NSW GOVERNMENT Health Infrastructure

SUTHERLAND HOSPITAL OPERATING THEATRES UPGRADE PROJECT (SHOTUP)

JHA

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DOCUMENT CONTROL SHEET

Title	Infrastructure Management Report – Electrical & Hydraulic Services
Project	Sutherland Hospital Operating Theatres Upgrade Project
Description	Infrastructure Management Report
Key Contact	Alex Hole

Prepared By

Company	JHA
Address	Level 23, 101 Miller Street, North Sydney NSW 2060
Phone	61-2-9437 1000
Email	Alex.Hole@jhaengineers.com.au
Website	www.jhaservices.com
Author	Jordon Galpin & Barry Martin
Checked	Diego Montelvere
Authorised	Diego Montelvere

Revision History

Issued To	Revision and Date								
Stephen Spedding	**REV**	P1	P2	P3					
CBRE	**DATE**	24/07/2020	02/11/20	25/01/21					
	REV								
	DATE								
	REV								
	DATE								

CONTENTS

DOCUMENT CONTROL SHEET 2

CONTENTS 2

1. EXECUTIVE SUMMARY 3

2. INTRODUCTION 3

2.1 ABBREVIATIONS 3

2.2 OPTION 4C 3

2.3 EXISTING SITE SERVICES 4

2.4 PROPOSED SITE SERVICES 4

3. ELECTRICAL SERVICES 5

3.1 ELECTRICAL SUPPLY - NETWORK 5

3.2 ELECTRICAL SUPPLY - GENERATOR 5

3.3 ELECTRICAL SUPPLY – UNINTERRUPTIBLE POWER SUPPLY 5

3.4 ELECTRICAL SUPPLY – MSB3 6

3.5 COMMUNICATIONS – TELCO LEAD-INS 6

4. HYDRAULIC SERVICES 8

4.1 POTABLE COLD WATER 8

4.2 NATURAL GAS 9

4.3 SEWER DRAINAGE & SANITARY PLUMBING 11

5. APPENDIX B – PRESSURE & FLOW INQUIRY 13

1. EXECUTIVE SUMMARY

The Sutherland Hospital Operating Theatre Upgrade Project (TSHOTUP) includes the expansion of the Hospital's Operating Theatre Complex to carry the hospital into the future and cater for the increase in demographics and demand from the residents of the Shire and surrounds.

The expansion of Sutherland Hospital has been identified as a State Significant Development. This report has been prepared in accordance with the requirements outlined in the Secretary's Environmental Assessment Requirements (SEARs) from the Department of Planning and Environment. The relevant services SEARs requirement is outlined below:

- *Prepare an Infrastructure Management Plan in consultation with relevant agencies, detailing information on the existing capacity and any augmentation and easement requirements of the development for the provision of utilities including staging of infrastructure.*

This report has been prepared by JHA Consulting Engineers (Electrical & Hydraulic services) to identify, analyse & conclude the effects of existing infrastructure services & utilities on the proposed development. The primary objective of this analysis is to provide advice on required works anticipated to infrastructure to accommodate the expansion. It should be noted that mechanical & fire services have not been included within this report due to minimal high level interfacing with infrastructure.

This document and related work has been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001 and ISO 14001.

2. INTRODUCTION

2.1 ABBREVIATIONS

Abbreviations	Description
IMP	Infrastructure Management Report
SEARs	Secretary's Environmental Assessment Requirements
CSSD	Central Sterilising Services Department
Existing Stage 1 Works	Expansion works completed in July, 2018
kPa	Kilopascal
m^3	Cubic metres
mJ	Megajoules
MRI	Magnetic Resonance Imaging
PACU	Post- Anaesthesia Care Unit

2.2 OPTION 4C

The diagram below illustrates the endorsed Masterplan Option 4C (source HDR).

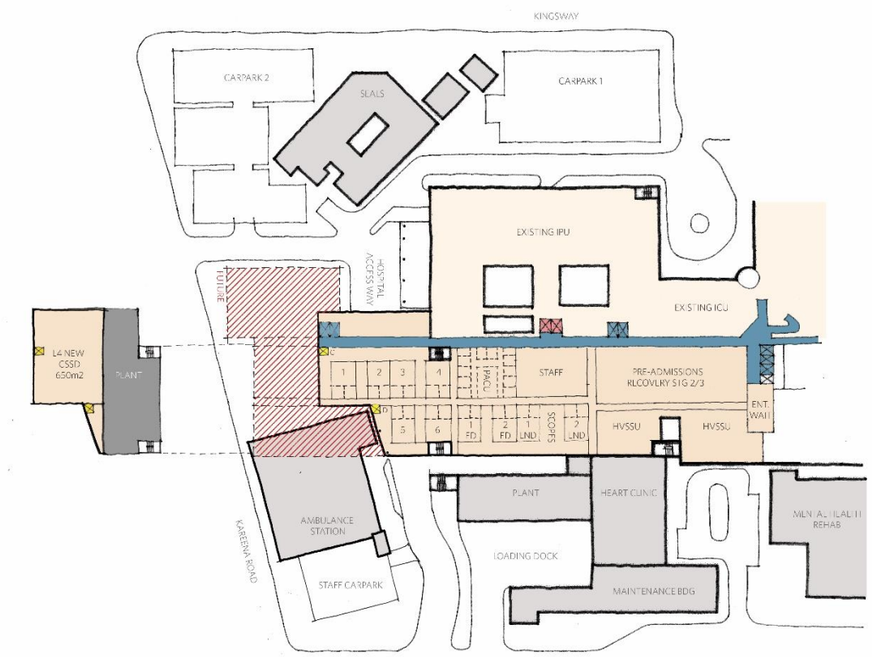


Image 2.1 – Endorsed Masterplan Option

2.3 EXISTING SITE SERVICES

Existing Combined Services Plan

Image 2.3.1 – Existing Site Services

2.4 PROPOSED SITE SERVICES

Proposed Combined Services Relocation Plan

Image 2.4.1 – Proposed Site Services

3. ELECTRICAL SERVICES

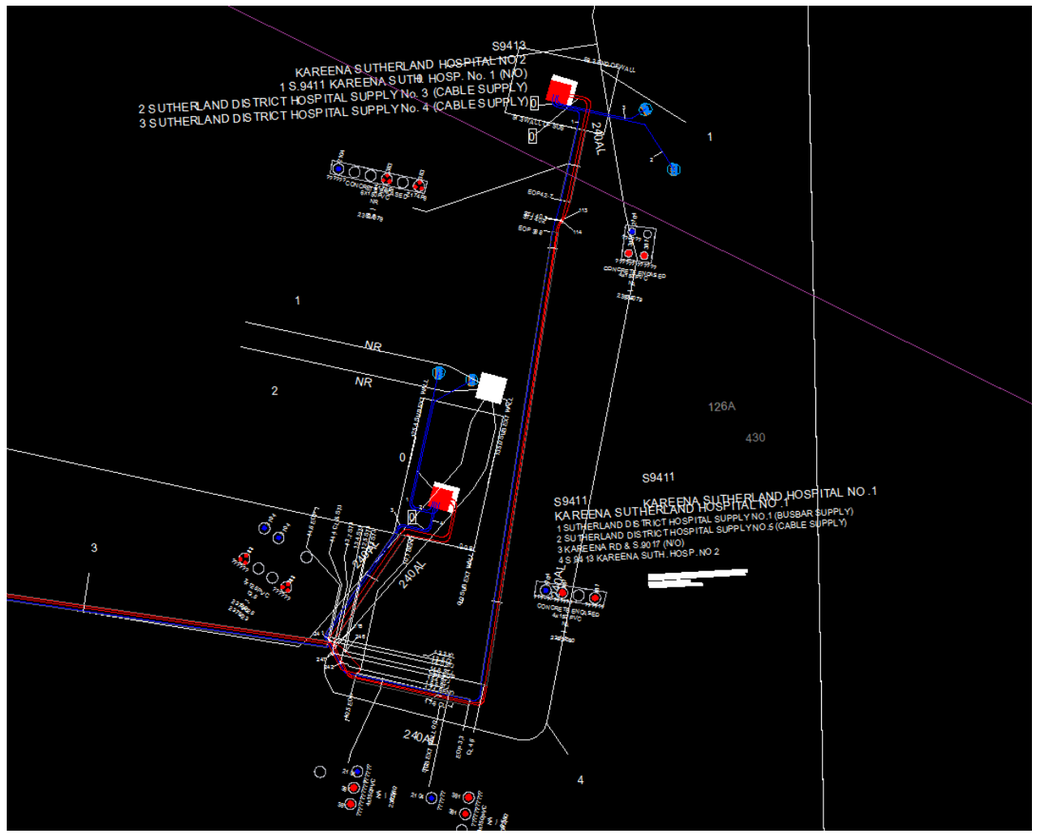
Infrastructure & utilities to be assessed within this REF report include:

- Electrical Supply - Network
- Electrical Supply – Backup Generator
- Electrical Supply – Uninterruptible Power Supply
- Electrical Supply – Main Switchboard 3
- Telecommunications - Carrier Services

3.1 ELECTRICAL SUPPLY - NETWORK

3.1.1 EXISTING INFRASTRUCTURE

The existing hospital is an Ausgrid customer and has two substations serving three main switchboards. Substation S9413 supplies Main Switchboard 1. Substation S9411 supplies Main Switchboards 2 and 3 – all are on level 1. Ausgrid advise that substation S9411 has 1130Amps spare capacity. An excerpt from Ausgrid's GIS is provided below.



3.1.1.1 Proposed Modifications

No upgrade works are proposed at this time for the network power supply system.

3.2 ELECTRICAL SUPPLY - GENERATOR

3.2.1 EXISTING INFRASTRUCTURE

The existing hospital is supported by two 750kVA, prime rated generators that are synchronised and paralleled before supplying loads. Each generator has a peak-recording meter on its output, but as the generators are regularly tested on load banks at full power, these peak-recording meters record the load test current rather than the actual current called on by the hospital.
By summing the maximum demands of the essential sections of all boards we get an indirect measure of the maximum demand on the generator. This figure is 811kVA or 572kW – a little over half the capacity of the generator system. Leaving a 10% margin of capacity, 540kVA of power is available for future growth.

3.2.2 PROPOSED MODIFICATIONS

It is proposed to add a meter to the generator output board to record the maximum demand supplied by the generator to the hospital (i.e. not to record the load bank testing current). This will provide useful information to the engineering department going forward. It is also proposed that the veracity of the metering on the main switchboards is checked by instantaneous measurements. Some meter readings are at the limits of what is likely (e.g. the power factor of some readings is 0.7) so corroboration of their accuracy is warranted.

The existing generator system, as adjudged by summated metering on sub-boards, appears to have sufficient capacity to support the new building and refurbishment works. No upgrade works are proposed at this time for the generator power supply system.

3.3 ELECTRICAL SUPPLY – UNINTERRUPTIBLE POWER SUPPLY

3.3.1 EXISTING INFRASTRUCTURE

A 75kVA UPS (Eaton 93PR) installed immediately outside main switchroom 3, supplies much of the site's communication equipment. It is loaded to only 13.3kVA (maximum demand) leaving 60kVA available for any future work.

5-off 1600W Socomec UPSs currently support theatre lights and 5-off 2400W Socomec UPSs currently support clinical loads within the theatres. These are located in the inter-building link on level 3 (to the south of the theatre area).

3.3.2 PROPOSED MODIFICATIONS

The existing 75kVA UPS will be utilised to supply all new comms rooms. It has ample capacity for this purpose.
A new 100kW UPS will be provided to support the clinical loads in the new and refurbished areas as well as the theatre lighting. It will be located in the level 4 plant room, in a two-hour fire-rated room. The multiple smaller UPSs currently used will be obsolete.

This will reduce maintenance costs and will improve diversity (ie will allow one theatre to draw more than 2400W on the rare occasion that it is needed).

3.4 ELECTRICAL SUPPLY – MSB3

3.4.1 EXISTING INFRASTRUCTURE

Main switchboard 3 is the western-most of the main switchboards and is the best solution for supplying the new building and refurbished areas. It is designed for a full load of 1600A but has a maximum demand to date of 820A – leaving around 780A available for any future development. As per 3.1.1 above, the figure of 820A is also within the spare capacity allowance of the substation that supplies MSB3.

MSB3 has one 800A-rated Automatic Transfer Switch. The maximum recorded demand of the MSB3 essential supply is 290A. There is therefore around 500A of spare capacity available on this ATS which, as per section 3.2.1, is also within the spare capacity allowance of the generator system.

An 800A step-load on the generator system would constitute a 40% step. This exceeds general recommendations for generator loading so if the full 800A capacity of the ATS was to be considered, a degree of sub-load stepping would be recommend to reduce the step.

As MSB3 is proposed to support the new building, this sub-load stepping would be achieved by using the BMS to stagger-start the generator-supported loads.

MSB3 has a number of 250A circuit breaker spaces available on both the essential and non-essential supplies. No 630A spaces are available, however some loads that are less than 250A (eg the above-mentioned UPS) have been installed in 630A spaces, so that if a larger circuit breaker was necessary for any future works, swapping these lightly loaded circuits to 250A spaces would be an option.

No equipment that would require 630A is currently envisaged for the new works. As it stands, the board would need no modification to support the new theatre expansion works except for the addition of new circuit breakers.

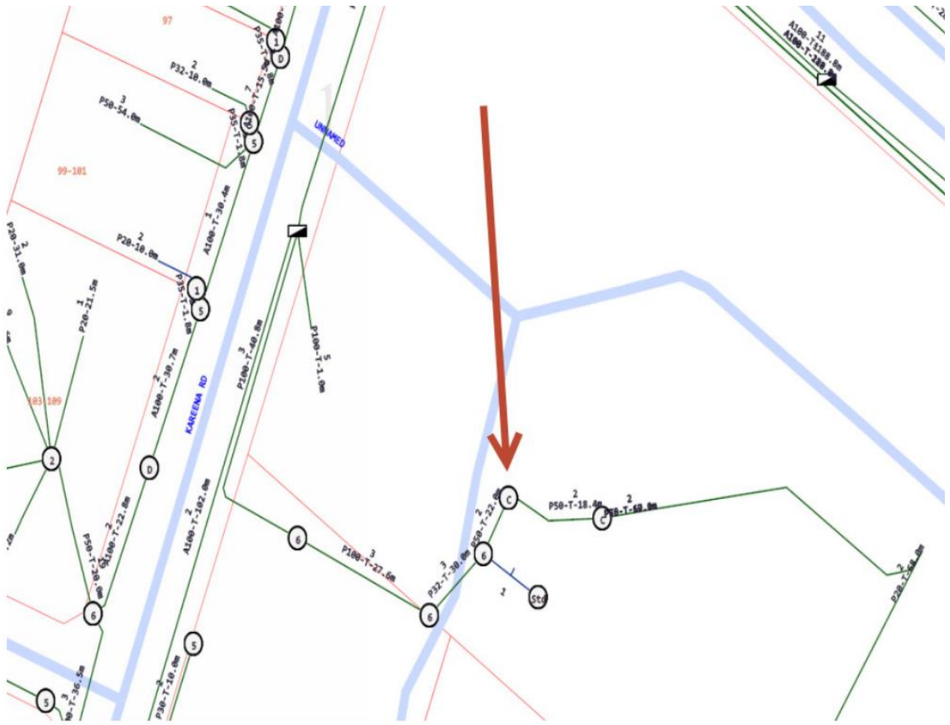
3.4.2 PROPOSED MODIFICATIONS

No upgrade works are proposed at this time for MSB 3 (below) to prepare for the new theatre works. New breakers will be added as part of that project.

3.5 COMMUNICATIONS – TELCO LEAD-INS

3.5.1 EXISTING INFRASTRUCTURE

Currently NBN, Telstra and Optus cable and fibre are buried underground in conduits that run across the site in a manner that does not correlate with boundaries. As such it renders some parcels of land unavailable for future development and exposes the cables to a higher risk of accidental disturbance. The image below is from Telstra's Dial-Before-You-Dig response with the arrowed pits at the edge of the existing hospital.



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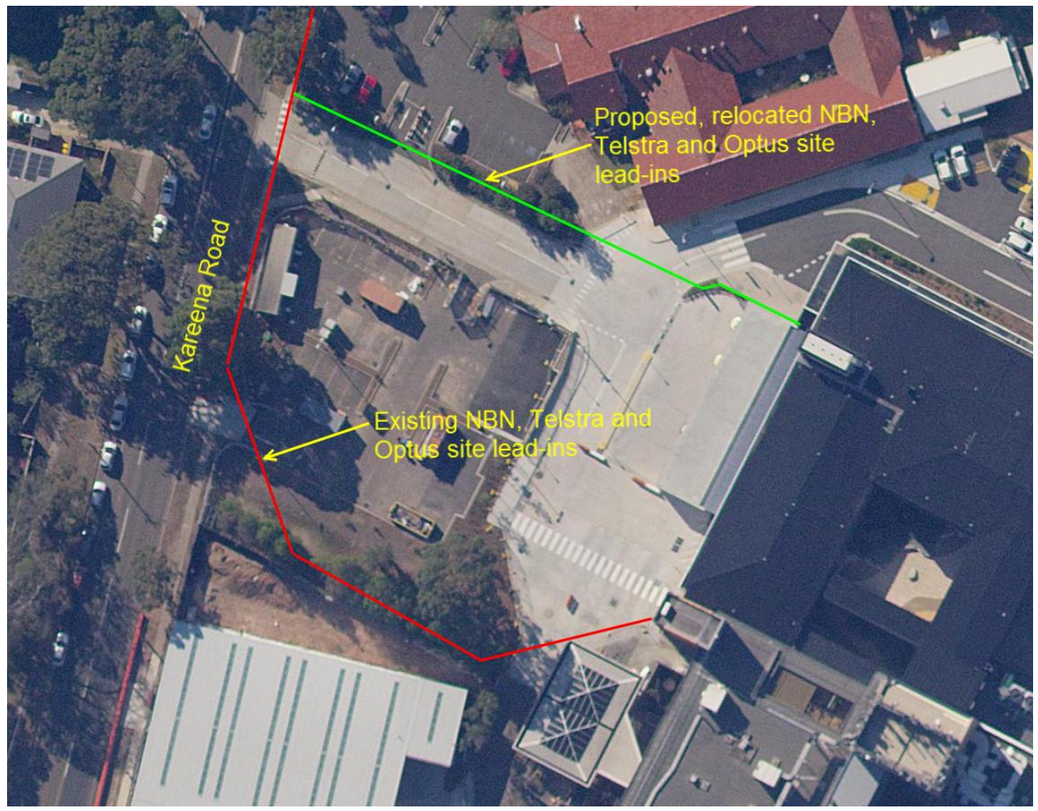


The incoming services are shown by a red line in the image below.

There is evidence of additional Telco cables (notably Uecomm, Lightpipes and TPG) that may also share the route but that did not return a Dial-Before-You-Dig positive response.. The exact route of these are under investigation.

3.5.2 PROPOSED MODIFICATIONS

As the cables and pits are beneath the new building footprint and will need to be relocated at the very least because of road level changes, it is proposed to relocate the three known lead-ins (and possibly others) to the route shown in green below.

The services would be buried beside the incoming road from Kareena Rd at the distance recommended by the NSW Road Opening Conference. Although not strictly a public road, standardising the burial of utilities beside roadways

a) Reduces the chance that they will interfere with any future building works
b) Allows them to be identified more readily when the need arises and
c) Reduces the chance that they will be accidentally disturbed by future work (e.g. installation of light poles, regarding of carparks, stormwater works etc.

The green route is yet to be confirmed as there is anecdotal evidence of a backup Telco service entering the building at the same point. This service is currently undocumented as far as we are aware.

It is recommended that any other utility changes in future should utilise the standardised road-side burial locations recommended by the Street Opening Conference document to minimise the amount of land sterilised by such services.

4. HYDRAULIC SERVICES

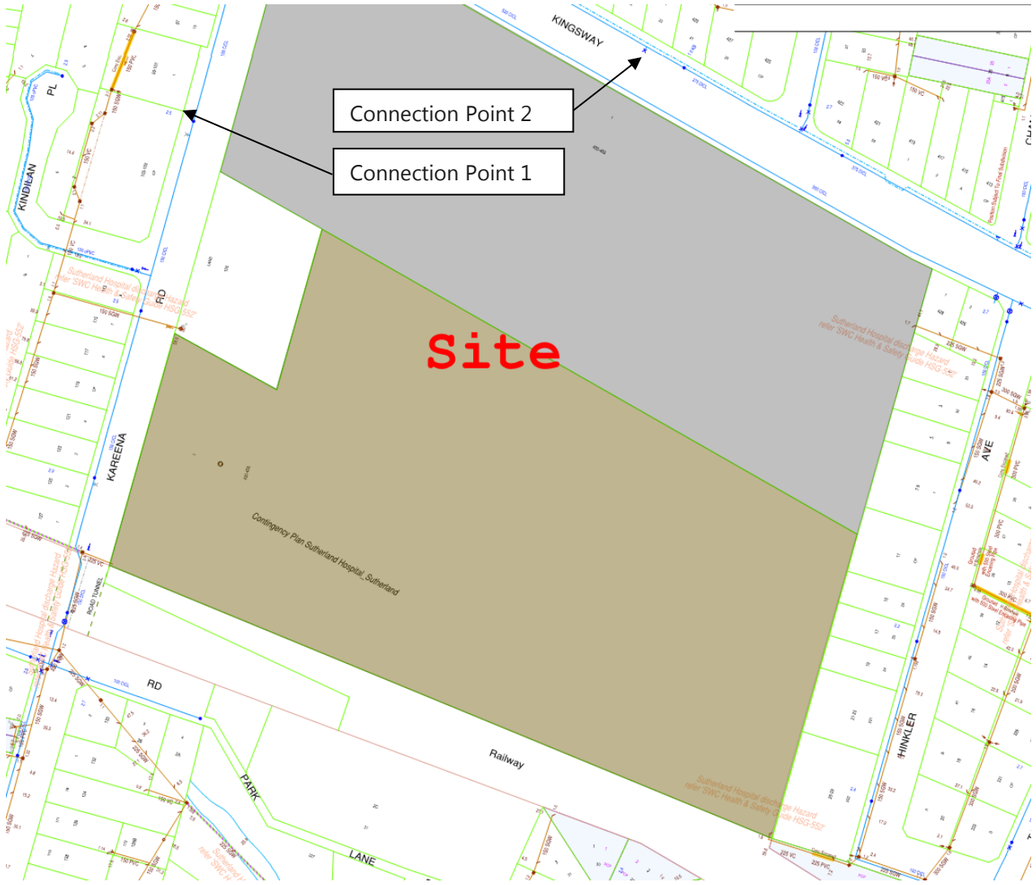
Hydraulic Infrastructure & utilities to be assessed within this IMP report include:

- Potable Cold Water
- Natural Gas
- Sewer Drainage

4.1 POTABLE COLD WATER

4.1.1 EXISTING INFRASTRUCTURE

The existing hospital precinct is supplied from Sydney Water's system via 2 independent connection points, being:
Image 4.1.1 – Potable Water Connection Points



1. Ø150mm connection complete with Ø150mm Water Meter Assembly and Reduced Pressure Zone Device (RPZD), from the existing Ø150mm watermain in Kareena Rd
2. Ø150mm connection complete with Ø150mm Water Meter Assembly and Reduced Pressure Zone Device (RPZD), from the existing Ø375mm watermain in the Kingsway

Each connection point runs into the existing potable water plant room (Level 1), which houses the following:

- Dual automatic backwash filters
- Dual Ultra Violet sterilising units

Upstream of the filters, the following allowances have been made:

- Supply offtake for fire hydrants and sprinkler services
- Provision for future installation of potable water booster pumps

The below diagram provides a schematic representation of the potable water supply to the existing hospital.

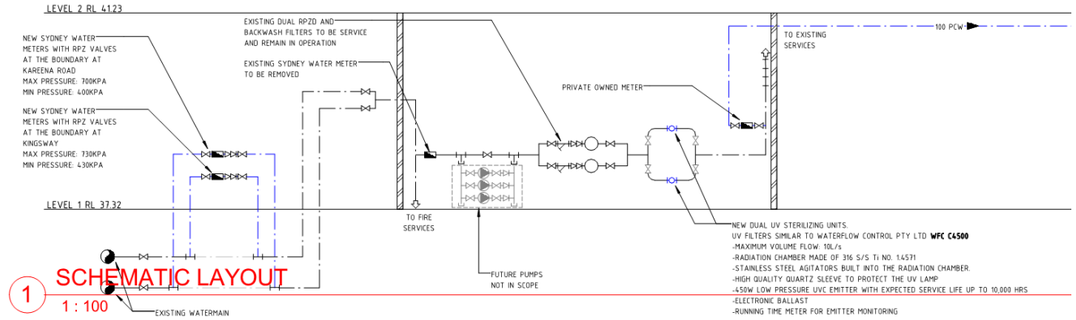


Image *4.1.2 – Schematic Layout of Potable Water Supply*

Image 4.1.3 – Existing authority meter assemblies

4.1.2 PROPOSED MODIFICATIONS

The 2 x existing Ø150 Sydney Water connections described in section 4.1.1 of this report are to be utilised as the primary source of potable cold water for the proposed expansion. It is noted that the Kareena Rd connection is currently closed. JHA propose this connection be opened to allow for dual water feed to the hospital.

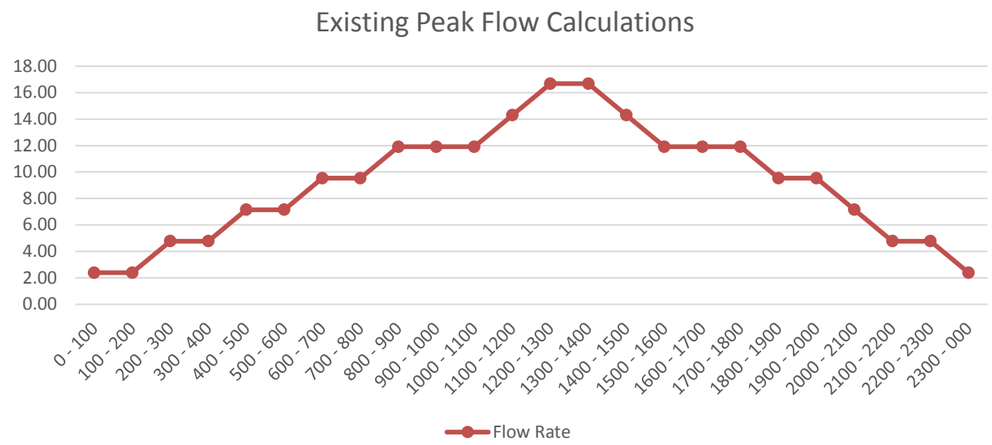
The existing private cold water service running between the main hospital building & ambulance station is proposed to be relocated to the common services trench within close vicinity. This is being completed to improve access to all services & provide flexibility for the hospital should they wish to undertake any expansion works.

4.1.3 LOAD ESTIMATION

Preliminary load estimated indicate that the existing cold-water infrastructure has sufficient flow & pressure capabilities to service the existing hospital's ongoing operations as well as the proposed expansion, as outlined in section 2.2 of this report. This has been verified utilising:

- Pressure & flow statements provided by Sydney Water (refer Appendix B)
- Assessment of existing water meter sizes & their inherent flow rate capacities in-line with AS3500.1

Water bills have been provided to JHA from the hospital with a peak water flow assessed throughout the course of a day as per below graph.



The peak potable cold-water flow rate has been estimated at approximately 13.5 to 16.5L/s, resulting in an estimated water velocity of 2.172m/s. A further slight increase in water loading is expected with the construction of the new expansion & associated refurbishment works. While the existing Ø100 CW service will be able to cater for these loads, a greater drop in pressure is expected during periods of peak usage. Provisions for a cold-water booster pump has been manifolded in the existing plant room completed as part of previous staged works. JHA has been directed by the Expert Reference Group to introduce a new cold water booster pump to provide improved water & flow for fixtures & plant equipment.

4.2 NATURAL GAS

4.2.1 EXISTING INFRASTRUCTURE

The existing hospital precinct is supplied with natural gas from the. Ø100mm 1,050kPa gas main in Kareena Rd, via dual authority gas meter assemblies.

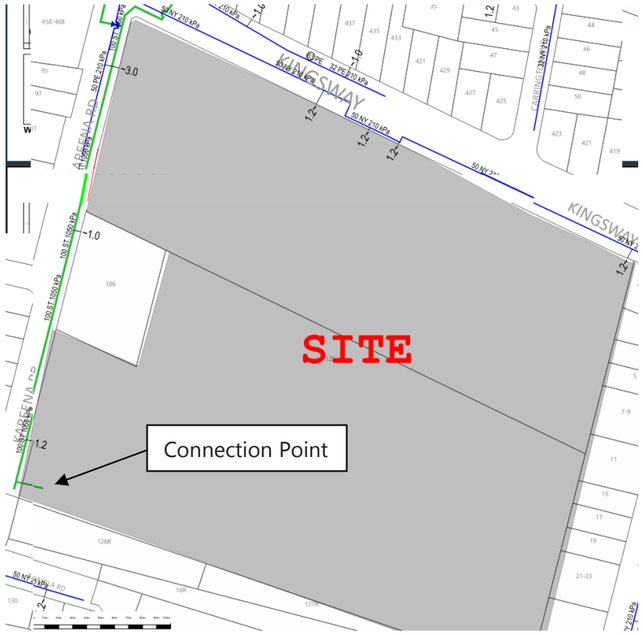


Image 4.2.1 – Existing authority gas connection point (Source DBYD)

Gas is reticulated around the existing hospital precinct from the dual gas meter manifold, via a single Ø100mm service, with the outlet pressure indicated at being 100kPa

Image 4.2.2 – Existing authority gas plant

4.2.2 PROPOSED MODIFICATIONS

The gas authority Jemena do not advise as to the capacity within their street mains for commercial properties, as it need to be negotiated via a retailer. Based on current commercial agreement with Weston Energy, no upgrades works are required to the authority connection to cater for the proposed expansion and refurbishment works.

Compliance issues with relation to the existing 100kPa natural gas service reticulating within the hospital has been identified & raised to the hospital as a latent condition of the site. JHA have proposed a new connection to the private 100kPa service in-ground with the pressure to step-down to 5kPa via an external regulator. This will assist in achieving design compliance for the new build whilst not adjusting the existing gas line. There is no intention of providing a new connection, adjusting of modifying the existing 100kPa gas line inside the hospital to eliminate possibilities of non-compliances carrying over to any new works.

4.2.3 LOAD ESTIMATION

Gas bills provided to JHA from the hospital have allowed for preliminary gas loading calculations to assess the suitability of existing infrastructure to service the new development. Refer to below table for monthly gas data & peak loading assessment.

Bill Cycle	Days	Total Consumption gJ	Total Consumption m^3	Average Daily Consumption m^3	Mean Hourly Consumption m^3	Mean Hourly Consumption mj/hr	Peak Hourly Consumption mj/hr	Peak Hourly Consumption m^3/hr
Jul-19	31	3450	90781	2928.42	122.02	4636.67	9273	**244**
Aug-19	31	3724	97991	3160.99	131.71	5004.90	10010	**263**
Sep-19	30	2656	69904	2330.15	97.09	3689.40	7379	**194**
Oct-19	31	2197	57824	1865.28	77.72	2953.36	5907	**155**
Nov-19	30	1656	43567	1452.23	60.51	2299.37	4599	**121**
Dec-19	31	1351	35563	1147.18	47.80	1816.38	3633	**96**
Jan-20	29	1099	28909	996.85	41.54	1578.35	3157	**83**
Mar-20	31	1526	40149	1295.14	53.96	2050.63	4101	**108**
Apr-20	30	2079	54706	1823.53	75.98	2887.25	5775	**152**
May-20	31	3584	94306	3042.13	126.76	4816.71	9633	**254**

Based on the above calculations, the peak loading expected for the site in its existing condition is approximately 240m^3/hr. The existing gas plant & infrastructure has a capacity of ~265m^3/hr @ a pressure drop of 12kPa. The system has approximately ~8% additional capacity to cater for the proposed expansion.

4.3 SEWER DRAINAGE & SANITARY PLUMBING

4.3.1 EXISTING INFRASTRUCTURE

The existing hospital precinct drains to Sydney Water's sewer drainage system via 3 x connection points, being:

1. Ø225mm connection point at the south-western corner of the site
2. Ø225mm connection point at the south-eastern corner of the site
3. Ø225mm connection point at the north-eastern corner of the site

Image 4.3.1 – Existing Sewer Connection Points

4.3.2 PROPOSED MODIFICATIONS

A portion of the existing sewer infrastructure is to be re-aligned to sit within the common trench of other existing services. This is proposed to improve maintenance, accessibility as well as being co-ordinated with structural slabs & footings for the new extension. Refer to figure 2.4 of this report. The re-aligned sewer service (south eastern connection/ connection point 2) shall serve as the drainage connection point for the new expansion works.

4.3.3 LOAD ESTIMATION

Current Discharge: ~4,600 Fixture units over 2 x Ø225mm connection points.

South Eastern Connection Point: ~2,200 Fixture Units to 1 x Ø225mm connection.

TABLE 3.3.1

MAXIMUM FIXTURE UNIT LOADING FOR VENTED DRAINS

Grade, %	Nominal size of drain, DN						
	65 (Note 1)	80	100	125	150	225	300
5.00	60	215	515	1450	2920	11 900	26 900
3.35	36	140	345	1040	2200	9490	21 800
2.50	25	100	255	815	1790	8060	18 700
2.00	×	76	205	665	1510	7090	16 600
1.65	×	61	165	560	1310	6370	15 000
1.45	×	(50)	(140)	485	1160	5810	13 900
1.25	×	(42)	(120)	425	1040	5360	12 900
1.10	×	×	×	(380)	935	4970	12 100
1.00	×	×	×	(340)	855	4500	11 400
0.85	×	×	×	×	(725)	3850	10 300
0.65	×	×	×	×	(595)	3250	9090
0.50	×	×	×	×	×	×	7720
0.40	×	×	×	×	×	×	6780

A Ø225mm private sewer line at standard grade of 1.0% is capable of handling 4,500 fixture units in accordance with AS3500.2. The hospitals cumulative fixture loading capacity is equal to approximately 13,500 fixture units or ~1,600 beds. Additionally it is noted that connection point 2 is currently running at about 2,200FU's, or 50% capacity.

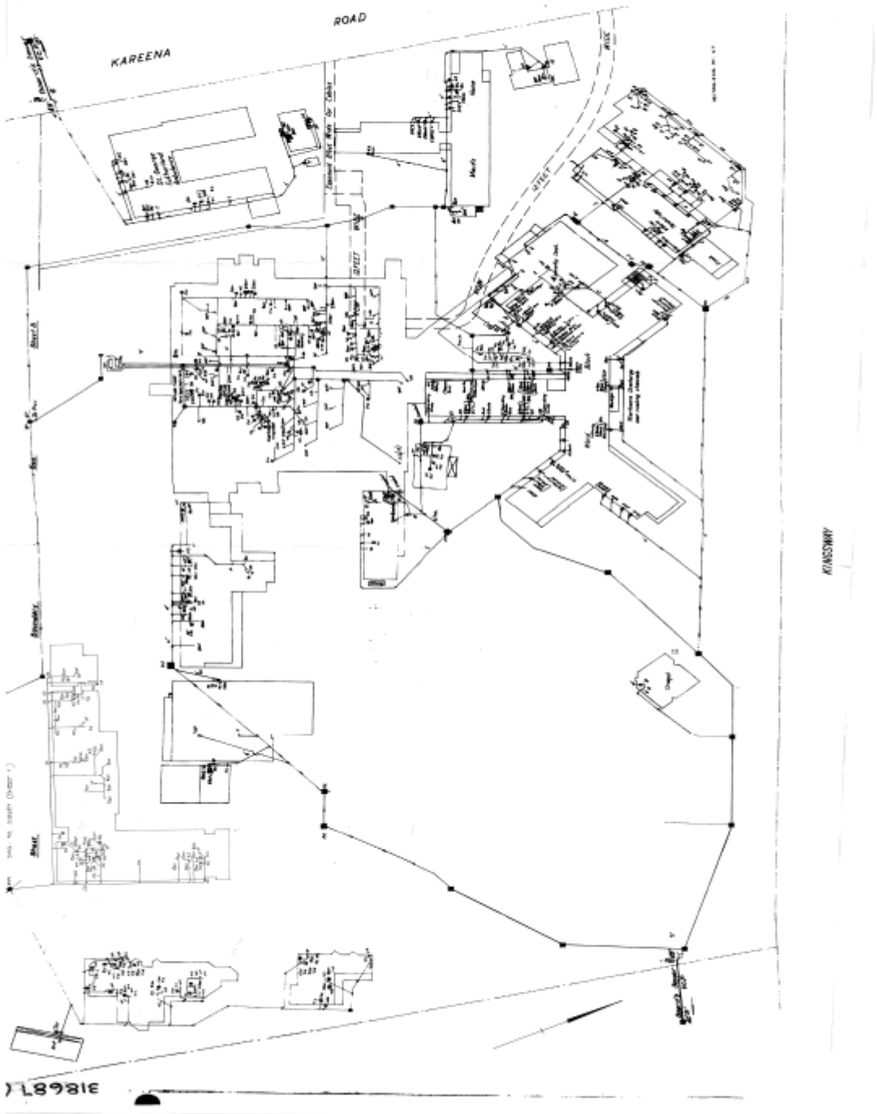
With this kept in mind, no additional sewer connection points are proposed for the site to handle the additional loading from this development. The sites sewer infrastructure has approximately 50% additional capacity for future works.

APPENDIX A – HOUSE DRAINAGE DIAGRAM

Sydney WATER

Sewer Service Diagram

Application Number: 834425



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5. APPENDIX B – PRESSURE & FLOW INQUIRY

Statement of Available Pressure and Flow

Sydney WATER

Diego Montelvere
23 101 Miller Street
North Sydney, 2060

Attention: Diego Montelvere Date: 22/05/2020

Pressure & Flow Application Number: 861904
Your Pressure Inquiry Dated: 2020-05-01
Property Address: 430-456 Kingsway, Caringbah 2229

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Kareena Road	Side of Street: West
Distance & Direction from Nearest Cross Street	55 metres North from Kindilan Place
Approximate Ground Level (AHD):	42 metres
Nominal Size of Water Main (DN):	150 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	70 metre head
Minimum Pressure	40 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	40
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5	52
	10	52
	15	51
	20	50
	30	47
	40	44
	50	39
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5	40
	10	39
	15	38
	20	37
	30	34
	40	30
	50	26
Maximum Permissible Flow	60	21

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

swtapin@sydneywater.com.au

Sydney Water Corporation ABN 49 776 225 038
1 Smith St Parramatta 2150 | PO Box 399 Parramatta 2124 | DX 14 Sydney | T 13 20 92 | www.sydneywater.com.au
Delivering essential and sustainable water services for the benefit of the community

Statement of Available Pressure and Flow

Sydney WATER

Services Sparks
91 George St
Parramatta, 2150

Attention: Services Sparks Date: 16/03/2016

Pressure & Flow Application Number: 26020
Your Pressure Inquiry Dated: Fri, Feb 5, '16
Property Address: 439 Kingsway, Caringbah 2229

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: KINGSWAY	Side of Street: North
Distance & Direction from Nearest Cross Street	20 metres East from KAREENA RD
Approximate Ground Level (AHD):	39 metres
Nominal Size of Water Main (DN):	375 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	73 metre head
Minimum Pressure	43 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	43
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5	55
	10	55
	15	55
	20	55
	26	54
	30	54
	40	54
	50	53
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5	42
	10	42
	15	42
	20	42
	26	41
	30	41
	40	41
Maximum Permissible Flow	50	40

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

connections@sydneywater.com.au

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