo Avenue,
Wulugul Walk, Watermans Cove and Public Pier

Submitted to the Department of Planning and Environment
On Behalf of Lend Lease (Millers Point) Pty Ltd

May 2017 ■ 10051

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JBA operates under a Quality Management System. This report has been prepared and reviewed in accordance with that system. If the report is not signed below, it is a preliminary draft.

This report has been prepared by:



Chris Ferreira

4/05/2017

This report has been reviewed by:



Michael Rowe

4/05/2017

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NSW EPA Accredited Site Auditor

Statement of Validity

Development Application Details

Applicant name	Lend Lease (Millers Point) Pty Ltd
Applicant address	Level 14, Tower Three, International Towers Sydney, Exchange Place, 300 Barangaroo Avenue Barangaroo NSW 2000 Australia
Land to be developed	Lot 214 in DP 1221076, Lot 101 in DP 1204946 and part of Darling Harbour
Proposed development	Public domain works for Hickson Park, Watermans Quay, part of Barangaroo Avenue, Wulugul Walk, Watermans Cove and the Public Pier, as described in Section 3.0 of this Environmental Impact Statement

Prepared by

Name	Michael Rowe
Qualifications	BPlan (Hons) MPIA
Address	173 Sussex Street, Sydney
In respect of	State Significant Development - Development Application

Certification

I certify that I have prepared the content of this EIS and to the best of my knowledge:

- it is in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2000;
- all available information that is relevant to the environmental assessment of the development to which the statement relates; and
- the information contained in the statement is neither false nor misleading.

Signature



Name	Michael Rowe
Date	4/05/2017

Disclaimer

All place names specified within this Environmental Impact Statement are used for identification purposes only and do not represent the final names which will be adopted. All place names will be subject to a separate naming approval process.

Executive Summary

Purpose of this Report

This Environmental Impact Statement (EIS) is submitted to the Department of Planning and Environment pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of a State Significant Development (SSD) application for the Barangaroo public domain works for all of Hickson Park (located within both Barangaroo South and Central Precincts), Watermans Quay, the remaining section of Barangaroo Avenue in Barangaroo South, Wulugul Walk (including the expanded boardwalk required by a condition of Concept Plan Mod 8), Watermans Cove and the Public Pier.

The proposed public domain works are located within both the Barangaroo South and Central Barangaroo Precincts and entirely within the Barangaroo Site, which is identified as a State Significant Site in Schedule 2 of *State Environmental Planning Policy (State and Regional Development) 2011*. As the proposed development will have a capital investment value in excess of \$10 million and is located within the Barangaroo site, it is SSD for the purposes of the EP&A Act.

This EIS has been prepared in accordance with the requirements of Part 4 of the EP&A Act, Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and the Requirements of the Secretary of the Department of Planning and Environment for the preparation of the EIS (refer to the SEARs for SSD 16_7944), which are included at **Appendix D**. This EIS should be read in conjunction with the supporting information and plans appended to and accompanying this report.

Overview of the Development

This application seeks approval for the following works within Barangaroo South and part of Central Barangaroo:

- Site preparation and remediation (if required);
- Construction of the public domain, comprising:
 - Watermans Cove;
 - the Public Pier in Darling Harbour, south of Watermans Cove;
 - Hickson Park, including a public amenities building;
 - Watermans Quay;
 - the remaining section of Barangaroo Avenue within the site; and
 - Wulugul Walk (including the expanded boardwalk required by condition of Concept Plan Mod 8).

The public domain works include provision of all ground treatments and finishes, landscaping, furniture and fixtures, public domain structures, lighting, civil and stormwater infrastructure and utility services. This DA does not seek approval for the future building on the Public Pier which will be subject to a separate planning application.

The Site

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Barangaroo Reserve, Central Barangaroo and Barangaroo South, and has been subject to multiple investigations that detail the physical and natural characteristics of the site. For the purposes of construction staging, Lendlease has broken Barangaroo South into three areas, referred to as Stage 1A, Stage 1B and Stage 1C. The area of land within which development is proposed under this Development Application, is identified as the public domain between and around Blocks 5, 4A, 4B and Y in the approved Concept Plan (Mod 8).

As part of the Concept Plan (Mod 8) determination, the Planning Assessment Commission extended the northern boundary of Hickson Park, which previously stopped at the northern extent of Barangaroo South, in to part of then Block 5 within Central Barangaroo, and also added approximately 14 metres of Darling Harbour in front of the Crown Hotel Resort site. Accordingly, this application, which includes Hickson Park and the remainder of the Stage 1B Public Domain also includes the creation of the park within former Block 5 of Central Barangaroo.

Planning Context

Section 4.1 of the EIS considers all applicable legislation in detail. The development is consistent with and complies with all the relevant strategic policies, environmental planning instruments, plans and guidelines, including Concept Plan (Mod 8).

Environmental Impacts and Mitigation Measures

This EIS provides an assessment of the environmental impacts of the development in accordance with the SEARs and sets out the undertakings made by Lendlease to manage and minimise potential impacts arising from the development. It demonstrates that the proposed development is satisfactory with respect to:

- Public Domain and Access
- Views and Visual Impacts
- Land Contamination
- Infrastructure provision
- ESD
- Water, Drainage, Stormwater
- Marine Ecology
- Heritage and Archaeology
- Maritime Navigation
- Air, Noise and Odour
- Transport and Accessibility
- Crime Prevention
- Environmental, Construction and Site Management
- Wind

All measures that have been recommended as part of the detailed technical studies to mitigate potential environmental impacts have been incorporated into the proposed development, or are included in the Mitigation Measures at Section 6.0.

Conclusion and Justification

Having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development, the carrying out of the development is justified for the following reasons:

- There is a strategic need to provide the public domain within Barangaroo South to ensure the large number of future visitors, residents and workers at Barangaroo South enjoy a high quality environment.
- The development is consistent with and complies with all the relevant strategic policies, environmental planning instruments, plans and guidelines, including Concept Plan (Mod 8).
- The development will have a wide range of positive social and economic impacts.
- There are no adverse environmental impacts that cannot be appropriately managed by the mitigation measures set out in this EIS.

1.0 Introduction

This Environmental Impact Statement (EIS) is submitted to the Department of Planning and Environment pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of a State Significant Development (SSD) application for the Barangaroo public domain works for all of Hickson Park (located within both Barangaroo South and Central Precincts), Watermans Quay, the remaining section of Barangaroo Avenue in Barangaroo South, Wulugul Walk (including the expanded boardwalk required by a condition of Concept Plan Mod 8), Watermans Cove and the Public Pier.

The proposed public domain works are located within both the Barangaroo South and Central Precincts and entirely within the Barangaroo Site, which is identified as a State Significant Site in Schedule 2 of *State Environmental Planning Policy (State and Regional Development) 2011*. As the proposed development will have a capital investment value in excess of \$10 million and is located within the Barangaroo site, it is SSD for the purposes of the EP&A Act.

The report has been prepared by JBA on behalf of Lend Lease (Millers Point) Pty Ltd (herein after referred to as Lendlease), and is based on the Public Domain Drawings (**Appendix A**) and Public Domain Report (**Appendix B**) prepared by Grant Associates, Civil Engineering Drawings prepared by Cardno (**Appendix C**), and other supporting technical information appended to the report (see Table of Contents).

This EIS has been prepared in accordance with the requirements of Part 4 of the EP&A Act, Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), and the Requirements of the Secretary of the Department of Planning and Environment for the preparation of the EIS (refer to the SEARs for SSD 16_7944), which are included at **Appendix D**. This EIS should be read in conjunction with the supporting information and plans appended to and accompanying this report.

1.1 Background

1.1.1 The Barangaroo Concept Plan

The Barangaroo Concept Plan (MP06_0162) was approved in February 2007. The Barangaroo Concept Plan covers urban design and policy initiatives and is the statutory planning approval to guide the urban renewal of Barangaroo.

The Barangaroo Concept Plan has been modified seven times since originally being approved and the Statement of Commitments has been revised accordingly. The most recent modification, Concept Plan (Mod 8) was approved on 28 June 2016 (Concept Plan).

The Concept Plan provides for:

- A mixed use development involving a maximum of 594,354m² gross floor area (GFA), including:
 - A maximum of 183,031m² of residential GFA of which a maximum of 154,000m² will be in Barangaroo South;
 - A maximum of 76,000m² of GFA for tourist uses of which a maximum of 59,000m² will be in Barangaroo South;
 - A maximum of 34,000m² of GFA for retail uses of which a maximum of 30,000m² will be in Barangaroo South;
 - A maximum of 5,000m² of GFA for active uses in the Public Recreation zone of which 3,500m² will be in Barangaroo South; and
 - A minimum of 12,000m² GFA for community uses.

- approximately 11 hectares of new public open space/public domain, with a range of formal and informal open spaces serving separate recreational functions and including a 2.2km public foreshore promenade;
- built form principles, maximum building heights and GFA for each development block within the mixed use zone;
- public domain landscape concept, including parks, streets and pedestrian connections;
- alteration of the existing seawalls and creation of a portion of new shoreline to the harbour.
- Construction, operation and maintenance of a concrete batching plant to supply concrete for construction of future development under this Concept Plan at Barangaroo South.

As part of the Mod 8 Determination, the Planning Assessment Commission made modifications to the proposed Concept Plan Modification. Most notably, the Commission extended the northern boundary of Hickson Park, which previously stopped at the northern extent of Barangaroo South, in to part of Block 5 within Central Barangaroo, and added approximately 14 metres of Darling Harbour in front of the Crown Hotel Resort site. Accordingly, this application, which includes Hickson Park and the remainder of the Stage 1B Public Domain also includes the creation of the park within former Block 5 of Central Barangaroo.

To facilitate the redevelopment of the Barangaroo site under the Concept Plan, the site was listed in Part 12 of Schedule 3 of the State Significant Precincts SEPP. The State Significant Precincts SEPP zones the Barangaroo site part B4 Mixed Use and part RE1 Public Recreation. It also establishes maximum building heights and gross floor area (GFA) restrictions for the nominated development blocks within the B4 Mixed Use zone and RE1 Zone within Barangaroo South.

The proposed development has been designed in accordance with Concept Plan (Mod 8) and the Schedule 3 of the State Significant Precinct SEPP.

1.1.2 Stage 1 Tender and Bid Process

The 22 hectare Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park (referred to herein as Barangaroo Reserve), Barangaroo Stage 2 (referred to herein as Central Barangaroo) and Barangaroo Stage 1 (herein referred to as Barangaroo South).

Lendlease was successfully appointed as the preferred proponent to develop Barangaroo South on 20 December 2009. This application forms one of a series of individual applications that Lendlease has and will be submitting to deliver Barangaroo South. As noted above, because of the modifications made by the PAC as part of its determination of Concept Plan (Mod 8), the application also includes the construction of Hickson Park within Central Barangaroo.

1.1.3 Barangaroo South

For the purposes of construction Barangaroo South has been divided into three areas, Stage 1A, 1B and 1C. A site plan of Barangaroo South is provided at **Figure 1**. Information regarding the status of each of the stages is provided below.

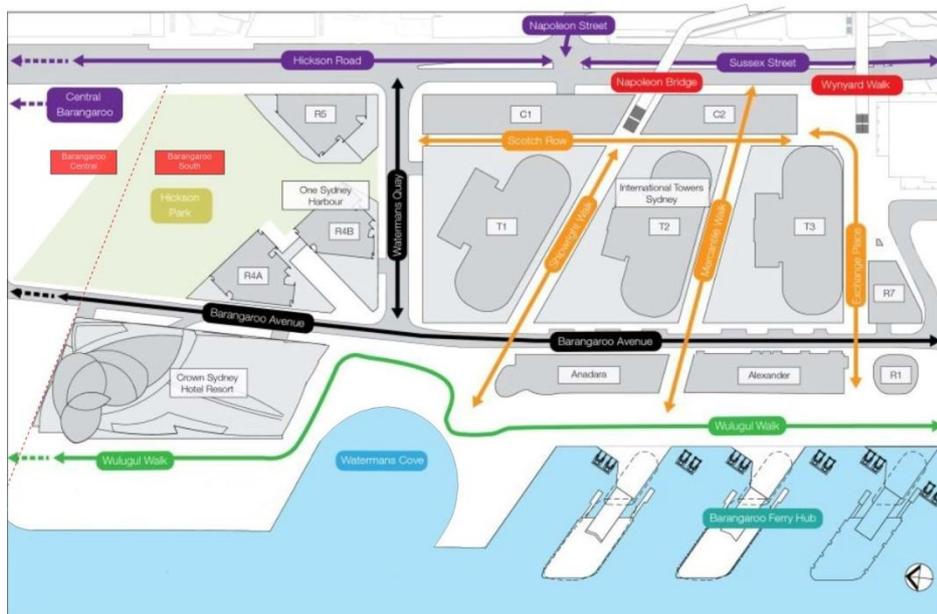


Figure 1 – Map of Barangaroo South

Stage 1A

Stage 1A refers to the portion of the Barangaroo South site south of Watermans Quay (formerly Globe Street). Within Stage 1A, approval has been granted for the shared Stage 1A Basement and Public Domain, four commercial buildings, known as Commercial Building C2, C3, C4 and C5, two Residential Buildings (R8 and R9), one mixed use commercial / retail building known as R7 and one retail building known as R1. The Public Domain, C3, C4 and C5, R7, R8 and R9 have all been completed and are now occupied. Construction has commenced C2. The single remaining building, C1, is yet to be designed and lodged for planning approval.

The site has been also subject to a number of minor DAs submitted to the City of Sydney Council for public art, signage, retail uses and outdoor seating.

Stage 1B

Stage 1B refers to the portion of the Barangaroo South site north of the existing Stage 1A, with the exception of the area being developed by Crown Resorts, which is referred to as Stage 1C. Stage 1B comprises three residential towers and the future northern park (known as Hickson Park) above a shared basement. Separate but concurrent SSD development applications have been prepared for these works and include:

- **Stage 1B Basement (SSD 6960):** The Stage 1B Basement will service the Stage 1B Residential Buildings (Buildings R4A, R4B and R5). The Stage 1B Basement will also provide the ground level slab and trunk services infrastructure for the Public Domain above, the subject of this SSD Development Application. SSD 6960 also includes interim public domain and landscaping works comprising landscaping the future Hickson Park. The provision of part of Barangeroo Avenue will also be undertaken as part of the Stage 1B Basement consent, however, it is noted should this Public Domain application be approved prior to its construction, it is intended that this updated and final design will take precedence and replace the Basement scheme.
- **Building R4A (SSD 6964):** Building R4A will be a residential tower and podium building of 72 storeys, comprising approximately 327 apartments. The building will

have a maximum height of RL 250 and a GFA of 47,882m² comprising predominantly residential floor space with retail at ground floor level.

- Building R4B (SSD 6965): Building R4B will be a residential tower and podium building of 60 storeys comprising approximately 297 apartments. The building will have a height of RL 210 and a GFA of 39,063m² comprising predominantly residential floor space with retail at ground floor level and podium level 1.
- Building R5 (SSD 6966): Building R5 will be a residential tower and podium of 29 storeys comprising approximately 151 apartments. The building will have a height of RL 105.89 and a GFA of 19,158m² comprising predominantly residential floor space with retail at ground floor level and podium level 1. Building R5 will accommodate 3,355m² of Key Worker Housing (39 apartments), in accordance with Lendlease's commitment for Barangaroo South.
- Barangaroo Public Domain Works (SSD 16_7944, the subject of this application): This SSD application will seek consent for all public domain works within 'Stage 1B' of the Barangaroo South Site and for the entirety of Hickson Park. The public domain works include the construction of Watermans Cove, and expanded Wulugul Walk and public pier along the foreshore, public domain works associated with Hickson Park (including a proposed public amenities building), the completion of the Barangaroo South street system, as well as all typical public domain features such as trees and other landscape features, walkways, street paving, street furniture, lighting and wayfinding signage.

A separate development consent (SSD 5897) has been granted for remediation of the Stage 1B Basement site. This existing approval also grants consent for the construction of groundwater retention walls, bulk excavation within the groundwater retention walls, diversion and augmentation of stormwater infrastructure, tree removal and management, and demolition of existing structures on the site.

Stage 1C

Stage 1C relates to the landmark hotel building (herein after referred to as the Crown Sydney Hotel Resort) within Block Y. The building and associated site preparation and basement works are being developed by Crown Resorts. An SSD DA (SSD 6957) was approved by the Planning Assessment Commission on 28 June 2016 for the Crown Sydney Hotel Resort. The approval includes:

- site remediation, earthworks, excavation, structural and site preparation works;
- construction and fit-out of a 71-storey (RL 275 metre) tower including podium;
- construction of three basement levels;
- a total GFA of 77,500m², comprising:
 - 66 residential apartments
 - hotel use (350 hotel keys/rooms) and ancillary guest and visitor facilities;
 - 6,085m² restricted gaming facility GFA; and
 - 6,700m² retail GFA;
- 610 on-site car parking spaces and 188 bicycle parking spaces;
- public domain works and landscaping; and
- business and building identification signage and signage zones.
- Construction of licensed dining terraces within the waterfront area of public domain

1.1.4 Barangaroo Delivery Authority

The Barangaroo Delivery Authority was established on 30 March 2009 under the *Barangaroo Delivery Authority Act 2009* (NSW) to manage the redevelopment of Barangaroo and to deliver world class benchmarks in urban design, public domain and sustainability.

The creation of the Barangaroo Delivery Authority reinforces the NSW Government's commitment to the delivery of Barangaroo in a coordinated and financially responsible manner. The Barangaroo Delivery Authority is subject to the control and direction of the NSW Premier.

The objects of the *Barangaroo Delivery Authority Act 2009* are:

- to encourage the development of Barangaroo as an active, vibrant and sustainable community and as a location for national and global business;
- to create a high quality commercial and mixed use precinct connected to and supporting the economic development of Sydney;
- to facilitate the establishment of Barangaroo Headland Park and public domain land;
- to promote the orderly and sustainable development of Barangaroo balancing social, economic and environmental outcomes; and
- to create in Barangaroo an opportunity for design excellence outcomes in architecture and public domain design.

The Barangaroo Delivery Authority is the registered landowner of most of the Barangaroo site.

1.2 Objectives of the Development

The objectives of the proposed Public Domain Works are to:

- provide a world class public domain experience that delivers a high level of pedestrian comfort;
- create part of the continuous waterfront promenade that links King Street Wharf and Darling Harbour to the south, with Barangaroo South, Central Barangaroo and Barangaroo Reserve;
- provide safe and efficient pedestrian access to the buildings within Stage 1B of Barangaroo South and the remainder of the Barangaroo site;
- create open spaces that are suited to the needs of local residents, workers and visitors;
- provide a new intimate urban park with a visual connection to the Central Barangaroo parklands and harbour beyond; and
- create an enhanced waterside experience through provision of a new cove and public pier, as envisaged under the Concept Plan, where visitors can physically interact with the harbour.

1.3 Summary of Approval Sought

This application seeks approval for the following works within Barangaroo South and part of Central Barangaroo:

- Site preparation and remediation (if required);
- Construction of the public domain, comprising:
 - Watermans Cove;

- the Public Pier in Darling Harbour, south of Watermans Cove;
- Hickson Park, including a public amenities building;
- Watermans Quay;
- the remaining section of Barangaroo Avenue within the site; and
- Wulugul Walk (including the expanded boardwalk required by condition of Concept Plan Mod 8).

The public domain works include provision of all ground treatments and finishes, landscaping, furniture and fixtures, public domain structures, lighting, civil and stormwater infrastructure and utility services.

This DA does not seek approval for the future building on the Public Pier which will be subject to a separate planning application.

1.4 Analysis of Alternatives

Strategic need for the proposal

As detailed in Section 1.1.1, the redevelopment of the Barangaroo site is the result of a long term strategic planning process which culminated in February 2007 when the NSW Minister for Planning and Infrastructure approved a Concept Plan to guide the urban renewal of Barangaroo.

The success of Barangaroo relies heavily on the design of publicly used space (i.e. the public domain) and the way it is experienced and used. It's importance is reflected in the Concept Approval which requires it to be provided prior to occupation of certain buildings. The proposed development will provide the public domain within the areas of Barangaroo South constituting Hickson Park, Watermans Quay, Barangaroo Avenue, Wulugul Walk, Watermans Cove and the Public Pier, and is therefore essential to ensure the large number of future visitors, residents and workers at Barangaroo South enjoy a high quality environment.

Alternative Options

Three options are available to Lendlease in responding to the identified need for a public domain within Barangaroo South.

Option 1: The Proposal

Option 1 involves providing the public domain as proposed in this Development Application (described in Section 3). The proposal will ensure that a high quality public domain will be provided on the site that responds to the strategic need identified above.

Option 2: Do Nothing

Not providing a holistic high quality public domain throughout the identified site would not be an appropriate outcome for a site of the strategic importance of Barangaroo and would be inconsistent with the Conditions of the Concept Approval.

If the public domain was not delivered, only the Stage 1A site would be publicly accessible. Not providing the public domain would also mean that no public access would be provided to the foreshore, which is also considered undesirable and contrary to State policy.

Option 3: Alternative Designs

The proposal reflects the outcome of years of careful consideration and design refinement consistent with the public domain vision that underpinned the Concept Plan. Multiple alternatives designs have been considered during that process and were deemed to not achieve the best possible outcome for the site. The proposed design has been developed in coordination with the design of the three residential towers, Crown Sydney Hotel Resort and Concept Plan Mod 8, and represents a high quality proposal that is well integrated with adjacent development and existing built context.

1.5 Project Team

An expert project team has been formed to deliver the project and includes:

Proponent	Lend Lease (Millers Point) Pty Limited
Urban Planning	JBA
Landscape and Public Domain Architect	Grant Associates
Traffic and Transport	ARUP
Contamination and Remediation	AECOM
Arboriculture	Norcue Pty Ltd SESL
Civil Engineering	Cardno
Marine Ecology, Sewall Over-structures and Maritime Navigation	Royal Haskoning DHV
Air Quality & Odour	AECOM
Noise & Vibration	Wilkinson Murray
Wind	WindTech
Environmental, Construction & Site Management	Lend Lease Building
Heritage / Archaeology	Casey & Lowe / TKDA
Wayfinding Strategy	THERE
Lighting	Speirs +Major
Ecologically Sustainable Development	Lend Lease Design
Accessibility	Morris Goding Accessibility
Marine Ecology	Royal Haskoning/Sydney Institute of Marine Science (UNSW)
CPTED	JBA

1.6 Secretary's Environmental Assessment Requirements

In accordance with section 89G of the EP&A Act, the Secretary of the Department of Planning and Environment issued the environmental assessment requirements for the preparation of the EIS on 5 October 2016 under SSD 16_7944. A copy of the Secretary's Environmental Assessment Requirements (SEARs) is included at **Appendix D**.

Table 1 provides a detailed summary of the individual matters listed in the SEARs and identifies where each of these requirements has been addressed in this report and the accompanying technical studies.

Table 1 – Secretary’s Environmental Assessment Requirements

Requirement	Location in EIS	
General		
The Environmental Impact Statement (EIS) must address the <i>Environmental Planning and Assessment Act 1979</i> and meet the minimum form and content requirements in Clauses 6 and 7 of Schedule 2 the Environmental Planning and Assessment Regulation 2000.	Sections 1-8	
Notwithstanding the key issues specified below, the EIS must include an environmental risk assessment to identify the potential environmental impacts associated with the development.	Section 4 and 5	
<ul style="list-style-type: none"> ▪ Adequate baseline data ▪ Justification of impacts ▪ Measures to avoid, minimise, and if necessary, offset the predicted impacts, including detailed contingency plans for managing any significant risks to the environment 		
<ul style="list-style-type: none"> ▪ The EIS must also be accompanied by a report from a qualified quantity surveyor providing: <ul style="list-style-type: none"> – A detailed calculation of the capital investment value (CIV) of the development (as defined in clause 3 of the Environmental Planning and assessment Regulation 2000), including details of all assumptions and components from which the CIV calculation is derived; and – Verification that the CIV was accurate on the date that it was prepared. 	Refer to CIV Certificate, submitted under a separate cover	
Key Issues	Report / EIS	Technical Study
1. Environmental Planning Instruments, Policies & Guidelines Address the relevant statutory provisions applying to the site, contained in the relevant EPIs, including: <ul style="list-style-type: none"> ▪ <i>State Environmental Planning Policy (State Significant Precincts) 2005</i> ▪ <i>State Environmental Planning Policy (State and Regional Development) 2011;</i> ▪ <i>State Environmental Planning Policy (Infrastructure) 2007;</i> ▪ <i>State Environmental Planning Policy 55 - Remediation of Land;</i> ▪ <i>Sydney Local Environmental Plan 2012;</i> ▪ <i>Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 and Foreshores and Waterways DCP</i> 	Section 4.1	-
Address the relevant provisions, goals and strategic objectives in the following: <ul style="list-style-type: none"> ▪ Plan for Growing Sydney; ▪ NSW State Priorities; ▪ Draft Sydney City Sub-Regional Strategy; ▪ Sydney City Centre Access Strategy; ▪ Sydney’s Walking Future; and ▪ Sydney’s Cycling Future. 	Section 4.1	-
Demonstrate consistency with the terms of approval of the Barangaroo Concept Plan MP06_0162 (as modified), including the Statement of Commitments (Schedule 3)	Section 4.1.2	
2. Public Domain and Access <ul style="list-style-type: none"> ▪ Identify proposed open space, public domain and linkages with and between other public domain spaces including: the Wulugul Walk (south), surrounding buildings, Hickson Road, Barangaroo Avenue (south), Scotch Row, Waterman’s Quay and Waterman’s Cove. ▪ Details of the interface between the proposed uses, public domain, and the relationship to, and the impact upon, the existing public domain, including demonstration of means of activating the public domain. ▪ Detailed plans, elevations and sections of all landscape works. ▪ Event management and recreational capacity, including passive and active recreational opportunities. ▪ Outline specific design features, including but not limited to: <ul style="list-style-type: none"> – footpaths and pavements, parking areas (including bicycle), roads and/or rights of carriageways; 	Section 4.2	Appendix A Appendix B
	Section 3.4	Appendix A Appendix B

Requirement	Location in EIS	
– materials and finishes;	Section 3.4	Appendix A Appendix B
– public art;	Section 3.8	Appendix G
– furniture and fixtures, including all temporary and permanent wind;	Section 3.5	Appendix A Appendix B
– mitigation measures;	Section 6.0	-
– street lighting, pedestrian lighting and feature lighting;	Section 3.7	Appendix F
– edges, screens and fences;	Section 3.4	Appendix A Appendix B
– walls, embankments and mounds;	Section 4.8	Appendix A Appendix B
– steps, ramps, vehicle crossings, decks and pathways;	Section 4.2	Appendix A Appendix B
– services where affected, utility poles, and service pits;	Section 3.12	Appendix C
– civil and stormwater infrastructure;	Section 3.12	Appendix C
– wayfinding signage;	Section 3.9	Appendix H
– tree planting;	Section 3.3	Appendix A Appendix B
– wind impact management measures; and	Section 4.16	Appendix L
– mass planting beds, planter boxes and individual plantings.	Section 3.3	Appendix A Appendix B
<ul style="list-style-type: none"> ▪ Detail compliance with access requirements under the Building Code of Australia and the Disability Discrimination Act 1992. 	Section 4.2.4	Appendix O
3. Built Form and Urban Design – Community Building <ul style="list-style-type: none"> ▪ Demonstrate how the proposed community building on the public pier will achieve design excellence by setting out the design excellence process leading to the proposal and justification of the suitability of the location of the proposed buildings. The design excellence process shall also include consideration of: <ul style="list-style-type: none"> – layout, setbacks, form, articulation, minimising impacts on solar access, improving the quality and amenity of the public domain, integration with the surrounding built form, connectivity and best practice ecologically sustainable development. 	The community building is no longer proposed as part of this application and therefore this requirement is no longer relevant to the application.	
4. Visual Impact and Views <ul style="list-style-type: none"> ▪ A visual impact assessment is to be provided of the proposed final design of the public domain works, including the proposed community building and other proposed buildings and structures, when viewed from key vantage points (including, but not limited to, from McMahons Point (Blues Point), Pyrmont, Balmain East, Walsh Bay, Darling Harbour and Millers Point). Photomontage images are to be prepared to demonstrate the impact of the proposed works. 	Section 4.3	Appendix P
5. Land Contamination <ul style="list-style-type: none"> ▪ The EIS must provide details of the nature and location of all activities that may involve excavation of, or interaction with, potentially contaminated soil, sediment or groundwater. ▪ The EIS must clearly explain and provide detailed justification for the preferred treatment methodology (on-site or off-site) of any contaminated material encountered during the works. ▪ If remediation works are required, the EIS must include a Remedial Action Plan (RAP). The RAP must be accompanied by a Section B audit statement prepared by an EPA accredited site auditor and the RAP must be prepared in accordance with the contaminated land planning guidelines under section 145C of the Environmental Planning and Assessment Act 1979 and relevant guidelines produced or approved under section 105 of the Contaminated Land Management Act 1997. 	Section 4.4	Appendix I Appendix Q
6. Water Quality and Contamination <ul style="list-style-type: none"> ▪ Undertake an assessment of the potential impacts on water quality of Darling Harbour. 	Section 4.5	Appendix C Appendix J

Requirement	Location in EIS	
<ul style="list-style-type: none"> ▪ Assess the impacts of the proposal on surface and groundwater quality and hydrology, for construction and operation. ▪ Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project). ▪ A detailed and consolidated site water balance and identification of an adequate and secure water supply for the life of the development. ▪ The assessment must include details of proposed erosion and sediment controls (during construction), the proposed stormwater management system (during operations) and management and mitigation measures for the containment of pollutants (e.g. fuel and sewage) and prevention of potential water quality impacts during construction and operation. ▪ Assess the potential for the development to intercept groundwater, including annual water volumes of groundwater proposed to be taken by the activity (including through inflow and seepage) from each groundwater source as defined by the relevant water sharing plan. ▪ Identification of any water licensing requirements or other approvals required under the Water Act 1912 or Water Management Act 2000. ▪ Assess the geotechnical and contamination issues (including Acid Sulphate Soils) associated with the construction of the development including the contamination status of the sediments to be disturbed, the impacts associated with disturbance of sediment, and the management and mitigation measures to be employed during marine works. ▪ Include a suitable water quality monitoring program including full technical details and data of any surface and groundwater modelling. ▪ An assessment of potential cumulative impacts on water sources and mitigation measures to manage the cumulative impacts. 		Appendix Q
<p>7. Heritage</p> <ul style="list-style-type: none"> ▪ The EIS is to include a Heritage Impact Statement which must assess the likely impacts of the proposal on the significance of heritage items in the vicinity of the site. ▪ The EIS should include an assessment of any potential maritime heritage including shipwrecks, previous maritime infrastructure, archaeological items and/or relics (both above and below water and under historical reclamation areas) that may be impacted by the proposal, including strategies and procedures to be followed in the case of an unexpected discovery of heritage items and/or relics. The maritime heritage component of the EIS should be undertaken by a suitably qualified maritime archaeologist. 	Section 4.6	Appendix X Appendix Y
<p>8. Marine Ecology</p> <ul style="list-style-type: none"> ▪ Prepare a Marine Ecology Report to assess the ecological impact of the proposed construction of Waterman's Cove, expanded foreshore promenade and the public pier on any flora and fauna, including threatened species, populations or communities (e.g. Psodonia seagrass) or their habitats. ▪ Recommendation of appropriate mitigation measures during construction and operation, including potential impacts of shading from fixed structures. 	Section 4.7	Appendix J
<p>9. Seawalls/Over-Water Structures</p> <ul style="list-style-type: none"> ▪ The EIS should address whether modifications to the estuarine foreshore comply with the recommendations of Environmentally Friendly Seawalls – A Guide to Improving the Environmental Value of Seawalls and Seawall-lined Foreshores in Estuaries (DECC, 2009). ▪ The EIS should detail plans for any proposed environmentally friendly seawall works or aquatic eco-engineering works to improve bio-diversity. ▪ Where structures are proposed to be built over water they should have regard to the Policy & Guidelines for fish habitat conservation and management (2013), and identify construction methods and techniques that minimise the impact on aquatic biodiversity. 	Section 4.8	Appendix Q
<p>10. Maritime Navigation</p> <ul style="list-style-type: none"> ▪ Provide a Navigation Impact Assessment (NIA). The NIA shall include consideration of impacts and a formal risk assessment on the navigation of cruise ships, bulk carriers and other commercial vessels. 	Section 4.9	Appendix K

Requirement	Location in EIS	
<ul style="list-style-type: none"> ▪ The NIA shall also demonstrate that adequate clearance is maintained at all times during construction of Waterman's Cove, the public pier and community building and also during operation of the proposed boat set down/pick up locations (including water taxi drop-off) and that the proposal will not adversely impact on ferry navigation, safety and service operation. 		
11. Transport and Accessibility (Construction and Operation)	Section 4.10	Appendix S
<ul style="list-style-type: none"> ▪ The EIS must include a Traffic Impact Assessment (TIA) that provides, but is not limited to, the following: ▪ Accurate details of the current and proposed daily and peak hour vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the road network located adjacent to the proposed development; 		
<ul style="list-style-type: none"> ▪ Details of on-street parking, loading zones, bicycle and pedestrian facilities including pedestrian crossings, bicycle parking, taxi facilities including taxi ranks proposed in the public domain and compliance with relevant Standards; 		
<ul style="list-style-type: none"> ▪ Details of pedestrian and cycling connections/circulation and required upgrades to meet the likely future demand within Barangaroo and connect to the external network. 		
<ul style="list-style-type: none"> ▪ In relation to construction traffic: <ul style="list-style-type: none"> – details of anticipated peak hour and daily truck movements to and from the site; – assessment of cumulative traffic impacts associated with all other construction activities within the vicinity of the site including construction of all other developments at the Barangaroo site and the Sydney Light Rail project; – assessment of road safety at key intersections and locations subject to heavy vehicle movements and high pedestrian activity; – details of anticipated construction barge/maritime movements to and from the site; – details of access arrangements for workers to/from the site, emergency vehicles and service vehicle movements; – details of temporary pedestrian and cyclist access during construction; – details of proposed construction vehicle access arrangements at all stages of construction; and – preparation of a Construction Pedestrian and Traffic Management Plan which includes vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures for all demolition/construction activities. 		
12. Infrastructure Provision	Section 4.11	Appendix C
<ul style="list-style-type: none"> ▪ Detail the existing infrastructure on-site and identify possible impacts on any such infrastructure from the proposal. 		
<ul style="list-style-type: none"> ▪ Detail the proposed infrastructure that will service the development and demonstrate that the site can be suitably serviced. This is to include lighting details and measure to mitigate light spill and potential impacts to the amenity of sensitive receivers surrounding the site, including residential and commercial premises. 		
<ul style="list-style-type: none"> ▪ Detail measures to mitigate the impacts of the proposal on any infrastructure items, including proposed relocation. 		
13. Ecologically Sustainable Development (ESD)	Section 4.12	Appendix T
<ul style="list-style-type: none"> ▪ Identify how the development will incorporate ESD principles in the design, construction and operation phases of the development. 		
14. Crime Prevention through Environmental Design (CPTED)	Section 4.13	Appendix N
<ul style="list-style-type: none"> ▪ Identify how the development will incorporate ESD principles in the design, construction and operation phases of the development. 		
15. Environmental, Construction and Site Management Plan	Section 4.14	Appendix R
<ul style="list-style-type: none"> ▪ The EIS shall provide an Environmental and Construction Management Plan for the proposed works, and is to address: <ul style="list-style-type: none"> – community consultation, notification and complaints handling; – impacts of construction on adjoining development and proposed 		

Requirement	Location in EIS	
measures to mitigate construction impacts; <ul style="list-style-type: none"> – construction traffic and pedestrian and management; – noise and vibration impact assessment on nearby sensitive receivers and proposed management, mitigation and monitoring measures; – air quality impact assessment (e.g. odour and dust) on nearby sensitive receivers and proposed management, mitigation and monitoring measures; – water quality management for the site; and – waste quantity, classification and management. 		
16. Staging <ul style="list-style-type: none"> ▪ Details regarding the staging of the proposed development 	Section 4.15	-
Consultation	Report / EIS	Technical Study
During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular, you must consult with: <ul style="list-style-type: none"> ▪ Roads & Maritime Services. ▪ Port Authority of NSW and Harbour Master. ▪ CBD Coordination Office within Transport for NSW. ▪ Environment Protection Authority. ▪ Department of Primary Industries ▪ Office of Environment and Heritage. ▪ City of Sydney Council. ▪ Local Aboriginal Land Council and stakeholders. ▪ Local Heritage Group/s, if relevant. <p>The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided</p>	Section 4.17	-

2.0 Site Analysis

2.1 Site Location and Context

Barangaroo is located on the north-western edge of the Sydney Central Business District, bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east and a range of new development dominated by large CBD commercial tenants to the south.

The 22 ha Barangaroo site is generally rectangular in shape and has a 1.4 kilometre harbour foreshore frontage, with an eastern street frontage to Hickson Road. The locational context of the Barangaroo development site is shown in **Figure 2**.

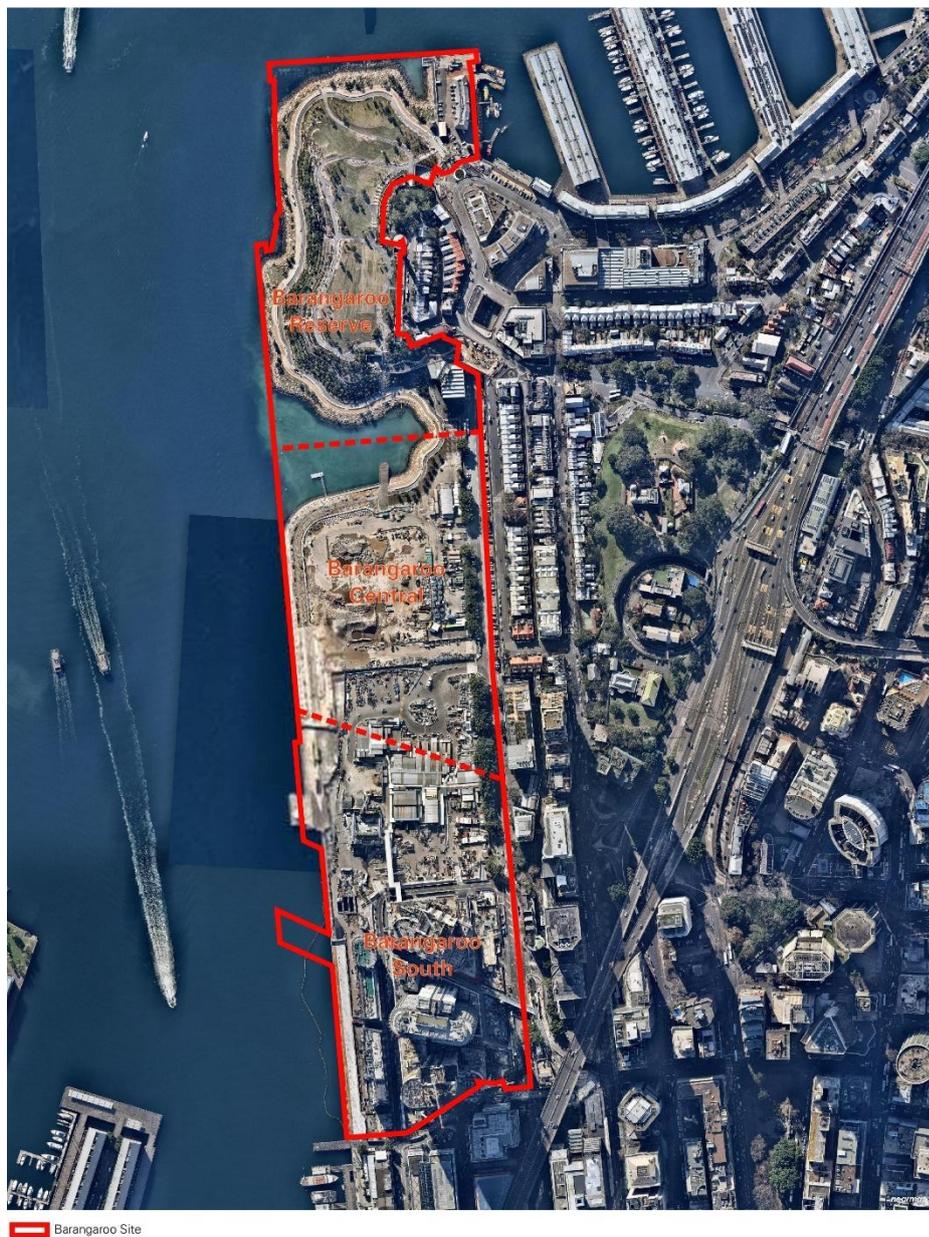


Figure 2 – Locality Plan

2.2 Site Description

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Barangaroo Reserve, Central Barangaroo and Barangaroo South, and has been subject to multiple investigations that detail the physical and natural characteristics of the site.

For the purposes of construction staging, Lendlease has broken Barangaroo South into two areas, referred to as Stage 1A and Stage 1C. The area of land within which development is proposed under this Development Application, comprises land within Barangaroo South (Stage 1B) and partly within Central Barangaroo, being land identified as public domain between and around Blocks 5, 4A, 4B and Y in the approved Concept Plan (Mod 8).

As detailed in Section 1.1.1 as part of the Mod 8 Determination, the Planning Assessment Commission extended the northern boundary of Hickson Park, which previously stopped at the northern extent of Barangaroo South, in to part of then Block 5 within Barangaroo Central. Accordingly this application, which includes Hickson Park and the remainder of the Stage 1B Public Domain also includes the creation of the park within former Block 5 of Central Barangaroo.

A Site Plan is included in **Figure 3**.

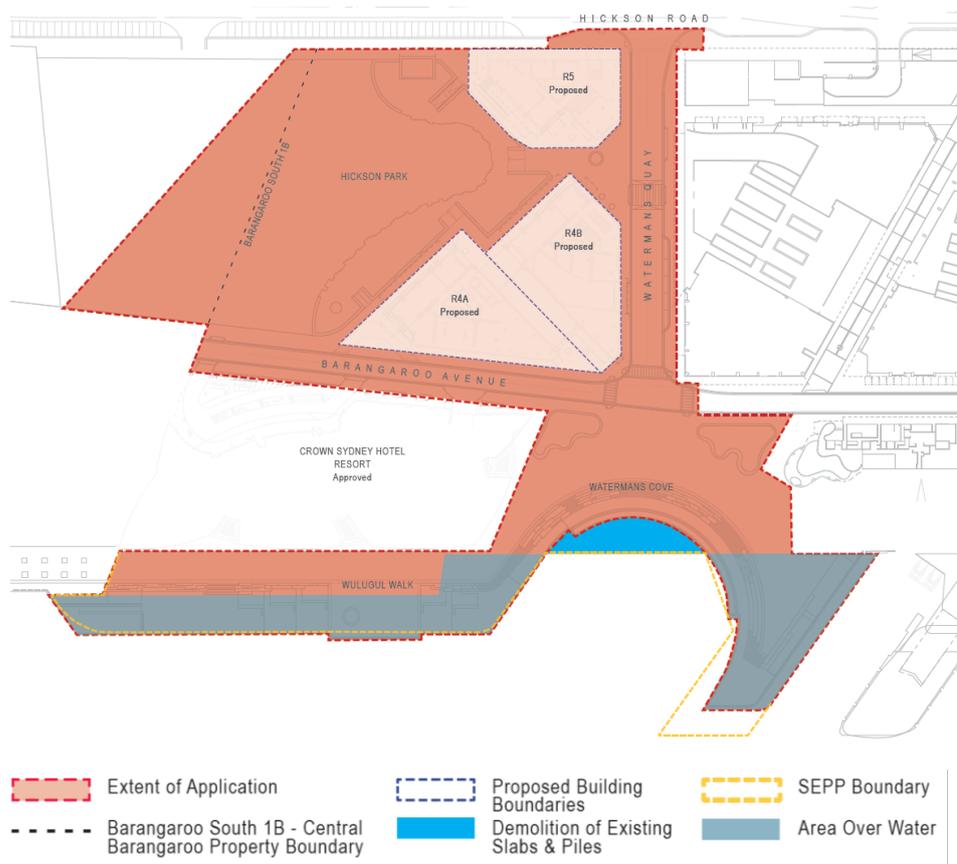


Figure 3 – Barangaroo site showing the Development Application site

Land Ownership and Description

A site survey plan is included at **Appendix E**.

Under the *Barangaroo Delivery Authority Act 2009* (NSW), Barangaroo is defined as the land identified as the “Barangaroo Delivery Authority operational area on the Barangaroo Delivery Authority Operational Area Map”.

The site the subject of this SSD DA is legally described as Lot 214 in DP 1221076, Lot 101 in DP 1204946 and includes an area of Darling Harbour. The Barangaroo Delivery Authority is the owner of the site, with the exception of the parts of Darling Harbour that form part of the site, which are owned by Roads and Maritime Services.

2.3 Existing Development and Structures

2.3.1 Built Form

The subject site largely comprises an open concrete/bitumen apron. It is currently used for circulation, site sheds and storage associated with the current construction of Crown Sydney and the remediation of Block 4. At the southern end of the site there are interim public domain works constructed under the Stage 1A Public Domain DA, and include part of Waterman's Quay and Wulugul Walk.

Development consent has been granted for remediation of the Stage 1B Basement site (SSD 5897). The approval includes consent for the construction of groundwater retention walls, bulk excavation within the groundwater retention walls, diversion and augmentation of stormwater infrastructure, tree removal and management, and demolition of existing structures on the site. These works have commenced.

As detailed in Section 1.1.3, concurrent SSD DAs have been lodged for construction of the Stage 1B Basement, Buildings R4A, R4B and R5. The Stage 1B basement was approved on 7 March 2017, and the Residential Buildings are currently under assessment. The Crown Sydney Hotel Resort is approved and is currently under construction. The public domain, the subject of this application has been designed in coordination with the future built form proposed under those applications, and will integrate with it.

2.3.2 Infrastructure and Services

Stormwater

The external catchment area draining to the site is approximately 5.3ha. Details of the catchments are as follows:

- **Catchment A:** This catchment has a total area of approximately 2.83 ha that discharges into Gas Lane and Jenkins Street through a 600mm diameter pipe and a 750mm diameter pipe and then into an existing 1200mm diameter pipe that traverses the Stage 1B Residential development site prior to ultimately discharging directly into Darling Harbour.
- **Catchment B:** This catchment has a total area of approximately 2.29 ha that discharges into the existing Hickson Road stormwater drainage network prior to ultimately discharging into Darling Harbour through a series of varying diameter pipes traversing the Stage 1B Residential development site.
- **Catchment C:** This catchment has a total area of approximately 0.15 ha that discharges into the stormwater diversion works that were constructed within Hickson Road and Watermans Quay as part of the Stage 1A works.

Based on the Stormwater Concept that formed part of Concept Plan (Mod 8) the development site will be divided into a number of sub-catchments as a result of the location and proposed surface grading of buildings, internal roads and open space. The combined sub-catchments total approximately 2.83ha and will ultimately discharge into Darling Harbour. The internal catchment area fronting Hickson Road that will discharge into the proposed external drainage system is approximately 0.6 ha; ultimately discharging to Darling Harbour via the proposed stormwater drainage network along Watermans Quay.

The existing stormwater network is characterised by a series of in-ground piped stormwater systems (typically between 300mm and 1800mm in diameter) draining Hickson Road and other external catchments through the Barangaroo site and

ultimately into Darling Harbour. As part of the Stage 1A works, a concrete pipe and box culvert diversion has been constructed. This diversion has the capacity to capture and convey storm events up to the 100 year ARI event (+ 50% pit blockage factor) and has been adopted to alleviate flooding within Hickson Road in the vicinity of the Sussex Hotel.

Changes to the existing stormwater network, including the provision of trunk drainage works and the relocation of existing stormwater pipes, are approved under SSD 5897. As part of the Stage 1B Basement DA, a permanent stormwater management solution is proposed to be introduced between Hickson Road and Darling Harbour.

All rainwater falling on roads and paths within the public domain will be collected via a combination of traditional stormwater capture devices and treated by water quality measures proposed within this application.

Utilities

The installation of proposed infrastructure services including potable water, telecommunications services and natural gas have been approved in SSD 6960, being the approval for the Stage 1B Basement for Barangaroo South.

Water

The existing water supplies to the Barangaroo site are supplied from a 300mm diameter Sydney Water main in Hickson Road. Connection of water services to the site has been approved and is being undertaken as part of the Stage 1B Basement DA.

Sewer

There is an existing sewer trunk main in Hickson Road near the western kerb line which drains to an existing Sydney Water sewage pumping station SP1129 outside the Barangaroo site. All sewer waste generated on the Barangaroo South site is conveyed to the on-site Blackwater treatment plant in Stage 1A and treated for reuse on site.

Electricity

The Barangaroo South site was served by 5 KV high voltage feeders entering the Barangaroo site at the southern end of Hickson Road and terminating in an AusGrid (formerly Energy Australia) HV switch room. The HV supply and private HV reticulation were decommissioned and the private substations demolished as part of demolition works in 2010/2011.

Telecommunications

The Stage 1B precinct will be serviced with incoming telecommunications services by Telecommunications Service Providers (TSPs) via connections included in the Stage 1B Basement application. Lead-in cabling will enter the site via a bank of ducts sufficient for the TSP's service requirements.

Natural Gas

There is an existing gas supply at the intersection of Napoleon Street and Hickson Road and also at the end of Lime Street near the south-west corner of the Barangaroo site.

2.4 Traffic and Transport

2.4.1 Vehicular and Pedestrian Access

Hickson Road connects into Sussex Street south of Napoleon Street and is the north-south access road for Barangaroo South. Local road access to the Barangaroo site is provided:

- via Napoleon Street and Margaret Street from the eastern CBD from Millers Point via Dalgety Road;
- via George Street from the north east; and

- via Harbour Street, Wheat Road (through King Street Wharf) to Shelley Street from the south via Sussex Street/Kent Street/Napoleon Street from the southern CBD.

The Public Domain site includes Watermans Quay as the primary vehicular entry from Hickson Road. Watermans Quay will connect to Hickson Road in the east, and Barangaroo Avenue in the west, which connects through to the King Street Wharf precinct to the south.

2.4.2 Public Transport

The Barangaroo site is served by the following public transport modes:

- **Rail:** Wynyard, Martin Place, Town Hall and Circular Quay railway stations are within walking distance of the Barangaroo site and provide frequent services throughout the day. In June 2015 the NSW Government announced a new underground railway station at Barangaroo will be part of the plans for the new Sydney Metro. The new station is expected to be located at Central Barangaroo. The timing for the delivery of the new station is yet to be confirmed.
- **Bus:** There is a major bus interchange located at Wynyard Station for buses servicing the Hills District, Northern Beaches and the North Shore areas. These services all utilise the bus lane on the Harbour Bridge to access Wynyard. Stops for services to other locations are provided through the CBD including along George, Park, Elizabeth and Castlereagh Streets.

A number of other bus routes terminate in the vicinity of the Barangaroo site, King Street Wharf and Circular Quay.

- **Ferry:** Commuter ferry services arrive and depart from both King Street Wharf and Circular Quay. NSW Ferries is currently in the process of constructing new ferry wharves at Barangaroo South near Building R9.

2.4.3 Pedestrians and Cyclists

Pedestrian Access

The NSW Government has finalised construction on Wynyard Walk, a direct pedestrian link between the new Barangaroo development and Wynyard Station and transport interchange. Wynyard Walk, now fully operational, provides a high level of access to public transport for the growing western corridor of the CBD, including Barangaroo and King Street Wharf. This pedestrian connection assists in accommodating the additional commuters who are expected to use this route to access the Barangaroo site.

Lendlease has also provided a second pedestrian bridge, known as Napoleon Bridge, which connects Wynyard Walk near Kent Street to the site between the Hickson Road Buildings C1 and C2.

Pedestrian access to Barangaroo is available along local roads, all of which are footpath lined. Notwithstanding the high degree of pedestrian footpaths and thoroughfares, there are generally low levels of pedestrian activity adjacent to the Barangaroo site. Whilst pedestrian access is still limited across the Barangaroo site due to ongoing development works, sections of Mercantile Walk, Wulugul Walk, Shipwright Walk and Barangaroo Avenue have now been opened.

Bicycles

A marked bicycle lane exists along part of Hickson Road and forms part of a cycle way between Circular Quay and Napoleon Street which is utilised by both commuter and recreational cyclists. Cycling connections to the site have been improved through the construction of separated cycleways along King Street and Kent Street by City of Sydney Council (Council). An on-road bicycle lane has recently been installed for eastbound riders (uphill), with a mixed traffic environment in the westbound direction.

The Sydney City Centre Access Strategy outlines the future city centre cycleway network to encourage growth in cycling and reduce pressure on the public transport

system. The Strategy's strategic cycleway network map indicates future cycleway connections into Barangaroo to be via the Pyrmont Bridge cycleway and the Harbour Bridge cycleway. These new links are yet to be determined.

2.5 Physical Characteristics

2.5.1 Geology and Geomorphology

Investigation reports prepared previously for the Block 4 Remediation SSD DA (SSD 5897) by AECOM and others provide a detailed analysis of the geological and geomorphological characteristics of the site and the Barangaroo site generally.

The Sydney Geological Map Scale 1:100,000 and the Sydney Geological Map Scale 1:250,000 indicate the Barangaroo site is underlain by Hawkesbury Sandstone. Quaternary sediments and man-made fill overlay the Hawkesbury Sandstone.

Previous Geotechnical Reports which considered the Barangaroo site indicate that it is underlain by manmade fill, which is in turn underlain by marine sediment and Hawkesbury Sandstone. The fill material is up to 21m deep and comprises a mix of silt clay, coarse gravel and fragments of concrete, brick, steel, glass and ash.

2.5.2 Site Contamination

A number of site history studies and environmental site investigations have been undertaken to assess the extent and nature of contaminants within the Barangaroo site as a whole, as well as within the Barangaroo South area which includes the site. Investigations revealed that both the soil and groundwater was contaminated, and that the extent of the contaminated materials varied across the Barangaroo site.

Concentrations of lead, total petroleum hydrocarbons (TPHs), benzene, xylenes and polycyclic aromatic hydrocarbons (PAHs) in the soil variably exceeded applicable guideline criteria. The contamination was largely associated with the operation of a former gasworks, and from the importation of materials historically used to fill the Barangaroo site.

In May 2009, the Department of Environment, Climate Change and Water (DECCW) (now the NSW EPA) declared part of the Barangaroo site (part of Blocks 4A, 4B and 5) and immediately adjacent land within the Hickson Road reservation to be a "remediation site" under the *Contaminated Land Management Act, 1997* (Declaration No. 21122) (known as the 'Declaration Area') (see **Figure 4**). The DA site includes part of the Declaration Area.

Remediation of the Declaration Area is being undertaken as three remediation areas that are in line with the development blocks as identified within Concept Plan (Mod 8). These remediation areas are:

- Block 4;
- Block 5; and
- Hickson Road.

The remediation of that part of the Declaration Area within Block 4 (i.e. the Block 4 Remediation Area) has been approved under SSD 5897. The site the subject of this DA is partly located within the Block 4 Remediation Area. Remediation of the Block 5 Remediation Area is being approved as SSD 6533 and remediation of part of Hickson Road (the Hickson Road Remediation Area) has been approved under SSD 6617.

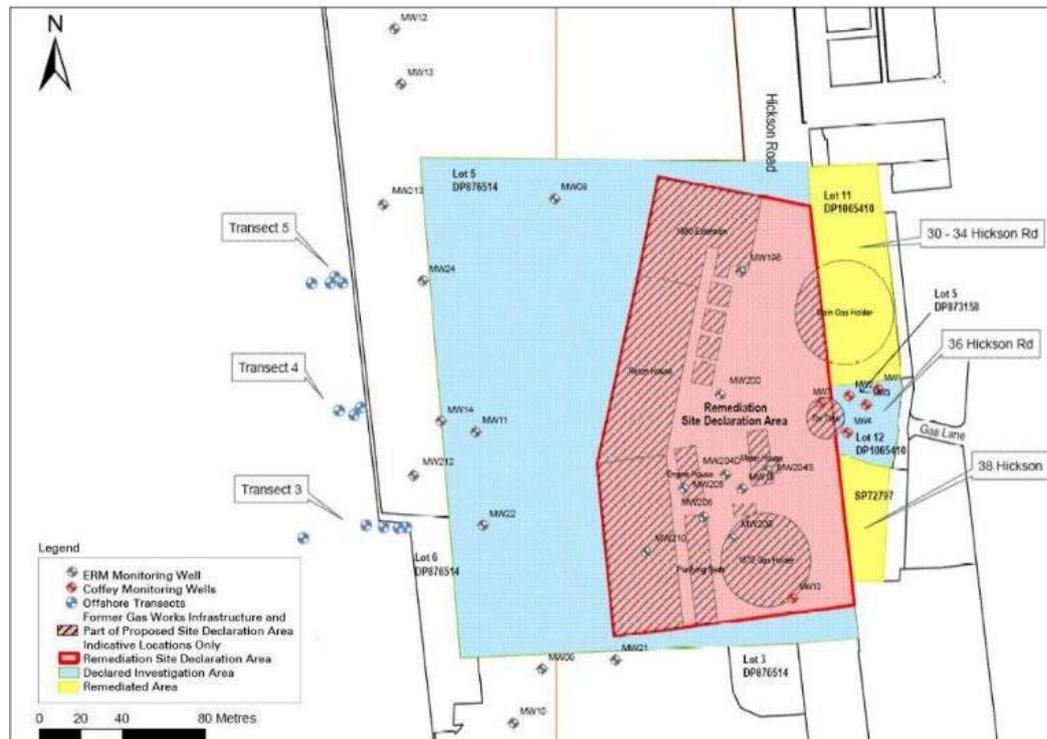


Figure 4 – Declared area

The Remedial Action Plans (RAPs) prepared for the various Site areas are as follows (hereafter referred to as ‘the RAPs’). The areas of the Site to which each of the RAPs applies are shown in **Figure 5** below.

■ **Barangaroo South:**

- RAP, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW (AECOM, 2013a) - referred to as the ‘VMP/Block 4 RAP’. The VMP/Block 4 RAP was approved under delegation by the Minister of Planning as part of SSD 5897 (dated 10 November 2014);
- RAP, Crown Hotel Development (Part of ORWN Area), Barangaroo South (AECOM, 2015) – referred to as the ‘Crown RAP’;
- RAP, Barangaroo South Stage 1B Waterfront Public Domain (AECOM, 22 January 2016a) – referred to as the ‘Stage 1B Waterfront Public Domain RAP’; and
- VMP/Block 4 RAP Addendum - Part Stage 1B Public Domain (Watermans Quay), Hickson Road, Millers Point, Barangaroo South (AECOM, 19 April 2016b) – referred to as the ‘Watermans Quay RAP Addendum’.

- **Central Barangaroo:** The ‘Block 5 Public Domain RAP’ is currently being prepared for the southern portion of Block 5 which forms part of the Site. The Block 5 Public Domain RAP will be based on assessing and, if required, remediating this part of the Site for public domain usage (recreational open space).

Soil and groundwater investigations have been historically undertaken across the Site to assess Barangaroo South and Central. The previous investigations undertaken on the different parts of the Site are detailed in each of the RAPs and a summary of the site history and analytical results is included in the RAPs.

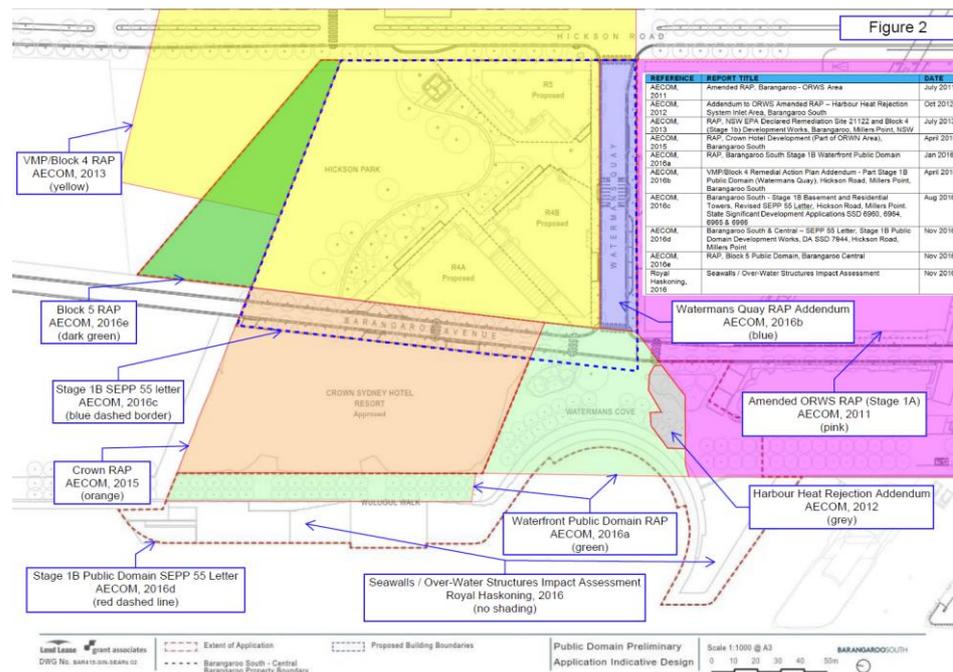


Figure 5 – Areas of the Site to which each of the RAPs applies

2.5.3 Groundwater and Hydrogeology

Existing Geological Conditions

The following subsurface conditions have been identified across the wider Barangaroo site, including the extent of the site:

- Hardstand consisting of concrete, asphalt and bitumen from ground level to a maximum depth of approximately 0.5 metres below ground level (bgl).
- Road base fill to a maximum depth of approximately 0.5 metres bgl.
- Fill material consisting of sandstone, building rubble, bricks, concrete and silty gravelly sand with black staining and odours up to 18 metres bgl.
- Marine Clay / Sand between 3 metres bgl and 33 metres bgl.
- Bedrock of varying quality between 1.3 metres bgl and 33 metres bgl.

Hydrogeology

A geotechnical assessment was undertaken by Coffey to accompany the Block 4 Remediation and Land Forming Works (SSD 5897). A summary of the findings included in this report pertaining to groundwater is presented below:

- The highest observed astronomical tide is RL 1.075 and the existing mean high spring water level is RL 0.67. Groundwater tidal level fluctuations were recorded adjacent to the existing caisson wall and were found to be very similar to tidal movements within Darling Harbour.
- At Hickson Road, groundwater monitoring suggested that the magnitude of groundwater fluctuation is approximately one quarter of the observed normal tidal amplitude at Darling Harbour, suggesting at least a moderate tidal influence on groundwater levels across the extent of the site.

2.5.4 Vegetation

The site is devoid of existing vegetation.

2.5.5 Heritage and Archaeology

Heritage

Neither the site, nor any structure/element within it, is listed as a local or State heritage item.

Indigenous and Non-Indigenous Archaeology

Stage 1B – Public Domain is part of the declared remediation area (**Figure 4**). The archaeological issues associated with area site are addressed and managed in SSD 5897 and SSD 6533. The archaeology and impacts are identified in two impact assessment reports for Blocks 4 and 5:

- *Heritage Impact Statement, SSD 5897 Remediation Development Application, Block 4, part of EPA Declaration Area 21122 and Stage 1b Basement Area, Block 4, Barangaroo South, Casey & Lowe for Lend Lease Millers Point (March 2011, updated August 2013).*
- *Heritage Impact Statement SSD 6533-2014 Remediation Development Application EPA Declaration Area 21122, Non-Indigenous Archaeology, Block 5, Barangaroo Central, Casey & Lowe for Lend Lease Millers Point, June 2014.*

Subsequent to these reports the following report was submitted to guide archaeological input to the remediation process: a *Non-Indigenous Archaeological Research Design & Management Strategy, Declaration Area: Block 4 and Block 5, Barangaroo South, Casey & Lowe for Lend Lease, September 2015.*

Maritime Archaeology

As part of Concept Plan (Mod 4) Casey & Lowe wrote 'Non-Indigenous Archaeological Assessment, Barangaroo Stage 1 (Barangaroo South), July 2010'. This report included a section by maritime archaeologist Cosmos Coroneos (pp. 67-69) which noted:

It is very rare however for a submerged archaeological waterfront landscape from the 19th century to remain undisturbed, especially if it is located within a fully functioning port in the 20th century. Dredging for the deepening of navigation channels and berths has been an integral part of keeping a modern port functional and competitive. The effects of dredging are to completely remove any cultural material within the dredging envelope.

This report noted that the general area of Darling Harbour, and Barangaroo South especially, as part of 20th-century wharfage, had been subject to decades of dredging. This would have removed any maritime archaeological wrecks or the like. Further to dredging were the impacts of modern wharf construction.

Aboriginal Archaeology

Two Indigenous Archaeological reports were written by Comber Consultants relating to the Blocks 4 and 5:

- *Aboriginal Archaeological Cultural Heritage Assessment and Heritage Impact Statement, Barangaroo, Barangaroo South, Block 4, SSD 5897-2013 Remediation Development Application, August 2013.*
- *Aboriginal Archaeological Cultural Heritage Assessment and Heritage Impact Statement, Barangaroo, SSD 6533-2014 Remediation Block 5, Development Application, June 2014.*

The conclusions from these reports were:

Block 4

This report concludes that the subject EPA Declaration Area has no Aboriginal archaeological or cultural heritage potential and that the remediation proposed under

SSD 5897-2013 can proceed without any further Aboriginal archaeological assessment, excavation or testing.

Block 5

This report concludes that the subject Site Remediation Area has no Aboriginal archaeological or cultural heritage potential and that the remediation proposed under SSD 6533-2014 can proceed without any further Aboriginal archaeological assessment, excavation or testing.

There is no potential for Aboriginal archaeology in the Public Domain site.

2.6 Surrounding Development

A description of the existing development and future proposed development envisaged under Concept Plan (Mod 8) (see **Figure 6**) is outlined below.

The development site is surrounded by the following existing development:

To the north: Block 5 of the Barangaroo site (as defined in Concept Plan (Mod 8)) is currently used as a construction compound for development at Stage 1A of Barangaroo South. Part of this area is also being used as a remediation compound under SSD 5897.

To the south: Stage 1A of Barangaroo South. This area is currently a development site which features the following buildings:

- Commercial Building C2;
- Commercial Building C3;
- Commercial Building C4;
- Commercial Building C5;
- Retail Building R1;
- Mixed Use Building R7;
- Residential Building R8;
- Residential Building R9;
- Stage 1A Basement Car Park; and
- Stage 1A Public Domain.

The closest of these buildings to the proposed Public Domain works is Commercial Building C3 and Residential Building R8. Under the approved Concept Plan (Mod 8), a future building, known currently as Building C1, is contemplated on land to the east of Building C3, fronting Hickson Road. A Development Application is yet to be submitted for this building. Full details regarding the current status of each of the buildings is provided in Section 1.1.3.

To the west: Darling Harbour.

To the east: Millers Point and the Central Sydney.

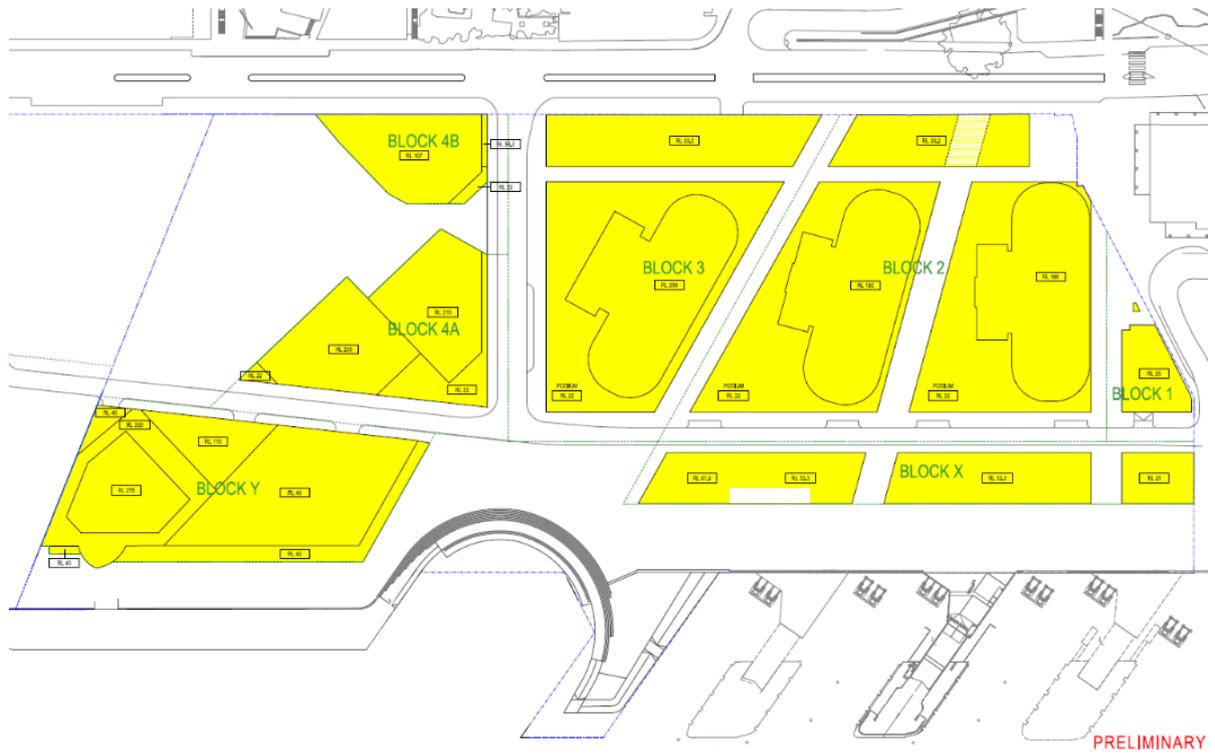


Figure 6 – Concept Plan (Mod 8) Indicative Building Layout

3.0 Description of the Development

This chapter of the report provides a detailed description of the proposed development. Public domain drawings and a design statement prepared by Grant Associates are included in **Appendix A** and **B**. Civil Engineering Drawings prepared by Cardno are included at **Appendix C**.

This application seeks approval for the following works:

- Site preparation and remediation (if required);
- Construction of the public domain, comprising:
 - Watermans Cove;
 - the Public Pier in Darling Harbour, south of Watermans Cove;
 - Hickson Park, including a public amenities building;
 - Watermans Quay;
 - the remaining section of Barangaroo Avenue within the site; and
 - Wulugul Walk (including the expanded boardwalk required by condition of Concept Plan Mod 8).

The public domain works include provision of all ground treatments and finishes, landscaping, furniture and fixtures, public domain structures, lighting, civil and stormwater infrastructure and utility services.

It is noted that the elements of the public domain which make up the vehicular crossings for One Sydney Harbour and the Crown Sydney Hotel Resort are either already approved (Crown Resort SSD 6957) or proposed through another SSDA and under assessment (One Sydney Harbour SSD 6964). Approval is also sought for these elements within this SSDA to ensure that the timing and staging of construction of the public domain is not contingent on the approval of applications under assessment or the construction of works associated with each approval.

It is also noted that street furniture selection as shown in the proposed drawings is indicative only and will be subject to change through design development. Furthermore, it is also noted that all place names that are not yet approved will be subject to a separate approval process.

A master plan of the proposed Stage 1B Public Domain is shown in **Figure 7**.

The Development Application does not seek approval for a building on the public pier or development that has been included in the Block 4 Remediation, Stage 1B Basement, Residential Building R4A, R4B and R5 and Crown Sydney Hotel Resort projects (see Section 1.1.3).



LEGEND

- Development application boundary
- Barangaroo South 1B boundary

Figure 7 – Stage 1B and Hickson Park Public Domain Master Plan

3.1 Site Preparation

The proposed development is integrated into the existing hardstand concrete apron and works approved under the Stage 1B Basement DA and approved Crown Sydney Hotel Resort DA. Accordingly no demolition of the concrete apron is proposed, with the exception of the works required for the creation of Watermans Cove. This area is however suspended structure and is not in contact with any ground or sub-surface fill.

A small section of existing suspended wharf structure and piling will be demolished to create the shape of Watermans Cove. Approximately 20 existing piles will be cut down to create the inner shape of the Cove. It is noted that it would be normal practice to cut the piles off at or below seabed level so they do not form a hazard to navigation. The actual level at which piles will be cut will be subject to a risk assessment during the design development phase, though as an objective will include aquatic eco-engineering works, utilising the piles, to improve bio-diversity.

3.2 Key Spaces and Destinations

The proposed public domain will feature a number of key spaces and destinations. A detailed description including plans, sections, indicative images, and montages is provided in the Public Domain Report and Drawings at **Appendix A** and **B**. In summary, the Public Domain will include the following key spaces and destinations (see **Figure 8**):

- **Watermans Cove:** Watermans Cove (see **Figure 9**) is the 'southern cove' of Barangaroo as envisaged under the Concept Plan. The land begins to step in level, becoming a place where visitors can physically interact with the harbour. The stepped cove will create an informal array of public seating and provides the opportunity to view events happening on the water such as outdoor stages, film screens and the like, which may be provided in the future (note: this application does not seek approval for the staging or management of public or private events).
- **Watermans Quay:** Watermans Quay is a 23.35m wide road reserve with an 11.5m carriageway which runs in an east west direction between Hickson Road and Barangaroo Avenue, providing the main east-west vehicular thoroughfare through the site. Watermans Quay will provide a street frontage to Buildings R4 and R4A to the north, as well as buildings in Stage 1A to the south.
- **Barangaroo Avenue:** Barangaroo Avenue (see **Figure 10**) is a 16.25m wide road reserve with an 7m carriageway which runs in a north-south direction, connecting Stage 1A to the south to the future Central Barangaroo to the north. Barangaroo Avenue will provide a frontage to the approved Crown Sydney Hotel Resort, the future Watermans Cove as well as a frontage to the future Building R4A.
- **Hickson Park:** Hickson Park (see **Figure 11**) is to be an approximately 11,000m² area of public open space with expansive grass lawn areas and substantial tree planting. The Park is framed by Buildings R4, R4A and R5 to the south, future Block 5 of Central Barangaroo to the north, Hickson Road to the east and Barangaroo Avenue to the west. Hickson Park links the Central Barangaroo harbour foreshore park to the city will be a significant public amenity for Barangaroo's workers, residents and visitors. The Park's northern orientation will maximise solar access and the built form around its perimeter will create a more intimate space, and provide protection from westerly winds will have a high level of amenity. Hickson Park also includes a small public amenities building near Hickson Road.
- **Wulugul Walk:** Wulugul Walk (see **Figure 12**) forms the north-south connection along the Barangaroo foreshore. Wulugul Walk forms the continuation of the Waterfront Promenade envisaged under the Concept Plan, extending along the western site boundary of Barangaroo, tracing the seawall and new foreshore edge as determined under Concept Plan (Mod 8). It will have a generous width to accommodate pedestrian movements, spaces for sitting and recreating, and provides the potential for programmed events and public art in the future. Wulugul

Walk continues the paved walkway and tree planting character established in Stage 1A and Central Barangaroo along the foreshore around Watermans Cove and past the Crown Sydney Hotel Resort. Wulugul Walk also incorporates a Boardwalk, comprising decking over water that integrates the former “Spirit of Tasmania” dock, which will be a paved area that includes a feature Fig tree on the foreshore. The Boardwalk also includes a water transport pontoon for set down and pick up only, including potential for water taxi services.

- **Public Pier:** The proposed public pier, located to the immediate south of Watermans Cove, will form part of an extension to the linear Wulugul Walk, enhancing the waterside experience, through interacting with the harbour and providing variety along the foreshore. The pier has been designed to accommodate a potential community building as envisaged under the Concept Plan in the future.

It is noted that the proposed application does not seek approval for any retail uses within the public domain.



LEGEND

- Development application boundary
- Barangaroo South 1B boundary

Figure 8 – Key Spaces and Destinations with the Barangaroo Public Domain



Figure 9 – Perspective of Watermans Cove



Figure 10 – Perspective of Barangaroo Avenue



Figure 11 – Perspective of Hickson Park



Figure 12 – Perspective of Wulugul Walk near the Crown Sydney Hotel Resort and Central Barangaroo beyond

3.3 Landscape Species

The proposed landscape species within site are detailed in the Tree and Shrub Strategy and Planting Strategy in **Appendix A** and **B**. An extract of the Tree Strategy is included at **Figure 13** and an extract of the Shrub Planting Strategy is included in **Figure 14**.

The Planting Strategy has been prepared with the objective of providing quality, large scale trees, which will assist in mitigating several micro-climate challenges and create meaningful, useable spaces. A planting strategy has been prepared for each of the destinations within the Public Domain to respond to their unique characteristics, including specifically selected species and aims for contributing to the wider goal of providing a world class public domain for the site.

Tree Planting Principles

The proposed tree planting palette has been selected to include a suitable mix of native and exotic species that represent distinct individual special qualities and diversity of colour, tone, form and texture. From a pragmatic perspective tree species will be required to respond, and thrive, under the site's specific microclimate conditions. Each of the species selected are outlined in the Planting Strategy, with the following principles applied to each destination:

- **Watermans Quay:** *Elaeocarpus Eumundi*
 - *Elaeocarpus eumundi* is well suited to street tree planting, having a dense upright character and volume suited for this wide street. The clean and upright nature of the tree canopy and trunk is well suited to avoid conflicts with building awnings and facades.
- **Barangaroo Avenue:** *Harpullia pendula*
 - *Harpullia* has been planted along Barangaroo Avenue in Stage 1A. The design intent for the remaining part of Barangaroo Avenue is to continue its existing character all of the way to the boundary of Central Barangaroo.
- **Hickson Park:** *Magnolia grandiflora* 'Exmouth', *Waterhousea floribunda*, *Syzigium paniculatum*, *Tristaniopsis laurina*, *Angophora costata*, *Ficus macrophylla*
 - These species have been selected to define the transition of the edges of the tree belt and the open lawn, to announce key entry and arrival points, to provide distinct character changes within the tree palette and to satisfy the recommendations of the wind report submitted with the application.
- **Hickson Park, Wulugul Walk and Boardwalk, Watermans Cove:** *Ficus microcarpa* var. *hillii*
 - These have been selected to announce key entry and arrival points and to mitigate and complement the surrounding built form and scale.
- **Wulugul Walk and Boardwalk:** *Celtis australis*
 - Currently planted along Wulugul Walk in Stage 1A and Barangaroo Central. *Celtis* has been proposed along Wulugul Walk in stage 1B for continuity with existing species.
- **Watermans Cove:** *Corymbia maculata*, *Corymbia gummifera*, *Waterhousea floribunda* var. 'Green Avenue'
 - Selected to define Waterman's Cove as a special place and differentiate it from the rest of the trees along Wulugul Walk. *Corymbia maculata* is one of the most recognisable of Eucalyptus trees, its evergreen canopy will help define and strengthen Watermans Cove as a distinctive place, when mature its scale is well suited to the scale of the Harbour and adjacent Crown Hotel.



Figure 13 – Tree Strategy
 Source: Grant Associates

Shrub Planting Principles

The proposed shrub planting palette will include a mixture of low ground cover, and medium sized shrub planting to ensure that the understory planting areas are enriched with diversity of suitable plant types, flowering colour and texture. Shrub planting defines two main areas of the proposal. These include the raised planter/seating areas and the understory planting at the base of the Hickson Park tree belt. For Hickson Park the tree belt planting understory is proposed to be composed of a variety of different native ferns in response to the shade patterns that are proposed by the adjacent building forms and mature tree canopies.

The fern species will be selected from the ferns that are already planted in Barangaroo Reserve. They will provide contrasting leaf form, texture and colour to the tree planting in the tree belt and are intended to provide a much more delicate planting character in and around this area of the Park. Each of the species selected are outlined in the Shrub Strategy, with the following shrubs to be utilised:

- **Fern Garden:** The fern garden will include a mix of ferns that have already been planted at Barangaroo Reserve. The delicate foliage will contrast well with the surrounding porphyry paving and the varied rich greens will contrast well with the natural sandstone “veins”.
- **Fig Raised Planter:** Star Jasmine will be planted at the base of the signature fig trees at each of the raised planter locations. Star jasmine is tolerant of shade and will ensure that clear views are permitted under the fig tree canopies
- **Cove Raised Planter:** The raised planters at the back of Watermans Cove provide a large area for shrub planting in an otherwise large area of hard paving. The species proposed differ from the raised fig tree planters and have been selected to exhibit a strong contrast in colour and flower which is representative of the overall design intent of these planters.



Figure 14 – Shrub Strategy
Source: Grant Associates

3.4 Materials and Paving

A variety of high quality and robust paving materials will be used throughout the public realm of Barangaroo that highlight particular spaces, movement patterns, and reflect the uses of the various streets and urban places. The specific materials for each of proposed spaces are identified in the Public Domain Drawings at **Appendix A**.

Hardscape Strategy

A Hardscape Strategy has been prepared which provides a number of guiding principles in the selection and composition of the elements that will collectively define the hardscape spaces in the public domain through detailed design. These principles include:

- High quality detailing and workmanship;

- All sandstone elements will be used in a manner that is restrained but that also maximises their natural colour and texture.
- All hardscape spaces will be robust enough to withstand the location and the anticipated amount and type of use for the area.
- The design will ensure that cast iron will be used to re-enforce an overall design narrative and identity across all parts of the public realm. This may include tree pits/grilles, manhole covers and even handrails. The furniture strategy includes the continuation of sandstone and cast iron as two key existing materials that have been used in Barangaroo Reserve and Stage 1A. These materials will be used in new ways to create a distinctive new furniture suite that will contribute to the unique characters for each of the proposed spaces. Ultimately, the materials will relate and define a singular cohesive character to the entire Barangaroo development.
- Significant co-ordination work will be developed at the detailed design stages to ensure that all existing services infrastructure is as integrated as possible into the finished paving.
- Awkward joints and diversions from overall paving patterns will be avoided. Detailed pavement interfaces will be studied to coordinate – and resolve – all pavement joints and changes of direction.
- Ensure that manholes and inspection covers are concealed with recessed access covers and filled with the same material as the surrounding areas.

The hardscape material palette for each of the key destinations of the proposal can be described as follows:

- **Watermans Quay and Barangaroo Avenue:** Watermans Quay and Barangaroo Avenue will be largely defined by a roadway hardscape palette, defining their functions as roads linking Barangaroo Avenue and Hickson Road. City of Sydney Granite Paving will make up the footpaths running alongside Watermans Quay and Barangaroo Avenue.
- **Hickson Park:** Hickson Park will be defined by Porphyry Paving and ‘Streetscape to Park Transition Paving’ in order to establish key transition points between destinations and spatially define the public domain areas surrounding each of the future residential buildings. Sandstone walls and terraces will separate key landscaped areas from paved walkways.
- **Wulugul Walk and Boardwalk:** The Wulugul Walk and Boardwalk will be defined by a mix of hardscape materials defining each of the various levels and public domain components, including Precast Unit Paving along the frontage of the Crown Sydney, stepping down to Porphyry Paving and sandstone walls and terraces. Timber decking will form the boardwalk with stone steps connecting some areas to the sandstone walls and terraces.
- **Watermans Cove:** Watermans Cove forms an extension of the Wulugul Walk and Boardwalk, establishing a connected sandstone wall and Porphyry Paving character on the upper levels, and stepping down towards the cove, a continuation of the timber decking and terraces.

Figure 15 below is an extract of the hardscape material palette included in the drawings in **Appendix A**.

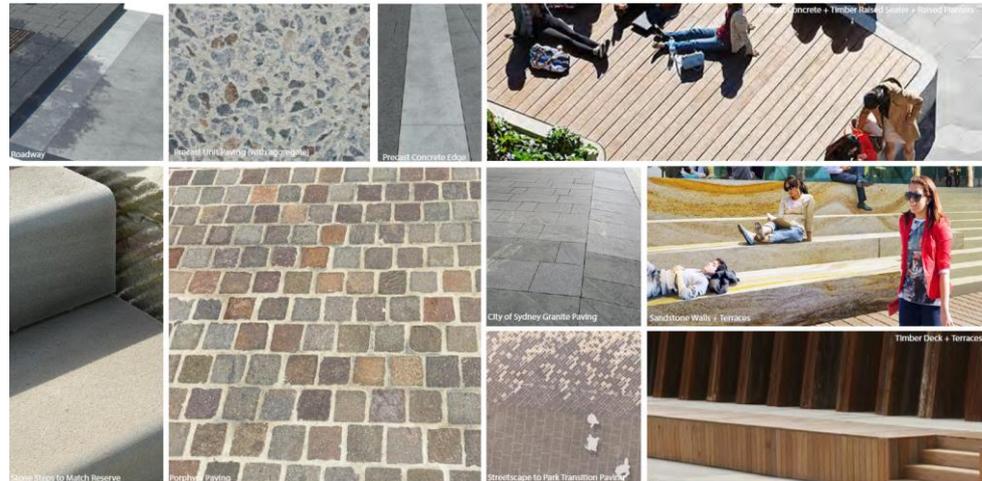


Figure 15 – Hardscape Material Palette

Paving Strategy

A Paving Strategy has been prepared which recognises that in order to be able to develop the whole of Barangaroo with a sense of unity there is the need to continue the materiality for some of the main spaces, including Barangaroo Avenue and Watermans Quay. The strategy includes the use of porphyry as a key paving material, continuing the Stage 1A Public Domain materiality where required, whilst also having unique sections of materiality in each of the distinct destinations within the public domain. The transitions between each of the destinations and the wider City of Sydney are detailed in the design drawings in **Appendix A**, and are outlined below.

‘City to Park’ Paving Transition

The transition between the City of Sydney’s Austral Black granite paving is proposed to be defined by a ‘City to Park’ paving transition. At these interfaces, and key entry points to Hickson Park, a carefully choreographed transition of materials is proposed – one distinctly park like and a continuation of the porphyry stone paving - and one distinctly civic through the continuation of the City of Sydney’s paving. **Figure 16** below demonstrates this transition.

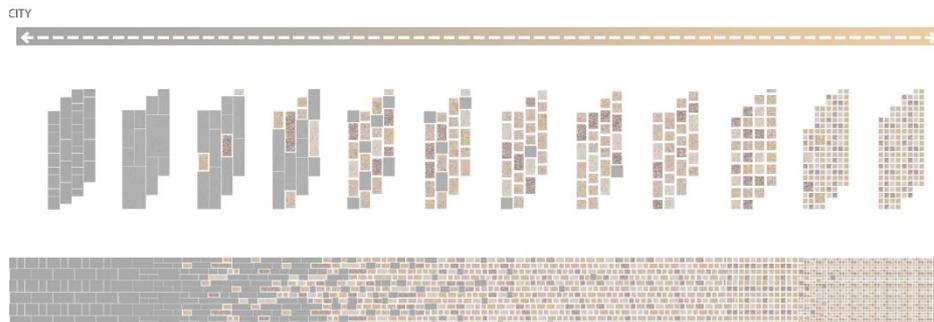


Figure 16 – City to Park paving transition

‘City to Cove’ Paving Transition

At the interface of the eastern side of Barangaroo Avenue and Watermans Cove a flush precast concrete edge, in the same alignment as the edge that is defined by the raised planters, will define the edge of the street and will mitigate the change in direction, and size, between the two unit paver types. **Figure 17** below demonstrates this transition.



Figure 17 – City to Cove paving transition

Wulugul Walk and Boardwalk Paving Transition

The edges of Wulugul Walk and the Boardwalk are defined by a mix of porphyry and sandstone. These key materials are extruded from Central Barangaroo to ensure continuity of the foreshore edge, as shown in **Figure 18**.



Figure 18 – Wulugul Walk and Boardwalk paving transition

3.5 Furniture and Fixtures

The furniture across Barangaroo South will be a variety of high quality and robust urban elements that will be used throughout the public realm to highlight particular spaces and reflect the paving palette of the various streets and urban places. The location of furniture and fixtures within the public domain is shown on the Furniture and Fixtures plan at **Appendix A**.

Given that there is a need to continue the existing furniture types that have been installed along Wulugul Walk and Barangaroo Avenue a strategy was developed to try and establish an equally strong but integrated character for the furniture for Hickson Park and Watermans Cove.

The furniture strategy includes the continuation of sandstone and cast iron as two key existing materials that have been used in Barangaroo Reserve and Stage 1A. These materials will be used in new ways to create a distinctive new furniture suite that will contribute to the unique characters for each of the 1B spaces. Ultimately relate and define a singular cohesive character to the entire Barangaroo development. An extract of the furniture palette is included in **Figure 19** below.

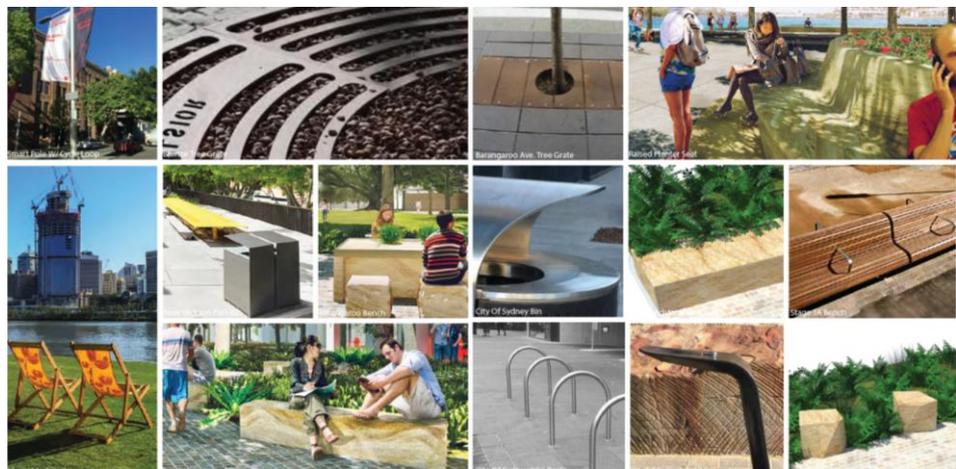


Figure 19 – Furniture Palette
 Source: Grant Associates

3.6 Seawalls and Overwater Structures

The proposed Wulugul Walk Boardwalk and Pontoon, comprises a fixed boardwalk over the majority of its length with a floating pontoon and hinged gangway at the northern end. At its furthest point, the structure extends approximately 15m into Darling Harbour beyond the face of the existing vertical caisson wall. The fixed boardwalk level steps down from RL 2.50 AHD in the south to a minimum of RL 2.05 AHD in the north at the top of the gangway leading to the pontoon.

A typical section through the fixed boardwalk near the northern end (deck level RL 2.05 AHD) is shown in **Figure 20**. A view of the boardwalk and pontoon looking south, drawn at Lowest Astronomical Tide (RL -0.925 AHD), is shown in **Figure 21**.

The proposed fixed boardwalk is supported by tubular steel piles (refer **Figure 20**). Situated above the piles would be precast concrete headstocks, precast concrete beams and timber decking. The floating pontoon is restrained by a series of steel tubular piles along the landward side (refer **Figure 21**). The pontoon is likely to be fabricated from steel.

It is noted that there are no new seawalls proposed to be built as part of this DA.

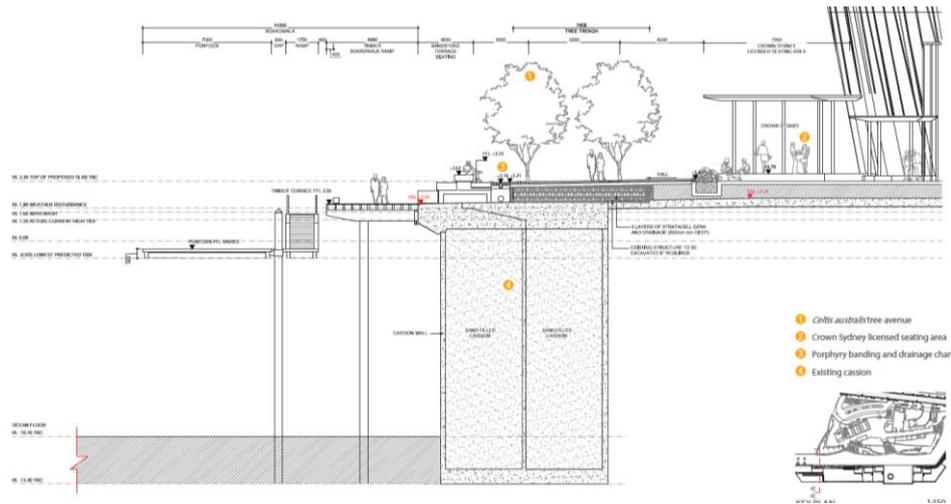


Figure 20 – Typical Wulugul Walk Boardwalk Section



Figure 21 – Wulugul Walk including the Boardwalk and Pontoon

3.7 Lighting

A Public Realm Lighting Concept has been developed by Speirs and Major for the Public Domain works, which is included in **Appendix F**. The lighting concept has taken into consideration factors such as accessibility, security, scale, flexibility, ecology and light pollution in providing a balanced and successfully lit environment for the public realm after dark.

The proposal includes:

- **A light intensity strategy:** To enhance the different characters of the Barangaroo public realm the lighting design requires varying luminance levels. The illumination levels are based on the Australian requirements *Lighting for Roads and Public Spaces - AS/NZS 1158.6*. These values have been taken from the Barangaroo lighting masterplan and lighting strategy for Stage 1A.
- **Colour temperature strategy:** A variety of colour temperatures of light shall be utilised to enhance the differing characters of the Barangaroo public realm, ranging from cool, neutral white, warm white and very warm white colours.

3.8 Public Art

Lendlease are providing \$40 million for public art. \$20 million of which will be spent within the Barangaroo South site, with the remainder provided to the BDA for allocation throughout all of Barangaroo. In 2015 Lendlease with the Barangaroo Delivery Authority prepared the Barangaroo Public Art and Cultural Plan (see **Appendix G**). The Plan three aims are to:

- enliven the entire Barangaroo precinct with iconic works of public art;
- provide engaging heritage interpretation of the Barangaroo site’s rich history; and
- deliver a world class cultural program of temporary art and events.

The Plan provides a strategic approach to delivering public art at Barangaroo by identifying areas where artists can contribute to the site-wide character of Barangaroo and the design of memorable public spaces. Under the Plan, public art, interpretation and cultural programs at Barangaroo will reflect and celebrate the many stories of the Barangaroo precinct, including the traditional owners of the land, the Gadigal people, and the maritime and labour histories. The context and themes identified in the Plan draw on the unique character and history of the site and support the key objectives for public art and cultural programs to embed Barangaroo in Sydney’s cultural landscape.

There are a large number of potential opportunities to implement artwork through the public domain in the form of heritage interpretation strategies, stand-alone artworks, and temporary works. The Plan establishes the process for procuring public art on the site, within the context of a significant committed budget. Specific potential locations for public art are not nominated in planning applications such as this. Instead, the key precincts and areas are identified in the Art Plan and then artists are free to propose artworks within a competitive environment. Accordingly, any future public art works will be the subject of future Development Application(s).

3.9 Signage

A Wayfinding Strategy has been prepared for the Public Domain (**Appendix H**) which aims to create a unified and strongly identifiable wayfinding system. It also aims to draw together the existing signage systems implemented in Stage 1A and Barangaroo Reserve and propose a cohesive and logical extension of wayfinding throughout the site. Eight different types of wayfinding signage are proposed within the site. Signage plans, identifying the types, locations and messaging for the signage proposed is included at **Appendix H**. The different types of signage proposed are shown at **Figure 22**.

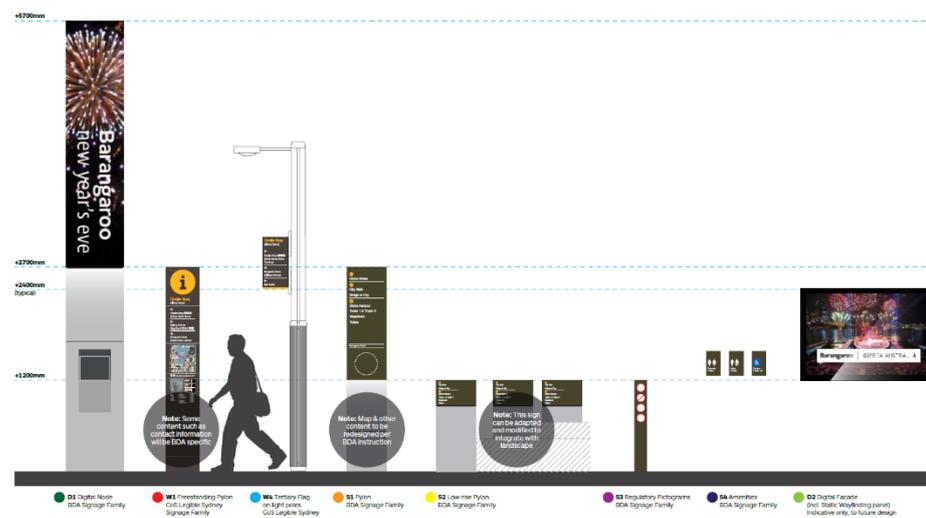


Figure 22 – Signage types to be used within the Public Domain

3.10 Public Amenities and Storage Building

A 75m² single storey public amenities and storage building is proposed near Hickson Road within Hickson Park. The building has been integrated into the landscape strategy as shown in **Figure 23** below. An indicative layout plan has also been prepared to demonstrate the allocation of space and use to the building, including male, female and disabled amenities as well as a storage area for loose furniture to be utilised in Hickson Park.

It is proposed that the detailed design of the building will be submitted to the Secretary prior to issue of the relevant Construction Certificate, noting that development for the purposes of 'amenity facilities' are exempt development at Barangaroo under Clause 58B of the Infrastructure SEPP. The detailed design of the building is intended to be procured through an architectural competition, most likely alongside the Pier Community Facility. This strategy will assist in ensuring both design excellence for what is a relatively prominent building, as well as a coordinated approach to the appearance of public buildings on the Barangaroo site.



Figure 23 – Location of the proposed public amenities within Hickson Park and layout

3.11 Internal Stormwater Drainage

The Internal Stormwater Drainage Strategy is set out in the Stormwater Management and Civil Infrastructure Report prepared by Cardno at **Appendix C**. Civil Engineering Drawings illustrating the proposed works stormwater drainage works are included at **Appendix C**.

The stormwater trunk network, including water quality measures is being provided as part of the Stage 1B Basement works. The proposed application seeks to provide the local pit and pipe drainage that will connect into the trunk infrastructure being provided as part of the Stage 1B Basement.

3.12 Infrastructure and Services

A Stormwater Management and Civil Infrastructure Report and associated civil drawings are included in **Appendix C**. All trunk infrastructure is approved in the Stage 1B Basement SSD DA (SSD 6960), with the local infrastructure (the subject of this SSD DA) to be refined and finalised through the design development process, consistent with the requirements of the relevant authorities.

Infrastructure that will be constructed as part of the Stage 1B development will include:

- **Potable water:** Minor water reticulation lines will be required to service public domain areas including the proposed amenities building adjacent to Hickson Road and bubblers along Wulugul Walk. Connections for these will be provided from the proposed 250mm diameter ring main that will be constructed within the Stage 1B site;
 - **Recycled water:** Recycled water may be supplied for sub-surface irrigation of Hickson Park and the proposed tree planters across the extent of the Stage 1B Public Domain works as a secondary source of water. Connections to the existing recycled water mains within Stage 1A or planned recycled water mains within Stage 1B would be made to supply recycled water to the Stage 1B Public Domain. Recycled water will be treated in accordance with Australian Recycled Water guidelines and reticulated throughout the Stage 1A and 1B developments for non-potable uses including landscape irrigation and toilet flushing.;
- **Chilled water:** A centralised chilled water plant and harbour heat rejection system have been constructed as part of Stage 1A works to provide reticulated chilled water to the Barangaroo South buildings, including the Stage 1B and Crown Hotel developments. Chilled water will be reticulated throughout the Barangaroo South development within a privately owned pipe network.
- **Sewerage:** Provision of wastewater services connections to the Stage 1B and the Crown Hotel developments has been addressed through the Site Servicing Strategy as agreed with Sydney Water. Sewerage from Stage 1B and the Crown Hotel development will discharge to the central RWTP located in the Stage 1A basement.
- **Natural gas:** The proposed gas servicing strategy for Stage 1B is currently being developed with Jemena, the gas asset owner and manager for the area. Jemena has confirmed that there is adequate capacity to service the Stage 1B development from the existing 110mm low pressure gas main in Hickson Road.
- **Electricity:** The electrical services that will be required for Stage 1B can be broadly separated into three categories:
 - Common infrastructure, including high voltage infrastructure that will be privately owned and operated.
 - Basement
 - Podium, including Public Domain

The scope of electrical services that will service Stage 1B include low voltage reticulation, main switchboards and distribution boards, standby power, energy

metering, earthing and lighting protection, lighting and controls, exit and emergency escape lighting and small power reticulation.

- **Telecommunications:** The scope of communications services that will ultimately be provided for Stage 1B and the Crown Hotel development (subject to separate applications) includes lead-in telecommunications service provider infrastructure, distribution, an Integrated Communications Network (ICN), Master Antenna Television System (MATV) and in-building (i.e. basement) mobile coverage / distributed antenna system.

3.13 Operational Management

Whilst no events are proposed, a plan of management will be prepared by the landowner, the Barangaroo Delivery Authority, to guide the ongoing operations and management of the site prior to opening of the precinct to the public.

The plan of management will outline matters such as:

- peak period and event management;
- security arrangements;
- maintenance;
- emergency services access; and
- waste management and cleaning.

4.0 Environmental Assessment

This section of the report assesses and responds to the environmental impacts of the proposed Development Application. It addresses the matters for consideration set out in the SEARs including relevant EPIs, policies and guidelines (see Section 4.1).

The Mitigation Measures at Section 6.0 complement the findings of this section.

As detailed in Section 1.1.3 of this EIS, the lodgement of this SSD DA follows approval of the Block 4 Remediation SSD DA and Crown Sydney Hotel Resort SSD DA, and follows lodgement of Residential Building R4A, R4B, R5 and the approval of the Stage 1B Basement (SSD 15_6960).

The Block 4 Remediation SSD consent allows for demolition works, site establishment, bulk earthworks, onsite treatment and remediation of contaminated soils. The Stage 1B Basement DA approves the construction of the cores associated with Buildings R4A, R4B and R5 (up to ground level), a basement car park and slab for the future public domain.

The Block 4 Remediation SSD DA and Stage 1B Basement DA provide detailed information and environmental assessment of a number of planning and environmental issues for a significant portion of the Public Domain works site, including, relevantly the following:

- demolition, part excavation and tree removal;
- remediation of contaminated material;
- non-indigenous archaeology;
- indigenous archaeology;
- geotechnical impacts;
- acid sulphate soils; and
- de-watering, groundwater treatment and water quality.

This SSD DA is informed by the detailed assessments included in the Block 4 Remediation and Stage 1B Basement applications to the extent that they are relevant to the proposed development. Consideration has also been given to the environmental assessments for the Stage 1A Public Domain, Commercial Building C3, Crown Sydney Hotel Resort, Buildings R4A, R4B and R5, which informs the proposed Public Domain.

4.1 EPIs, Policies and Guidelines

4.1.1 Strategic and Statutory Instruments

Table 2 demonstrates that the proposed development will comply with / is consistent with the relevant strategies and environmental planning instruments as set out in the SEARs.

Table 2 – Summary of consistency with relevant Strategies, EPIs, Policies and Guidelines

Instrument / Strategy	Comments
Strategic Plans	
A Plan for Growing Sydney	<p>The SSD DA is consistent with the Plan for Growing Sydney, as it will deliver the public domain within Barangaroo South Stage 1B, which is identified as a key element of maintaining Sydney's global reputation, as per Direction 1.1 of the Plan for Growing Sydney.</p> <p>More specifically the Public Domain is consistent with the goal of a 'a competitive economy with world-class services' in that it will create socially inclusive, adaptable and accessible places that promotes social, cultural and recreation opportunities. It also achieves one of the priorities for Sydney Harbour by increasing recreational access to the Harbour foreshore and waters and providing visitor and tourism experiences on the foreshore.</p>
NSW State Priorities	<p>NSW 2021 is a 10 year plan to rebuild the economy, provide quality services, renovate infrastructure, restore government accountability, and strengthen our local environment and communities. The Barangaroo site has an important role in the NSW 2021 Plan as it will assist with achieving multiple goals set out in the Plan, including but not limited to improving the performance of the NSW economy, increasing the competitiveness of doing business in NSW, providing critical infrastructure and building liveable centres.</p> <p>As discussed in Section 1.2, the public domain works will play a role in the success of Barangaroo South and achievement of the above goals.</p>
Draft Sydney City Sub-Regional Strategy	The SSD DA is consistent with the Draft Sydney City Subregional Strategy as it will deliver a building at Barangaroo South which is identified in the Draft Strategy as a major development opportunity to conduct a focused and considered renewal process aimed at generating a new urban precinct in Australia's premier city.
Draft Central District Plan	Barangaroo is identified as one of the Global Sydney Precincts under the plan which will contribute to employment and housing within the Central District. The proposed public domain will provide key amenity to the future land uses on the site and therefore contribute to Sydney being a productive, liveable and sustainable city.
Sydney City Centre Access Strategy	<p>The proposed development is consistent with the Sydney City Access Strategy, encouraging the use of existing and future public transport linkages in close proximity to the site. The Strategy seeks to connect Barangaroo to the city centre and Sydney transport network through the following infrastructure:</p> <ul style="list-style-type: none"> – Wynyard Walk, which provides a direct, accessible pedestrian connection between Barangaroo and the Wynyard Station interchange precinct; – New bus routes serving Barangaroo and Walsh Bay; and – A new Barangaroo ferry hub and new routes to provide more opportunities to access Barangaroo and the mid-town precinct by public transport. <p>The proposal is consistent with the Strategy, providing public domain areas in a location highly accessible to existing and planned public transport and employment. The proposal will not impact on the ability for the Government to deliver the planned infrastructure and service upgrades as part of the Strategy.</p>
Sydney's Walking Future	<p>Sydney's Walking Future was released in December 2013, and seeks to make walking the transport choice for quick trips under two kilometres and help people access public transport.</p> <p>Given the proximity of the site to the CBD, existing and planned pedestrian connections and public transport services, the proposed development will support the proposed actions contained within the Plan.</p>
Sydney's Cycling	Sydney's Cycling Future was released in December 2013, and outlines the intent to

Instrument / Strategy	Comments																																		
Future	create a safer and easier bicycle riding experience for the people of Sydney. Bicycle parking for residents and visitors will be provided as part of the overall public domain works in accessible locations.																																		
State Legislation																																			
Roads Act	The proposed development involves works to and a connection with a public road and therefore requires the consent of the roads authority under Section 138 of the Roads Act.																																		
EP&A Act	<p>The proposed development is consistent with the objects of the EP&A Act for the following reasons:</p> <ul style="list-style-type: none"> – it reflects the proper development of the site for the purpose of promoting the social and economic welfare of the community and a better environment; – it will ensure the promotion and co-ordination of the orderly and economic use and development of land by delivering the public domain in conjunction with the future uses; and – it will enable the appropriate parts of the site to be used for public purposes. <p>The proposed development is consistent with Division 4.1 of the EP&A Act, particularly for the following reasons:</p> <ul style="list-style-type: none"> – the development has been declared to have state significance; – the development is not prohibited by an environmental planning instrument; and – the development has been evaluated and assessed against the relevant heads of consideration under section 79C. 																																		
EP&A Regulations	<p>The EIS has addressed the specification criteria within clause 6 and clause 7 of Schedule 2. Similarly, the EIS has addressed the principles of ecologically sustainable development through the precautionary principle (and other considerations), which assesses the threats of any serious or irreversible environmental damage (see Section 7.3).</p> <p>As required by Clause 7(1)(d)(v) of Schedule 2 of the EP&A Regulation, and as set out below, with the exception of a consent under section 138 of the <i>Roads Act 1993</i>, no additional approvals will be required in order to permit the proposed development to occur.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: black; color: white;">Act</th> <th style="background-color: black; color: white;">Approval Required</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="background-color: #e0e0e0;">Legislation that does not apply to State Significant Development</td> </tr> <tr> <td>Coastal Protection Act 1979</td> <td>N/A</td> </tr> <tr> <td>Fisheries Management Act 1994</td> <td>N/A</td> </tr> <tr> <td>Heritage Act 1977</td> <td>N/A</td> </tr> <tr> <td>National Parks and Wildlife Act 1974</td> <td>N/A</td> </tr> <tr> <td>Native Vegetation Act 2003</td> <td>N/A</td> </tr> <tr> <td>Rural Fires Act 1997</td> <td>N/A</td> </tr> <tr> <td>Water Management Act 2000</td> <td>N/A</td> </tr> <tr> <td colspan="2" style="background-color: #e0e0e0;">Legislation that must be applied consistently</td> </tr> <tr> <td>Fisheries Management Act 1994</td> <td>No</td> </tr> <tr> <td>Mine Subsidence Compensation Act 1961</td> <td>No</td> </tr> <tr> <td>Mining Act 1992</td> <td>No</td> </tr> <tr> <td>Petroleum (Onshore) Act 1991</td> <td>No</td> </tr> <tr> <td>Protection of the Environment Operations Act 1997</td> <td>No</td> </tr> <tr> <td>Roads Act 1993</td> <td>Yes</td> </tr> <tr> <td>Pipelines Act 1967</td> <td>No</td> </tr> </tbody> </table>	Act	Approval Required	Legislation that does not apply to State Significant Development		Coastal Protection Act 1979	N/A	Fisheries Management Act 1994	N/A	Heritage Act 1977	N/A	National Parks and Wildlife Act 1974	N/A	Native Vegetation Act 2003	N/A	Rural Fires Act 1997	N/A	Water Management Act 2000	N/A	Legislation that must be applied consistently		Fisheries Management Act 1994	No	Mine Subsidence Compensation Act 1961	No	Mining Act 1992	No	Petroleum (Onshore) Act 1991	No	Protection of the Environment Operations Act 1997	No	Roads Act 1993	Yes	Pipelines Act 1967	No
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Roads Act 1993	Yes																																		
Pipelines Act 1967	No																																		
SEPP (State Significant Precincts) 2005	<p>The Barangaroo site is listed as a State Significant Site under Part 12 of Schedule 3 of the State Significant Precincts SEPP. The following is an assessment of the proposal's compliance against the State Significant Precincts SEPP</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Clause 8 - Zone B4 Mixed Use</td> <td>The proposed works are permissible and consistent with the objectives of the B4 Mixed Use zone.</td> </tr> </table>	Clause 8 - Zone B4 Mixed Use	The proposed works are permissible and consistent with the objectives of the B4 Mixed Use zone.																																
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Instrument / Strategy	Comments	
	Clause 9 - Zone RE1 Public Recreation	The proposed works are permissible and consistent with the objectives of the RE1 Public Recreation zone.
	Clause 19 - Design Excellence	The proposed development demonstrates Design Excellence in accordance with clause 19. See further discussion at Section 4.2.1.
SEPP (State and Regional Development)	Development that has a capital investment value of more than \$10 million on land identified as being within a State Significant Development Site is State Significant Development under Schedule 2 State Environmental Planning Policy (State and Regional Development) 2011 (State and Regional Development SEPP). Accordingly, this development is State Significant Development.	
SEPP (Infrastructure)	The proposed development does not involve excavation more than 2m below ground level within 'Zone B' on the interim rail corridor map. Therefore no further assessment in relation to the future Metro Corridor is required.	
SEPP 55	A SEPP 55 Assessment has been undertaken by AECOM (See Appendix I). The Assessment concludes that the proposed Public Domain works are consistent with the land uses and development works anticipated by the RAPs in place for the site and therefore the consent authority can be satisfied that the site can be made suitable for the proposed development.	
Sydney LEP 2012	The Sydney LEP does not apply to the site.	
Sydney Harbour REP	Clause 20 General	The matters referred to in Division 2 are addressed below.
	Clause 21 Biodiversity, ecology and environment protection	The proposed mitigation measures set out in Section 6 will ensure the development will not have any impact on the Harbour's biodiversity, ecology or environment (See Section 4.5 and 4.7).
	Clause 22 Public access to, and use of foreshores and waterways	The objective of the proposed development is to provide improved pedestrian access to Barangaroo and the foreshore, and is therefore considered entirely consistent with clause 22.
	Clause 23 Maintenance of a working harbour	The proposed public domain works support the redevelopment of the wider Barangaroo site for mixed uses that was assessed as part of the Concept Plan for the site.
	Clause 24 Interrelationship of water and foreshore uses	The proposed development will not have any adverse impacts on the use of waterway for maritime functions (See Section 4.9). The development will provide public access to the foreshore, which was previously unavailable.
	Clause 25 Foreshore and waterways scenic quality	This application seeks to provide a high quality public domain that will contribute to the scenic quality of the waterway (See Section 4.3).
	Clause 26 Maintenance, protection and enhancement of views	The proposed development will not adversely impact any views and vistas and will provide new views to the Harbour from and through the public domain.
	Clause 27 Boat storage facilities	N/A. No boat storage facilities are proposed.
Foreshores and Waterways DCP	Whilst the DCP does not apply to the Barangaroo site, this EIS assess those matters set out in the DCP, including an assessment of the ecological impacts (see Sections 4.7), landscape impacts (see Section 4.3) and design considerations (see Section 4.2).	
City of Sydney Signage and Advertising Structure DCP 2005	The proposed wayfinding signage is generally consistent with the general signage provisions in Section 2 of the DCP. Specifically the signs will be of a high quality and add to the character of the streetscape.	

4.1.2 Consistency with the Barangaroo Concept Plan

Under the Transitional Provisions for Part 3A in Section 6A of the EP&A Act, the consent authority must not grant consent to development under a Part 3A Concept Plan unless it is generally consistent with the Concept Plan.

The following section provides an assessment of the proposal against Concept Plan (Mod 8). The section demonstrates that the proposed development is generally consistent with the approved Concept Plan.

Instrument of Approval

An assessment against the relevant conditions in the Instrument of Approval is provided in **Table 3**.

Table 3 – Consistency with the relevant conditions in the Instrument of Approval

Condition	Comment	Consistency
Part A - Terms of Approval		
A1 and A2	Consistent with Condition A1 the proposed public domain will contribute new public open space / public domain, with a range of formal and informal open spaces servicing separate recreation functions. This includes a new public waterfront promenade. The location of the public domain is generally consistent with the indicative public domain layout in Concept Plan (Mod 8).	✓
Part B – Modifications to Concept Plan		
B3 (1) Hickson Park	The proposed design is consistent with the modifications to the Concept Plan, specifically: <ul style="list-style-type: none"> – Hickson Park has been provided in accordance with the map at Appendix 1 of the Concept Approval. – It includes view corridors from Hickson Road to the Harbour. – It has been designed to support large trees (see further discussion below). – It will not be overshadowed during the nominated times. – The park design primarily comprises soft landscaping, including extensive areas of grass. 	✓
B3 (5) Barton Street	Barton Street does not need to be completed for construction purposes. The area formerly identified for Barton Street is proposed as parkland as required by the Modification.	✓
B3 (6) Foreshore Promenade in Vicinity of Block Y	The foreshore promenade along the western side of Block Y has been designed consistent with the Modification as it: <ul style="list-style-type: none"> – covers the area as mapped in the SEPP Amendment – reads as public open space – includes mature tree plantings and other soft landscaping elements and places to stop and sit. 	✓
B4 Built Form	The proposed amenities building comprises 75m ² of community uses GFA. The proposed GFA complies with the maximum GFA under the Concept Plan and contributes to the minimum of 12,000m ² required for community uses.	✓
B5 Revised Design Principles	A detailed assessment against the design principles is provided below.	✓
B7 Community Uses	The proposed development includes an amenities block which will form part of the minimum community uses GFA requirement. No community facilities are proposed on the public pier as part of the DA.	✓
B12 Staging	The proposed DA, which provides the public domain elements outlined in B12 is necessary in order to satisfy this condition. See Section 4.15.	✓

Condition	Comment	Consistency
Part C – Future Applications		
C2 Design Excellence	The proposed public domain achieves design excellence. Whilst the development site is greater than 1,500m ² , because of the nature of the Public Domain application a design competition waiver is requested (see Section 4.2.1).	✓
C5 Marine Ecology	An assessment of the marine ecology impacts of the development has been undertaken by Royal Haskoning and is included at Appendix J (see further detail at Section 4.7).	✓
C7 Pedestrian Linkages, Activation of Streets and Public Domain	The proposal includes the provision of public domain along the promenade and through site links. The design in conjunction with the approved and proposed developments in Blocks 4A, 4B and Y will promote visual connectivity and legibility as intended under the Concept Plan.	✓
C8 Road Design in the Vicinity of Block Y	No road is proposed north of the Port Cochere of the Crown Sydney Hotel Resort as part of this application.	✓
C10 Public Pier and future building and other building works over the water	a) The public pier is located wholly within the site boundary and clearly defines the southern edge of Waterman's Cove.	✓
	b) No building is proposed as part of this DA.	
	c) No use is proposed on the pier as part of this DA.	
	d) Lendlease has consulted with TfNSW and Sydney Ferries in relation to the pier (see Section 4.17).	
	e) A Navigation Impact Assessment is included at Appendix K . See also Section 4.9.	
C11 Landscaped Areas	Landscaped areas above basement car parking provide adequate soil depth to support long-term viable stands of mature medium to large scale trees (see further discussion below).	✓
C12 Wind Assessment Report	A Wind Assessment has been prepared by Windtech (see Appendix L) and further discussion at Section 4.2.4.	✓
C13 Lighting Strategy	A Lighting Strategy prepared by Speirs and Major has been submitted as a component of the Public Domain Report (See Appendix F). Sydney Observatory has been consulted with as part of the preparation of the DA (see Section 4.18).	✓
C14 Intersection Design	Lendlease consulted with TfNSW and RMS in relation to the design of the intersection (see Section 4.18).	✓

Barangaroo South Built Form and Urban Design Controls

The proposed development is consistent with the relevant Barangaroo Built Form Principles in that it provides:

- a public promenade along the waterfront as part of the City's new western façade;
- the public domain that interfaces with the buildings which define the streets;
- the primary pedestrian connections through Stage 1B of the site; and
- the open space within the blocks to create the fine gran structure as well as open space.

The Urban Design Controls provide specific built form controls for each development block and therefore are not directly relevant to the Public Domain application. The proposed Public Domain is however generally consistent with the Urban Design Controls, notably it provides the public domain at ground level to achieve the ground floor permeability and accessibility of public realm controls for each relevant block.

Deep Soil/Soil Depth and Landscaped Areas

The Concept Plan (as modified) contains a number of conditions guiding the future design of Hickson Park. Condition B3 contains a reference to a 2,000m² 'deep soil' zone with a minimum depth of 3 metres. Condition C11, also discusses the growth of medium to large scale trees within adequate soil depth above basement car parking. In addition, the recent approval of the Stage 1B Basement (SSD 6960) by the Planning Assessment Commission both interprets the Concept Plan conditions and establishes

the principle that the 3m deep soil zone should be located to be **generally** consistent with the location of significant trees in Hickson Park.

Accordingly, a 2,000m² zone of deep soil achieving a depth of three metres is proposed within Hickson Park, in the area shown in **Figure 21** below. The key criteria that have contributed to the delineation of this zone include the following:

- **External location to the Crown basement footprint:** The Crown basement and its final structural levels has been approved by the PAC. There is an inability to increase soil depth over the approved Crown basement structure as structural design loads will be exceeded and the mounding that would result at ground level will serve to restrict views and accessibility of Hickson Park.
- **External location to the Stage 1B Basement loading dock area:** The Stage 1B Basement and its structural levels have been approved, albeit with the requirement for a setdown of the ground slab to accommodate the deep soil zone. Due to the clearances required to accommodate service vehicles in the basement there is an inability to relocate the current approved zone.
- **Maximum coverage of significant trees:** Approximately 62% of the total area of significant trees sits above the Stage 1B Basement. Of this area, 64% of the trees sit above the ground slab set down for 3m deep soil.

Figure 26 below illustrates the slab set down area as well as all of those areas within this zone that can achieve a 3m soil depth. Areas outside the 3m deep zone can only provide a lesser volume due to ramping and interfaces with external and existing ground levels. These areas are typically within a root zone for the adjacent trees, and while not 3m, these trees would have access to a deep soil zone well in excess of the 1-1.4m recommendation of consulting arborists (see below) and close to the 3m condition requirement.

Appendix A contains a full set of sections illustrating the conditions at these interface areas. The following sections are an extract of these.



Figure 24 – North-south section through Hickson Park (H-H)



Figure 25 – South-west to north-east section through Hickson Park (K-K)

In summary, the basement is proposed to accommodate a 2,500sqm set down area, which then accommodates a 2,000sqm area of 3m deep soil. A significant majority of the significant tree area available to accommodate a 3m soil depth has been provided. Interface areas also accommodate in excess of 2m, and in some cases up to just under 3m, adding significant area to the 2,000sqm 3m deep soil zone for trees. Under these circumstances, and in respect of the interpretation provided by the PAC's determination of the Stage 1B basement it is considered that the proposal satisfies Concept Plan Condition B3.

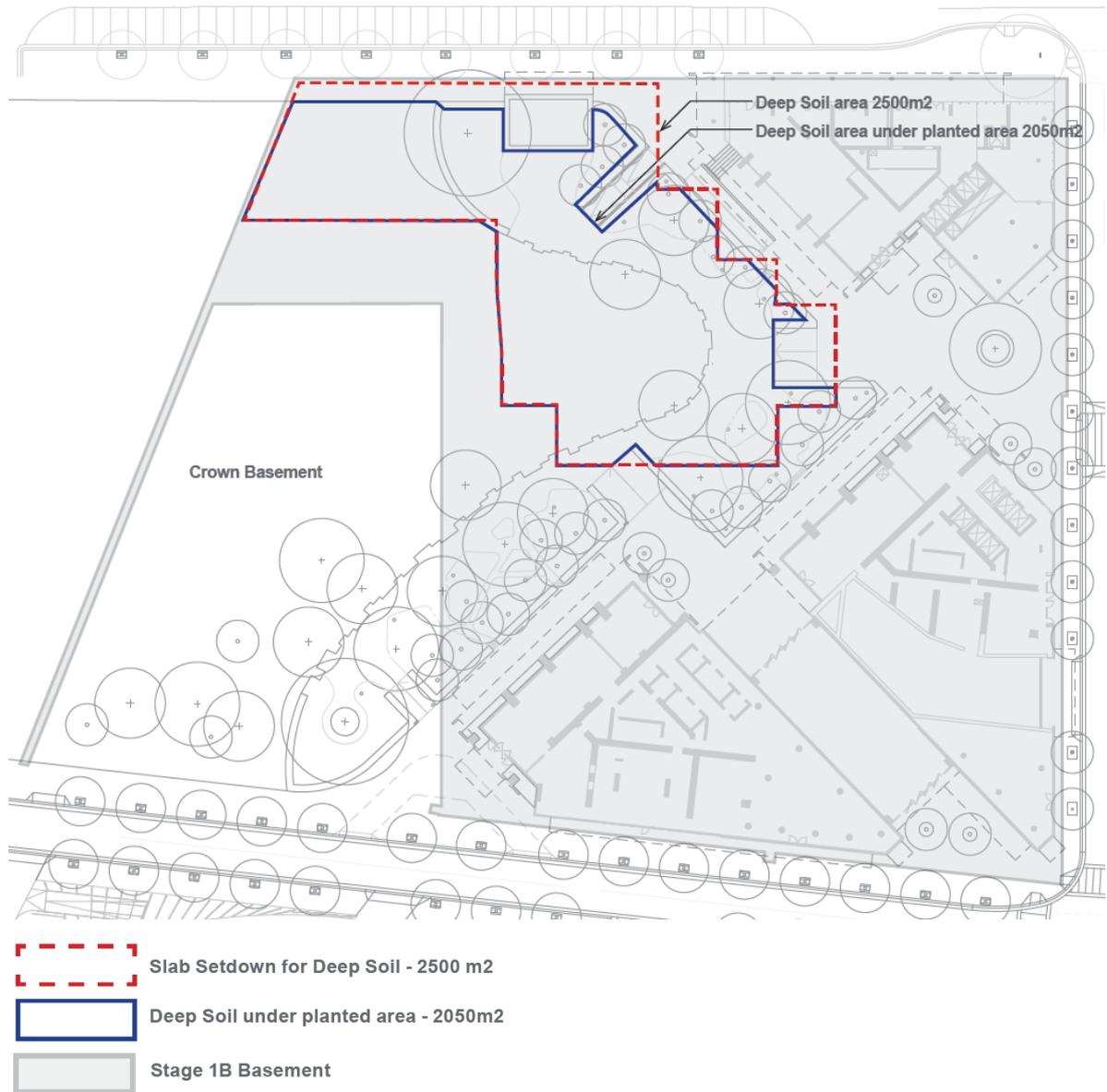


Figure 26 – Location of proposed 2,000m², 3 metre deep soil zone within Hickson Park
 Source: Grant Associates

Despite the proposal including a 3m deep soil zone on the Hickson Park site, it is considered that the provision of a deep soil zone at a depth of 3m is neither required nor necessary, noting that a zone with less depth would still achieve consistency with Condition C11 of the Concept Plan. The design of the Park, and indeed all of the site's planted areas has been undertaken to identify appropriate tree species and soil depth profiles required to support the successful growth of large mature trees. Following over twelve months of design evolution and engagement, it appears clear that a 3 metre soil depth profile is excessive and that depths of up to 1.5 metres, along with a suitable volume, is appropriate for the successful growth of trees planted over structure. Condition C11 states:

C11 Landscaped Areas

Where landscaped areas involving the planting of trees are proposed above basement car parking, the Proponent must ensure that there is adequate soil depth to support long-term viable stands of mature medium and large scale trees (to a height of at least 15 m, with well-formed canopies). Trees selected for landscaping shall not include species that are declared a noxious weed under the Noxious Weeds Act 1993. (our emphasis)

In consideration of Condition C11, the project team has consulted widely to determine appropriate soil depths for different scales of trees to be located outside the designated 2,000m², 3 metre deep soil zone. Following this consultation and detailed investigations, it is proposed that a variable rate of soil depth be provided across Hickson Park, consistent with the requirements of the landscape elements to be provided in any particular location. Critical to understanding the appropriateness of these soil depths has been expert inputs to identify the growth patterns of large trees and ensure that the intent and purpose of all conditions with the Concept Plan (as modified) are achieved.

Expert advice provided by Stuart Pittendrigh (arborist-horticulturist) and Simon Leake (soil scientist) has identified the requirements for tree growth and provided an assessment of the proposed depths (refer to **Appendix M**). These experts have confirmed that tree roots ordinarily grow in a horizontal manner, rarely penetrating below 500mm of the ground level surface. A limited number of roots, known as 'sinker' roots, will penetrate further into the soil to allow for the collection of water. The depth of these sinker roots will vary depending on soil quality, but in soil which has good drainage, these roots could penetrate as low as 1500mm below the ground level surface. This depth is considered by the experts to be the lowest possible extent of roots, as below this depth, oxygen is limited and root growth is impeded.

The experts have considered the recommended soil depths based on past experience, including a number of key metropolitan redevelopment projects and Barangaroo Reserve. Soil depth above structures in Barangaroo Reserve comprises 1500mm of functional soil (including a drainage layer) under the largest Ficus trees. There has been no loss of large trees in Barangaroo Reserve except where drainage was compromised separately to soil depth. The experts have advised specific soil depths for different scales of trees, all of which will be achieved by the proposal. Furthermore, the experts have emphasised that three metres of soil depth is not necessary, nor appropriate, given past experience and factual knowledge that only 1,500mm of soil depth is required for root growth.

In light of the state-wide requirement of the ADG for 'soil depth above a structure' (between 800mm and 1,200mm depending on the size of the tree); and expert advice on the factual growth requirements of large mature trees; in addition to the proposed 2,000m² component of 3 metre deep soil within Hickson Park, a range of soil depths between 1.1m to 1.5m are proposed to constitute the remainder of Hickson Park, with the specific requirements for individual tree specimens provided for in both soil depth and soil volume (further detail is provided in the Public Domain Report at **Appendix B**).

A number of large, mature trees are proposed in Hickson Park outside the 2000m², 3 metre deep soil zone, which can be successfully accommodated with the soil depths proposed, allowing Hickson Park to be a useable and desirable space for the

community. The proposal is generally consistent with the Concept Plan (as modified) in that it achieves the intent and purpose of all conditions in providing suitable soil depth to facilitate the growth of large mature trees (amongst other scaled trees and planting). The end outcome of the Concept Plan (as modified), which the conditions of the Concept Plan (as modified) seek to shape, will be achieved; consistent with the vision which the PAC created for Hickson Park as a place which will sustain large trees.

Statement of Commitments

The Statement of Commitments requires a number of Plans and Strategies to be submitted to the Planning Reference Group prior to lodgement of any relevant Project Application (other than for demolition or early /site preparation work). In conformance with the Statement of Commitments the above Plans and Strategies were submitted to the Planning Reference Group prior to the submission of the Commercial Building C4 Project Application.

The Statement of Commitments also includes a number of commitments that are specific to the preparation of the Public Domain DA.

- Commitments 115, 117-118: Consultation has been undertaken with the relevant authorities, see Section 4.18.
- Commitment 120: The public domain has been designed in accordance with CPTED Principles (see **Appendix N** and Section 4.13).
- Commitments 126-27: The detailed design of Waterman's Cove and the foreshore promenade is generally consistent with the approved Concept Plan documentation.
- Commitments 128-129: This EIS includes the required environmental assessment associated with creation of Waterman's Cove and the Public Pier.

4.2 Public Domain and Public Access

This section provides an assessment of the key issues relating to the design of the public domain.

4.2.1 Design Excellence

High Standard of Architectural Design

Some of the key design features of the Public Domain that demonstrate the high standard of architectural design include:

- its consistency with the Barangaroo Concept Plan;
- there are a range of spaces and key destinations within the site that will create a diverse, active and identifiable public domain (see Section 3.2);
- it integrates a high level of sustainability (see Section 4.12); and
- the proposed materials and finishes are all of the highest standard (see Section 3.4).

Design Review Process

The proposed Public Domain design has been through a rigorous process of design review, both internally and with the independent design experts. The proposed design was presented to the Barangaroo Delivery Authority's Design Director and design advisors. Comments from all of the design reviewers have been taken into account and have led to the refinement of the proposed modified design. The design was also presented at a 50% Concept stage to the Department of Planning's Mod 8 Design Review Panel, and to the Planning Assessment Commission. Importantly, both these groups will recognise that the current SSDA design is entirely consistent with the designs presented to them.

Achieving Design Excellence

The proposed development will exhibit design excellence as:

- renowned landscape architectural practice Grant Associates has been engaged as landscape architects on the project along with other esteemed members of the consultant team;
- a high standard of design, materials and detailing is achieved, appropriate to the location;
- the design of the public domain provides a high level of amenity;
- Lendlease commits to ensuring continuity in the design process and realisation of the submitted Public Domain design in the completed public domain by ensuring that Grant Associates has direct involvement in the design documentation phase for construction certification;
- it complies with the planning framework established for the Barangaroo site;
- it utilises Lendlease's skills and proven track record to deliver exemplary places; and
- it explores and implements innovative technical and sustainable solutions, contributing to cutting edge design excellence.

4.2.2 Public Domain Interfaces and Connectivity

Interface with Existing Public Domain

The approved Concept Plan, Stage 1A and future Stage 1B Basement features levels within the Barangaroo site to respond to climate change predictions. As a result, the level of the Barangaroo site is not flush with the levels of the existing public domain outside of the Barangaroo site.

The detailed design of the interface between the site and Hickson Road will need to be refined closer to the time of development. The DA design proposes an integration solution based on the existing levels. The intent will be to provide an equal or better quality accessibility and pedestrian safety solution as provided for in the Landscape Drawings at **Appendix A**.

The materials and paving, furniture and fixtures, lighting and signage proposed within the public domain have all been prepared to either use the City of Sydney standard palette or design or will use a reconfigured 'of the city' palette or design that integrates with the existing City of Sydney public domain palette. The general approach sees that all streets are of the City's palette, Wulugul Walk is consistent with the Stage 1A area in its utilisation of key elements of the City's palette. The key spaces of Hickson Park and Watermans Cove have been designed to express an individual character befitting of their importance, though this design is complementary of the established palette utilised elsewhere in the site.

Interface with Future Uses / Public Domain

The proposed public domain has been designed to respond to the current and future uses within Blocks 3, 4A, 4B and Y sites. Specifically:

- Watermans Quay provides the main street frontage to Buildings R4A and R4B to the north, as well as buildings in Stage 1A to the south.
- Barangaroo Avenue connects Stage 1A to the south to the future Central Barangaroo to the north, and will provide a street frontage to the approved Crown Sydney Hotel Resort, the future Watermans Cove as well as a frontage to the future Building R4A.
- Hickson Park provides the interface with future Buildings R4A, R4B and R5, which have been designed to activate the park with retail and lobby uses. Hickson Park also provides the link between the future Central Barangaroo Parkland to Hickson

Road. Linkages have also been created to connect the Park to Waterman's Quay, Wulugul Walk, Barangaroo Avenue and Scotch Row.

- Wulugul Walk follows the western edge of the Harbour as defined under the Concept Plan, and will provide a level continuation of the waterfront promenade in Stage 1A that connects through to Central Barangaroo. It will be activated by the outdoor seating areas associated with the ground floor restaurants in the Crown Sydney Hotel Resort.
- Watermans Cove has been designed to step in level to enable visitors to physically interact with the harbour whilst also creating an informal array of public seating. The Cove is the termination of Watermans Quay and is also accessible from Wulugul Walk.

The levels of the proposed public domain have been determined to provide an at-grade interface with the future uses. The levels also match those levels provided in the Stage 1A Public Domain and Central Barangaroo Waterfront Promenade DA.

4.2.3 Events

No events are proposed as part of this Public Domain DA. If required planning approval for events will be the subject to future planning applications. The public domain however will be designed for the possibility of events in the future. This includes ensuring suitable availability of infrastructure and accessibility for vehicles that may be involved in set-up.

In the future if events in the public domain are being considered, an Event Plan of Management will be prepared in consultation with the relevant authorities. This plan will also inform traffic and maritime management.

4.2.4 Equitable Access

The public domain has been designed to achieve compliance with the relevant access requirements in the BCA and under the *Disability Discrimination Act 1992*. An Access Report prepared by Moris Goding is provided at **Appendix O**.

4.3 Visual Impact and Views

As the proposed works relate to the public domain, and does not include the building on the public pier, the works will not be visible from most of the key vantage points established as part of the historical visual impact analysis undertaken for the site as part of the Concept Plan and as referenced in the SEARs. Accordingly, the identified viewpoints in the SEARs are inappropriate as they will not provide a view of the works or are such a significant distance that any view is negligible.

Two views have been selected for the formal Visual Impact Analysis prepared by Virtual Ideas (see **Appendix P**). The views were selected from vantage points where the proposed development will be most visible from the public domain outside of the site, being:

- Ballarat Park from the west
- The Bond Steps overlooking the site from the east

Additional perspective views within the site of the public domain has also been prepared by Grant Associates (see **Appendix B**). The visual impact assessment in conjunction with the additional views demonstrate that:

- external to the site, the proposed development will have a limited visual impact, with the only visible elements likely to be trees and landscaping, which will have a positive visual impact; and
- internal to the site, the proposed development will greatly enhance the visual character of the site.

4.4 Land Contamination

A report has been prepared by AECOM (**Appendix I**) which has been prepared to confirm that the proposed public domain works are:

- Consistent with what was contemplated in the RAPs prepared for the various Site areas and other applications for the Barangaroo Development Site and can be appropriately managed by those documents, and the portion of the proposed public domain works within Block 5 and subject to the RAP prepared for the Block 5 Public Domain, included in **Appendix Z**; and
- Will enable the relevant consent authority to comply with Clause 7 of SEPP 55 in relation to the proposed future use of the land as a public domain.

A summary of the RAPs, confirmation of the land use which was anticipated by those documents and whether remediation is required to facilitate the proposed Stage 1B public domain development works is provided in **Appendix I**. Based on the information provided, the proposed development is consistent with the land uses that were envisaged in the RAPs. Therefore, the site will be suitable for the land use proposed following remediation (as required) in accordance with the RAPs.

Soil and groundwater investigations have been historically undertaken across the site to assess Barangaroo South and Central Barangaroo. The previous investigations undertaken on the different parts of the site are detailed in each of the RAPs and a summary of the site history and analytical results is included in the RAPs. As outlined in **Appendix I**, the proposed unsaturated soil validation works in some parts of the Site (where the existing soils will remain outside basement areas as part of the proposed development) will provide supplementary data to enable appropriate assessment of site suitability. The scope of these works will be described in Sampling and Analytical Quality Plans to be endorsed by the NSW EPA Accredited Site Auditor.

The report also identifies that:

- If Confirmed Impacted Material (CIM) and/or Separate Phase Gasworks Waste and Tar (SPGWT) is identified by the proposed validation sampling, remediation of the identified CIM/SPGWT and validation of the remediated areas will be conducted in consultation with the NSW EPA Accredited Site Auditor.
- Specifically in relation to the sediments in the area of the proposed new boardwalk and public pier, Section 3.5.2 of the Royal Haskoning (2016) report (**Appendix Q**) concludes that *“while the existence of elevated concentrations of contaminants in sediments has the potential to impact on water quality and aquatic ecology, in practice any impacts would be negligible, for the following reasons:*
 - *disturbance during construction activity would be minimal, limited to minor localised movement of surface sediments during piling;*
 - *any disturbed sediments would locally re-settle and remain in the same physico-chemical environment;*
 - *piling operations would be intermittent and temporary in duration;*
 - *once constructed the proposed over-water structures would not lead to any significant alteration of existing low tidal velocities near the seabed given the large cross sectional area of the Darling Harbour waterway and limited ‘blockage’ caused by the isolated pile foundations.”*

With regards to compliance with SEPP 55, the presence, or otherwise, of contamination within the site has been appropriately assessed by the review of soil and groundwater analytical data obtained by the environmental site investigations listed and summarised in the RAPs. It is also considered that the proposed public domain development works are consistent with the land uses and development works anticipated by the RAPs.

In addition, the findings of the Royal Haskoning report (**Appendix Q**) recommended that, while the potential for contamination in the sediment to impact on water quality and aquatic ecology was negligible, a variety of mitigation measures should be adopted during the proposed Harbour construction works.

Accordingly, it is concluded that:

- The information provided including the proposed soil validation data will enable the relevant consent authority to comply with Clause 7 of SEPP 55 in relation to the proposed development;
- The Public Domain Works as proposed are consistent with the land uses detailed in the RAPs and can be appropriately managed by those documents;
- The RAPs include contingency measures which are appropriately designed to manage a variety of possible events, in consultation with the NSW EPA Accredited Site Auditor, should unexpected finds be encountered during the proposed Public Domain works; and
- The mitigation measures recommended by the Royal Haskoning (2016) report should be implemented during the proposed Harbour construction works to mitigate potential risks associated with the contamination status of sediments in the area of the proposed new boardwalk and public pier.

4.5 Water Quality and Contamination

Potential Impacts on Water Quality of Darling Harbour

The Marine Ecology Impact Assessment prepared by Royal Haskoning DHV considers the potential impacts that the proposed works will have on water quality in Darling Harbour. The main impact is considered to be the installation of piling, which has the potential to disturb sediment and increase turbidity. It is considered that any disturbed sediments would be likely to settle in the same place and therefore remain in the same environment. In addition to this, piling work would be intermittent and temporary in duration. Accordingly, it is considered that there would be no significant impacts due to piling operations.

In the context of this assessment, it is recommended that water quality monitoring is undertaken, unless similar marine activities have demonstrated that installation of a silt curtain is not necessary to ensure satisfactory water quality.

Further to this, the Stormwater Management and Civil Infrastructure Report prepared by Cardno notes that the Stage 1B site is currently comprised of an impervious surface and will generally remain this way, with the exception of some pervious areas that are proposed as part of the public domain works. As a result of this, there will be a minor reduction in the volume of surface water discharging to Darling Harbour.

Impacts on Surface and Groundwater Quality and Hydrology

The Stormwater Management and Civil Infrastructure Report prepared by Cardno (**Appendix C**) assesses the potential water quality and hydrology impacts of surface water generated by both upstream external catchments and the Stage 1B public domain works, as well as groundwater present on the site.

Construction

During construction, the implementation of extensive erosion and sediment control measures across the site will ensure that surface water runoff into Darling Harbour will be maintained at acceptable levels. In accordance with the requirements of the Environmental, Construction, and Site Management Plan (**Appendix R**), surface water quality will be managed by implementing erosion and sediment controls, including:

- Diversion of clean water around the site into stormwater pits downstream of the works.
- Installation of additional sediment fencing.

- Pumping captured stormwater to a water treatment plant if required.
- Installation of silt curtains in the harbour adjacent to the existing wharf to contain turbidity generated during demolition or piling works.
- Installation of sediment controls around and along any stormwater drains.

These measures would be inspected and maintained throughout construction in accordance with auditing undertaken throughout the project.

In relation to groundwater, the proposed works are unlikely to have an impact on groundwater quality during construction. This is partly due to the preceding remediation and basement construction works that are likely to have a positive impact on groundwater quality due to the removal of contaminated material that is currently impacting groundwater quality on the site. In addition to this, a number of measures to manage, monitor and mitigate potential groundwater impacts are proposed. These include:

- A groundwater control and retention wall to intercept shallow groundwater flows where required.
- Local grouting of groundwater control and retention walls to be undertaken where required.
- Intercepted groundwater to be transferred to a groundwater treatment plant to be screened and treated prior to discharge to Darling Harbour.
- Monitoring of groundwater to be undertaken during dewatering and excavation works.
- If required, a site settlement survey may be undertaken before, during and after construction to determine any potential effect of groundwater extraction on surrounding infrastructure.

Operation

During the operation of the works (e.g. post-construction), surface water quality will be managed through the implementation of a number of measures that will capture and treat surface water runoff prior to discharge to Darling Harbour. These include Water Sensitive Urban Design measures to remove gross pollutants, suspended solids and nutrients and include works such as:

- Tree pits.
- Sand filtration within areas of public open space.
- Gross pollutant traps.

As noted above, the proposed works are considered unlikely to have an impact on groundwater quality either during construction or operation as the preceding remediation and basement construction works are considered likely to improve groundwater quality through the removal of contaminated material impacting groundwater at the site.

Assessment of Volumetric Water Licensing Requirements

The proposed public domain works will not involve any groundwater extraction works and therefore any volumetric water licensing requirements in accordance with the *Water Act 1912* will not be required.

Site Water Balance and Supply

As detailed in the Stormwater Management and Civil Infrastructure Report (**Appendix C**), an Integrated Water Management Strategy has been established for Barangaroo South to achieve a positive water balance based on exporting recycled water from the site in a greater quantity than potable water is imported. This strategy will ensure that there is an adequate and secure water supply for the life of the development and will be achieved through a site-wide approach that focuses on:

- Potable water demand reduction, including a commitment to achieve a reduction in potable water consumption compared to a standard practice development.
- Water balance modelling, including:
 - Review of potential sources of both potable and non-potable water.
 - Investigation of sewer mining.
 - Assessment of appropriate treatment measures.
 - Further development of the existing conceptual water balance model.

The proposed water balance model for Barangaroo South (encompassing Stage 1A and Stage 1B) is presented in the Barangaroo Sewer, Water and Recycled Water Masterplan Report prepared by Warren Smith & Partners.

A schematic diagram illustrating the proposed water balance is shown at **Figure 27** below.

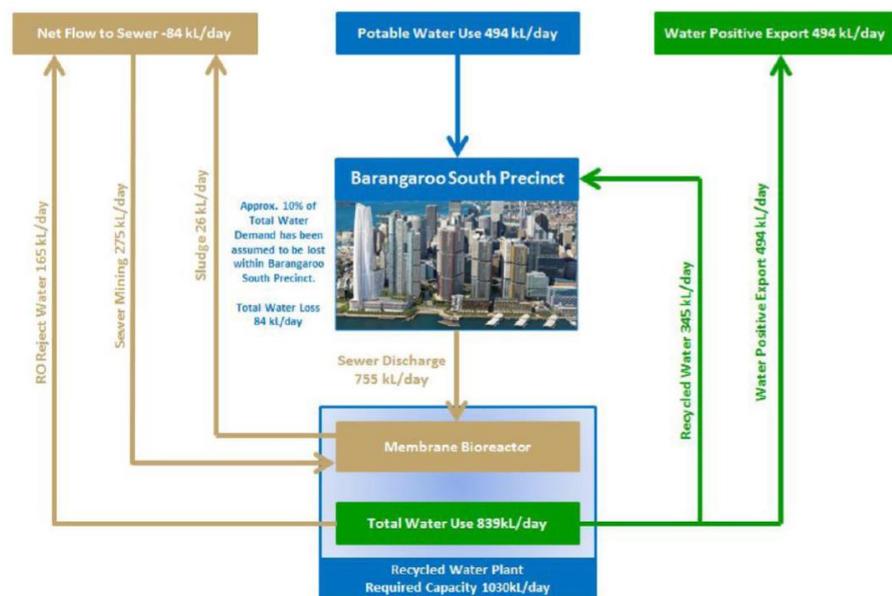


Figure 27 – Barangaroo South Water Balance Schematic Diagram
 Source: Warren Smith & Partners

In particular relation to the public domain works, water demand and sewage loading will arise from the following elements:

Potable Water

- Water bubblers around Hickson Park, Wulugul Walk and Watermans Cove.
- Amenities building adjacent to Hickson Road.
- Irrigation of Hickson Park (to be implemented only as an alternative water supply option during prolonged periods of dry weather or if recycled water cannot be supplied from the treatment plant).

Recycled water

- Amenities building adjacent to Hickson Road (for toilet flushing).
- Irrigation of Hickson Park.

Sewage Loading

- Amenities building adjacent to Hickson Road (to discharge to the Barangaroo South Recycled Water Treatment Plant via connection to the proposed sewer line in the Stage 1B basement).

Based on the projected overall water positive export of approximately 180 megalitres per year from Barangaroo South, it is considered that this the proposed Sewer, Water and Recycled Water scheme will be able to provide an adequate and secure water supply for the life of the development. In particular, Hickson Park – which will have one of the higher demands for water in the precinct – is estimated to require only 2.3 mega litres of water per year for irrigation. This is equivalent to approximately 1% of the total water that will be harvested from the site throughout the year.

Erosion and Sediment Control

All erosion and sediment control measures will to be implemented during construction will be designed, installed and maintained in accordance with *Managing Urban Stormwater – Soils & Construction Volume 1* (Landcom 2004).

Prior to any earthworks commencing on the site, all erosion and sediment control measures will be implemented in accordance with the Construction Framework Environmental Management Plan. These works will include:

- Installation of A-class hoarding around the perimeter of the site.
- Installation of truck wash down facilities at each point of exit from the site.
- Installation of sediment fencing around disturbed areas, including any stockpiled topsoil.
- Placement of geotextile bags filled with sand and/or gravel around and along existing and proposed catch drains and stormwater drainage pits.
- Installation of water monitoring facilities within Darling Harbour.

To minimise the volume of polluted stormwater runoff generated by construction work, stormwater within and adjacent to the site will generally be managed by diverting clean rainfall and runoff from any disturbed areas. Measures that will be implemented to prevent the ingress of surface water runoff into excavation areas include bunds, silt fences and drainage diversions.

The majority of these erosion and sediment control measures are required for the construction of the Stage 1B basement (subject to a separate SSD approval) and will remain in place during the proposed public domain works.

Stormwater Management

During operation of the proposed public domain works, stormwater will be managed in accordance with the comprehensive stormwater management system that has been developed for the Barangaroo South precinct.

Mitigation Measures – Water Quality

A number of management and mitigation measures will be implemented during construction and operation to contain pollutants and prevent potential water quality impacts. These include:

- Minimising the volume of contaminated water during the works wherever possible by directing surface water away from excavations, depressions, pits and stockpiles through the construction of drainage works such as bunds and diversion drains.
- Sediment basins may be implemented to collect surface water if it is necessary for the maintenance of water quality.
- Water will be reused on site as dust suppression and other site operations, subject to suitable treatment measures.

In addition to this, any discharge to the adjoining stormwater drainage network will be in accordance with the relevant regulatory guidelines.

Potential for Development to Intercept Groundwater

The Stormwater and Civil Infrastructure Report prepared by Cardno determines that there are no groundwater interception works proposed as part of the Stage 1B Public Domain works either during construction or operation.

Water Licensing Requirements

As the proposed works do not require any groundwater extraction works, a license under the *Water Act 1912* is not required.

Similarly, as the proposed works do involve any activities that are governed by a water sharing plan, a license under the *Water Management Act 2000* is not required.

Geotechnical and Contamination Assessment

The Seawalls / Over-Water Structures Impact Assessment prepared by Royal HaskoningDHV (**Appendix Q**) considers geotechnical and contamination issues relevant to marine works.

It is noted that acid sulphate soils are not considered to be a potential contaminant as they are a naturally occurring material. It is not proposed to remove any sediments from the seabed and as such there is no potential for these materials to be placed in an environment where they may oxidise. Accordingly, acid sulfate soils are not considered to be an issue in relation to the proposed works.

In relation to geotechnical conditions, the existing conditions at the site allow piles to be installed into the seabed with the appropriate pile driving equipment. Accordingly, geotechnical conditions at the site are not an issue for the completion of the project.

Assessment of potential contaminants finds that the existence of elevated concentrations of contaminants in sediments has the potential to impact on water quality and aquatic ecology, however any impacts would be negligible as:

- Disturbance during construction activity would be minimal and limited to localised movement of surface sediments during piling.
- Any disturbed sediments would be likely to resettle within the same area and remain in the same environment.
- Piling operations would be intermittent and temporary in duration.
- The proposed over-water structures would not lead to any significant alteration of existing low tidal velocities near the seabed.

In order to mitigate any potential impacts, the following measures are recommended to be introduced during construction:

- Installation of a silt curtain (unless it is demonstrated that similar construction activities have not required such a measure).
- Water quality monitoring.
- Ensure site spillage equipment is available to absorb any spills that may enter the water.
- Prepare and implement a Construction Environmental Management Plan.

4.6 Heritage

A Statement of Heritage Impact has been undertaken by TKD Architects (**Appendix W**) to assess the likely impacts of the proposal on the significance of heritage items in the vicinity of the site.

Whilst the proposed development of the Barangaroo Stage 1B Public Domain is not immediately adjacent to some heritage items or the conservation areas around Millers Point and Dawes Point, the site of the proposed works does lie within their current visual curtilage. As a result of this, the principle heritage impacts relate to views to and from these items. Overall, it is considered that proposed public domain works will have no impact on the views to and from heritage items in the surrounding area. In addition to this, the heritage assessment finds that the proposed works will improve the setting of the nearby heritage items.

A detailed summary of the potential heritage impacts on surrounding heritage items is outlined in **Table 4** below.

Table 4 – Summary of potential heritage impacts

Heritage item	Impact
Grafton Bond Store and Sandstone Wall	No impact on views to the building within the public realm.
MSB Stores Complex	Existing views to the buildings along Hickson Road will not be impacted. The proposed works will improve the visual setting of the heritage item as the existing open space in front of the MSB Complex will connect visually with the new Hickson Park and through to Darling Harbour.
Millers Point and Dawes Point Village Precincts	There is sufficient distance between these precincts and the site of the proposed works to ensure there will be no impact on the heritage character of the area. It is considered that the proposed works will improve the broader setting of the Millers Point and Dawes Point Village Precincts.
Millers Point Conservation Area	It is considered that there is an adequate distance between the conservation area and the site of the proposed works to ensure there will be no impact on the heritage character of the area.
Walsh Bay Wharfs Precinct	Due to Walsh Bay be located a sufficient distance away from the site of the proposed works, it is considered that there will be no impact on the heritage character of this precinct. In addition to this, the topography of the area further minimises any potential heritage impacts.
Terrace Groups, 3-9 High Street and 115 – 125 Kent Street	It is considered that the proposed works will improve the broader setting of the terraces at 3-9 High Street, whilst there is adequate separation distance between the site of the proposed works and the terraces at 115 – 125 Kent Street to negate any potential heritage impacts.
Tennis Court and Pavilion, Agar Steps and Terrace, Carlson Terrace.	The proposed works will not impact on the setting of these heritage items due to their location relative to the site, the existing tall buildings on Kent Street between the two sites as well as existing mature trees providing screening.
Sydney Observatory.	It is noted that harbour and city views form an important part of the heritage significance of the Observatory, however the proposed works will not impact on the views from the Observatory or its setting.
Bureau of Meteorology, Fort Street Primary School and Messenger's Cottage for Sydney Observatory.	The proposed works will not impact on the heritage character of any of these items as there is adequate distance between them, as well as the visual separation provided by high-rise commercial development at the northern end of the Sydney CBD.
National Trust Centre.	The proposed works will have no impact on the heritage fabric of the building due to existing development providing separation between the two sites.
Observatory Park and Sydney Observatory Group (including Messenger's Cottages for Fort Phillip and Sydney Observatory).	The proposed works will not be visible from the western side of Observatory Park, being the point closest to the public domain site. It is considered that the proposed development will not affect the heritage character of the park and the associated individual heritage items.

In relation to potential archaeological impacts, it is noted that the Archaeological Impact Statement prepared for site preparation works undertaken in accordance with SSD 5897 assessed potential Aboriginal and maritime archaeological artefacts on the site. This assessment found that there would be no potential impacts on Aboriginal or maritime archaeology in the site. An Archaeological Statement has been prepared by Casey & Lowe (**Appendix X**) which concludes that there is not potential for impacts on maritime, historical or Aboriginal archaeology from the proposal.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 contains provisions relating to the heritage significance of Sydney Harbour, its islands and foreshores and includes a list of heritage items located within the Sydney Harbour catchment. This schedule of heritage items does not identify any items at the Barangaroo site. Furthermore, it is considered that the proposed works will result in a positive impact on the scenic qualities of the foreshore area at Barangaroo.

It noted that the proposed works are located on land that had no aesthetic merit and historically has comprised large open spaces devoted to container and other shipping, and the natural shoreline before that. As a result of this, it is considered that the public domain works will have no physical impact on any significant landscape. By incorporating names that reference the previous uses of the site, it is considered that the proposed works will maintain a connection to the historic use of the site.

Overall, the Statement of Heritage Impact finds that:

- There are no physical impacts on identified heritage items and conservations areas within the vicinity of the proposed works.
- The existing curtilage around heritage items and conservations areas is largely unaffected, which will allow the ongoing appreciation of the heritage significance and interpretations of the heritage items.
- The proposed works will not have any impact on views to and from the majority of heritage items in the vicinity due to the location of the subject site relative to the items, as well as the undulating topography of the area and existing development throughout the area.
- The proposed development will improve the broader setting and visual curtilage of MSB Stores and terraces in High Street.

4.7 Marine Ecology

A Marine Ecology Impact Assessment has been prepared by Royal Haskoning DHV (see **Appendix J**) to assess the ecological impact of the proposed construction of Waterman's Cove, expanded foreshore promenade and the public pier on any flora and fauna, including threatened species, population or communities or their habitats. In addition to this Marine Ecology Impact Assessment also recommends mitigation measures to be implemented during construction and operation, including potential impacts of shading from fixed structures.

In particular, the assessment considers the proposed Wulugul Walk Boardwalk and pontoon as well as Watermans Cove and the Public Pier in the context of existing marine ecology, water quality and sedimentary conditions at Barangaroo. In order to carry out the assessment, marine surveys were conducted using commercially qualified divers who undertook visual assessment of the sea floor, underwater photography and sediment coring as well as remotely operated video transect techniques.

Construction Impacts

As a result of this study, the following potential construction impacts were identified:

- **Waste:** Partial demolition of the existing wharf at Watermans Cove may generate waste which has the potential to impact on the health of the marine environment in

Darling Harbour if appropriate mitigation and waste disposal measures are not implemented.

- **Noise:** It is anticipated that marine biota will experience noise impacts over the duration of the works. It is considered that mobile marine fauna have the ability to move to other locations within harbour during construction and that no significant impact is expected.
- **Marine construction equipment:**
 - The use of boats and barges during piling works would result in some disturbance to benthic habitat through activities such as anchoring, however it is not considered that there would be any impact on sensitive marine environments as these do not occur in the vicinity of the proposed works.
 - Construction vessels also have the potential to cause pollution through fuel and oil leaks.
- **Water quality:** installation of piling has the potential to create increases in turbidity through re-suspension of sediments. It is considered that any disturbed sediments would be likely to re-settle locally and remain in the same environment. As the works would be intermittent and are temporary in duration, no significant impact on water quality due to piling is expected.
- **Benthic habitat:**
 - Installation of piles into the seabed would displace soft sediment benthic habitat and crush any benthic fauna. However, there is a high availability of similar benthic habitat in Sydney Harbour and any benthic communities at Barangaroo are likely to be widespread, therefore any localised impacts from piling would be considered to be negligible.
 - Elevated concentrations of contaminants currently exist in the sediments at the site and it is not considered likely that the proposed works will lead to any additional contamination. As a result of existing contamination, it is considered that benthic communities would have adapted and that the proposed works will not result in any additional impact.
- **Sessile organisms:**
 - Removal of part of the existing wharf and its support structure at Watermans Cove would result in a reduction of the artificial habitat for sessile invertebrates which currently exist at the site. However, the proposed over-water structures would increase the surface area of habitat available for sessile fauna.
 - Eco-engineering works are expected to increase both intertidal and subtidal habitat.
 - Recent research in Sydney Harbour has found that minor and infrequent disturbance of contaminated sediments does not significantly impact on sessile marine organisms as they have adapted to frequent changes in the marine environment. As a result of this, the potential disturbance of sediments at the site is unlikely to have any significant impacts on sessile marine organisms in the vicinity.
- **Aquatic vegetation:** No seagrass or other aquatic vegetation exists at the site, and therefore no impact on any sensitive marine environment is expected. The proposed over-water structures have the potential to impact on light availability to the seabed, however the lack of aquatic vegetation at the site renders this impact negligible.
- **Threatened and protected species:**
 - The proposed works are not expected to have a significant impact on any threatened or protected species of flora or fauna. In particular, no aquatic vegetation protected under the *Fisheries Management Act* is present in the vicinity of the proposed development and there is not the appropriate habitat on the site for any aquatic habitat which have the potential to occur in the area.

- Any aquatic species that has the potential to occur in the area has the ability to remove itself from the area if the conditions are unsuitable.

Construction Mitigation Measures

As a result of the potential impacts identified through the Marine Ecology Impact Assessment, a number of mitigation measures to be implemented during construction have been recommended. These include:

- Removal of all construction waste from the site.
- Prevention of waste entering Sydney Harbour.
- Management of all waste in accordance with NSW Environmental Protection Authority's (EPA) Environmental Guidelines – Assessment, Classification and Management of Liquid and Non-Liquid Wastes.
- Preparation and implementation of a detailed Construction Environment Management Plan (CEMP) for the proposed development.
- Ensure that all waste associated with barges and boats is contained and disposed of appropriately.
- Undertake a survey of the seabed by divers at completion of the works.
- Manage noise in accordance with the EPA Noise Control Guidelines – Construction Site Noise.
- Implement the use of silencers on engines and machinery where possible.
- Install silt curtains prior to the commencement of works where required.
- Undertake water quality monitoring.
- Ensure site spillage equipment is available.

Operational Impacts

As the proposed works involve a boardwalk, pontoon and pier that extend into the water of Darling Harbour, the Marine Ecology Impact Assessment considers the ongoing impact of these structures in the marine environment. Potential post-construction impacts of the proposed development relate to:

- Shading of sensitive habitat such as seagrass.
- Restriction of fish passage.
- Alteration of tidal currents due to installation of piling.

As noted above, there is an absence of sensitive habitat at the site and as such any shading of sensitive habitat is not considered to be an issue.

Due to the design of the structures (e.g. pylons and similar structures with open space in between), fish and other aquatic creatures would still be able to make passage through the harbour post-construction of the public domain works.

It is also considered that the proposed structures would not lead to any significant alteration of the existing tidal currents near the seabed based on the large area of the Darling Harbour waterway and the limited obstruction caused by the structures.

In the context of these considerations, it is considered that there will be no significant long term impact due to the proposed over-water structures. Further to this, it is proposed to introduce eco-engineering works to improve biodiversity at the site.

Operational Mitigation Measures

As it is considered that there will be no long term adverse impacts associated with the proposed over-water structures, no specific mitigation measures are recommended for the post-construction phase.

4.8 Seawall / Over-Water Structures

A Seawall / Over-Water Structures Impact Assessment has been prepared by Royal Haskoning DHV (see **Appendix Q**) to assess the impact of the proposed structures on the existing estuarine foreshore and aquatic biodiversity, as well as to detail eco-engineering works to improve biodiversity. These issues are discussed separately below.

Potential Impact on Foreshore

In order to determine the impact on the existing estuarine foreshore, assessment against the *Environmentally Friendly Seawalls – A Guide to Improving the Environmental Values of Seawalls and Seawall-lined Foreshores in Estuaries* ('Seawalls Guide') (Department of Environment and Climate Change, 2009) was undertaken. The existing foreshore along the Public Domain site comprises a vertical faced reinforced concrete caisson north and south of Watermans Cove and a sloping rock revetment within the area of Watermans Cove.

The proposed modification in the area of the existing concrete caissons involves an increase in the crest level which will result in the proposed works being situated above the existing intertidal zone. As a result of this, the Seawalls Guide is not considered to be relevant to the modification. It is considered that should sea level rise occur in the future, an increase of 1 metre would be necessary for the proposed works to become intertidal. This amount of sea level rise is in excess of anticipated sea level rise and it is therefore considered unlikely that the works affecting the estuarine foreshore would become intertidal over the life of the project. As a result of this, the recommendations in the Seawalls Guide are not considered relevant. Should unanticipated sea level rise occur, adaption measures could be readily applied to the affected areas. These are likely to include pooling or crevice elements installed on the face of the foreshore.

The works to be carried out will have no impact on the existing sloping rock revetment. As a result of this, the Seawalls Guide does not apply. It is noted that the removal of existing overwater deck structure to create the Cove would remove some overshadowing of the rock revetment. This is considered to be beneficial to the aquatic environment.

Eco-engineering

Aquatic eco-engineering works are proposed in conjunction with partial demolition of the existing over-water deck and retention of 20 cut-down piles. These piles will be cut off below the Lowest Astronomical Tide level but above the seabed and concrete reef balls, steel plates and other similar fittings to promote aquatic colonisation and recruitment. This will have the outcome of contributing to improved biodiversity in the area. It is intended that the detailed design of the eco-engineering works would be undertaken in accordance with NSW Department of Primary Industries and the Sydney Institute of Marine Sciences (SIMS). The development and monitoring of the aquatic eco-engineering works have the potential to form part of the SIMS Sydney Harbour Research Program.

Potential Impact on Aquatic Biodiversity

In determining potential impacts on aquatic biodiversity, reference has been made to the Department of Primary Industries *Policy & Guidelines for fish habitat conservation and management (2013)* ('the DPI policy'). The relevant section considerations of the DPI policy relate to foreshore works and waterfront development and it is considered that the majority of policies would not influence the proposed over-water structures as:

- The waterway is not TYPE 1 – High Sensitive Key Fish Habitat.
- The proposed structures would not restrict fish passage.
- The structures would not shade seagrass as no seagrass exists at the site.

Observations indicate that there are no highly sensitive key fish habitat located at the site, encompassing consideration of seagrass. As water depth at the site greater than

10 metres and there is limited light penetration to the seabed, it is considered that the growth of seagrass in the footprint of the proposed over-water structures would be restricted.

As a result of these limited impacts, no specific construction methods or techniques are considered necessary to minimise potential impacts on aquatic biodiversity. Further to this, it is noted that the proposed eco-engineering works will contribute to improved aquatic biodiversity in the surrounding waters and that any potential impact on aquatic biodiversity is likely to be positive.

4.9 Maritime Navigation

A Navigation Impact Assessment has been prepared by Royal Haskoning DHV to consider how the proposal will impact on the navigation of vessels within the harbour and that adequate clearance is maintained at all times. It is noted that post-construction, boating traffic would not be permitted in Watermans Cove and that the public pier would not cater for berthing or pick-up / drop-off activities.

Potential impacts from the construction of the boardwalk and pontoon relate to reducing the width of channels within the harbour and impinging on vessel turning circles. It is noted that due to the location of the proposed works and the shape of the harbour, there will be minimal impacts on existing channel widths. In addition to this, any impingement on vessel turning circles can be mitigated through measures recommended by the Port Authority of NSW ('the Port Authority'), outlined below.

The Port Authority has completed a risk assessment (submitted with the Navigation Impact Assessment at **Appendix K** and has made a number of recommendations to assist with the management of the increased risk associated with the installation of the proposed over-water structures, comprising:

- No vessels are to use the pontoon for berthing or transferring passengers whilst a large vessel is manoeuvring in the swing basin.
- The pontoon and boardwalk are to be adequately lit on the water side of the structure.
- During the construction phase, no associated barges or equipment should be located outside of the proposed footprint whilst a large vessel is transiting the area.
- Make pilots aware of the reduced margin area so additional manoeuvring room can be allowed. This is to be managed by the Port Authority.
- Make pilots and escort vessel personnel aware of the reduced manoeuvring room to ensure small vessels keep clear of vessel and tugwash. This is to be managed by the Port Authority.

As a result of the assessment undertaken by the Port Authority, it was found that the implementation of the controls identified above would ensure that any risk to the navigation of cruise ships, bulk carriers and other commercial vessels would be minimised to acceptable levels.

The structures for the public pier are south of the proposed boardwalk and pontoon and as such are located further from the operation of cruise ships, bulk carriers and other commercial vessels. As a result of this, these works are not a significant concern for the Port Authority. Due to the orientation, clearance, limited maximum projection and absence of any berthing facilities at the pier, it is considered that it will not result in any adverse navigation or safety issues. In order to mitigate any potential impacts, it is recommended that fender piles be installed to the southern side of the pier to indicate a berth box for the northernmost ferry berth at the future Barangaroo Wharf.

During construction, the temporary use of a barge may result in some temporary navigation impacts. It is considered that satisfactory construction arrangement could be achieved and that in order to manage any potential construction, a Construction Vessel Traffic Management Plan should be prepared.

4.10 Transport and Accessibility

A Transport Assessment has been prepared by Arup and is included at **Appendix S**. A summary of the assessment and proposed mitigation measures are provided below.

Proposed Traffic Levels

Vehicle Traffic

The mid-block two-way traffic flow on Barangaroo Avenue is predicted to be approximately 220 vehicles in the AM peak hour and up to 290 vehicles in the PM, peak hour. This is within the limits of the capacity for a local street as defined by RMS in *Guide to Traffic Generating Developments*.

The daily traffic flow is expected to be 2,500 to 3,000 vehicles per day.

These traffic volumes will be accommodated on local roads and predominantly will provide access to Barangaroo South and adjacent uses.

Pedestrian Flow

The forecast pedestrian flows across the AM, lunchtime and PM peak hours, as well as across the full day, are summarised in the transport assessment in **Appendix S**, with the following summary provided for the whole site's forecast pedestrian flows:

- AM (8am-9am): 6,439
- Midday (12:30pm – 1:30pm): 17,404
- PM (5pm-6pm): 11,544
- Full day: 121,489

Proposed Traffic and Transport Facilities

The southern kerb of Watermans Quay contains a number of indented parking bays. These bays will be used as a taxi rank to service both the Stage 1A and 1B precincts.

Bicycle parking will be provided in the public domain to service visitors to the Barangaroo precinct. The quantum of parking has been determined based on the expected peak population estimates for a typical weekday for the Barangaroo South site. Population estimates were derived from the Barangaroo Pedestrian Precinct Demand Study in conjunction with Lendlease and the BDA.

It is expected more than 20,000 visitors may be present on the Barangaroo site (i.e. Barangaroo South, Central Barangaroo and Barangaroo Reserve) at any one time on a typical day. Of these visitors, approximately 6,000 are anticipated to be directly attributable to uses in the Stage 1A and 1B precincts.

Consistent with the Stage 1A precinct, bicycle parking is to be provided for 4% of visitors to the precinct, requiring 240 spaces across the entire Barangaroo South precinct. These spaces are to be allocated as follows:

Area	Number of visitor parking spaces
Stage 1A Public Domain (including outside commercial towers)	103
Public Domain in vicinity of Crown Sydney	37
Stage 1B Public Domain	100
Total	240

Spaces within the Stage 1B precinct may be provided within standard City of Sydney bicycle racks, or spaces mounted on smart poles on Watermans Quay and Barangaroo Avenue

Connectivity

The primary pedestrian routes that run across the Barangaroo South site from east to west are along Watermans Quay and Shipwright Walk, both of which provide a connection to Napoleon Bridge for access to Wynyard Walk. This facilitates an easy connection to the train station at Wynyard, as well as the northern part of the CBD.

Wulugul Walk will primarily act as a pedestrian pathway to be shared with cyclists and will allow pedestrians an uninterrupted path of travel from Darling Harbour and King Street wharf through to Barangaroo Reserve. A low speed environment will be created where cyclists will be required to give way to pedestrians at all times, similar to the operation of King Street Wharf and Darling Harbour.

The internal road network along Watermans Quay and Barangaroo Avenue is also available for the use of cyclists, in a shared environment with other vehicles. These will function as mixed traffic streets given the relatively low levels of vehicular traffic and anticipated 40km/hr speed limit (as outlined in the following section). The route along Barangaroo Avenue will connect with a future recreational cycle route which will continue through Barangaroo Central and Barangaroo Reserve.

Traffic Control and Proposed Upgrades

There is potential that the development of the Barangaroo South precinct could facilitate the introduction of a 40km/hr High Pedestrian Activity Area (HPAA) along Barangaroo Avenue and Watermans Quay.

It is proposed that a pedestrian zebra crossings will be installed on Watermans Quay and Barangaroo Avenue to connect with key pedestrian routes throughout the precinct. The crossings will be installed as wide crossings and angled to suit the pedestrian desire line.

In order to ensure the safe operation of the road network, traffic signals will be installed at the intersection of Hickson Road and Watermans Quay. Detailed design of the traffic signals will be undertaken in consultation with RMS and TfNSW.

Construction Traffic

An assessment has been made of the cumulative impacts of construction activities in the precinct and takes into account the effect of construction activities being undertaken concurrently with the proposed works. The proposed construction timeframe for the public domain will extend into the period of the occupation of the Barangaroo South Stage 1A development. As such, an assessment of the road network impact of these works during this time has also been undertaken.

The works associated with construction of the public domain including Barangaroo Avenue and Watermans Quay will be spread over a 30 month period with truck movements peaking at 8 movements per hour during high intensity activities. On average a typical hour would involve 4 truck movements. This activity will be occurring at the anticipated peak period in December 2020 and represents a negligible 1% increase in activity. The majority of construction truck movements occur prior to the afternoon peak commuter period, minimising the impact on the local road network. During the morning peak period the access road generally operates satisfactorily and requires no further works to accommodate the levels of construction traffic anticipated.

Access for construction vehicles to the site will be via Hickson Road, approximately 350 metres north of the intersection of Sussex Street and Napoleon Street. This site access will be utilised until January 2019, after which time it will be relocated approximately 25 metres south along Hickson Road.

The results of the intersection analysis (**Appendix S**), which considered examines in detail the future stage traffic operations of the five nearest and most relevant intersections to Barangaroo South construction site, forecast minimal changes in the operation of key intersections as a result of the construction of the Stage 1B development (including the public domain), when compared with the base case scenario. The additional construction vehicles associated with the Stage 1B works

(including the public domain) has a negligible impact on forecast road network performance.

During the AM peak hour, when construction vehicles attributable to Stage 1B are expected to access the site, the road network generally operates satisfactorily. The addition of construction traffic movements associated with the Stage 1B works does not impact the overall operation of the local road network, and requires no further works to accommodate the levels of construction traffic anticipated.

Accordingly, the cumulative impacts of construction and development traffic activity associated with all works currently planned in the precinct have been assessed with the additional traffic arising from the works proposed under the Development Application being acceptable and able to be appropriately managed.

4.11 Infrastructure Provision

Details of the existing utility services that will service the Stage 1B development are contained in the report titled Stormwater Management and Infrastructure Servicing Strategy (Cardno, August 2015), which was lodged under SSD 6960. The proposed works are not expected to impact on these services. The Stormwater Management and Civil Infrastructure Report, prepared by Cardno and submitted at **Appendix C**, sets out the proposed utility services for the proposed development which include potable water, recycled water, sewerage, chilled water (for heating, ventilation and air conditioning), natural gas, electrical and telecommunications.

The Stormwater Management and Civil Infrastructure Report confirms that the proposed works can utilise existing supply lines and that sufficient capacity is available to service the proposed development. The provision of services will be integrated with the surrounding precinct via connection to existing infrastructure in Hickson Road. Where possible, water supply will be integrated with the central Recycled Water Treatment Plant to reduce net consumption within the precinct and contribute to the positive water generation within Barangaroo South.

The Stormwater Management and Civil Infrastructure Report does not identify any possible impacts on infrastructure as a result of the proposal. Accordingly, no detailed measures to mitigate the impacts of the proposal on any infrastructure items are proposed. It is noted that Lendlease will enter into the necessary arrangements and obtain the necessary approvals for water supply, electrical supply, communications, sewer and stormwater connections from the relevant authorities, as required.

4.12 Ecologically Sustainable Development

As detailed in the Sustainability Report prepared by Lendlease and submitted at **Appendix T**, significant sustainability targets have been established for Barangaroo South that will be delivered progressively throughout the development phase.

The public domain specific initiatives include:

- Use of sustainable materials within the public domain will be considered in the detailed design process. These include recycled timber, reduced cement content in concrete and responsibly sourced materials.
- Low energy public domain lighting and onsite photovoltaic generation sized to generate an amount of energy that is more than the public domain and the recycled water treatment system energy use.
- Exceeding National Best Practice standards of 80% reduction in total suspended solids, 45% reduction in nitrogen and 45% reduction in phosphorous for stormwater run-off.
- Recycling of construction waste in accordance with the Barangaroo South (Stage 1) Waste Management Plan.
- Operational waste to landfill reduction strategies through onsite separation of waste.

- Provision of pedestrian circulation and recreation spaces and integration with surrounding pedestrian, cycle and public transport networks.
- Use of native flora and encourage habitats for fauna.
- Landscaped public spaces.

The ESD Report prepared by Lendlease included at **Appendix T** demonstrates that the proposed development supports the site wide aspirations through the use of renewable energy, water sensitive urban design and selection of environmentally responsible materials.

An analysis of the proposal against the principles of ecologically sustainable development set out in the EP&A Regulation is provided in **Section 7.3**.

4.13 Crime Prevention

A Crime Prevention Through Environmental Design (CPTED) Report has been prepared by JBA and is submitted at **Appendix N**. The CPTED report has evaluated the nature of crime in the area and has assessed the project against the relevant matters. The CPTED report concludes that to further improve the safety and security of the development, the following recommendations are implemented in the detailed design, noting that many of them are already provided for conceptually as part of the DA design:

- Use tree species with high canopies to provide for clear sightlines at eye level. A strict regime of maintenance of species with low and mid canopies is to be implemented if these species are provided within the final landscaping scheme.
- Provide way finding signage and building identification signage where appropriate to reinforce perceptions of safety and legibility in the development.
- Install CCTV cameras, especially in areas which could potentially be used for loitering/concealment. If CCTV cameras are to be provided, they should be used in conjunction with adequate illumination to ensure clear CCTV footage can be captured.
- Provide sufficient lighting which is bright and evenly distributed, high quality finishes to ensure that surveillance opportunities are maximised and ownership over the space is clear.
- Provide appropriate lighting in and around the development and consult a qualified lighting engineer to ensure the correct lighting is provided to meet minimum Australia and New Zealand Lighting Standards, and ensure lighting is sufficient and bright enough to enable surveillance.
- Ensure mechanisms are in place for on-going maintenance of landscaping and the building, which includes:
 - rapid removal policy for vandalism repair and the removal of graffiti;
 - maintenance of perimeter landscaping; and
 - maintenance of public furniture and access pathways;
- Use high quality materials for construction to lessen the likelihood of damage and help to reduce maintenance costs.

4.14 Environmental, Construction and Site Management Plan

An Environmental Construction and Site Management Plan (ECSMP) has been prepared by Lendlease (**Appendix R**) to address environmental issues associated with the construction of the Public Domain including the following as required by the SEARs:

- Community consultation, notification and complaints handling;
- Impacts of construction on adjoining development and proposed measures to mitigate construction impacts;
- Construction traffic and pedestrian management;
- Noise and vibration impacts on nearby sensitive receivers and proposed management, mitigation and monitoring measures;
- Air quality impacts on the neighbourhood;
- Water quality management for the site; and
- Waste management.

Key elements of the ECSMP can be summarised as follows:

- Works are proposed to be undertaken between the hours of 7.00am and 6.00pm Monday-Friday and between 7.00am and 5.00pm on Saturdays. No work will be undertaken on Sundays or public holidays.
- The site will be enclosed by hoardings along all frontages.
- Site vehicular access will be off Hickson Road. Vehicular and pedestrian traffic management and controls will be implemented and monitored to minimise disruptions to site activities and the surrounding road network.
- Lunch, change and ablution facilities will be provided for the use of all site personnel.
- All site personnel, including subcontractors and visitors, will be inducted under Lendlease's Environment, Health and Safety Management System (EH&S). Records of all induction, ongoing training and reporting will be maintained.
- A materials handling team member will ensure the efficient management of deliveries and removals and hence minimise disruption to traffic around the Barangaroo site.
- Site specific Environmental Management protocols will be established to ensure environmental responsibilities are implemented and documented.
- Primary contact(s) to deal with environmental emergencies will be nominated and their 24 hour/day 7 days/week contact details will be prominently displayed on site.
- Management and monitoring of the noise and vibration generated from construction activity will be addressed according to the recommendations of the *Barangaroo South Stage 1B Public Domain Construction Noise & Vibration Assessment*, prepared by Wilkinson Murray, dated November 2016.
- Surface water quality, including Darling Harbour water quality, will continue to be monitored and supplementary erosion and sediment controls will be implemented to manage surface runoff during construction.
- Management of construction generated solid and liquid waste will be addressed in accordance with the Spoil & Waste Management Sub-Plan operating at the site. No hazardous materials or dangerous goods will be stored on site.
- The site haulage route and delivery locations will continue to be managed in accordance with the works and processes set out in the Stage 1B Basement DA.

- Adequate directional and warning signage will be installed surrounding the development site to clearly inform motorists, cyclist and pedestrians of the approaching changes within Hickson Road. Signage will also inform delivery drivers of the proposed entry and exit gate locations.
- A comprehensive Stakeholder Engagement Strategy (refer to Appendix B of the ECSMP) will be implemented to maintain a good neighbour policy with surrounding businesses, residents and special interest groups during construction.

The development will be undertaken in accordance with **Appendix R** and accordingly the above recommendations are reflected in the Mitigation Measures in Section 6.

4.14.1 Construction Air Quality

An Air Quality and Odour Impact Analysis has been prepared by AECOM and submitted at **Appendix U**. Given the project relates to public domain works, there are no air quality or odour impacts relating to the operation of the public domain. Accordingly, this assessment focuses on the potential air quality and odour impacts associated with the construction of the public domain.

The Air Quality and Odour Impact Analysis states that the construction activities that are expected to potentially result in air emissions, are the excavation of limited concrete hardstand, landscaping works and the piling and construction works associated with the construction of Waterman's Cove. An analysis of the volumes of materials associated with these activities concludes that these will be unlikely to generate significant quantities of air pollutants if managed correctly. The management measures, currently in place as part of the Lendlease Air Quality and Odour Management Sub Plan are sufficient to ensure that air quality is not compromised during construction.

Air Quality and Odour Impact Analysis recommends the inclusion of the following measures specific to the Stage 1B Public Domain Work in the Air Quality and Odour Management Sub Plan:

- Active management of the excavation area dust emissions through the use of water sprays and stockpile management to limit the potential for particulate emissions; and
- Ensuring that vehicle paths are managed to minimise potential for track-out of dust, and cleaned in the event that track-out is present.

4.14.2 Construction Noise Impacts

A Construction Noise Report has been prepared by Wilkinson Murray and is included at **Appendix V**. There will be no noise producing sources associated with the Stage 1B Public Domain works during the operation of the public domain. Therefore, no assessment is warranted and the acoustic and vibration assessment at **Appendix X** addresses construction-related impacts only. A summary of the assessment and proposed mitigation measures are provided below.

Assessment

Wilkinson Murray has identified the sensitive residential and commercial receivers located within the vicinity of the Barangaroo South site. It is expected that the public domain works will take place once the approved buildings in the Barangaroo South site are either completed or substantially under construction.

Wilkinson Murray has established ambient background noise levels at Barangaroo South, taking into consideration the residential and commercial receivers. Background noise levels at all locations were free of the influence of extraneous noise sources, such as plant or construction activities. Noise management levels were also established, based on the ambient background levels.

Noise impact modelling was based on “typical worst case”, therefore the modelling represents likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur.

Wilkinson Murray has identified that noise from the proposed construction works associated with the Public Domain will comply with the noise management levels established for all commercial receivers. Compliance with noise management levels will be achieved at all surrounding residential receivers during weekday construction with the exception of residences located in the northern end of Building R8. A minor exceedance is also predicted at residences at 38 Hickson Road for paving works occurring on Saturdays. Wilkinson Murray consider that these exceedances will be intermittent given the nature of the public domain construction works which will move around the site thereby reducing the exposure of noise to any particular group of residences.

It is considered the marginal exceedances are manageable by the measures set out in the Environmental Construction and Site Management Plan (see **Section 4.16** and **Appendix R**). These works are not generally noise intensive in that smaller equipment will be used for these works whereby hand held tools and manual labour activities will occur for much of the time. In addition, buildings within the precinct will provide noise shielding to surrounding residences.

Wilkinson Murray confirm that the Public Domain works will be below overall cumulative noise levels at the surrounding most affected receivers with the exception of residences on and around R8 residence where building works will be the closest. In this location noise from Public Domain works will be of a higher magnitude to other construction noise sources, be it only for a relatively short time.

Due to the nature of the construction works associated with the public domain, no significant vibration levels are expected to be generated. Wilkinson Murray also confirm that traffic noise associated with on-site construction activities is considered to be negligible and no mitigation measures will be necessary.

Mitigation Measures

Wilkinson Murray has noted that no specific noise and vibration measures are required for the proposed public domain works. It is recommended by Wilkinson Murray that the procedures and management measures included in the Environmental Site Construction Management Plan are continually applied during the construction of the public domain. The following project-specific mitigation measures are recommended to be incorporated into the existing Construction Noise and Vibration Management Sub Plan:

- Plant Noise Audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor.
- Operator Instruction – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- Equipment Selection – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines.
- Site Noise Planning – Where practicable, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.

- Install a noise barrier between the site and street frontages. This should be a minimum 17mm thick structural plywood or equivalent panel. (Included in noise modelling)

4.15 Staging

Condition B12 of the Concept Plan requires the Foreshore Promenade, Pier, Watermans Cove and Hickson Park to be constructed, landscaped and publicly accessible prior to the issue of any occupation certificate within Block 4A, 4B or Y. Construction of R4A, R4B and R5 cannot commence until remediation and the Stage 1B basement are complete. As a result, these buildings are likely to progress concurrently with the construction of Hickson Park and will extend for a significant period after the completion of both it and the Crown Hotel. Under such circumstances, it will be necessary to ensure that the appropriate exclusion zones for public safety are put in place around the ongoing construction sites, which as a result has implications for the achievement of Concept Plan Condition B12 requiring Hickson Park to be "constructed, landscaped and publicly accessible" prior to the issue of an occupation certificate for a building in Block 4A, 4B or Y. Accordingly, this SSD DA seeks flexibility in the interpretation/application of Concept Plan Condition B12 in order to provide access to a safe and secure public domain.

While subject to detailed review and programming, at a high level, the most likely scenario for staged construction will follow the following order:

1. Cove apron demolition and construction of maritime structures
2. Construction of "on-land" waterfront areas
3. Construction of Barangaroo Avenue
4. Construction of Hickson Park
5. Construction of Watermans Quay (widening and enhancements)

4.16 Wind

A Pedestrian Wind Environment Study has been prepared by Windtech and is included at **Appendix L**.

The results of the study indicate that no public domain treatments are necessary to be implemented to achieve the desired wind conditions for certain outdoor trafficable locations. Within the private/semi-public domain, the report recognises the need for operator managed screening within the retail tenancies at the base of the residential towers.

With the inclusion of the proposed landscaping plan and taking into account recommendations within the report, the results of this study indicate that wind conditions for all outdoor trafficable areas within and around the Public Domain precinct are expected to be suitable for their intended uses. The inclusion of additional densely foliating vegetation within and around the outdoor trafficable areas of the precinct is expected to further enhance the local wind conditions.

4.17 Consultation

In accordance with the SEARs for this SSD DA (see **Appendix D**), an appropriate level of consultation was undertaken with Council and State government agencies.

This section details the consultation undertaken as part of the preparation of this SSD DA and proposed ongoing stakeholder engagement. Accordingly, consultation has been undertaken as required by the SEARs and in conformance with the Department of Planning and Environment's *Major Project Community Consultation Guidelines 2007*.

In addition to the consultation processes described below, the proposed development will be placed on public exhibition for 30 days in accordance with Clause 83 of the *Environmental Planning and Assessment Regulation 2000*. During the public exhibition

period Council, State agencies and the public will have an opportunity to make submissions on the project.

Council and Agency Consultation

Lendlease recognises the importance of positive relationships with Council and agencies and seeks to proactively engage with them over the duration of the project. Lendlease proposes to undertake stakeholder engagement to ensure all individuals and/or groups that have an interest in the Development Application are consulted with.

As part of the preparation of the Development Application, Lendlease met with the City of Sydney and presented the draft public domain. During the presentation the City of Sydney provided feedback, which has been incorporated into the Development Application submission where appropriate. Specifically, the City raised the following matters:

- How Public Art would be integrated into the Precinct: see Section 3.8.
- How the application would deal with the community facility on the Public Pier, noting the City was of the view that a community facility (i.e. multi-function space, meeting rooms etc.) was not required or needed in the area: The DA maintains a zone own the pier, however the actual development to be a separate application.
- How the design responds to providing a place for all ages and is inclusive: see **Appendix A**.
- How the public domain interfaces with the proposed residential buildings: see **Appendix A**.

Lendlease met with Transport for NSW, including the CBD Coordination Office. The public domain proposal was presented and TfNSW provided feedback in terms of the manner the transport issues were to be addressed within the Traffic and Transport Assessment as well as provided commentary around future details such as detailed design of signals, pedestrian crossings and the like.

A number of separate meetings have also been held with the RMS in relation to the over harbour structures. Following an initial presentation of the project, these meetings have focused on finalisation of construction licence and long term lease arrangements for the over water structures

Lendlease met with the EPA 28 October 2016. Lendlease presented the design package and explained that there was no intended breaching of the existing apron and that Lendlease is in the process of preparing a RAP for the additional area of Hickson Park. The EPA requested that the EIS should identify where piling is proposed (marine structures) and what management measures would be put in place for possible contamination (see **Appendix I** and **J**).

Lendlease met with the NSW Department of Primary Industries on 25 October 2016. Lendlease presented the design package and a range of matters were discussed in relation to changes to the concrete apron, stormwater, waste water, impacts from creation of Waterman's Cove, and selection of tree species along the waterfront.

Lendlease has met on multiple occasions with the Port Authority of NSW as part of the preparation of the DA. As a result of the consultation the Port Authority undertook its own risk assessment of the over harbour structures and determined that the development will have a minimal impact on operations currently undertaken by the Port Authority (see further discussion at **Appendix K**).

Lendlease offered to meet with the Office of Environment and Heritage, however no response was received in relation to their request.

Community and Stakeholder Engagement

The Barangaroo Delivery Authority and Lendlease are consulting with local residents, the local business community and other relevant stakeholders as part of its ongoing

community engagement program related to Barangaroo. The opportunity to participate has been provided through a number of direct and indirect mediums including community consultation events, Barangaroo Open Day, presentations and workshops, the Barangaroo South website and Barangaroo South newsletter.

Lendlease engaged with the Metropolitan Local Aboriginal Land Council via Comber Consultants in April 2010 during the preparation of the Barangaroo South Aboriginal Archaeological and Cultural Heritage Assessment and subsequent Aboriginal Archaeological Management Plan and Research Design Report. These documents were originally prepared in relation to the Basement Car Park project (MP10_0023) and relate to the whole Barangaroo South site. Of particular relevance to the proposed scope of works, the Land Council noted that interpretation of Aboriginal history should be included in the redevelopment of the site. The Public Art and Cultural Plan and Interpretation Plan that sets the framework for public art, interpretation and cultural programs at Barangaroo has been prepared to reflect and celebrate the many stories of the Barangaroo precinct, including the traditional owners of the land, the Gadigal people, and the maritime and labour histories.

Noting that the lighting is all at ground level and will have no impact on the Sydney Observatory's functions, Lendlease met with the Observatory to take it through the Lighting Strategy that has been prepared for the DA and answer any questions.

Lendlease will undertake further detailed consultation and notification to the local community and relevant stakeholders, prior to the commencement of works.

5.0 Environmental Risk Assessment

The Environmental Risk Assessment (ERA) establishes a residual risk by reviewing the significance of environmental impacts and the ability to manage those impacts. The ERA for the Public Domain has been adapted from *Australian Standard AS4369.1999 Risk Management and Environmental Risk Tools*.

In accordance with the SEARs, the ERA addresses the following significant risk issues:

- the adequacy of baseline data;
- the potential cumulative impacts arising from other developments in the vicinity of the Site; and
- measures to avoid, minimise, offset the predicted impacts where necessary involving the preparation of detailed contingency plans for managing any significant risk to the environment.

Figure 28 indicates the significance of environmental impacts and assigns a value between 1 and 10 based on:

- the receiving environment;
- the level of understanding of the type and extent of impacts; and
- the likely community response to the environmental consequence of the project;

The manageability of environmental impact is assigned a value between 1 and 5 based on:

- the complexity of mitigation measures;
- the known level of performance of the safeguards proposed; and
- the opportunity for adaptive management.

The sum of the values assigned provides an indicative ranking of potential residual impacts after the mitigation measures are implemented.

Significance of impact	Manageability of impact				
	5 Complex	4 Substantial	3 Elementary	2 Standard	1 Simple
1 – Low	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)	2 (Low)
2 – Minor	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)
3 – Moderate	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)
4 – High	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)
5 – Extreme	10 (High)	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)

Figure 28 – Risk Assessment Matrix

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
Key: C – Construction, O: Operation						
Water, Drainage, Stormwater and Groundwater	C+O	<ul style="list-style-type: none"> – Disturbed sediment and increased turbidity as a result of piling. – Potential for increased sediment in runoff. 	<p>In relation to impacts on the marine environment, Royal Haskoning DHV recommend that water quality monitoring be undertaken, unless similar marine activities have demonstrated that installation of a silt curtain is not necessary to ensure satisfactory water quality.</p> <p>Cardno have assessed the impacts on surface and groundwater quality and hydrology to determine that any impacts can be appropriately managed during construction through the implementation of erosion and sediment controls, including:</p> <ul style="list-style-type: none"> – Diversion of clean water around the site into stormwater pits downstream of the works. – Installation of additional sediment fencing. – Pumping captured stormwater to a water treatment plant if required. – Installation of silt curtains in the harbour adjacent to the existing wharf to contain turbidity generated during demolition or piling works. – Installation of sediment controls around and along any stormwater drains. <p>During operation, surface water quality will be managed through the implementation of a number of measures that will capture and treat surface water runoff prior to discharge to Darling Harbour. These include Water Sensitive Urban Design Measures to remove gross pollutants, suspended solids and nutrients, and include works such as:</p> <ul style="list-style-type: none"> – Tree pits. – Sand filtration within area of public open space. – Gross pollutant traps. 	3	2	5 (Low/Medium)

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
Water Quality	C+O	– Impacts to water quality through increased sediments and turbidity as a result of piling.	A number of management and mitigation measures will be implemented during construction and operation to contain pollutants and prevent potential water quality impacts. These include: <ul style="list-style-type: none"> – Minimising the volume of contaminated water during the works wherever possible by directing surface water away from excavations, depressions, pits and stockpiles through the construction of drainage works such as bunds and diversion drains. – Sediment basins may be implemented to collect surface water if it is necessary for the maintenance of water quality. – Water will be reused on site as dust suppression and other site operations, subject to suitable treatment measures. 	3	2	5 (Low/Medium)
Operational Traffic	O	– Increased delay times – Diminished level of service	No mitigation measures are recommended.	3	1	4 (Low/Medium)
Heritage	O	– Detract from heritage fabric	The Statement of Heritage Impact prepared by TKD Architects finds that the proposed works will have minimal to no impact on heritage items in the surrounding area. As a result, no mitigation measures are proposed.	1	1	2 (Low)
Marine Ecology	C+O	– Impact on marine fauna and habitat – Impact on water quality	Royal Haskoning DHV have prepared a Marine Ecology Impact Assessment, as well as an assessment of the impact of over-water structures on the marine ecology of Darling Harbour. As a result of the potential impacts identified through the Marine Ecology Impact Assessment, a number of mitigation measures to be implemented during construction have been recommended. These include: <ul style="list-style-type: none"> – Removal of all construction waste from the site. – Prevention of waste entering Sydney Harbour. – Management of all waste in accordance with NSW Environmental Protection Authority's (EPA) Environmental Guidelines – Assessment, Classification and Management of Liquid and Non-Liquid Wastes. 	2	2	4 (Low/Medium)

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
			<ul style="list-style-type: none"> - Preparation and implementation of a detailed Construction Environment Management Plan (CEMP) for the proposed development. - Ensure that all waste associated with barges and boats is contained and disposed of appropriately. - Undertake a survey of the seabed by divers at completion of the works. - Manage noise in accordance with the EPA Noise Control Guidelines – Construction Site Noise. - Implement the use of silencers on engines and machinery where possible. - Install silt curtains prior to the commencement of works where required. - Undertake water quality monitoring, - Ensure site spillage equipment is available. <p>The assessment finds that there are significant issues associated with ongoing operation and as such no mitigation measures are recommended for this aspect of the project.</p>			
Maritime Navigation	C+O	<ul style="list-style-type: none"> - Reduced width of water channels - Impingement on vessel turning circles 	<p>In the Navigation Impact Assessment prepared by RoyalHaskoningDHV it is found that any impacts on navigation can be appropriately managed on the basis that the following mitigation measures are implemented:</p> <ul style="list-style-type: none"> - No vessels are to use the pontoon for berthing or transferring passengers whilst a large vessel is manoeuvring in the swing basin. - The pontoon and boardwalk are to be adequately lit on the water side of the structure. - During the construction phase, no associated barges or equipment should be located outside of the proposed footprint whilst a large vessel is transiting the area. - Make pilots aware of the reduced margin area so additional manoeuvring room can be allowed. This is to be managed by the Port Authority. - Make pilots and escort vessel personnel aware of the reduced manoeuvring room to ensure small vessels keep clear of vessel and tugwash. This is to be managed by the Port Authority. 	1	1	2 (Low)

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
Infrastructure Provision	O	<ul style="list-style-type: none"> Impact on existing infrastructure Light impacts on amenity of surrounding receivers 	Cardno has advised that no mitigation measures are required. It is noted that Lendlease will enter into the necessary arrangements and obtain the necessary approvals for water supply, electrical supply, communications, sewer and stormwater connections from the relevant authorities, as required.	1	1	2 (Low)
Ecologically Sustainable Development	C + O	<ul style="list-style-type: none"> Potential carbon emissions Potential water usage Potential waste creation 	The ESD Report prepared by Lendlease demonstrates that the proposed development supports the site wide aspirations through the use of renewable energy, water sensitive urban design and selection of environmentally responsible materials. No mitigation measures are required	1	1	2 (Low)
Crime Prevention	O	<ul style="list-style-type: none"> Potential antisocial behaviour 	<p>The CPTED report recommends the following measures:</p> <ul style="list-style-type: none"> Use tree species with high canopies to provide for clear sightlines at eye level. A strict regime of maintenance of species with low and mid canopies is to be implemented if these species are provided within the final landscaping scheme. Provide way finding signage and building identification signage where appropriate to reinforce perceptions of safety and legibility in the development. Install CCTV cameras, especially in areas which could potentially be used for loitering/concealment. If CCTV cameras are to be provided, they should be used in conjunction with adequate illumination to ensure clear CCTV footage can be captured. Provide sufficient lighting which is bright and evenly distributed, high quality finishes to ensure that surveillance opportunities are maximised and ownership over the space is clear. Provide appropriate lighting in and around the development and consult a qualified lighting engineer to ensure the correct lighting is provided to meet minimum Australia and New Zealand Lighting Standards, and ensure lighting is sufficient and bright enough to enable surveillance. Ensure mechanisms are in place for on-going maintenance of landscaping and the building, which includes: 	2	2	4 (Low/Medium)

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
			<ul style="list-style-type: none"> – rapid removal policy for vandalism repair and the removal of graffiti; – maintenance of perimeter landscaping; and – maintenance of public furniture and access pathways; – Use high quality materials for construction to lessen the likelihood of damage and help to reduce maintenance costs. 			
Environmental, Construction and Site Management Plan	C	<ul style="list-style-type: none"> – Increased construction traffic including deliveries – Building and construction waste – Communication with surrounding community 	<p>A CESMP has been prepared by Lendlease to address the management of the site during construction. This plan specifically provides that:</p> <ul style="list-style-type: none"> – Works are proposed to be undertaken between the hours of 7.00am and 6.00pm Monday-Friday and between 7.00am and 5.00pm on Saturdays. No work will be undertaken on Sundays or public holidays. – Site vehicular access will be off Hickson Road. Vehicular and pedestrian traffic management and controls will be implemented and monitored to minimise disruptions to site activities and the surrounding road network. – Site specific Environmental Management protocols will be established to ensure environmental responsibilities are implemented and documented. – Management of construction generated solid and liquid waste will be addressed in accordance with the Spoil & Waste Management Sub-Plan operating at the site. No hazardous materials or dangerous goods will be stored on site. <p>A comprehensive Stakeholder Engagement Strategy (refer to Appendix B of the ECSMP) will be implemented to maintain a good neighbour policy with surrounding businesses, residents and special interest groups during construction.</p>	4	2	6 (Medium)
Construction Air Quality	C	<ul style="list-style-type: none"> – Diminished air quality – Increased dust 	<p>AECOM recommends that the Air Quality and Odour Management Sub Plan be updated to include:</p> <ul style="list-style-type: none"> – Active management of the excavation area dust emissions through the use of water sprays and stockpile management to limit the potential for particulate emissions; and – Ensuring that vehicle paths are managed to minimise potential for track-out of dust, and cleaned in the event that track-out is present. 	4	3	7 (High/Medium)

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
Construction Noise	C	<ul style="list-style-type: none"> Increased noise at nearby residential dwellings and commercial buildings 	<ul style="list-style-type: none"> Wilkinson Murray has recommended that the procedures and management measures included in the Environmental Site Construction Management Plan are continually applied during the construction of the public domain. Wilkinson Murray recommend that the Construction Noise and Vibration Management Sub Plan be updated to incorporate new procedures and policies on plant noise audit, operator instruction, equipment instruction, site noise planning, and a noise barrier between the site and street frontages. 	3	2	5 (Low/Medium)

6.0 Mitigation Measures

The collective measures required to mitigate the impacts associated with the proposed works are detailed in **Table 5** below. These measures have been derived from the previous assessment in Section 5.0 and those detailed in appended consultants' reports.

Table 5 – Mitigation Measures

Mitigation Measures
Water, Drainage, Stormwater and Groundwater
<p>Construction impacts will be managed through the implementation of erosion and sediment controls, including:</p> <ul style="list-style-type: none"> – Diversion of clean water around the site into stormwater pits downstream of the works. – Installation of additional sediment fencing. – Pumping captured stormwater to a water treatment plant if required. – Installation of silt curtains in the harbour adjacent to the existing wharf to contain turbidity generated during demolition or piling works. – Installation of sediment controls around and along any stormwater drains. <p>During operation, surface water quality will be managed through the implementation of a number of measures that will capture and treat surface water runoff prior to discharge to Darling Harbour. These include Water Sensitive Urban Design Measures to remove gross pollutants, suspended solids and nutrients, and include works such as:</p> <ul style="list-style-type: none"> – Tree pits. – Sand filtration within area of public open space. – Gross pollutant traps.
Water Quality
<p>A number of management and mitigation measures will be implemented during construction and operation to contain pollutants and prevent potential water quality impacts. These include:</p> <ul style="list-style-type: none"> – Minimising the volume of contaminated water during the works wherever possible by directing surface water away from excavations, depressions, pits and stockpiles through the construction of drainage works such as bunds and diversion drains. – Sediment basins may be implemented to collect surface water if it is necessary for the maintenance of water quality. – Water will be reused on site as dust suppression and other site operations, subject to suitable treatment measures.
Construction Air Quality and Noise
<p>Air Quality Impacts</p> <p>The Air Quality and Odour Management Sub Plan be updated to include:</p> <ul style="list-style-type: none"> – Active management of the excavation area dust emissions through the use of water sprays and stockpile management to limit the potential for particulate emissions; and – Ensuring that vehicle paths are managed to minimise potential for track-out of dust, and cleaned in the event that track-out is present.
<p>Noise Impacts</p> <ul style="list-style-type: none"> – Wilkinson Murray has recommended that the procedures and management measures included in the Environmental Site Construction Management Plan are continually applied during the construction of the public domain. – Wilkinson Murray recommend that the Construction Noise and Vibration Management Sub Plan be updated to incorporate new procedures and policies on plant noise audit, operator instruction, equipment instruction, site noise planning, and a noise barrier between the site and street frontages.
Marine Ecology
<p>During construction, the following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> – Removal of all construction waste from the site. – Prevention of waste entering Sydney Harbour. – Management of all waste in accordance with NSW Environmental Protection Authority's (EPA) Environmental Guidelines – Assessment, Classification and Management of Liquid and Non-Liquid Wastes. – Preparation and implementation of a detailed Construction Environment Management Plan (CEMP) for the proposed development. – Ensure that all waste associated with barges and boats is contained and disposed of appropriately. – Undertake a survey of the seabed by divers at completion of the works.

Mitigation Measures

- Manage noise in accordance with the EPA Noise Control Guidelines – Construction Site Noise.
- Implement the use of silencers on engines and machinery where possible.
- Install silt curtains prior to the commencement of works where required.
- Undertake water quality monitoring,
- Ensure site spillage equipment is available.

The assessment finds that there are no significant issues associated with ongoing operation and as such no mitigation measures are recommended for this aspect of the project.

Maritime Navigation

The following mitigation measures will be implemented:

- No vessels are to use the pontoon for berthing or transferring passengers whilst a large vessel is manoeuvring in the swing basin.
- The pontoon and boardwalk are to be adequately lit on the water side of the structure. A suitable lighting solution is to be proposed by the lighting designer, and approved by the NSW Ports Authority prior to construction
- During the construction phase, no associated barges or equipment should be located outside of the proposed footprint whilst a large vessel is transiting the area.
- Make pilots aware of the reduced margin area so additional manoeuvring room can be allowed. This is to be managed by the Port Authority.
- Make pilots and escort vessel personnel aware of the reduced manoeuvring room to ensure small vessels keep clear of vessel and tugwash. This is to be managed by the Port Authority.

CPTED

- Use tree species with high canopies to provide for clear sightlines at eye level. A strict regime of maintenance of species with low and mid canopies is to be implemented if these species are provided within the final landscaping scheme.
- Provide way finding signage and building identification signage where appropriate to reinforce perceptions of safety and legibility in the development.
- Install CCTV cameras, especially in areas which could potentially be used for loitering/concealment. If CCTV cameras are to be provided, they should be used in conjunction with adequate illumination to ensure clear CCTV footage can be captured.
- Provide sufficient lighting which is bright and evenly distributed, high quality finishes to ensure that surveillance opportunities are maximised and ownership over the space is clear.
- Provide appropriate lighting in and around the development and consult a qualified lighting engineer to ensure the correct lighting is provided to meet minimum Australia and New Zealand Lighting Standards, and ensure lighting is sufficient and bright enough to enable surveillance.
- Ensure mechanisms are in place for on-going maintenance of landscaping and the building, which includes:
 - rapid removal policy for vandalism repair and the removal of graffiti;
 - maintenance of perimeter landscaping; and
 - maintenance of public furniture and access pathways;
- Use high quality materials for construction to lessen the likelihood of damage and help to reduce maintenance costs.

Environmental, Construction and Site Management Plan

- Works are proposed to be undertaken between the hours of 7.00am and 6.00pm Monday-Friday and between 7.00am and 5.00pm on Saturdays. No work will be undertaken on Sundays or public holidays.
- Site vehicular access will be off Hickson Road. Vehicular and pedestrian traffic management and controls will be implemented and monitored to minimise disruptions to site activities and the surrounding road network.
- Site specific Environmental Management protocols will be established to ensure environmental responsibilities are implemented and documented.
- Management of construction generated solid and liquid waste will be addressed in accordance with the Spoil & Waste Management Sub-Plan operating at the site. No hazardous materials or dangerous goods will be stored on site.

7.0 Justification of the Proposal

In general, investment in major projects is justified if the benefits of doing so exceed the costs. Such an assessment must consider all costs and benefits. The EP&A Act specifies that such a justification must be made having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.

The proposed development involves provision of the public domain within Stage 1B of Barangaroo South and part of Central Barangaroo. The assessment must therefore focus on the identification and appraisal of the effects of the proposed change over the development site's existing condition.

Various components of the biophysical, social and economic environments have been examined in this EIS and are summarised below.

7.1 Social and Economic

Barangaroo South is the southern 7.5 hectares of the Barangaroo site, which is destined to become the greenest and most advanced financial district and the first large scale, carbon neutral precinct in Australia. It will comprise a mix of uses, including commercial, residential, retail and dining along with a new landmark hotel and public open space. The social and economic success of Barangaroo relies heavily on the design of public space and the way it is experienced and used.

The proposed development will provide the public domain within Stage 1B of Barangaroo South and the part Central Barangaroo and will therefore have a significant positive social and economic impact for the large number of future visitors, residents and workers at Barangaroo South. Specifically, the proposed Public Domain will:

- attract visitors and tourists to the site, supporting the retail and hotel functions on the site and wider Sydney CBD;
- provide recreation areas for visitors, residents and works to enjoy throughout the year;
- ensure there is a high level of accessibility and connectivity within the site for businesses and their workers;
- create a world class address for the commercial buildings, attracting businesses and business to the site; and
- provide a range of employment opportunities during construction and operation.

There are no adverse social or economic impacts as result of the proposed development.

7.2 Biophysical

Section 4.0 of this EIS contains a thorough assessment of the likely biophysical impacts of the proposed development. The environmental risk assessment contained at Section 5.0 demonstrates that the proposed development will not result in any significant adverse environmental impacts that cannot be appropriately addressed through standard conditions of consent or the mitigation measures included at Section 6.0.

The environmental impact assessment of the proposed development has demonstrated that:

- water management measures will be implemented to ensure that there are no adverse water, drainage, stormwater or groundwater impacts;
- appropriate measures can be implemented to prevent any impacts to water quality during the construction and operation phases;

- measures will be implemented to manage potential sea level rise and climate change impacts;
- responsive measures will ensure that air quality impacts are managed during the construction phase;
- no specific noise or vibration management measures are required for the proposal; and
- construction and operational traffic can be appropriately managed.

7.3 Ecologically Sustainable Development

The EP&A Regulation lists four principles of ecologically sustainable development to be considered in assessing a project. They are:

- the precautionary principle;
- intergenerational equity;
- conservation of biological diversity and ecological integrity; and
- improved valuation and pricing of environmental resources.

An analysis of these principles follows.

Precautionary Principle

The precautionary principle is utilised when uncertainty exists about potential environmental impacts. It provides that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The precautionary principle requires careful evaluation of potential environmental impacts in order to avoid, wherever practicable, serious or irreversible damage to the environment.

This EIS has not identified any uncertain and serious threat of irreversible damage to the environment.

Intergenerational Equity

Inter-generational equity is concerned with ensuring that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. The proposal has been designed to benefit both the existing and future generations by:

- providing access to the foreshore for future generations to appreciate and enjoy;
- providing recreation areas near housing and employment uses; and
- implementing safeguards and management measures to protect environmental values.

The proposal has integrated short and long-term social, financial and environmental considerations so that any foreseeable impacts are not left to be addressed by future generations. Issues with potential long term implications such as climate change will be avoided and/or minimised by design and through the application of safeguards and management measures described in this EIS and the appended technical reports during construction.

Conservation of biological diversity and ecological integrity

The principle of biological diversity upholds that the conservation of biological diversity and ecological integrity should be a fundamental consideration.

This EIS has demonstrated that the proposal will not have any significant effect on the biological diversity and ecological integrity of the study area. The potential impacts associated with development identified in the expert consultant reports (see Section 4), particularly those associated with construction, have been incorporated into the mitigation measures as Section 6 of this EIS.

Improved valuation, pricing and incentive mechanisms

The principles of improved valuation and pricing of environmental resources requires consideration of all environmental resources which may be affected by a proposal, including air, water, land and living things. Mitigation measures for avoiding, reusing, recycling and managing waste during construction and operation would be implemented to ensure resources are used responsibly in the first instance.

Additional measures will be implemented to ensure no environmental resources in the locality are adversely impacted during the construction or operational phases.

8.0 Conclusion

The EIS has been prepared to consider the environmental, social and economic impacts of the proposed Barangaroo public domain works for all of Hickson Park (located within both Barangaroo South and Central Precincts), Watermans Quay, the remaining section of Barangaroo Avenue in Barangaroo South, Wulugul Walk (including the expanded boardwalk required by a condition of Concept Plan (Mod 8)), Watermans Cove and the Public Pier.

The EIS has addressed the issues outlined in the Secretary Environmental Assessment Requirements and accords with Schedule 2 of the EP&A Regulation with regards to requirements for an environmental impact statement.

Having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development, the carrying out of the project is justified for the following reasons:

- There is a strategic need to provide the public domain within Barangaroo South to ensure the large number of future visitors, residents and workers at Barangaroo South enjoy a high quality environment.
- The development is consistent with and complies with all the relevant strategic policies, environmental planning instruments, plans and guidelines, including Concept Plan (Mod 8).
- The development will have a wide range of positive social and economic impacts.
- There are no adverse environmental impacts that cannot be appropriately managed by the mitigation measures set out in this EIS.

Given the merits described above it is requested that the application be approved.