Lend Lease (Millers Point) Pty Limited

Barangaroo South - C3 Commercial Building

Building Services Report - Project Application

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1 Introduction

This report supports a Project Application submitted to the Minister for Planning pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Application seeks approval for construction of a commercial building (known as Building C3) and associated works at Barangaroo South as described in the Project Summary Description section of this report.

1.1 Background

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

Lend Lease was successfully appointed as the preferred proponent to develop Barangaroo Stage 1 (otherwise known as Barangaroo South) on 20 December 2009.

1.2 Planning History & Framework

On 9 February 2007 the Minister approved a Concept Plan for the site and on 12 October 2007 the land was rezoned to facilitate its redevelopment. The Approved Concept Plan allowed for a mixed use development involving a maximum of 388,300m^2 of gross floor area (GFA) contained within 8 blocks on a total site area of 22 hectares.

Modification No. 1 was approved in September 2007 which corrected a number of minor typographical errors.

On 25 February 2009 the Minister approved Modification No. 2 to the Concept Plan. The Approved Concept Plan as modified allowed for a mixed use development involving a maximum of 508,300m^2 of gross floor area (GFA) contained within 8 blocks on a total site area of 22 hectares.

On 11 November 2009 the Minister approved Modification No. 3 to the Concept Plan to allow for a modified design for the Headland Park and Northern Cove. The Approved Concept Plan as modified allows for a mixed use development involving a maximum of 489,500m^2 of gross floor area (GFA) across Barangaroo as a whole.

On 16 December 2010 the Minister approved Modification No. 4 to the Barangaroo Concept Plan. The Approved Concept Plan as modified allows for approximately 563,965m^2 Gross Floor Area of mixed use development across the entire Barangaroo site.

This Project Application forms one of a series of individual Applications that Lend Lease will be submitting to deliver Barangaroo South. This Project Application is consistent with the established planning framework for the site, including the approved Concept Plan (as modified).

A Project Application (MP10_0023) has been approved for the bulk excavation and construction of a basement car park to accommodate up to 880 car parking spaces and associated services and infrastructure to support the initial phases of

the future development of Barangaroo South. A Section 75W Modification Application was subsequently submitted seeking to modify MP10_0023 to extend the area of the approved basement to the south. This modification was approved by the Minister for Planning on 3 March 2011.

A further Section 75W application has been submitted to the Department of Planning and Infrastructure (the Department) and is currently being assessed, which seeks the Minister's approval to modify the depth of the excavation and change the reduced levels of the basement structure, using the same construction methodology as detailed and approved as part of the original project application. This includes:

- reduced excavation and bulk earthworks;
- reduced structural works – foundations, basement levels, perimeter retention system etc; and
- installation of associated services and infrastructure to support the initial phases of the future development of Barangaroo South.

A project application for the first commercial building, known as C4, was submitted to the Department of Planning on 29 October 2010. This application sought consent for construction and use of a new commercial Building C4 with a maximum 98,514m^2 GFA accommodating commercial and retail uses, a child care centre, bicycle parking and associated use and operation of car parking and loading facilities in the basement. Consent was issued by the Minister on 3 March 2011.

A Section 75W application has been submitted to the Department and is currently being assessed which seeks the Minister's approval to modify certain elements of the approved C4 building, including:

- mix of the uses within the building;
- total GFA;
- shape of floor plates of the podium and the tower elements of the building;
- facade details;
- roof treatment; and
- basement layout.

1.3 Site Location

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 bounded to the south by a range of new development dominated by large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Stage 2 (also known as Barangaroo Central) and Barangaroo South.

The area of land within which development is proposed under this Project Application extends over land generally known and identified in the approved Concept Plan as Block 3 which comprises Lot 5 in DP 876514.

1.4 Project Summary Description

This Project Application seeks approval for the construction of a 49 storey building, comprising ground floor retail, a commercial lobby, childcare, podium and office tower, provision for associated cars and bicycle parking and the construction of the surrounding ancillary temporary public domain which includes access streets and landscaping.

1.5 Purpose of this Report

This report has been prepared to accompany the Project Application for the C3 Commercial Building and associated works at Barangaroo South. It addresses the relevant Director-General Requirements for the project. These Director-General Requirements are discussed in the Environmental Assessment Report (EAR) that has been prepared to support the application.

The building services disciplines contained within this report comprise:

- Mechanical Services;
- Electrical, Communications, Security and Lighting Services;
- Fire and Hydraulic Services; and
- Vertical Transportation Services.

The following report provides details on the services infrastructure and design proposed for building C3 in support of the planning application for this building.

1.6 Sustainability Targets

The building services for building C3 are positively contributing towards the following sustainability targets:

- 6 Star Green Star Office Design and As Built V3;
- 5 Star Green Star Retail Design V1, subject to reaching an agreement on an appropriate rating tool with the Green Building Council of Australia;
- 5 Star + 30% NABERS Energy Rating;
- 5 Star NABERS Water Rating;

1.7 Existing Infrastructure Connections

The Barangaroo South development requires the upgrading and extension of existing site infrastructure services to ensure that there is sufficient capacity and redundancy for the development as a whole. The exact nature of these upgrade requirements are to be developed in conjunction with the local authorities. For existing infrastructure information please refer to the Services Overview Report prepared by Cardno Limited – Report number 600062-R002 Nov 2005.

2 Mechanical Services

2.1 Design Criteria

The buildings mechanical services systems will generally be designed to meet the following requirements.

2.1.1 External Design Conditions

The following design conditions are standard for the Sydney CBD:

- Summer: 32°C DB, 23°C WB.
- Winter: 7°C DB.

2.1.2 Internal Design Conditions

The following values will be applied to the design, with assessment for modification as noted.

Table 1: Internal Design Conditions

Room	**Room Occupancy (m^2/person)**	**Room Temp (ºC)**	**Relative Humidity (%)***	**Min. Outside Air (l/s/person)**	**Lighting Load (W/m^2)**	**Small Power (W/m^2)**
Office	10	21.5 ºC to 24.5ºC summer 20.5 ºC to 23.5ºC winter	40-60	11.25	5	15
Lobby (where conditioned)	3.5	18ºC - 27ºC	40-60	To AS1668.2 minimum	5	-
Retail	5.0	24ºC summer** 21ºC winter**	40-60	To AS1668.2 minimum	50	

* Active humidity control will be provided in accordance with Green Star Requirements.

2.2 Proposed Commercial Office HVAC System

2.2.1 Proposed System

The air conditioning system is intended to consist of:

- Energy efficient air supply system coupled with chilled beams, to serve the commercial office, subject to final design development and Green Star assessments;
- Mechanical ventilation in accordance with AS1668.2 to toilet and back of house areas; and
- Tenant cooling water loop for supplementary tenant plant.

2.2.2 Chilled Beam Systems

Subject to final design development and Green Star assessments, chilled beams are to be provided to the perimeter and internal zones together with a treated fresh air supply. Air handling equipment is to be located in each of the mid level and roof level plant rooms.

Air handling fans will be selected for high efficiency.

2.2.3 District Cooling Plant

Chilled water will be generated in the district cooling plant and reticulated to a central cooling room dedicated to C3 within the basement of the building.

District cooling plant will improve the overall energy efficiency as well as achieving effective cooling plant redundancy. Chilled water will be reticulated from the central cooling room to air handling units and chilled beams via variable flow circuits complete with heat exchangers and pumps. Pumps will be fitted with variable speed drives (for variable flow systems only) and high or premium efficiency motors.

2.2.4 Heating Plant

A de-centralised building based heating system will be provided via gas fired hot water heater units to serve the heating and hot water requirements of the building. The hot water units are likely to be located in the C3 tower plant rooms.

2.2.5 Free Cooling

The option of introducing an economy cycle to the air side systems is being explored. The economy cycle will be introduced pending results of the final energy analysis and Green Star study to determine if it offers substantive energy savings.

2.2.6 After Hours Provision

An after hours facility will be provided to enable running of central plant systems and associated air handling plant economically during out of hours operation. The

after hours facility will include a web based switch interface to the Building Automation System.

2.2.7 Mechanical Ventilation

Mechanical ventilation will be provided to toilets, cleaner's rooms, plant rooms and storerooms in accordance with the current AS1668.2 as adopted by the BCA.

2.2.8 Air Filtration

Air filters in compliance with AS1324 will be used in air handling units.

2.2.9 Smoke Management

The smoke control systems will meet the requirements of the BCA and will likely be a zone pressurisation system.

A fire isolated exit pressurisation system for all fire isolated exits will be installed. These systems will be designed in accordance with AS/NZS1668.1.

2.2.10 Carpark Ventilation

Carpark ventilation will be provided as a separate system independent of the tower in accordance with the requirements of the BCA and AS1668.2 as part of the basement works being done under a separate Project Application.

2.2.11 Substation Ventilation

The new substations associated with the C3 building will be ventilated in accordance with the requirements of Ausgrid.

2.3 Supplementary Systems

2.3.1 Supplementary Outside Air System

Supplementary outside air will be provided to satisfy tenant needs for additional outside air to meeting rooms, training areas, etc. The system will be fitted with a variable speed fan to conserve energy when the maximum air quantity is not required.

Supplementary fans will be provided in the C3 tower upper level plant rooms.

2.3.2 Tenant Cooling Water Circuit

A dedicated closed loop tenant cooling water circuit, served from the basement central cooling room via heat exchangers at the mid level plant rooms, with tee-offs at each floor will be provided to cater for tenant needs.

2.3.3 Commercial Kitchen Exhaust

Provision shall be made for one future kitchen exhaust system per rise servicing the building. The design will comply with AS/NZS1668.1 and AS1668.2.

2.4 Noise and Vibration

All mechanical equipment and/or plant areas will be provided with acoustic attenuation and vibration isolation to ensure noise levels do not exceed the requirements of AS2107 as described in the Acoustic Report.

2.5 Building Automation System

A computerised Building Automation System (BAS) will be used to automatically control, monitor and provide alarms for the nominated building services.

2.6 Retail

2.6.1 Air Conditioning

A dedicated closed loop tenant cooling water circuit, served from the basement central cooling room via heat exchangers, with tee-offs at each floor will be provided to cater for tenant needs. Heating will be provided by the tenant via heating hot water units in dedicated plant locations.

2.6.2 Ventilation

Base building ventilation systems including kitchen exhaust, smoke exhaust and toilet exhaust will be provided for the retail tenants' use and connection. Tenant plant will be located within the tenancy and intakes and discharges at the podium roof. Odour control and acoustic treatments will be the responsibility of the tenant.

3 Electrical Services

3.1 Regulations and Authorities

The works are to be completed in accordance with the relevant standards and requirements including Ausgrid network standards.

Detailed discussions are underway between Lend Lease and Ausgrid to provide site wide infrastructure for the distribution of a 33 kV network supply. Ausgrid has indicated in preliminary discussions that the demand requirements for Barangaroo South can be met by the existing capacity from the Pyrmont zone sub-station. A design information pack and network standards for Barangaroo South have been prepared by Ausgrid and issued to Lend Lease for review. Detailed design will commence in due course. The distribution network will supply C3.

3.2 Main and Standby Power Supply

The city grid shall be extended to serve the Barangaroo development as current power infrastructure at the site is inadequate.

Electricity to the C3 building will be provided by three (3) onsite Ausgrid chamber substations located in the basement and suspended mid level plant rooms. The commercial tower will also be provided with onsite emergency standby diesel generation plant for backup energy supply to emergency services and facilities.

The required substations will be provided with power from the City network grid.

In the event of failure of the grid supply, the standby diesel generation system will provide standby backup power for safety services loads in an orderly manner. A Supervisory Control and Data Acquisition (SCADA) system will operate the power system and be responsible for the orderly distribution of standby power to the required safety services and pre-defined building loads. Bulk diesel storage will be located in the basement.

3.3 Consumer Mains

Consumer's mains will be provided between the substations and the main switchboards. The consumer mains will be rated to the full output rating of the substation to serve the house and tenant loads. Consumers mains shall be fire rated where they serve main switchboards supplying fire safety services equipment.

3.4 Main Switchboards

Each main switchboard will comply with the following:

Table 2: Switchboard Requirements

Element	Requirement
Standard	AS3439.1

Element	Requirement
Form of segregation	Form 4 with limited arc fault containment and venting as specified in Annex ZD of AS3439.1.
Form of construction	Free standing.
Capacity	Fully rated to the output from the substations.
Spare space	25% for additional outgoing circuits spread across the switchboard.
Earthing	M.E.N.
Degree of protection.	IP42

The outgoing circuits / sub mains from the main switchboards will be protected by circuit breakers.

The main switchboards will be provided with 25% spare space including poles for separate sub mains for connection of future tenant UPS sub mains or computer room A/C units.

Surge protection will be provided to all main switchboards.

The switchboards shall be configured to allow house services to be separately metered from tenant services. Each tenant shall be capable of being individually metered.

Retail node rooms shall be established to house all the retail tenant distribution panels and associated tariff meters.

3.5 Energy Monitoring

The main switchboards and tenant distribution boards will be provided with power recording meters to enable NABERS metering functionality. Outgoing sub-mains from the main switchboards rated greater than 100kVA will be monitored. BMS integration will be provided.

3.6 Power Factor Correction

Power factor correction equipment will be installed where required to maintain the power factor of house services to a minimum of 0.95 at all times.

Space provision for tenant power factor correction equipment will be provided.

3.7 Sub-mains

Sub-mains cables will be designed to AS3008.1.

Reduced sized neutrals will not be used.

Cable riser reticulation will be via vertical risers through the office tower cores.

Tenant sub-mains will be a rising mains system of cables with tee offs for the commercial office in accordance with AS3000

Reticulated sub-mains to the retail shall be provided.

3.8 Cable Management

The building cores will contain a number of cable risers and associated riser cupboard spaces specifically to assist in the management of 'House' and 'Tenant' Services. These include:

- House lighting and power risers;
- House communications/BMCS/Fire/SSISEP risers;
- Tenants lighting, power and data risers; and
- Retail.

3.9 Tenant Cable Zone

A suitable tenant cable zone within the ceiling or potential false floor will be accommodated.

3.10 Distribution Boards

Distribution boards (DB's) will be readily accessible situated in cupboards specifically designed for the purpose. Distribution boards will be form 1, of the dead front type, totally enclosed with insulated bus-bars. Outgoing circuits will be protected by circuit breakers.

Commercial tenant DB's will be provided to each tenant floor. DB's will be sized with pole space at the rate of 1 pole per 15m^2 NLA.

3.11 General Purpose Outlets

Provision of space via ceiling or under floor shall be made available for future tenant power distribution from tenant distribution boards to office areas.

General purpose outlets to toilet areas, lobbies, store rooms, amenities, etc for equipment, cleaning and general usage will be provided.

Earth leakage protection will be provided in accordance with Australian Standard requirements.

General purpose outlets requirements within the retail shops shall be the responsibility of the individual tenant.

3.12 Lighting

Lighting will comply with the following:

- AS1680 – Interior Lighting and the Visual Environment
- Building Code of Australia

3.12.1 Office Area Lighting

High efficiency light fittings to be provided such as fluorescent T5 lamps, high efficiency electronic ballasts, high purity aluminium, semi-specular, low iridescent louvers with batwing distribution suitable for screen-based tasks.

Light fittings and resultant lux levels are to be consistent with AS/NZS1680, NABERS and Green Star targets for the project.

3.12.2 Entrance Lobbies

In addition to general lighting, specialist lighting will be provided to enhance the visual environment of the main entry lobby at ground.

3.12.3 General Areas

Fluorescent or other discharge type lighting of type suited to task will be provided in all other areas of the project, including:

- plant rooms;
- riser cupboards, rooms;
- toilets, cleaners rooms, showers;
- house areas; and
- store rooms.

3.12.4 External Lighting

External building feature lighting will be installed to provide interest and to highlight architectural features. External lighting will be installed to public domain areas within the C3 site.

No light beam will be directed beyond the site boundaries or upwards without falling directly on a surface to minimise light pollution. Lighting will be controlled by photoelectric cells or time switches.

3.12.5 Retail Lighting

The lighting for the front of house external to the retail tenancy areas shall be provided. Light sources shall be chosen with consideration to their energy efficiency and long life. Resultant lux levels shall meet the requirements of AS/NZS1680.

Emergency lighting provisions to AS2293.1 will be provided for shell and core retail tenancies. Modifications to the emergency lighting, and general fitout lighting are the responsibility of the tenant.

3.13 Lighting Controls

3.13.1 House Areas

A distributed intelligent lighting controller is to be provided in each house distribution board and interfaced to a central control location.

Motion sensors shall be provided in the toilets and other low-trafficable areas (fire stairs) to control lighting when movement is detected and ensure efficiency and safety is optimised.

3.13.2 Commercial Tenancy Areas

A distributed intelligent lighting controller is to be provided in each tenant distribution board. The lighting is to be controlled in groups from a panel located in each core area.

Switching zones shall be operated by programmable contactor modules and locally controlled by the switch-plates.

3.13.3 Exit and Emergency Lighting

Emergency and evacuation and exit signs complying with the requirements of the BCA and AS2293.1 shall be provided.

A central computer monitoring system shall be provided for testing, certification and monitoring of the emergency and exit lighting system in all areas.

3.14 Photo-Voltaic Array

A photovoltaic (PV) array is proposed on the building roof to provide a renewable electrical supply. The PV array shall be connected to the Ausgrid grid via DC to AC inverter systems. The grid connected inverter system shall be connected to the base building supply for tariff bill crediting by the building owner.

3.15 Lightning Protection

Lightning protection will be provided in accordance with AS1768 and will consist of air terminals at the top of the building connected to earth electrodes at basement level via down conductors.

3.16 Earthing

Earthing will comply with AS3000 for an M.E.N. System of earthing.

4 Communications

4.1 Incoming Service

Lead-in cable routes will be provided for up to three service providers, with redundant, diverse paths for provision of incoming services from two (2) different points for redundancy. Lead in conduits will go to each of the Building Distributor Rooms.

Connections will be made to the precinct wide communication infrastructure.

Multi core copper or fibre optic lead-in cables to be provided depending on agreement with the respective carriers.

4.2 Building Distributor Rooms

Two Building Distributor Rooms will be provided for the presentation of carrier services, each 2-hour fire rated and sized to accommodate three carriers' equipment. The rooms will be air-conditioned and suitable for electronic equipment.

4.3 Communications Risers

House communication risers will be provided. The risers will be of sufficient size for main building backbone cabling, data/communications incoming fibre-optic cabling, Master Antenna Television (MATV) and/or Satellite system, security, fire and Building Management Control Systems (BMCS) wiring.

4.4 Communications Roof Top Facilities

A dedicated clear space will be provided for roof top communications with access from the communications cable risers.

4.5 MATV

A MATV backbone will be provided with antenna and head end equipment. The system will be suitable for digital television signals and Pay TV connections.

4.6 Mobile Phone Reception

Coverage will be provided to 100% of the building NLA.

4.7 Retail

Communications wiring shall be run on cable trays in false ceiling areas from the local retail node rooms to each tenancy.

4.8 Public Address System

A public address system shall be provided for the retail areas. This system shall be integrated into the emergency warning system.

4.9 Wireless Internet Provision

Provision shall be made for wireless internet connection within the C3 ground floor public lobby.

4.10 Informatics

Provision will be made to display in C3 public areas sustainable building information.

5 Security Systems

A complete electronic security system will be provided for the base building, consisting of:

- Central supervisory system;
- Access control system;
- Closed Circuit Television (CCTV) system;
- Intruder alarm system; and
- Intercommunication system.

5.1 Central Supervisory System

A building central supervisory system shall be provided and interfaced to the access control, closed circuit television, intruder detection system and intercommunication system. It shall monitor and control various areas of the building. The central supervisory system shall provide flexible control strategies to allow implementation of control measures to suit building operational requirements.

5.2 Access Control

The building will be provided with an access control system, which will control access by proximity card or other approved means to:

- Lifts;
- Car Parks;
- Main Entries;
- Major Plant Rooms;
- Conduits will be provided in the fire stairs for future installation of proximity card access control to allow re-entry on each level (subject to tenant requirements); and
- Allow retail tenants after hours access to their tenancies via designated after hours access points.

The access control system will be linked with the CCTV system, and will be capable of connecting to the internet for remote access and monitoring if required.

5.3 CCTV System

The building will be provided with a CCTV surveillance system. CCTV cameras will provide coverage of:

- All entries and exits;
- Main Lobbies;
- Car park entrance;
- Loading dock;

- All public areas within the building;
- Front of house retail areas; and
- Lift cars subject to further assessment.

The cameras will be of high resolution, and will be connected to a digital recording system; either through Digital Video Recorders (DVR's) or hard drive Local Area Network (LAN) based system. The CCTV system will be interfaced with the access control system. The system will be monitored at a central security station within the building.

5.4 Intruder Detection

All perimeter doors, fire stair doors, plant room doors and access controlled doors will be monitored via reed switches, with monitoring and alarms via the main building supervisory system.

5.5 Intercommunication System

Card reader entry points shall be provided with an intercom system comprising call station and master system.

6 Fire Services

The objectives of the provisions of the BCA for fire fighting equipment and services are to:

- Safeguard occupants from illness or injury while evacuating during a fire;
- Provide facilities for occupants and the fire brigade to undertake fire-fighting operations; and
- Prevent the spread of fire between buildings.

In general the fire detection, emergency warning and fire protection systems for the building shall be designed and installed in accordance with the BCA and all relevant standards.

The design shall be co-ordinated with the overall Fire Engineering solution for the building.

The following fire services systems shall be provided:

- Fire Hydrant and fire hose reel system
- Automatic sprinkler system
- Fire detection and alarm system

6.1 Fire Hydrants, Automatic Fire Sprinklers, and Fire Hose Reel System.

A combined fire hydrant and sprinkler system shall be installed in accordance with the requirements of the BCA, AS2419.1, AS2118.1, AS2118.6, AS2941, Sydney Water and Fire and Rescue NSW.

Fire hose reels will be provided in accordance with AS2441.

The system will be supplied with water from a Grade 1 supply connected to the town's water main and a basement located tank.

Fire Brigade Booster connection points shall be installed and located in compliance with AS2419.1, AS2118.1 and Fire and Rescue NSW requirements or fire engineered solutions. A central water supply tank shall be provided in the basement to supply water to the pump sets for testing purposes. The water shall be recirculated from the test lines back to the tank. Valves shall be installed to isolate the town's main from the pumps for testing purposes.

The test drains for the sprinkler and hydrant riser shall be connected to the test water tank.

With respect to the sprinkler system design, all devices shall be monitored by the Fire Indicator Panel (FIP). The maximum hazard classification on a floor shall determine the design density for that floor. These classifications are likely to be retail ordinary hazard III and commercial office light hazard. The design flow rate for the sprinkler system shall match the most onerous sprinkler demand.

6.2 Fire Pump Sets

Fire pumps shall be installed for the combined sprinkler and hydrant system and comply with the requirements of the BCA, AS2941, Sydney Water and Fire and Rescue NSW. The pumps shall be designed and installed to provide the required water flow and pressures for the various stages of the hydrant and sprinkler systems in the building.

The pumps shall have all control and monitoring equipment as required by the AS2941 and be connected to remote controls in the Fire Control Room. A pump running signal shall raise an alarm at the FIP.

6.3 Fire Detection System

A fire detection system shall be installed within the building as per the requirements of the BCA, AS1670.1, AS1670.4, AS/NZS1668.1 and Fire and Rescue NSW where appropriate.

The detection system shall monitor all devices connected to the fire hydrant, fire sprinkler and fire pump systems.

Ceiling mounted photo optical smoke detectors, probe type photo optical sampling detectors or other proposed detection types shall be analogue addressable.

The FIP shall be located in the Fire Control Room for C3. The system shall be a programmable analogue addressable type. All devices shall be compatible with the FIP. The system shall utilise Data Gathering Panels located at regular intervals within the building.

Depending on the location of the Fire Control Room a mimic panel may be located in the building lobby.

A graphic display panel shall be installed in the Security control room indicting alarms and faults as they occur. System control shall only be available from the main FIP.

6.4 Sound System and Intercom System for Emergency Purposes

A Sound System and Intercom System for Emergency Purposes (SSISEP) shall be installed throughout the building. The SSISEP shall be designed and installed in compliance with the requirements of the BCA, AS1670.1-2004, AS1670.4-2004 and Fire and Rescue NSW.

The SSISEP control panel shall be located in the Fire Control Room for C3.

6.5 Fire Extinguishers

Fire extinguishers shall be provided in accordance with Table E1.6 of the BCA throughout the building and in accordance with AS2444. Generally fire extinguishers shall be located within fire hydrant/hose reel cupboards, adjacent to electrical switchboards and within plant rooms.

The fire extinguishers shall be of the type suitable for the environment in which they are installed. They will be rechargeable hand operated and suitably identified.

6.6 Fire Fan Control Panel

A Fire Fan Control Panel (FFCP) shall be located in the Fire Control Room.

The FFCP shall be connected to FIP and control the automatic activation and shut down of smoke control equipment.

The FFCP shall have manual controls available for fire fighter use. The panel fascia shall have indicator lamps showing the status of the system.

6.7 Distribution Piping and Wiring Systems

The fire services and life safety distribution piping and wiring systems will be coordinated with the architectural design and all other services to follow set services routes throughout the building to conceal services wherever possible and minimise any access issues for maintenance and servicing.

6.8 Passive Fire Protection

All fire services passing through any walls, floors and ceilings required to have a fire resistance level (FRL) rating will be sealed with approved passive fire protection systems to satisfy Section C, Part C3 of the Building Code of Australia, AS1530 and Local Government requirements.

6.9 Fire Safety Management

A comprehensive set of fire safety management and evacuation plans will be developed consistent with all fire protection equipment to be installed and the NSW Environmental Planning & Assessment (EP&A) regulations relating to fire safety.

7 Hydraulic Services

7.1 Introduction

This section provides a description of the intended hydraulic services strategy outlining proposed concepts for the development whilst aiming to achieve the building's Green Star targets.

7.2 Proposed Systems

The systems proposed include the following:

- Sanitary plumbing and drainage;
- Trade waste (where required);
- Grease interceptor system for commercial kitchen waste;
- Stormwater roof drainage;
- Domestic hot/warm water;
- Potable and non-potable cold water;
- Sanitary fixtures, tapware and outlets; and
- Gas supply for plant items and kitchens.

7.3 Codes and Standards

The sanitary plumbing, drainage and water supply systems shall be designed to comply with the requirements of the following, where relevant:

- Relevant Australian Standards;
- Building Code of Australia;
- NSW Code of Practice for Plumbing and Drainage;
- Sydney Water Corporation requirements;
- AGL requirements; and
- Local Council regulations.

7.4 Design Criteria

The design criteria shall include but shall not necessarily be limited to the following:

- Rainwater roof drainage shall be based on rainfall intensity for a 1:100 year average recurrence interval for a storm event of 5 minute duration.
- Complete sanitary system shall be provided to base building areas only. All fitout, retail "shell and core" components of this development shall only be provided with capped waste and vents branch for future fitout connection/s (inclusive of trade waste points).
- Complete domestic hot/warm and cold water system shall be provided to base building only. All fitout, retail "shell and core" components of this

development shall only be provided with valved and capped water points for future fitout connection/s.

- Domestic hot water generally delivered at 60 – 65 °C to temperature control devices within area being served.
- Temperature control of the domestic hot water delivery at respective outlets shall be capable of a maximum temperature setting of:
  - Base Building Areas
    - Male/Female 50 °C
    - Disabled toilets 45 °C
    - Cleaner's room 50 °C
- Thermal insulation to pipework to maintain required water supply temperatures to hot/warm water.
- Acoustic treatment to all pipework services running within sound sensitive areas.

7.5 Water Conservation

Water conservation measures to be incorporated into the building will include the following:

- Reducing town's main water supply;
  - Reuse of fire test drain water,
  - Harvesting rainwater (subject to design development + integration benefits with blackwater system,
  - Building integration with central black water treatment for water reuse
- Reducing water usage in toilets by the use of:
  - Dual flush WCs
  - Low flow urinals or alternatively waterless urinals;
- Reducing water usage by utilising water pressure reducing devices;
- Reducing water usage in basins, sinks, showers etc by utilising low flow tapware and outlets;
- Hot water system management.

The building will be designed to target a 5 Star NABERS water rating through incorporation of these measures.

7.6 Sewer and Sanitary System

The sanitary drainage system will convey wastes from basins, urinals, WC's, showers, sinks, floor wastes and other waste fixtures through a vented single pipe system to the central Barangaroo South black water treatment plant with an overflow discharge extension via gravity system to the local authority sewer main along Hickson Road.

Kitchen waste (where required) will be conveyed from kitchen waste points via a separate vented drainage system to the grease interceptor where it will be conveyed to the black water plant.

Trade waste is to gravitate to a suitably sized grease arrestor located in the common basement.

Connections to be provided to the central black water treatment plant (subject to a separate Project Application).

7.7 Recycled Water System

A central black water treatment plant shall be provided in the common basement of the Barangaroo South development. This shall treat waste water to Grade A standard where it shall be distributed across the development including to building C3. The central recycled water system will enable the C3 building to minimise potable water consumption and minimise discharge to sewer.

7.8 Domestic Cold Water System

Domestic cold water shall be provided from the Authority's main and reticulated throughout the building.

Engagement has commenced between Lend Lease and Sydney Water to provide side wide infrastructure for potable water reticulation. The reticulation system will supply C3 and will be designed and implemented prior to construction commencement.

A C3 water meter room shall be provided containing pumps to meet pressure and flow requirements.

Domestic cold water will be distributed to all fittings requiring potable supply. Each floor level will have a control valve for services isolation. Isolation valves will be installed to isolate the base building fixture groups for maintenance without affecting adjacent fixtures. Domestic cold water will be supplied to all basins, cleaner's sinks, showers, drinking fountains and as a backup for the recycled water system.

It is proposed to serve WCs, urinals where required, irrigation and wash down facilities with recycled water from the central Barangaroo black water treatment plant.

Tenant water potable water connections shall be provided for tenants on each floor for tenant connections at the core. The supply will be capable of metering to Green Star, NABERS and Sydney Water requirements.

7.9 Domestic Hot Water System

Domestic hot water shall be provided to base building areas only.

Hot water is to be generated using gas supplied hot water plant, located in the elevated plant rooms, reticulating via a flow and return system to reduce 'dead legs' and ensure good hot water circulation. The pipework will be insulated against heat loss and provided with adequate allowance for expansion. Each floor

will have an isolation and balancing control lock shield valve on the hot water return line to allow initial setup and subsequent isolation without the need for a rebalance.

Groups of sanitary fixtures will be configured to enable them to be isolated without affecting adjacent fittings. Basins and showers will be provided with thermostatic mixing valves to limit temperature. The return lines will be routed to each Thermal Mixing Valve (TMV) to minimise dead legs.

7.10 Sanitary Fixtures and Tapware

The building will have water saving outlets installed which provide low flow tapware to minimise water use within the property

All fixtures and tapware selected for use on the project shall be high quality commercial water efficiency rating of 4 star WELS or better.

Dual flush WC's will be installed within the building to minimise water consumption. Waterless or low flush urinals will be considered where appropriate.

Disabled toilets will be fitted with sanitary fixtures, tap ware and fittings in accordance with AS3500.

7.11 Natural Gas Service

A new metered natural gas service, located in the gas meter room, will be provided for the building. All gas fitting and natural gas installation will be carried out to AS5601, Gas Supply Authority Recommendations and AGA approvals.

Engagement has commenced between Lend Lease and Gemena to provide site wide infrastructure for the distribution network supply. The distribution network will supply C3. The load demand for C3 is modest and will be primarily required by the retail tenants and to service the central hot water heaters.

The gas shall be supplied to serve the mechanical services heating plant requirements and the domestic water heating requirements with capacity for additional loads from retail outlets and tenant kitchens.

7.12 Stormwater Drainage

Rainwater harvesting within the development will be assessed during the design development to maximise potential water re-use opportunities in conjunction with the central black water treatment plant.

Any stormwater over flows will connect to the new storm water infrastructure being provided in accordance with local Council requirements. All storm water leaving the site shall be treated to best practice. Refer to the Storm Water Management Plan for further details.

8 Vertical Transportation

8.1 Introduction

The C3 development will be provided with modern, high performance vertical lift and escalator systems, designed and installed in accordance with the relevant requirements of the Lift Code AS1735, the Building Code of Australia and Workcover Authority requirements.

All Lifts will incorporate facilities for persons with disabilities, fire brigade operations and stretcher access requirements.

8.2 Vertical Transportation Performance Criteria

The Vertical Transportation design for the commercial tower will achieve a Premium Grade level of service as defined by the Property Council of Australia guidelines summarised below.

Table 3: PCA Performance Guidelines

Element	**Requirement**
Performance Level	Premium Grade
Up Peak Handling Capacity	15% of total building population in any 5 minute period
Target Waiting Interval	< 25 seconds
Car Loading	< 80%
Occupancy	12m² (per person)

8.3 Commercial Tower Lift Design

The commercial tower passenger lift system will consist of 3 separate rises as defined below, (subject to final traffic study assessments).

8.3.1 Low Rise Passenger Lifts Numbered 1 to 9

Table 4: Low Rise Passenger Lifts Numbered 1 to 9

Description	**Details**
Lift Type	Gearless / Passenger
Capacity	1800 kg / 24 Passengers to 2000 kg / 26 Passengers
Rated speed	4 mps to 5 mps
Travel	72.6 m
Levels Served	B2, B1(Loading Dock)(lift no. 9), Ground, Level 1 to level 17
Power / Drive system	VVVF with Regenerative Drive
Special Requirements	Destination Control Service AS1735.12 Facilities for Persons with Disabilities

8.3.2 Mid Rise Passenger Lifts Numbered 9 to 19

Table 5: Mid Rise Passenger Lifts Numbered 9 to 19

Description	Details
Lift Type	Gearless / Passenger
Capacity	2000 kg / 26 Passengers
Rated speed	7.0 mps
Travel	135.4 m
Levels Served	B2, B1(Loading Dock)(lift no. 19), Ground, Level 17 to Level 33
Power / Drive system	VVVF with Regenerative Drive
Special Requirements	Destination Control Service AS1735.12 Facilities for Persons with Disabilities

8.3.3 High Rise Passenger Lifts Numbered 20 to 29

Table 6: High Rise Passenger Lifts Numbered 20 to 29

Description	Details
Lift Type	Gearless / Passenger
Capacity	2000 kg / 26 Passengers
Rated speed	9.0 mps
Travel	194.4 m
Levels Served	B2, B1(Loading Dock)(lift no. 29) Ground, Level 33 to Level 48
Power / Drive system	VVVF with Regenerative Drive
Special Requirements	Destination Control Service AS1735.12 Facilities for Persons with Disabilities

8.3.4 Goods Lift Number 23

The building will be served by a dedicated goods lift as defined below.

Table 7: Goods Lift Number 23

Description	Details
Lift Type	Gearless Class A General Goods
Capacity	2500 kg / 33 Passengers
Rated speed	3.5 mps
Travel	198.6 m
Levels Served	B2, B1(Loading Dock), Ground to Level 48
Power / Drive system	VVVF with Regenerative Drive
Special Requirements	

8.3.5 Car Park Passenger Lifts

The C3 building footprint is not directly above the multi-level basement carpark and an appropriate means will be provided linking the commercial building and basement parking areas.

8.4 Podium

8.4.1 Retail Escalators

Retail areas will be provided with escalators. When selecting escalators, consideration will be given to their operating environment and application as these will largely determine step widths, balustrade heights and the quantum of flat steps provided at transition areas.

Table 8: Escalators

Description	Details
Angle of Inclination	30°
Step Width	1000 mm
Contract Speed	0.5 mps
Drive Type	Variable Voltage, Variable Frequency
Energy Conservation Facilities	Automatic slow speed operation during off peak periods LED lighting

8.4.2 Passenger Lifts – Retail

Suitable passenger lifts will be provided where tenancies span more than 1 level for general (facilities for persons with disabilities) access.

Table 9: Passenger Lifts - Retail

Description	Details
Lift Type	Machine-roomless / Passenger
Capacity	1275 kg / 17 Passengers
Rated speed	1.0 mps
Travel	5.5 m
Levels Served	Ground & Level 1
Power / Drive system	VVVF
Special Requirements	AS1735.12 Facilities for Persons with Disabilities AS1428.2

8.4.3 Goods Lifts – Retail

Retail areas will be provided with a goods lift to serve retail requirements.

Table 10: Goods Lifts - Retail

Description	Details
Lift Type	Gearless Traction
Capacity	2000 kg / 26 Passengers
Rated speed	1.0 mps
Travel	14.9 m
Levels Served	B1(Loading Dock), Ground, Level 1 & 2
Power / Drive system	VVVF
Special Requirements	Heavy Duty Lift Car Finishes

8.4.4 Level 1 Restaurant

The Level 1 restaurant will be provided with a passenger lift to serve their requirements.

Table 11: Passenger Lift - Restaurant

Description	Details
Lift Type	Machine-roomless / Passenger
Capacity	1275 kg / 17 Passengers
Rated speed	1.0 mps
Travel	5.5 m
Levels Served	Ground & Level 1
Power / Drive system	VVVF
Special Requirements	AS1735.12 Facilities for Persons with Disabilities AS1428.2

8.4.5 Function Centre

The function centre will be provided with a passenger lift to serve their requirements.

Table 12: Goods Lifts - Retail

Description	Details
Lift Type	Machine-roomless / Passenger
Capacity	1275 kg / 17 Passengers
Rated speed	1.0 mps
Travel	10 m
Levels Served	Ground & Level 2
Power / Drive system	VVVF
Special Requirements	AS1735.12 Facilities for Persons with Disabilities AS1428.2

8.5 Sustainable Design

The vertical transportation elements will be designed to minimise energy use where practicable. Lifts and escalators shall include Variable Voltage Variable Frequency (VVVF) motor drives ideally with Regenerative Drive feature's which allows the lift to generate power when the out of balance load is assisting the direction of travel. Additional equipment features that will be reviewed to reduce the power consumption of the lift system include:

- High efficiency permanent gearless motors;
- LED down lights, T5 fluorescent or equivalent low energy units;
- Motion sensing / timing devices to turn off elevator car lighting, ventilation fans and dim signalisation screens when the elevator is not in use; and
- Eco mode whereby lifts are parked during periods of low demand.

8.6 Facilities for Persons with Disabilities

All passenger lifts will be provided with facilities for persons with disabilities in accordance with the BCA and AS1735.12 and AS1428.2.

8.7 Lift Security

All lifts shall be fully integrated with the building access security control system and include the following provisions where required:

- Have an electronic data key or swipe card reader which allows for individual floors to be secured or released.
- Have allowance for CCTV cabling within the lift car trailing cables.

8.8 Maintenance Requirements

All equipment shall be of latest technology with a proven reliability and serviceability under the anticipated traffic loads and environment.

Particular attention shall be afforded to the design and layout of equipment to make provisions for suitable maintenance access in line with safe working practices.

8.9 Standards & Design

The lift installation will be developed in accordance with the following standards;

- AS1735 Lifts, Escalators and Moving Walks
- AS1735.12 Facilities for Persons with disabilities
- AS1428.2: Design for Access and Mobility; Part Two: Enhanced and Additional Requirements – Buildings and Facilities
- AS4431 Guidelines for Safe Working on New Lift Installations in New Constructions
- Building Code of Australia

9 Conclusion

Arup has prepared this Building Services Report to inform and accompany the Project Application for the C3 Commercial Building at Barangaroo South.

Our conclusion is that the project presented in the proposed C3 Commercial Building Project Application can be designed and constructed utilising industry standard and proven design and construction techniques.