

NATURAL GAS SERVICING STRATEGY

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1 Introduction

The Barangaroo Precinct is a 22 hectare land parcel located on the north-western edge of the Sydney central business district and the southern end of the Sydney Harbour Bridge at the western shore of Millers Point. The site comprises approximately 1.4 kilometres of Darling Harbour foreshore extending from Johnston’s Bay north to the eastern head of Walsh Bay.

Lend Lease intends to develop the 7.5 hectare southern part of the Barangaroo site to provide approximately 480,000 square metres of mixed use GFA and approximately 2.5 hectares of open space. The project will include a mix of commercial, retail, residential, hotel, cultural and civic facilities along with improved transport infrastructure. The site is generally the southern portions of Lot 3, Lot 5 and Lot 6 in Deposited Plan (DP) 876514. The development area subject to this report is generally known as Blocks 1, 2 and 3 (including associated Public Domain areas) within the Barangaroo Stage 1 Development (hereafter referred to as “the site”).

This strategy encompasses supply of natural gas for tariff only supply. This document does not include any natural gas demand for the proposed onsite power generation facility.

This Servicing Strategy will be provided to Jemena as a part of the application process for each stage of the Barangaroo development. It is the aim of this document to provide an overview of the development and its requirements for gas and service provision for interim and ultimate scenarios.

The Barangaroo development is divided into three main portions of work as indicated in Figure 1.1.



Figure 1.1: Barangaroo Development Overview

2 Scale of Development

Table 2.1 summarises the total Gross Floor Area (GFA) of the development for both Barangaroo South and Central by building type.

AREA Schedule Barangaroo South	GFA / No. Of APARTMENTS
Residential (783 apartments)	99,763 m ²
Hotel	33,000 m ²
Commercial	323,700 m ²
Retail	27,621 m ²
Barangaroo Central	
Commercial	20,000 m ²
Residential	40,000 m ²

Table 2.1: Proposed Floor Area

It is noted the area of the basement is included in the GFA of the buildings included in the above table.

It is proposed to submit an application for the provision of gas service for the entire Development and a separate application for each approved Development Planning Application. At this point of time the approved Development Planning Application are the Basement and the C4 tower.

3 Anticipated Loading Programme

3.1 Natural Gas Supply Demand

Table 3.1 provides estimate of cumulative natural gas requirements set against the expected occupation of each building area within the Barangaroo South and Barangaroo Central development.

SUMMARY GAS SUPPLY	CONNECTED LOAD Mj	Diversified Load Commercial Weighted 7am *	Diversified Load Residential Weighted 7pm *	Comments
Stage 1: First occupation 30/6/2015	58,000	36,955	21,430	First stage of the development includes Tower Building C4, C4 retail and the Basement.
Stage 1A (includes Stage 1)	272,135	148,062	132,621	Progressively required following from that date as per schedule below. Note that 75% of the load is connected by 2018
Stage 1B:	78,316	23,098	62,653	
Barangaroo Central	24,148	10,899	14,668	
TOTAL	374,599	182,059	209,941	

Table 3.1: Natural gas Supply Demands

* Design Diversified Loads are Lend Lease preliminary estimates as described below. To be confirmed by Jemena.

3.2 Diversified Loadings

Commercial Weighted diversity

The diversified loadings to the project have been assessed using two peak diurnal events. The first event is when commercial building loads would be at the greatest. This will occur on cold winter mornings when boilers will be fully operational during early morning building heating. Cooking and domestic water heating will be low. The ratings for commercial weighted diversified loadings are:-

Diversity: 7am	
Building Type	Diversity
Commercial	0.9
Residential	0.3
Retail	0.2
Hotel	0.8

Residential Weighted diversity

A design check was undertaken for peak loading for the residential component. This is expected to be in the evening during peak cooking time. Loadings were based on:

Diversity: 7pm	
Building Type	Diversity
Commercial	0.1
Residential	0.8
Retail	0.8
Hotel	0.8

BARANGAROO PRELIMINARY GAS CONNECTED LOAD AND ESTIMATED ANNUAL GAS CONSUMPTION							
Description	Area / No. Apts	Total Gas Load Mj (No Diversity)	Allowance for Cooking (Includes Balcony Bayonet Fitting for BBQ) Mj	Allowance For Hot Water Mj	Allowanc e for Space Heating (Boilers) Mj	Estimated Total Gas Consumptio n Gj/yr	Peak Gas Consumption Mj/day
Building R1	15	1,650	1,050	600	674	195	5,994
Building R2	60	6,600	4,200	2,400	2,694	780	23,976
Building R3	160	17,600	11,200	6,400	7,184	2,080	63,937
Building R4	135	14,850	9,450	5,400	6,062	1,755	53,947
Building R5	113	12,430	7,910	4,520	5,074	1,469	45,156
Building R6	0	0	0	0	0	0	0
Building R7	68	7,480	4,760	2,720	3,053	884	27,173
Building R8	84	9,240	5,880	3,360	3,772	1,092	33,567
Building R9	63	6,930	4,410	2,520	2,829	819	25,175
Building R10	24	2,640	1,680	960	1,078	312	9,591
Building R11	48	5,280	3,360	1,920	2,155	624	19,181
Sub Total	770	84,700	53,900	30,800	34,575	10,010	307,698
HOTEL (245 Rooms)	m2						
HOTEL	25,000	13,275	4,000	3,500	5,775	2,206	6,045
COMMERCIAL	m2						
Building C1	7,940	2,638	349	105	2,184	336	3,679
Building C2	4,450	1,478	196	59	1,224	188	2,062

**BARANGAROO PRELIMINARY
 GAS CONNECTED LOAD AND ESTIMATED ANNUAL GAS CONSUMPTION**

Description	Area / No. Apts	Total Gas Load Mj (No Diversity)	Allowance for Cooking (Includes Balcony Bayonet Fitting for BBQ) Mj	Allowance For Hot Water Mj	Allowanc e for Space Heating (Boilers) Mj	Estimated Total Gas Consumptio n Gj/yr	Peak Gas Consumption Mj/day
Building C3	107,222	42,300	4,718	1,415	36,167	4,534	49,687
Building C4	100,000	36,300	4,400	1,320	30,580	4,229	46,340
Building C5	82,608	32,300	3,635	1,090	27,575	3,493	38,281
Building C6	4,270	1,418	188	56	1,174	181	1,979
Building C7	0	0	0	0	0	0	0
Building C8	5,300	1,761	233	70	1,458	224	2,456
Building C10	0	0	0	0	0	0	0
Sub Total	323,700	118,195	13,719	4,116	100,361	13,688	144,484
RETAIL	m2						
R1 Retail	892	1062	811	45	206	1,353	7,411
R2 Retail	2,478	2949	2253	124	572	3,757	20,584
R8 Retail	2,478	2949	2253	124	572	3,757	20,584
R9 Retail	3,443	4097	3130	172	795	5,219	28,596
C4 Retail	5,000	19500	18376	200	924	6,064	33,225
C5 Retail	5,000	30000	28314	300	1386	9,095	49,838
C3 Retail	5,000	29000	27595	250	1155	7,579	41,531
R10 Retail	3,330	3963	3027	166	769	5,048	27,658
Sub Total	27,621	93,520	85,759	1,381	6,380	41,870	229,427
Barangaroo Central							

BARANGAROO PRELIMINARY GAS CONNECTED LOAD AND ESTIMATED ANNUAL GAS CONSUMPTION							
Description	Area / No. Apts	Total Gas Load Mj (No Diversity)	Allowance for Cooking (Includes Balcony Bayonet Fitting for BBQ) Mj	Allowance For Hot Water Mj	Allowanc e for Space Heating (Boilers) Mj	Estimated Total Gas Consumptio n Gj/yr	Peak Gas Consumption Mj/day
Barangaroo Central Commercial	20,000	6,644	880	264	5,500	846	4,634
Barangaroo Central Residential	113	12,430	7,910	4,520		1,469	8,049
Sub Total		19,074	8,790	4,784	5,500	2,315	12,683
Basement Hot Water		2,200		2,200		Included above	
Civic Building/Publi c Realm	12,000	3986	528	158	3,300	507	5561
TOTALS		334,951	166,695	46,939	155,891	77,733	710,902

3.3 Project Occupation Dates and Loading Requirements

	Occupation	Total Connected Load Mj (No Diversity)
Building C4	30/06/2015	36300
C4 Retail	30/06/2015	55800
Basement Hot Water	30/06/2015	58000
Building C5	29/09/2015	90300
C5 Retail	29/09/2015	120300
Building C3	23/12/2015	162600
C3 Retail	23/12/2015	191600

	Occupation	Total Connected Load Mj (No Diversity)
Building R7	26/02/2016	202133
Building C2	18/05/2016	203612
Building R1	5/06/2016	205935
R1 Retail	5/06/2016	206997
Building R8	15/06/2016	220009
R8 Retail	15/06/2016	222958
Building R9	15/06/2016	232717
R9 Retail	15/06/2016	236814
Building C8	13/11/2016	238575
Building C6	3/12/2016	239993
Hotel	23/05/2017	253268
Building R11	12/04/2018	260703
Building R2	12/05/2018	269997
R2 Retail	12/05/2018	272947
Building R3	12/05/2018	297731
Building C1	16/09/2019	300369
Building C7	16/09/2019	300369
Building R4	25/05/2020	321280
Building R10	28/07/2020	324998
R10 Retail	28/07/2020	328961
Building R5	13/08/2020	346465
Barangaroo Central Commercial	13/08/2020	353109
Barangaroo Central Residential	13/08/2020	370613
Civic Building	13/08/2020	374599

4 Gas Servicing Strategy

4.1 Proposed Servicing Strategy for ultimate development

Concept design layout for natural gas supply is shown on the drawing No BB1 HD0000003 Revision 01 titled Hydraulic Services Concept – Overall Site Gas Supply Strategy.

The Barangaroo project is divided into three stages, and will be delivered progressively over the next 6-10 years. The three stages are:

1. Barangaroo South Stage 1A
2. Barangaroo South Stage 1B
3. Barangaroo Central (developed by the BDA)

Note that 75% of the total gas load is expected to be connected by 2018.

4.1.1 First Stage Regulator

The proposed servicing strategy is to supply the site from the 1050kPa gas main in Hickson Road adjacent to the site. A boundary regulator is to be provided reducing the pressure to 100kPa for general reticulation around the site as a private distribution main. We seek Jemena's endorsement on reducing the pressure from 1050 kPa to 100 kPa.

The main high pressure regulator for servicing Stage 1 and Stage 1A is proposed to be located off Hickson Road. It is noted that as the project is developed it may be necessary to install multiple 1050-100kPa regulators in the gas room. We require Jemena's advice regarding required regulator arrangement and room size.

The main regulator/metering gas room is proposed to be located at the upper basement level. As the room is located in the basement, it shall be mechanically ventilated with external venting of regulators and equipped with a gas detection and safety equipment in accordance with Jemena's requirements.

It is proposed the 100-7kPa regulators for Basement gas supply and nearby Commercial buildings (C1 and C8) be located in the main gas room.

Future stages, Barangaroo South 1B and Barangaroo Central, are proposed to have dedicated 1050-100kPa regulators.

In Jemena's response to this document, we need a clear delineation of scope of works and funding arrangements of the equipment between the Developer and Jemena.

4.1.2 100kPa Reticulation

The private reticulation within the site is proposed to be 100kPa. Lower pressure reticulation will require very large pipe sizing (greater than 300mm dia) to achieve acceptable pressure losses. As a result of that, lower pressure reticulation has not been considered as practical. The pipework for Stage 1A and Stage 1B will be mostly located within the basement area, generally within general basement loading dock / Carpark area that have mechanical ventilation. 100kPa pipework shall not be located within an unventilated space or within a room that does not have adequate ventilation.

4.1.3 Second Stage Regulators 100kPa-7kPa

It is proposed each building to be serviced with a dedicated 7 kPa regulator for pipe reticulation within the individual building. The location of those secondary regulators could be in a separate room in the Basement or on at ground level on an external wall. We require Jemena’s advice regarding possible location and arrangement of secondary 100-7kPa regulator.

The regulators may be grouped and placed in common regulator rooms.

4.1.4 Contestable Meters and 2.75kPa Regulators

Contestable meters with 2.75kPa regulators will be located within the buildings as follows:

METER	LOCATION
Individual Residential Units	Within each unit
Residential Central Hot Water Systems	Adjacent to the hot water plant, probably at roof level or at ground level or upper basement level adjacent to the building 7kPa Regulator
Retail food tenancies	In each tenancy
Retail Space Heating	If gas space heating is required, it is proposed the meter be located at ground level or upper basement level adjacent to the building 7kPa Regulator
Retail Domestic Hot Water	If central gas water heating is to be provided the meter is proposed to be located at ground level or upper basement level adjacent to the building 7kPa Regulator
Commercial Space Heating	Gas meters will be located at the 2.75 regulator provided in the roof level plant room adjacent to the boiler room
Commercial Domestic Hot Water	Gas meters will be located at the 2.75 regulator provided in the roof level plant room adjacent to the boiler room
Commercial kitchens located in the commercial tower buildings	Gas meters will be located at the 2.75 regulator provided at the level of the commercial kitchen

4.2 Interim Strategy for Approved Developments

The following option has been considered for natural gas supply for the currently approved developments, C4 Tower Building including associated retail and Basement.

Install a high pressure regulator in the proposed main Gas Meter Room as per the ultimate development strategy and a 100kPa gas supply from the main gas room to the C4 gas meter room and Basement meter room.

Jemena's advice is required on gas availability from the existing Jemena's system for the interim supply to the approved developments, C4 and the Basement.

We understand that Jemena as yet have not undertaken detailed modelling for gas supply to building C4 and assessed potential available capacity from the existing gas network in the vicinity of the site,, including required assessment for any required augmentation works.

4.3 Internal 100 kPa reticulation design

The internal reticulation for Stage 1A was modelled using the two diversity scenarios to confirm pipe sizes and pressure losses.

1. Commercial weighted diversity, 7:00am cold winter morning
2. Residential weighted diversity, evening peak cooking 7:00pm.

The modelling output reports will be made available to Jemena if required.

5 Gas Supply Metering Strategy

5.1 Location of the Main Gas Meter Room

It is proposed a main/central Gas Meter Room is provided with nominal dimension 6m x 3m, a room where a master gas meter set and/or regulator set is installed. The location is in the common basement area.

The room shall be mechanically ventilated with external venting of regulators, monitored gas detection system and be provided with electrical safety rating in accordance with Jemena's requirements and Australian Standards.

5.2 Location of Buildings Meter Room

We have identified two possible options for the individual building meter rooms; individual meter rooms for equipment servicing each building and combined meter rooms for equipment servicing number of buildings.

We would like the opportunity to discuss the options with Jemena and obtain advice regarding the required regulator room sizes.

6 Process and Program

Barangaroo South development is proposing to provide natural gas to all buildings and benefit the development with effective, efficient and green energy source.

We are submitting this document, Natural gas servicing strategy, to instigate a formal application process with Jemena for provision of natural gas to Barangaroo South Development.

Lend Lease, the Developer, is seeking a formal response on this preliminary request for service provision in order to understand the availability of natural gas for servicing the initial stage of the development from the existing system and to see the requirements for servicing the whole Barangaroo South development.

In this document, we present our view on gas demand, reticulation option and pressure, location of the main gas room and other natural gas supply elements. We appreciate a formal response from Jemena so we understand the:

- Connections application process and connection requirements
- Infrastructure that would be required to service the development initial and ultimate development stages
- Spatial and technical/access requirements for the master gas meter set and boundary regulator

- Functional responsibility including design, construction, connection, provision of equipment and other required advices by Jemena to Lend Lease
- Developer charges, funding responsibilities
- Program for delivering the works required for the provision of natural gas to Barangaroo South Development

We have noted in the Introduction section that this document doesn't include demand for possible power generation on site; however, we would like to understand the program, time required for provision of natural gas for the proposed Cogen/Trigen facility.

Lend Lease appreciates Jemena's assistance so far and we are looking forward to work together in the future to provide natural gas at Barangaroo in the safest, most efficient and cost effective way.