

Our Ref YN210079-17-0397(V3)
Contact Michael Hodges

13 October 2017

Lendlease Building Pty Ltd
Level 14, Tower Three,
International Towers Sydney
Exchange Place, 300 Barangaroo Avenue
Barangaroo NSW 2000

Attention: Jeremy Tompson

Dear Jeremy,

BUILDING C1, BARANGAROO SOUTH, DEVELOPMENT APPLICATION (SSD 8529), WATER & STORMWATER DESIGN STATEMENT

Cardno (NSW/ACT) Pty Ltd has been commissioned by Lend Lease Building Pty Ltd (LLB) to undertake the design and documentation for trunk stormwater drainage, infrastructure adjustments, external roadworks and public domain works associated with Barangaroo South.

This letter addresses Section 8 and 12 of the Secretary's Environmental Assessment Requirements (SEARs) for the C1 building (SSD 8529) associated with the Barangaroo South Development.

All trunk infrastructure including stormwater drainage required to service the proposed building C1 has been provided as part of the approved Bulk Excavation and Basement Car Parking Project Application (MP10_0023) and the Stage 1A Public Domain SSDA (SSD6303). As all external and internal trunk infrastructure is covered in separate reports, this statement is aimed to provide a summary of previously issued information.

[Sydney Water Local Area Servicing Plan](#)

Further to the LASP being prepared in 2013, we confirm the following:

1. Section 3 – Staging and Funding
 - a. All stormwater traversing the Stage 1A development site has been diverted under Sydney Water Case CN126589;
 - b. A loop water main through the site has been constructed generally along Shelley Street, Barangaroo Avenue (formerly Globe Street) and Watermans Quay (formerly Globe Street) under Sydney Water cases CN127713 and CN127713 and CN131355);

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

Level 9
The Forum
203 Pacific Highway
St. Leonards NSW 2065

P.O. Box 19
St Leonards NSW 1590
Australia

Phone: +61 2 9496 7700
Fax: +61 2 9439 5170

www.cardno.com.au

- c. Additional waste water emergency storage associated with SPS 1129 to preserve the dry weather storage has been completed under Sydney Water case CN132852; and
- d. Local extensions of water and sewer reticulation have been constructed to service buildings, including Building C1 within the Stage 1A development area.

2. Section 8 – Servicing Strategy Summary and Interface

- a. Under the Stormwater Section, Area south, the LASP indicates stormwater deviation works associated with Barangaroo South stage 1B have not been submitted to Sydney Water. It is noted applications have been made and approvals of the Temporary and Permanent deviations have been accepted by Sydney Water under case numbers CN135412SW and 135414SW. It is further noted these deviation have no impact on the servicing requirements for Building C1.

Site Servicing Strategy Barangaroo South

Further to the Site Servicing Strategy being prepared in 2013, we confirm:

1. Section 1.3 - Barangaroo Sustainability Initiatives

- a. The Site Servicing Strategy report states that Lendlease plans to improve the overland flow conveyance such that existing flooding in Hickson Rd is removed during the 100 year ARI event.

As part of the overall drainage strategy, flood modelling was undertaken to determine final flood levels within Hickson road and Sussex St. The Cardno flood study indicates 1% AEP flood water levels are consistent with the original flood levels post construction of stormwater drainage and road works, reducing the original depth of water from 1140mm to 200mm with a 50% blockage factor on inlet drainage structures. This result is considered consistent with the intent of the original initiative and has been approved by all stakeholders including Sydney Water and the City of Sydney Council.

Potable Water and Non Potable Water

Sydney Water is the primary potable water supplier for the Barangaroo South Development through an existing DN300 pipe located in Hickson Road. This water main is proposed to be replaced as part of the Hickson Road upgrade works under Sydney Water case number CN139932.

Minor water reticulation will be required to service the proposed C1 building with connections for potable water and fire services from this main.

Climate Change Adaption

The risk and likely magnitude of climate change-induced sea level rise is addressed in detail in the Climate Change and Sea Level Rise Report prepared by Arup. The report recommends adoption of 2100 Harbour level of RL 1.975. It is noted that this level is 25mm lower than the existing low point in Hickson Road.

In the coming years, the existing local drainage systems in the area surrounding the development may reduce in capacity and effectiveness as the outlets to the harbour become increasingly submerged.

These risks have been addressed through:

- Locating site based stormwater discharge points at a high level within the new sea wall to allow gravity flow of the run-off to the Harbour;
- Design of stormwater transport systems to incorporate partial inundation from tide flows;
- Specification of materials to marine grade to prevent accelerated degradation;
- Use of tidal flaps on stormwater discharge points; and
- Provision of local overland flow paths within the development site should the discharge point become obstructed.

Stormwater Drainage External to Barangaroo South

Diversion of the existing stormwater assets traversing the Barangaroo South site have been considered and constructed as part of the Basement Car Parking Application. Deviation of existing Sydney Water assets were approved by Sydney Water in consultation with BDA, Transport for NSW and RMS.

The diversion as approved include:

- A permanent diversion to the south of the development and generally along the line of the existing Shelley Street discharging to Darling Harbour.

The permanent diversion improves the conveyance capacity of the external drainage network to cater for the 100 year ARI event including predicted future harbour water level increases due to climate change generally in accordance with current NSW Government and Council guidelines.

Computer modelling demonstrates no overland flows from the external catchments are expected to drain through the site in storm events as large as the PMF (refer Barangaroo South Flood Study prepared by Cardno dated May 2015).

Barangaroo South Internal Stormwater Drainage

The stormwater network for Stage 1A of Barangaroo South has been designed to provide:

- Low flow stormwater drainage through tree pits and associated water quality measures;
- Internal site piped drainage for major storm event flows (100 year ARI) with 50% blockage on all sag pits; and
- Safe overland flow paths in the event of failure of the 100 year ARI system.

The stormwater drainage network has been designed generally in accordance with the following standards and guidelines:

- Australian Rainfall and Runoff Volume 1 and 2, 1987;
- NSW Floodplain Development Manual 2005;
- City of Sydney Council Policies;

- AS3500 – Stormwater and Drainage Design codes;
- AS3725 – Loads on Buried Concrete Pipes;
- Managing Urban Stormwater – Soils and Construction Volume 1, 4th edition; and
- WSUD best practice. The design for stormwater conveyance and quality does not preclude transfer of the drainage network to Sydney of City Council where appropriate.

All rainwater falling on roads or public domain areas are collected via a combination of traditional stormwater capture devices and water quality measures such as bio-retention systems and gross pollutant traps, prior to discharge. There is no requirement for on-site detention (OSD) as the Barangaroo South site is adjacent to the Harbour, at the downstream end of the catchment where attenuation would normally have little impact on upper catchment flows.

The trunk drainage system consists of prefabricated box culverts installed above the structural slab. This system serves as the connection points for all existing and future buildings and the Public Domain. All trunk drainage works have been constructed under the Bulk Excavation and Basement Car Parking Project Application (MP10_0023), relating to Stage 1A Barangaroo South. Gratings and inlets to collect surface flows from the Public Domain form have been constructed under (SSD 6303) for the Public Domain.

The Barangaroo South water sensitive urban design has been developed to meet the following pollutant reduction targets:

Water Quality Parameter	BDA Obligation % Reduction	City of Sydney DCP % Reduction
Total Suspended Solids (TSS)	80	85
Total Phosphorus (TP)	45	65
Total Nitrogen (TN)	45	45
Gross Pollutants	3 Months ARI	90 (> 5mm)

The City of Sydney Development Control Plan reduction targets are consistent with current best practices adopted by Urban Growth (Landcom) for urban developments. The marginally higher phosphorus and suspended solids targets are however relevant for more sensitive receiving waters.

The water quality strategy consists of the following measures to achieve the required reductions in pollutant targets.

A series of bio retention systems have been constructed as 'at source' treatment devices. The system will includes planter beds at tower podium and building roofs as well as tree pits along roads and the waterfront promenade.

Approximately 30 tree pits have been provided along Barangaroo Avenue and Watermans Quay. Stormwater drains to the filter media via a series of openings in the kerb at the sag locations along the road network. Stormwater is treated through the filter media and drained back to the trunk drainage system above the structural slab.

Three underground gross pollutants traps have been constructed at the downstream end of the drainage system prior to discharging to the Harbour. These GPTs work as the primary treatment system to remove litter, vegetative matter, free oils, grease and coarse sediments.

In addition to the 'at source' treatment system, an end of line proprietary system has been installed to

achieve the pollutant reductions targets. The 'Storm360' system installed as part of the Stage 1A Public Domain is an underground filtration system that efficiently captures high levels of stormwater pollutants without impacting on the public domain footprint.

The system has a reduced maintenance schedule compared with other traditional bio-retention systems, and provides a lower operating invert level.

The Proposed Building

It is proposed to capture and convey rainwater from roof and podium areas through conventional gutters, roof top drainage outlets and associated downpipes. Detailed design will be undertaken by the building hydraulic consultant and coordinated to allow connection to the trunk stormwater drainage within Watermans Quay and Shipwright Walk. We confirm the existing trunk drainage network has capacity for the proposed building and there will be no physical impact on, or detrimental impact on the operation of the existing infrastructure as a result of the development.

Related Reports

The following reports shall be read in conjunction with this document:

1. Public Domain Stormwater and Infrastructure Report, 13-0302 Revision G, dated 1 May 2014, prepared by Cardno;
2. Flood Study, CS7300-15-132, dated 11 March 2015 Revision 1, prepared by Cardno;
3. Site Servicing Strategy, 11-0321 Revision K, dated March 2013, prepared by Cardno.

Conclusion

Based on the content of previous reports prepared for the basement and Stage 1A public domain works associated with the Barangaroo South development, adequate stormwater infrastructure to service the C1 development site has been incorporated into the base design.

This design statement shall not be construed as relieving any other party of their responsibilities, liabilities or contractual obligations.

Yours Sincerely



Michael Hodges
Principal
Manager Civil Design – Urban Infrastructure
for **Cardno**