Bathurst Hospital Redevelopment

Net Zero Statement

06/09/2024 **Ref: 301351221**

PREPARED FOR:

Andrew Neill

PREPARED BY:

Stantec

Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer	Independent Reviewer	Project Manager Final Approval
1	08/03/2024	Issue for Review	NR, DS, JB, AW	RD	MT	RD
2	06/09/2024	Issue for SSDA	RD	AW	-	RD

Disclaimer

The conclusions in the statement are Stantec's professional opinion, as of the time of the statement, and concerning the scope described in the statement. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. The statement relates solely to the specific project for which Stantec was retained and the stated purpose for which the statement was prepared. The statement is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorised use or reliance is at the recipient's own risk.

Stantec has assumed all information received from the client and third parties in the preparation of the statement to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This statement is intended solely for use by the client in accordance with Stantec's contract with the client. While the statement may be provided to applicable authorities having jurisdiction and others for whom the client is responsible, Stantec does not warrant the services to any third party. The statement may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Contents

List of tables

List of figures

1. Cover Letter and Certification

Attention: Andrew Neill

Dear Andrew

RE: **Bathurst Hospital Redevelopment**
Site address: 361-365 Howick Street, Bathurst, NSW 2795

Pursuant to the provisions of Clause 35C of the Environmental Planning and Assessment Act Regulation the State Environmental Planning Policy (Sustainable Buildings) 2022 requires a Net Zero Statement describing how a project will avoid dependence on fossil fuels.

I Allan Wong of Stantec Australia, Level 9, 203 Pacific Highway, St Leonards NSW 2065

Qualifications
Bachelor of Electrical Engineering

hereby certify: -

The project requires a transition strategy. Evidence provided in Section 4 On-Site Fossil Fuel Usage details each of the fossil fuel systems used and the electrification transition strategy. Further, I confirm that the project incorporates infrastructure, or space for necessary infrastructure, to transition, including consideration of plant, equipment, and ventilation.

To the best of my knowledge all evidence and information contained within this statement is accurate and credible.

Yours sincerely
Stantec Australia Pty Ltd

Allan Wong
Electrical Project Technical Lead

2. Consultant Declaration

PROJECT DETAILS	
Project name	Bathurst Hospital Redevelopment
Application number	SSD-64733959
Address of subject land	361-365 Howick Street, Bathurst
Lot / DP	Lot 100 in DP 1126063
APPLICANT DETAILS	
Applicant name	Health Administration Corporation
Applicant address	1 Reserve Road, St Leonards, NSW 2065
REPORT DETAILS	
Name of report this declaration relates	Net Zero Statement
Report reference no.	2
Report date	05/09/2024
Company name (inc. ABN / ACN)	Stantec Australia Pty Ltd. 17 007 820 322
Author name	Rebecca Dracup
Author qualifications	BEng
Author address	Level 9, 203 Pacific Hwy, St Leonards, NSW
DECLARATION BY CONSULTANT	
Name	Rebecca Dracup
Registration no.	N/A
Organisation registered with	N/A
Declaration	The undersigned declares that the Net Zero Statement: • has been prepared in accordance with the following policy, guidelines, or legislative requirements: - Net Zero Statement Technical Note • contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the Net Zero Statement relates; • does not contain information that is false or misleading; • identifies and addresses the relevant Planning Secretary's environmental assessment requirements (SEARs) for the project; • identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments to which the Net Zero Statement relates; • contains a consolidated summary of the proposed or necessary mitigation measures

Signature	
Date	06/09/2024

3. Introduction

This Net Zero Statement has been prepared by sustainability consulting services on behalf of Health Infrastructure for the redevelopment of the Bathurst Hospital at 361-365 Howick Street, Bathurst.

The site is located at 361-365 Howick Street, Bathurst, in the Bathurst Local Government Area. It is occupied by Bathurst Health Service, a Level C referral facility in the Western NSW Local Health District.

This report accompanies a State Significant Development Application that seeks approval for the construction and operation of a new-build expansion, refurbishment and repurposing works to the existing Bathurst Health Service main hospital building. Proposed works will include:

- A new-build, three-storey health services building expansion (including 1 plant level) to include overnight inpatient accommodation and non-admitted care services and a new hospital front-of house and entrance
- A new-build, two-storey expansion to the Emergency department and Operating Theatres (plus 1 plant level)
- A new-build, single-storey expansion to the existing Cancer Service building – Daffodil Cottage
- Refurbishment and repurposing to areas of the existing hospital
- Site establishment, demolition of some existing structure, cut and fill and remediation works
- Vehicular circulation and car parking improvements
- Tree removal
- Landscape works
- Alteration and amplification of existing hospital plant and services infrastructure
- For a detailed project description, refer to the Environmental Impact Statement prepared by Ethos Urban.

3.1 SEARS Reporting

Item	SEARS Requirement	Relevant Section of Report
9	**Ecologically Sustainable Development (ESD)**	
	o provide a net zero statement (as defined in section 35C of the EP&A Regulation) that includes:	1 Cover Letter and Certification
	- evidence of how the development will either be fossil fuel-free after the occupation of the development commences or transition to be fossil fuel-free by 1 January 2035.	4 On-Site Fossil Fuel Usage
	- details of any renewable energy generation and storage infrastructure implemented and any passive and technical design features that minimise energy consumption.	5 Energy-Efficient Design 6 Renewable Energy Generation and Storage
	- estimations of annual energy consumption for the building and amount of emissions relating to energy use in the building (if information is available).	7 Energy Consumption and Carbon Emissions Calculations

4. On-Site Fossil Fuel Usage

The project uses pre-existing fossil fuel systems to service refurbished areas and the eastern expansion. This section outlines the areas subject to on-site fossil fuel usage, electrification strategies, and confirms that there is sufficient space for the transition. The Bathurst Hospital Redevelopment building systems are capable of operating without on-site fossil fuel combustion in accordance with the Net Zero Statement by 2035, subject to planning approval.

The following identifies the fossil fuel systems used by the project.

	Refurbished Existing Main Hospital Building Areas	**East Expansion** (Health Services)	**Southern Expansion** (Emergency Department)
Domestic Hot Water	Existing gas fired boilers	Electric heat pump	Existing gas fired boilers
Space Heating	Existing gas fired boilers	Electric heat pump	Electric heat pump
CSSD	Electric	N/A	N/A
Kitchen Cooking	Existing gas stoves	Electric	N/A

Where fossil fuel systems have been used, it is principally because:

1. The Bathurst Hospital Redevelopment project does not include replacement of the main hospital building services equipment.
2. The existing equipment is relatively new or has not yet reached its end-of-life. Replacing the existing boilers would be an inefficient use of taxpayer funds.
3. The existing cooking equipment is in a part of the existing main hospital building, in a location which is not part of the Bathurst Hospital Redevelopment project scope.
4. The project has insufficient budget to undertake replacement of building services equipment serving the main hospital building.

There is in excess of 10,000m^2 of outdoor on-grade carparking and landscaping which will still be available on the Bathurst Hospital site after the Bathurst Hospital Redevelopment. This space is more than sufficient for any additional plant space requirements once the transition to electric building systems takes place.

4.1 Domestic Hot Water

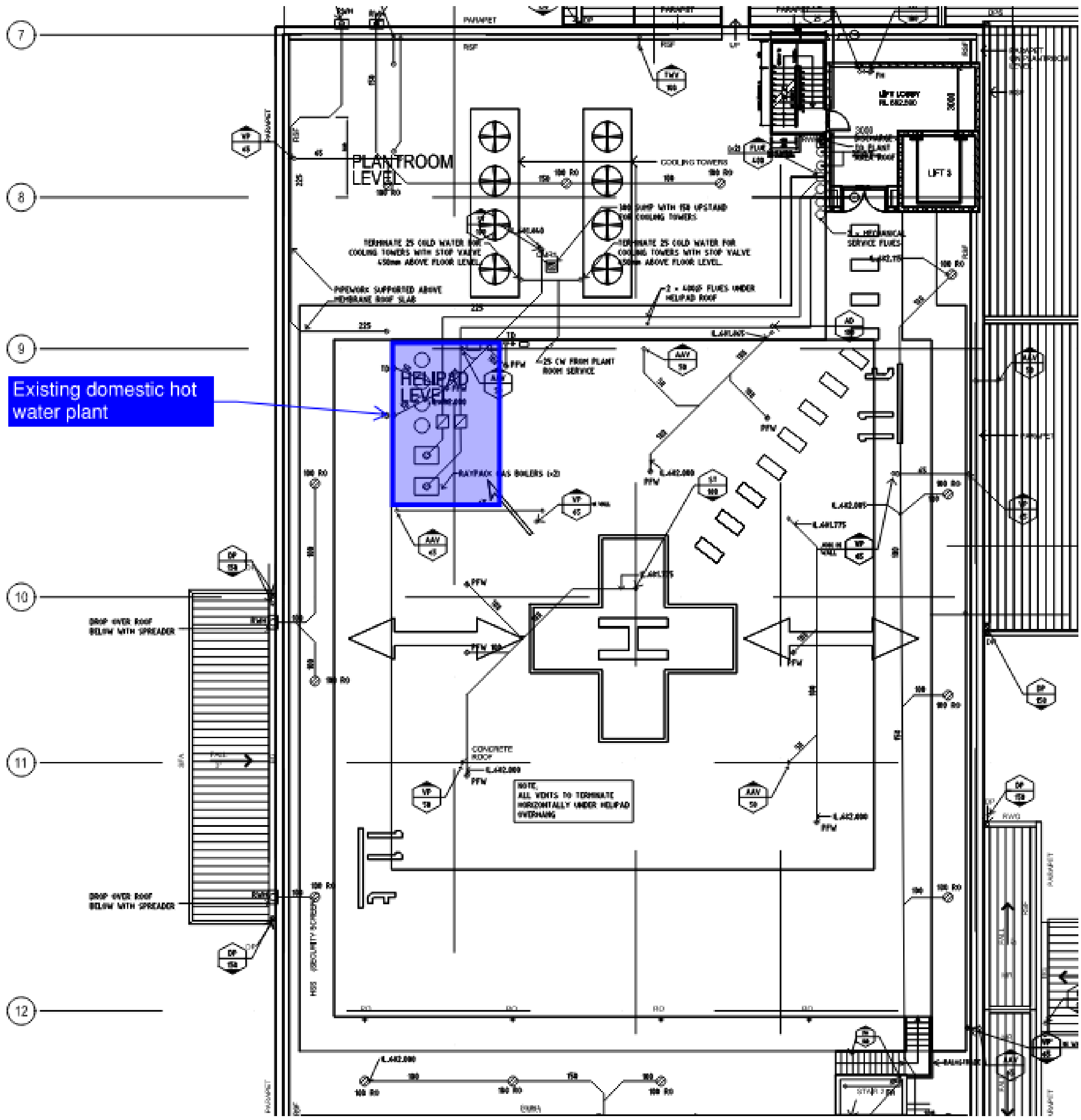
4.1.1 Existing Building Systems

The existing areas of the main hospital building, areas being refurbished and new emergency department (ED) -medical imaging and operating theatre expansion will be connected to the existing domestic hot water system services served by a fossil fuel-dependent system (natural gas) in the Bathurst Hospital Redevelopment project.

Table 1 Existing Hot Water Plant Equipment – Main building

Equipment	Size	Location	No	Make/Model
Gas Boilers	765 MJ/hr (each)	Roof Plantroom	2	Rheem Raypak Model No: 0768NCO/ID Gas indoor
Storage Tanks	325L	Roof Plantroom	4	Rheem Model No: 610340
Warm Water Unit	160L/min (each)	Roof Plantroom	2	Rheem Guardians Model No: 940160

The existing hot and warm water system is located in the roof plant room of the main hospital building.



Existing domestic hot water plant location

4.1.2 Existing Building Transition Strategy

To electrify the main hospital building the existing fossil fuel hot water plant will need to be replaced by electric hot water heat pumps. No replacement or removal of existing warm water system is necessary, it can remain as-is. The proposed hot water plant for the transition consists of electric air to water heat pumps and storage tanks installed with electric boost heating elements as a supplementary heating device.

The proposed heat pumps use either CO2 (R744) or 1234YF as a refrigerant. Both type of refrigerants have a global warming potential (GWP) of equal or less than 1. Selecting these air to water heat pumps reduces the embodied carbon emissions of the design and facilitates an opportunity to target the refrigerant impacts credit in the HI ESD Evaluation Tool Pathway.

Some electric hot water plants require more space compared to gas hot water systems. The existing plant room is shared with existing mechanical equipment and the existing space allocated for gas hot water plant is approximately 25-30m^2. The existing plant room has capacity to accommodate new replacement hot water plant of approximately 45-50m^2, which is sufficient space for electric hot water plant currently on the market. The new expected electrical load to be approximately 200kW. During the future design of the domestic hot water plant transition, coordination with the mechanical engineers for space in the plant room is required.

From the hot water plant there are two existing independent loops, a warm water loop and a hot water loop. The warm water loop reticulates around each level and feed most basins, showers, and patient sinks. The hot water loop feeds dirty utility rooms and other non-patient areas. There is no anticipated work required to upsize the existing hot and warm water loops, they will remain as per current conditions.

Given the above it is concluded that the existing main hospital building domestic hot water systems can transition to be fossil-fuel free by 1 January 2035 as required by the SEARs.

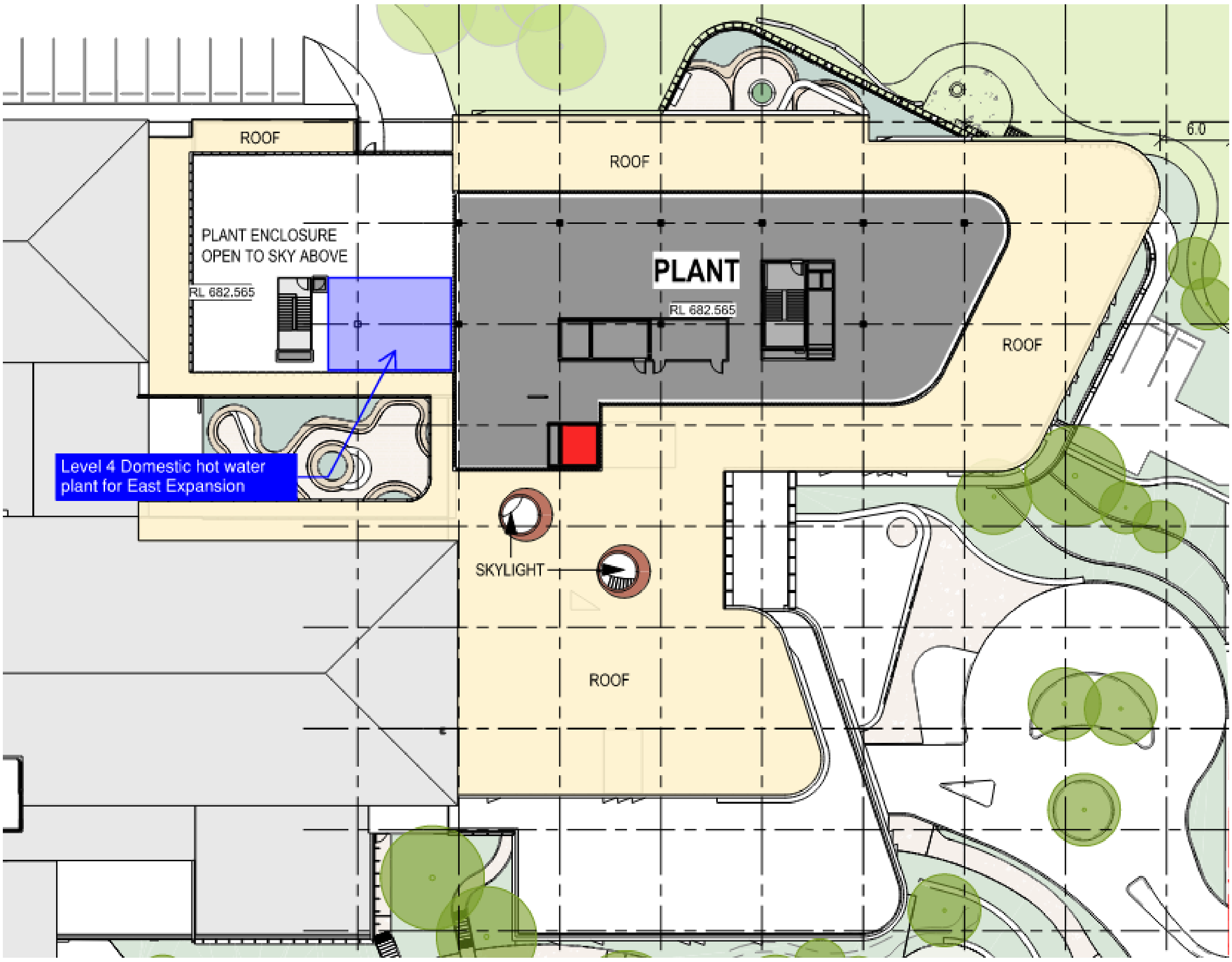
4.1.3 East Expansion Electric Systems

The new east building expansion is served by a new electric hot water plant. The hot water plant will consist of electric air to water heat pumps and storage tanks installed with electric boost heating elements as a supplementary heating device. The hot water plant will occupy approximately 35 m^2 with an approximate electrical load of 140kW. The new hot water plant shall be located in the Level 04 Plantroom space.

The hot water system is to be designed with flow and return pipework reticulation with circulating pumps. The hot is to be reticulated at 65°C to eliminate risks of Legionella and a return pipework is to be sized to have return water at no less than 60°C. TMV monitoring back to the BMS is required. A warm water system is not proposed for the new east expansion.

The proposed heat pumps use CO2 (R744) as a refrigerant. CO2 is a natural refrigerant and has an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of 1. Selecting a CO2 air to water heat pumps reduces the embodied carbon emissions and allows us to target the refrigerant impacts credit in the HI ESD Evaluation Tool Pathway.

The east expansion is designed to operate as fossil fuel free as part of the Bathurst Hospital Redevelopment and therefore does not require a transition strategy.



New domestic hot water plant location

4.1.4 South Expansion Transition Strategy

For the Bathurst Hospital Redevelopment, the new south expansion and existing areas, which are being refurbished, are to be designed with a thermostatic mixing valve (TMV) monitoring system. It is proposed to be served from the existing gas hot water plant. The monitoring system is to be connected to the BMS. The existing main hot water loop in the main hospital building is proposed to be extended to service the south expansion including new ED, medical imaging and operating theatre and refurbished areas.

As the south expansion will be served by the existing gas hot water plant, the transition strategy for this area is as per that outlined in 4.1.2 Existing Building Transition Strategy. The existing plant room has capacity to accommodate new replacement hot water plant of approximately 45-50m^2 and therefore the south expansion can transition to be fossil-fuel free by 1 January 2035 as required by the SEARs.

4.2 Space Heating

4.2.1 Existing Building Systems

The existing main hospital building and Heritage Admin Building (Figure 1) are served by a fossil fuel-dependent system (natural gas). The heating hot water generators are housed within the 470m^2 rooftop plant room. The central heating water generation (HHWG) plant is shown in Figure 2, and the equipment served by the HHWG are detailed in Table 2 & Table 3.

Figure 1 Existing Main Hospital and Heritage Admin Building

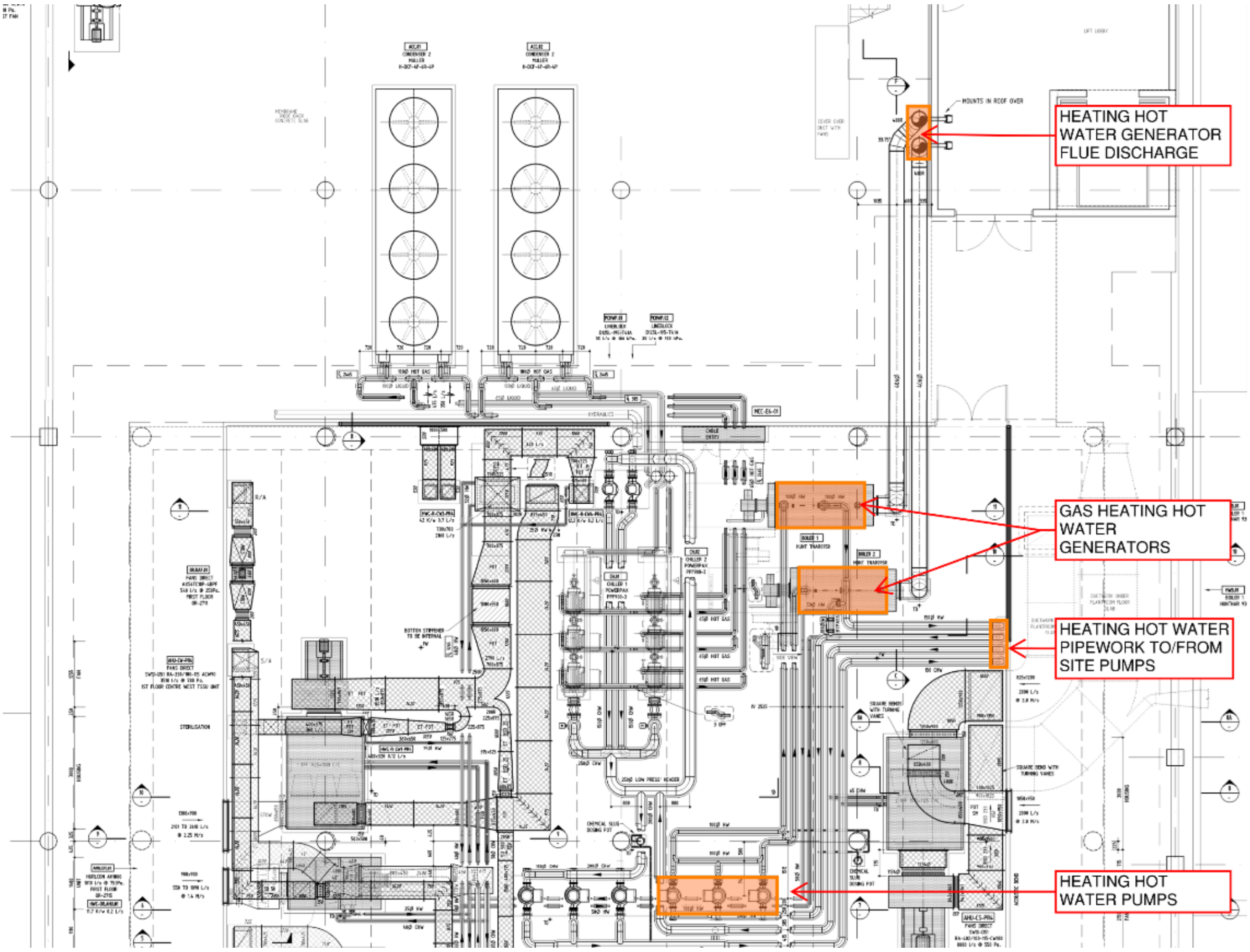


Figure 2 Current Central Heating Hot Water Plant

Table 2 Existing Infrastructure – Main building

Equipment	Tag	Location	No	Make/Model
Heating Hot Water Generators – (MJ/hr 4120 each)	HWB-1/2	Rooftop Plantroom	2	HUNT/TNAR950
Heating Hot Water Coils	HWC-XX	Throughout the hospital	122	Coils Australia
Air Handling Units	HWC-AHU-OR1/2/3/4	Rooftop Plantroom	4	-
Fan Coil Units	HWC-FCU-XX	Throughout the hospital	6	Temperzone
Under Floor Heating Pump	UFHWP-4	Level 1	1	TRUFLO/ L80-235
Heating Hot Water Pumps (2 Duty, 1 Standby)	HWP-1/2/3	Roof Plantroom	3	TRUFLO/L65B-315

Note: Most of the plant equipment is approximately 17 years old

Table 3 Existing Infrastructure – Heritage Building

Equipment	Tag	Location	No	Make/Model
Booster Heating Hot Water Coil	HER-HC-1	Level 1	1	Coils Australia
Air Handling Unit	HER-AHU-1	Level 3	1	Trane
Fan Coil Units	HER-FCU-XX	Throughout the hospital	15	SINKO

Note: Most of the plant equipment is approximately 17 years old

4.2.1.1 Central Plant

Two gas-fired heating hot water generators (HHWG) of 900kw each, located on level 4 plant room (PR4) as shown in Figure 3 & Figure 4, provide heating hot water (HHW) to the main hospital building and the heritage admin building.

Figure 3 Heating Hot Water Generators (PR4)

Figure 4 Heating Hot Water Generators (PR4)

4.2.1.2 Pumps

Three existing HHW pumps set in duty/duty/standby configuration (Figure 5) circulate hot water at temperatures of 80/65°C through 150Ø mm HHW pipework to and from the site. These pumps connect to the space heating equipment which includes, Air Handling Units (AHUs), Fan Coil Units (FCUs), Heating Hot Water Coils (HHWC), and Underfloor Hot Water System (UHWS).

In Plant Room 9 (PR9) on the lower ground (as shown in Figure 6), there is a HHW booster pump that increases water pressure to supply HHW to the heritage admin building.

The main entrance foyer is warmed by an underfloor heating system, which is served by the HHWGs

Figure 5 Heating Hot Water Pumps (PR4)

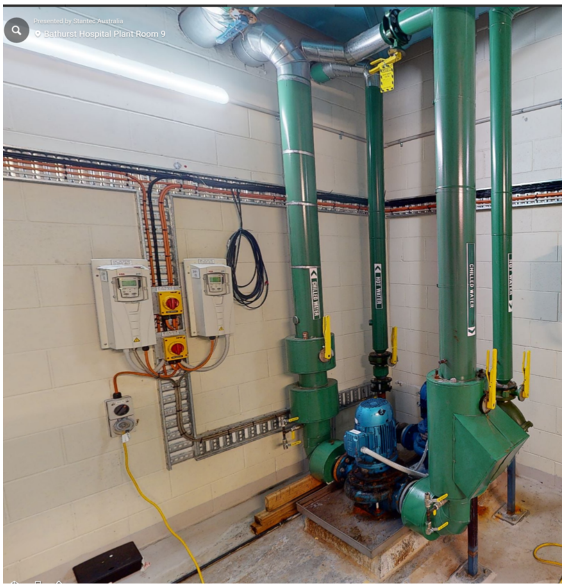


Figure 6 Booster HHW Pumps (PR9)

4.2.1.3 Pipework and Coils

The current HHW pipework which is 150Ø mm, extends from the level 4 plant to all levels of the main hospital and the administrative heritage building. Given the current market, heat pumps can match the existing temperature differential, Stantec anticipates that most of the pipes can be kept in place during electrification, subject to their condition and remaining economic life.

4.2.2 Existing Building Transition Strategy

Electrification of the Bathurst Hospital Redevelopment would require the mechanical heating hot water system to be served by an electric heat pump or similar technology instead of traditional combustion technologies using gas. This will significantly increase the site's electrical load and require an estimated minimum power input of ~800kW, refer to Table 4 Heating Hot Water Heat Pump Options. Note that this peak power input will not occur simultaneously with the cooling load peak and is not a net increase. Further assessment of the heating and cooling loads is required at the time of the design to inform the final mechanical equipment simultaneous electrical load.

This section is focused on reviewing available options, rather than being a design directive. In the current market, there are various technologies for heat pumps that use different refrigerants and configurations with different supply water temperatures. Stantec selected three solutions that could be further explored during the design stage of works when the Hospital is looking to upgrade their central energy plant. Only refrigerants like HFOs and HFCs with low GWPs have been considered.

Table 4 Heating Hot Water Heat Pump Options

Option	Advantages	Disadvantages
Option 1 – High-Temperature Modular Air to Water Heat Pumps	• High supply water temperature ~80°C to match existing • High temperature differential for better efficiency up to 20°C dT • The system can maintain the current water temperatures and flow, enabling the reuse of the current infrastructure, including HHW Coils, pipes, and pumps.	• Maximum capacity of each module is low ~100kw. Hence, more modules will be required which will incur extra costs and more plant space (~70m^2) compared to option 2 • Large external plant area ~160 m^2 • Large power consumption ~ 1300kw • A new substation might be needed to handle the extra electrical load. This is subject to the final equipment for the redevelopment areas.
Option 2 – Medium Temperature Modular Air to Water Heat Pumps	• High temperature differential for better efficiency up to 15°C dT • The system can maintain the current temperature differential and water flow, enabling the reuse of the existing pipework • Less plant area compared with option 1. Approximate 36 m^2 plant area • Low power consumption compared to options 1&3 ~800kw • There is enough existing spare capacity in the substation to cover the additional electrical demand • Total external plant area ~90 m^2	• Medium supply water temperature ~55°C • Water temperatures will be different from the current. This will mean that AHU, FCU and HHW reheat coils should be replaced throughout the hospital • Temporary loss of air conditioning to existing areas as HHW coils will need to be replaced.

Option	Advantages	Disadvantages
Option 3 – Water to water booster systems - TBC	• High supply water temperature ~80°C to match existing • High-temperature differential for better efficiency up to 20°C dT • Better reliability via design simplicity. • Higher total overall plant COPs – those can be further enhanced via hot water reset strategy. • Internal plant area can replace existing HHWG ~60 m^2 required	• New technology, only a few suppliers can offer this option • More power consumption than options 1 & 2 ~1470kw • A new substation may be required to cater to the additional electrical load. Pending confirmation on the redevelopment final equipment selection. • Largest external plant area ~250 m^2

Stantec recommend option 3 to be further investigated during the design stages. The key reason is that this heat pump configuration can accommodate the current water temperature, flow, and system differential temperature. Consequently, most of the existing hot water heating infrastructure, including pipework, coils, and pumps, can be retained. If option 2 is selected, the existing systems listed in Table 2 & Table 3 will need to be replaced. The typical impact of replacing this equipment in clinical areas is represented in Figure 7.

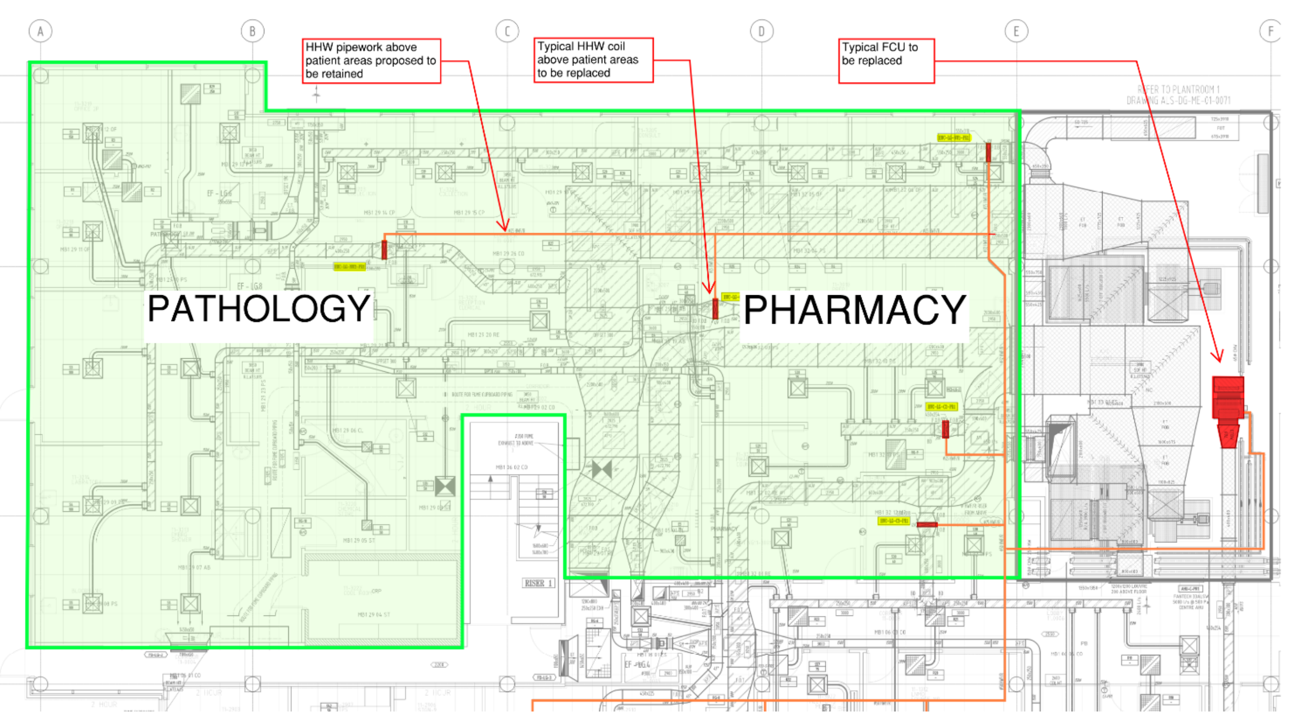


Figure 7 Typical impact of HHW equipment replacement on existing areas - Level 1 Zone 1 (Pharmacy & Pathology)

The size of the existing plant room is sufficiently sized (470m^2) to provide an area which can accommodate the heating hot water plant (~300m^2) and the domestic hot water plant (~50m^2). There is likely to be some shifting of the plantroom walls required to provide ventilation for the heat pumps so that they are located in a well-ventilated or outdoor environment.

4.2.2.1 Mechanical Services Electrical Demand

A gas-fired hot water generator requires minimal electricity as heat is produced through combustion. However, the installation of heat pumps will substantially increase the system's electrical needs as discussed in Table 4. The proposed heat pump system has a rated electrical load of ~1470kW.

Subject to the final equipment installed after the redevelopment of Bathurst Hospital, a new substation might be needed to handle the extra electrical load of the heat pumps, this will need to be further reviewed after the redevelopment is completed. Stantec recommends that the current hot water generator's mechanical services board and supply cable be sized to accommodate this future load.

One of the current HHWG is backed up by the generator for air conditioning. Therefore, it is suggested that the new heat pumps also have a generator backup, like for like. An additional generator may be required to handle the extra electrical load of the heat pumps. The impact of the heat pumps on the generator is to be further reviewed during the design.

The Bathurst Hospital site area contains sufficient spatial allowances for the main hospital building to transition to be fossil-fuel free by 1 January 2035 as required by the SEARs. It may need conversion of part of the existing on-grade carpark. Any additional generators and substations can be located comfortably within the footprint of the existing open-air, on-grade carpark (over 2,000m^2 is available). To retain the same number of carparking spaces, the carpark many need to be converted into a multi-story carpark.

4.2.3 East and South Expansion Electric Systems

No on-site fossil fuel combustion will be used for expansion systems' space heating. Space heating will be provided to the main hospital expansions via a combination of electric heat pumps and direct expansion systems. These systems will use different refrigerants like HFOs and HFCs with low GWPs.

4.2.3.1 Main Mechanical Plant

Figure 8 presents the proposed major mechanical services plants as part of the Bathurst Hospital Redevelopment

- Level 4 – Eastern expansion
- Level 4 - Southern expansion
- Level 1 - Eastern expansion

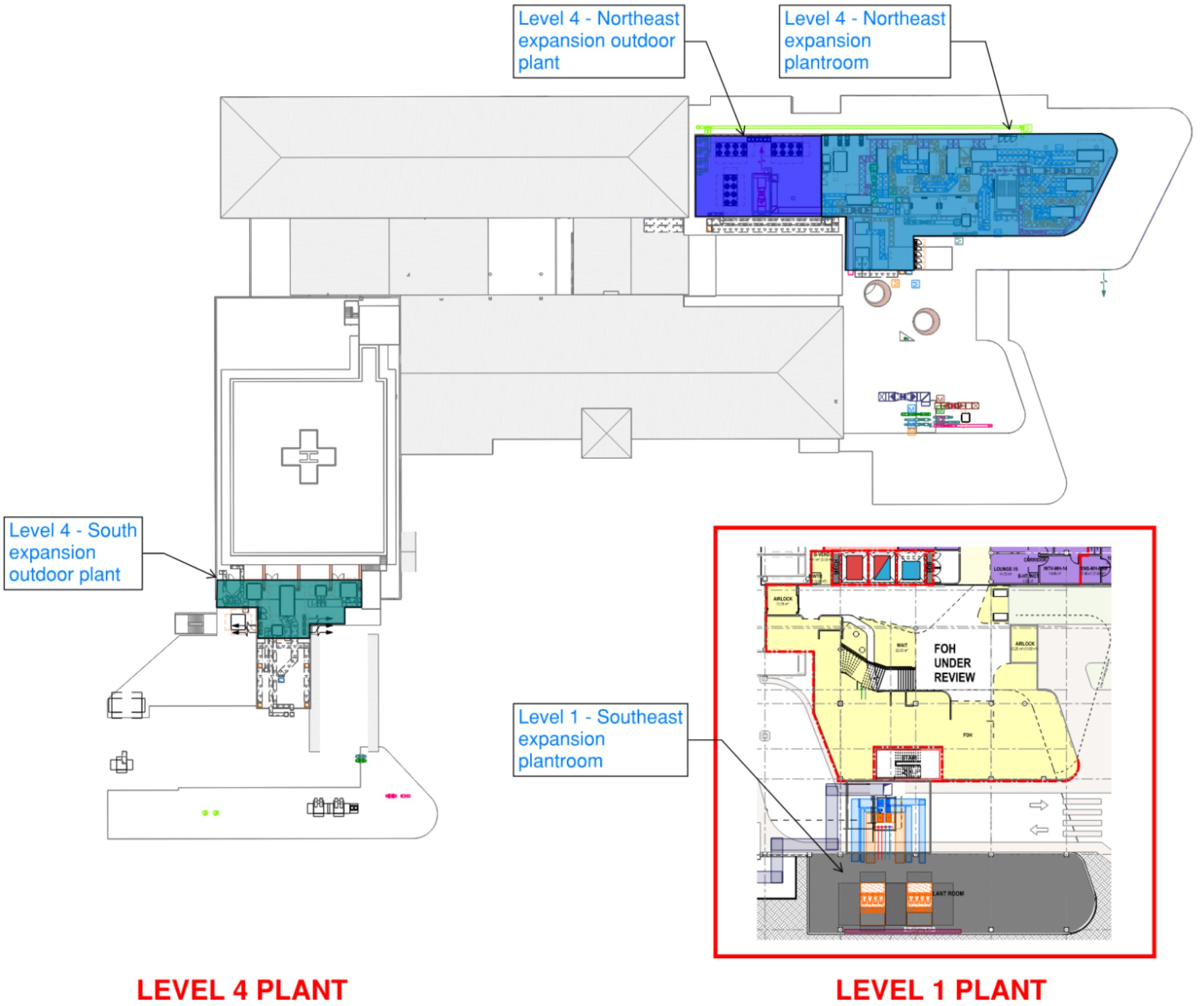


Figure 8 Main Mechanical Plants

4.2.3.1.1 Mechanical Services Plant - Eastern Expansion

The eastern building expansion is proposed to be served by three rooftop air source heat pumps (ASHP) each capable of providing both cooling and heating functions simultaneously, and with a total ~1200kW capacity. These ASHPs are designed with heat recovery capabilities and a primary field pumping configuration.

4.2.3.1.2 Mechanical Services Plant - Southern Expansion

The refurbishment and expansion of the emergency department will utilize both heating hot water and direct expansion (DX) systems. This is to meet the ESG guideline that mandates separate systems for each primary zone of EDs.

4.3 CSSD

4.3.1 Existing Building Electric Systems

The existing CSSD is located on level 3 as shown in Figure 9. The CSSD consultant and LHD have confirmed that current CSSD MME use electric self-steam generating systems as shown in Table 5

Table 5 Existing CSSD Equipment

Equipment	Type	Location	No	Make/Model
Steam Sterilizers	Electrical	Level 3/ CSSD	2	Gentinge/HS 6613 EM-2
Washer Disinfector	Electrical	Level 3/ CSSD	2	Gentinge/WD464
Pass-Through Cabinet	Electrical	Level 3/ CSSD	1	Atherton

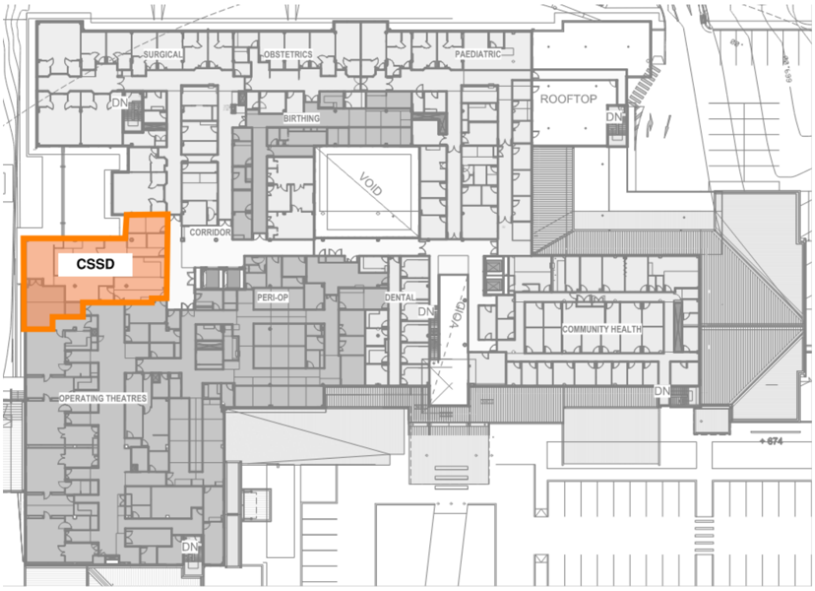


Figure 9 Existing CSSD

Figure 10 Existing Sterilizers

Figure 11 Existing Batch Washers & Pass-Through Cabinet

All new MME listed in SVA (Figure 12) report *BHR_ComplianceAndCapacityAssurance_V1.0* is proposed to be electric with self-steam systems.

SSD Reprocessing Machines:	Model	Capacity Each	Design Qty	Design Capacity/hr	Total Trays/hr
Batch Washers	TBA	10 Tray	3	30 Trays/hr	30
Steam Sterilizers	TBA	8-10 Tray	3	30 Trays/hr	24-30
Low Temperature Sterilizers	TBA	2 Tray	1	2 Trays/hr	2
Scope Reprocessor	TBA	2 bowls	2	8 Scopes/hr	8
Scope Cabinets	TBA	8-10	3	24 Scopes/hr	24
Ultrasonicator	TBA	1-3 Tray	1	1-3 Trays/hr	1-3
RMD Dryer	TBA	8-10	1	8 Trays/hr	8

Figure 12 Extract from SVA report - Proposed MME

4.4 Kitchen Cooking

4.4.1 Existing Building Systems

The existing Main Hospital Building has two areas for cooking, the Catering Kitchen located on level 1 (Figure 13) and the hospital café located on level 2 next to the main entrance (Figure 14).

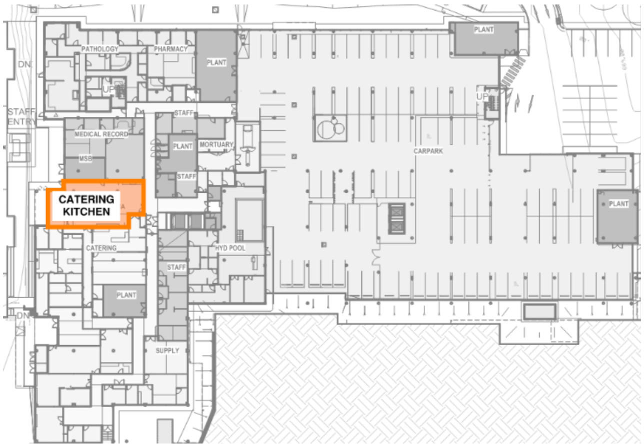


Figure 13 Catering Kitchen

Figure 14 Hospital Cafe

4.4.2 Existing Building Transition Strategy

The existing catering kitchen utilizes fossil fuel (natural gas) for the cooking process. The current kitchen gas-fired equipment is listed in Table 6 and shown in the figures below. The catering kitchen equipment is no longer used as originally planned, on-site cooking is not anticipated in the future and should be disconnected and decommissioned. Should demand to use the catering kitchen equipment begin again in the future this equipment can be disconnected and replaced with an electric type (such as induction) to support a transition to electrification.

Table 6 Existing Fossil Fuel Kitchen Equipment

Equipment	Location	No	Make/Model	Fuel Usage (MJ/hr)
Stovetop with convection oven	Ground Level Catering Kitchen	1	WALDORF/RN8610GC	198
Griddle Cooktop	Ground Level Catering Kitchen	1	WALDORF/RN8609G-LS	63
Salamander	Ground Level Catering Kitchen	1	WALDORF/SN8200G	31.5
Deep Fryer	Ground Level Catering Kitchen	1	WALDORF/FN8120G	90

Figure 15 Stovetop with convection oven

Figure 16 Salamander

Figure 17 Griddle Cooktop

Figure 18 Deep Fryer

4.4.3 East Expansion Electric Systems

The Bathurst Hospital Redevelopment will replace the existing hospital café with a new one. All the cooking equipment in the new hospital café will be electric, and design will be undertaken by the F&B Designer.

5. Energy-Efficient Design

The below list outlines the passive and technical design features that minimise energy consumption for the Bathurst Hospital Redevelopment. It covers only the scope of work covered by the Bathurst Hospital Redevelopement, not the future redevelopment for the electrification transition.

The building envelope thermal performance (roof, walls, floors, glazing) will be designed in accordance with energy efficiency requirements of NCC Section J 2022 Part J4. This will include the specification of compliant levels of building fabric thermal insulation, consideration of thermal bridging and utilisation of high-performance glazing.

In accordance with Section 2.5.10 of the NSW Health Infrastructure – Engineering Service Guidelines (ESG), the project is also targeting an improvement against the minimum NCC 2022 Section J provisions. The standard identifies an improvement of 10% in "energy efficiency compared to a baseline of NCC 2022 Section J compliance applicable to the development".

Bathurst Hospital minimises energy consumption with the following energy efficient design features:

- **Architecture -** Vernacular architecture principals, designed to maximise the specific needs of all occupants and users of the building. The building is designed to deliver comfort, practicality, connection to the outside through views and energy conservation with its architectural design intent. The development will also offer fresh air and daylight access to occupants in many forms to indoor spaces.

- **Shading and Blinds** – Design of external shading and use of internal blinds will reduce direct solar gains, control radiant heat and increase comfort without compromising the connection to the outside.

- **Glazing** – Considering high performance glazing, to exceed the thermal requirements of the Building Code of Australia.

- **Thermally Efficient Construction** – Consideration of thermal mass, insulation where required and the lack of insulation where beneficial. Airtightness in the façade design to reduce bulk airflow, a pragmatic approach to wrapping the entire building to exceed code requirements and using the appropriate colours and finishes.

- **Efficient HVAC System** – Selection of efficient HVAC systems with high COPs, appropriately designed to meet the needs of the internal loads. HVAC systems will require adequate efficiency, with economy cycle to promote energy efficiency in the design. It is recommended to use floor diffusers for air conditioning of common room to reduce the volume of conditioned area in space. This will contribute to *E1: Target to save energy across all government sites* of the GREP. Further details regarding energy efficient HVAC system is provided in separate *Net Zero Statement*.

- **Photovoltaic System** – Incorporating a roof-mounted PV system to reduce the energy consumption and Carbon Impact. This will contribute to *E3: Whole-of-government solar target* as required by the GREP, address NCC 2022 J9D5 requirements, and renewable energy requirements as per Sustainable Buildings SEPP. Further details regarding Solar PV system is provided in separate *Net Zero Statement*.

- **Water Efficient Fixtures and Fittings** - Selection of low-flow showers and taps, which will reduce the hot water demand across the development associated with showering, sinks and hand basins. This responds to *W3: Minimum standards for new water-using appliances* of the GREP.

- **Efficient Lighting Systems** – Providing high efficiency LED lighting with lighting controls including timers and occupancy sensors to reduce the demand on the lighting system.

- **Energy Efficient Appliances** – Specifying high energy star rated refrigerators/freezers and dishwashers to improve general building energy use, minimum ratings (as per *E3: Minimum Standards for New Electrical Appliances and equipment* of the GREP) include:

    - Refrigerators - 2.5 Stars
    - Dishwashers – 4 stars
    - Fridge/freezers – 3.5 Stars
    - Freezers – 3 Stars
    - Televisions – 5 stars

Computers, printers, photocopiers and DVD players will have an Energy Star label recognising high efficiency.

- **Smart Energy Metering and Monitoring** - Metering shall be designed to meet metering guidelines under the weights and measurement legislation, as outlined under the current National Measurement Regulations and requirements as per NCC 2022 J9D3. Metering to be provided to each floor and for any single loads exceeding 5% of the total energy use, or 10% of the total water use.

- **Electric Vehicles Infrastructure**- Facilities of electric vehicle charging equipment and future proofing (power and communication conduits) for 2% of the total number of car spaces shall be provided as per the requirements of HI's *DGN 046 Electric Vehicle Charge Points in Hospital Carparks* and NCC 2022 J9D4.

6. Renewable Energy Generation and Storage

The proposed solar PV array for the Bathurst Hospital Redevelopment has an estimated rated electrical output of 200kW. The solar PV system will be located on the roof of the existing hospital main building and the east and south expansion roof areas.

No on-site renewable energy storage initiatives are proposed.

7. Energy Consumption and Carbon Emissions Calculations

The following sections provide calculations for the estimated annual energy consumption and greenhouse gas emissions related to energy use in the building. Energy software (IES VE 23) has been utilized to simulate the Bathurst Hospital Redevelopment's energy consumption.

7.1 Modelled Energy Consumption

The modelled energy calculations table below provides the estimated annual energy consumption for the Bathurst Hospital Redevelopment. These figures are limited to the scope of the Bathurst Hospital Redevelopment but exclude space heating of existing spaces being refurbished as sufficient information for these spaces is not available.

Building System	Electricity Consumption (kWh/yr)	Fossil Fuel Consumption (MJ/yr)
HVAC		
Heating	653,251	
Cooling	279,279	
Heat Rejection	8,218	
Air Conditioning Fans	645,963	
Mechanical Ventilation Fans	626,690	
Pumps	20,185	
Services		
Domestic Hot Water	109,111	624,075
Vertical Transport	11,060	
Artificial Lighting	391,794	
Photovoltaic (200kW)	-280,436	
TOTAL	2,465,114	

7.2 Modelled Carbon Calculations

The table below provides the estimated direct (scope 1) greenhouse gas emissions related to on-site combustion for the existing domestic hot water plant servicing the south expansion of the Bathurst Redevelopment Project.

Table 7 Scope 1 Direct Greenhouse Gas Emissions Estimation

Building System	GHG Emissions (kgCO2e)	Proportion of total
Services		
Domestic Hot Water	32,159	100%
TOTAL	32,159	

The table below provides the estimated indirect (scope 2) greenhouse gas emissions related to electric energy use in the Bathurst Redevelopment Project. These figures are limited to the scope of the Bathurst Hospital Redevelopment but exclude space heating of existing spaces being refurbished as sufficient information is not available.

Table 8 Scope 2 Indirect Greenhouse Gas Emissions Estimation.

Building System	GHG Emissions (kgCO2e)	Proportion of total
HVAC		
Heating	555,002	23.8%
Cooling	237,275	10.2%
Heat Rejection	6,982	0.3%
Air Conditioning Fans	548,810	23.5%
Mechanical Ventilation Fans	532,436	22.8%
Pumps	17,149	0.7%
Services		
Domestic Hot Water	92,701	4.0%
Vertical Transport	9,396	0.4%
Artificial Lighting	332,868	14.3%
Photovoltaic (200kW)	-238,258	
TOTAL	2,094,361	

stantec.com/au

Stantec Australia Pty Ltd
Level 9, The Forum,
203 Pacific Highway
St Leonards NSW 2065
Tel +61 2 9496 7700