HEALTH INFRASTRUCTURE

# Ecologically Sustainable Development

## Bathurst Hospital Redevelopment

31-Jan-25

Version Number 07

SSDA

NSW GOVERNMENT

## 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 | Ecologically Sustainable Development Report |
| Report reference no. | |
| Report date | 30/01/2025 |
| Company name (inc. ABN / ACN) | Stantec Australia Pty Ltd. 17 007 820 322 |
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| **DECLARATION BY CONSULTANT** | |
| Name | Rebecca Dracup |
| Registration no. | N/A |
| Organisation registered with | N/A |
| Declaration | The undersigned declares that the Ecologically Sustainable Development Report:<br>• has been prepared in accordance with the following **policy, guidelines, or** legislative requirements:<br>- Planning Secretary's Environmental Assessment Requirements (SEARs)<br>- NSW Environmental Planning and Assessment Regulation 2021<br>- NSW Government Resource Efficiency Policy<br>- National Construction Code (NCC) 2022 Amendment 1<br>- Health Infrastructure Design Guidance Note (DGN) No.058 Rev C 2023 – Environmentally Sustainable Development<br>- Health Infrastructure (HI) ESD Evaluation Tool<br>- Bathurst Regional Development Control Plan (DCP) 2014<br>- State Environment Planning Policy (SEPP)- Sustainable Buildings 2022<br>• contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the Ecologically Sustainable Development Report 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 Ecologically Sustainable Development Report relates;
- contains a consolidated summary of the proposed or necessary mitigation measures

| | |
|---|---|
| Signature | |
| Date | 31/01/2025 |

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# Version Control

| Version | Date | Issue to | Description |
|---|---|---|---|
| 1 | 04 August 2023 | Andrew Neil | Issue for Business Case |
| 2 | 02 February 2024 | Andrew Neil | Issue for SD |
| 3 | 16 February 2024 | Andrew Neil | Issue for SSDA |
| 4 | 26 April 2024 | Andrew Neil | Updated with HI Sustainability Advice for Final Business Case |
| 5 | 27 August 2024 | Andrew Neil | Updated for SSDA |
| 6 | 23 January 2025 | Andrew Neil | Updated for SSDA |
| 7 | 31 January 2025 | Andrew Neil | Updated for SSDA as per HI Comments |

# 1. Executive Summary

This HI Sustainability Plan has been prepared on behalf of Health Infrastructure c/- TSA for the Bathurst Hospital Redevelopment in Western NSW Local Health District (WNSWLHD).

The report aims to identify the ESD concepts and initiatives that are proposed to be included within the project and ensure that the development delivers a sustainable project outcome.

Information contained within this Sustainability Plan has been prepared in direct response to:

- Planning Secretary's Environmental Assessment Requirements (SEARs)
- NSW Environmental Planning and Assessment Regulation 2021
- NSW Government Resource Efficiency Policy
- National Construction Code (NCC) 2022 Amendment 1
- Health Infrastructure Design Guidance Note (DGN) No.058 Rev C 2023 – Environmentally Sustainable Development
- Health Infrastructure (HI) ESD Evaluation Tool
- Bathurst Regional Development Control Plan (DCP) 2014
- State Environment Planning Policy (SEPP)- Sustainable Buildings 2022

This report includes:

- An overview of the sustainability drivers for the project (both regulatory & identified project drivers).
- An assessment of the energy and water uses and proposed measures to ensure energy and water efficiency.
- Detail regarding specific ESD initiatives which are to be targeted throughout all phases of the project.
- A comparison of the project's ESD principles and how they have been considered in line with the NSW Health Infrastructure position on ecological sustainable development.

In accordance with the above, the project will implement several sustainable design principles which include initiatives designed to mitigate the development's environmental impact across the following areas:

- **Management –** including reviews of commissioning and tuning, building information and other operational processes.
- **Indoor Environment Quality** – including high air quality, acoustic/lighting comfort and reduction of indoor pollutants.
- **Energy** – including improved energy efficiency of the building operations through design and technology.
- **Sustainable Transport** – access to public transport and sustainable transport options
- **Water Efficiency** – reduce potable water demand and potentially utilizing the rainwater.
- **Materiality** – considering the whole of life materials and their selection to minimise harm to the environment, including efficiency and construction.
- **Ecology** - maintaining ecology through landscaping & on-site environmental management processes during both construction & operation.
- **Emissions** – minimisation of pollution to the environment.

As per HI DGN No.058- *Environmentally Sustainable Development*, the Bathurst Hospital Redevelopment will achieve a minimum 4-star rating as per HI's ESD Evaluation Tool.

## 1.1 Introduction

This Sustainability Plan has been prepared by Stantec 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.

## 1.2 SEARs Reporting

This report responds to section 9 *Ecologically Sustainable Development (ESD)* requirements of the SEARs through the following:

| Item | SEARs Requirement | Relevant Section of Report |
|---|---|---|
| 9 | Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development. | Section 1.4.5 *The NSW Environmental Planning and Assessment Regulation 2021*<br>Section 1.5 *Sustainability Opportunities and Risks*<br>Section 1.6 *Sustainability Initiatives List*<br>Section 5 *Sustainability in Design* |
| 9 | Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards. | Section 1.5.1 *Opportunities*<br>Section 2.1 *NSW Government Sustainability requirements*<br>Section 8 *Appendix A HI ESD Evaluation Tool* |

| | | |
|---|---|---|
| 9 | Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources. | Section 1.3.1 *Greenhouse Gas Emissions and Energy Efficiency*<br>Section 1.3.2 *Water Efficiency*<br>Section 1.3.2.1 *Water Sensitive Urban Design (WSUD)*<br>Section 1.3.3 *Environmentally Friendly Materials*<br>Section 1.3.4 *Material Waste Management*<br>Section 3.2.2.2 *Net Zero Energy Plan* |

## 1.3 Project sustainabilty vision

In pursuit of sustainable design principles across the development, the Project will pursue Ecologically Sustainable Development (ESD) excellence benchmarks to deliver a sustainable project outcome.

These include best practice design initiatives from:

- NSW Environmental Planning and Assessment Regulation 2021
- NSW Government Resource Efficiency Policy
- National Construction Code (NCC) 2022 Amendment 1
- Health Infrastructure Design Guidance Note No.058 Rev C 2023- Environmentally Sustainable Development
- Health Infrastructure Design Guidance Note No.046 Version 2 2022- Electric Vehicle Charge Points in Hospital Car Parks
- Health Infrastructure Engineering Services Guide
- Health Infrastructure (HI) ESD Evaluation Tool
- Bathurst Regional Development Control Plan (DCP) 2014
- State Environmental Planning Policy (SEPP) Sustainable Buildings 2022
- State Environmental Planning Policy (SEPP) Planning Systems 2021

The following ESD initiatives have been considered for the Project:

### 1.3.1 Greenhouse Gas Emissions and Energy Efficiency

The proposal will require compliance with the Energy Efficiency provisions of the BCA outlined within NCC Section J 2022. The Project is targeting a mandatory 10% improvement on National Construction Code (NCC) Section J – Energy Efficiency standards, in line with the minimum requirements of HI's DGN 058.

Best practice energy conservation dictates that in the first instance, demand for greenhouse gases is reduced. This has a much greater benefit to the overall long-term sustainability of the site compared to efficiency measures or renewables/offsets. As such, the focus will be on the elements that provide the greatest return on investment.

Energy efficiency measures which will be applied across the development to reduce its energy consumption include the following, as also noted within the Net Zero Statement under the requirements of Sustainable Buildings SEPP:

- **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**- Power and communication conduits for 2% of the total number of car spaces and power allowance for 1% 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 Version 2* (issued on 7th July 2022*)* and NCC 2022 J9D4.

#### 1.3.1.1 NCC 2022 Section J- Building fabric requirements

NCC 2022 Section J – energy efficiency provisions will apply to the design and construction of the development with the intent to ensure the build form and associated building services demonstrate a minimum level of energy efficiency performance.

All conditioned (heated or cooled) areas of the project are required to comply with the thermal performance requirements of Section J 2022. In order to demonstrate section J compliance, the conditioned areas will be assessed in accordance with the energy modelling provisions of an Alternative Solution, known as a J1V3 Performance Solution assessment.

A Performance Solution is based on assessing the energy performance of a proposed building against that of a reference building. This involves detailed simulation modelling of the proposed buildings to provide a holistic assessment of the building's energy efficiency in accordance with the requirements of Section J of the BCA. This method of compliance provides much higher levels of flexibility in the design of a building's envelope.

The proposed building fabric will likely exceed prescriptive values in order to work with the architecture and mechanical performance of the building, including:

- Light colored roof - Solar Reflectance Index of 82 or greater.
- Windows: As required to exceed compliance. Options include:
    - Double glazed systems
    - Low E coatings
    - Shading structures as documented
    - Operable windows for efficiencies

A detailed NCC Section J1V3 report has been provided in association with the project tender design demonstrating compliance with the provisions of the NCC Section J – energy efficiency. Refer to *Appendix B NCC Section J J1V3 Energy Modelling Report*.

#### 1.3.1.2 Energy Target Compliance- NSW HI ESG (7.4)

As part of the project's sustainability drivers and under the mechanical consultant services scope of works, the project design team is required to demonstrate a minimum 10% improvement on NCC Section J via J1V3 energy modelling protocols. Detailed computer simulation in accordance with Specification J1V3 is to demonstrate compliance via a full year energy demand assessment. A number of different design elements and configurations are to be considered to reduce impacts on energy consumption, including:

- Consideration of gravity systems and inherently low energy demand designs and techniques, all mechanical equipment to comply with minimum energy performance (MEPS).
- Energy management systems integrated with a direct digitally controlled BMCS allows monitoring, targeting and load-shedding capability of selected plant.
- The incorporation of modular variable speed pumps to minimise and reduce energy output for peak and non-peak demands.
- Efficient insulation of hot and warm water distribution pipework to minimise heat losses.
- Consideration of energy input for hot water systems including energy and heat recovery from mechanical plant heating systems.
- System zoning and time control of reticulated services to enable maximum turn down during night and weekend off peak parameters to address peak demand reductions as per the Net Zero Statement.

- Intelligent design of maintenance and duty-cycle parameters to ensure availability and maintenance cycles encourage energy efficiency, noting that tariff efficiency may also be impacted in terms of load-factor issues for example.
- A Net Zero Statement has been prepared to address how the building will be 100% electric in operation and a transition strategy will be provided to address how the existing fossil fuel dependent systems will transition to electric to enable the development to operate as fossil fuel free by 2035.

### 1.3.2 Water Efficiency

Reduced potable water demand is a key ESD initiative identified within industry best practice standards. The development is targeting a reduction in potable water demand via the inclusion of the following initiatives:

- **Sanitary Fixtures** - By implementing low-flow water fixtures, the consumption associated with the bathrooms will be significantly reduced. As per *W3: Minimum Standards for New Water-using Appliances* of the GREP, all sanitary fixtures are to be at least the WELS ratings identified below:

| Fixture / Equipment Type | WELS Rating (minimum) |
|---|---|
| Taps | 5 Star |
| Toilet | 4 Star |
| Showers | 3.5 Star (<= 9 L/min) |
| Dishwashers | 5 Star |

- **Utility Meters and Water Consumption Monitoring** - Metering will be designed to meet metering guidelines under the weights and measurement legislation, as outlined under the current National Measurement Regulations. A water monitoring system will be installed to help with early identification of leaks.
- **Rainwater Capture and Reuse** – A rainwater tank will optimize the potential for rainwater reuse on the site.
- **Landscape**- Native and drought-tolerant plant species with drip irrigation will be specified to minimize landscape irrigation water consumption.

#### 1.3.2.1 Water Sensitive Urban Design (WSUD)

The following WSUD principles will be considered for implementation by the Project:

- To maintain natural water balance;
- To make more efficient use of water resources by conserving water, particularly potable water;
- To reduce stormwater runoff and general flood risk;
- To reduce erosion of waterways, slopes and banks;
- To control stormwater and waste water pollution and improve water quality in waterways and groundwater;
- To integrate stormwater management with water supply and wastewater treatment; and
- To integrate stormwater treatment into the landscape.

The following stormwater control measures have been proposed to be adopted within the site to meet the stormwater strategy objectives:

- Gross pollutant traps are proposed to be used as a means of primary stormwater flow treatment before discharging into the proposed bioretention basin.
- A bio-retention system is proposed for the development to filter and remove pollutants from surface water runoff as it flows through the vegetation layer and underlying filter media.
- Onsite stormwater detention basin with surcharge pits, drainage pipes and weirs across basin crests for managing stormwater flows.
- Vegetated swales are proposed to capture and treat runoff where suitable.

### 1.3.3 Environmentally Friendly Materials

To meet the requirements of *A2: Low-VOC materials* of the GREP, The Project is targeting to use environment-friendly materials via the inclusion of the following initiatives:

- **Low Volatile Organic Compound (VOC) -** Selection of all paints, carpets, adhesives and sealants used on site from low VOC content as per the below tables:

Table 1: Maximum TVOC Limits for Paints, Adhesives and Sealants

| Category | Max TVOC content in grams per litre (g/L) of ready to use product |
|---|---|
| General purpose adhesives and sealants | 50 |
| Interior wall and ceiling paint, all sheen levels | 16 |
| Trim, varnishes and wood stains | 75 |
| Primers, sealers and prep coats | 65 |
| One and two pack performance coatings for floors | 140 |
| Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives | 250 |
| Structural glazing adhesive, wood flooring and laminate adhesives and sealants | 100 |

Table 2: Carpet Test Standards and TVOC Emission Limits

| Compliance option | Test protocol | Limit |
|---|---|---|
| ASTM D5116 | ASTM D5116- Total VOC limit* | 0.5mg/m$^2$ per hour |
| | ASTM D5116-4-PC (4-Phenylcyclohexene)* | 0.05mg/m$^2$ per hour |

| | | |
|---|---|---|
| ISO 16000 / EN 13419 | ISO 16000 / EN 13419 – TVOC at three days | 0.5mg/m$^2$ per hour |
| ISO 10580 / ISO/TC 219 (Document N238) | ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours | 0.5mg/m$^2$ per hour |

* Both limits should be met when testing against ASTM D5116

- **Low Formaldehyde Emission Wood -** Selection of engineered wood products from low formaldehyde emission products that meet the relevant limits as specified in the table below:

Table 3: Formaldehyde Emission Limit Values for Engineered Wood Products

| Test Protocol | Emission limit/ Unit of Measurement |
|---|---|
| AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood | ≤1mg/ L |
| AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16 | ≤1.5 mg/L |
| AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16 | ≤1mg/ L |
| AS/NZS 4357.4 - Laminated Veneer Lumber (LVL) | ≤1mg/ L |
| Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL | ≤1mg/ L |
| JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460 | ≤1mg/ L |
| JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460 | ≤1mg/ L |
| JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates) | ≤0.1 mg/m$^2$hr* |
| ASTM D5116 (applicable to high pressure laminates and compact laminates) | ≤0.1 mg/m$^2$hr |
| ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates | ≤0.1 mg/m$^2$hr (at 3 days) |
| ASTM D6007 | ≤0.12mg/m$^3$** |
| ASTM E1333 | ≤0.12mg/m$^3$*** |
| EN 717-1 (also known as DIN EN 717-1) | ≤0.12mg/m$^3$ |

| | |
|---|---|
| EN 717-2 (also known as DIN EN 717-2) | ≤3.5mg/m²hr |

*mg/m²hr may also be represented as mg/m²/hr.

**The test report must confirm that the conditions of Table 3 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

***The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

### 1.3.4 Material Waste Management

#### Construction Waste

Construction and demolition waste is becoming much easier to recycle as the traditional landfill evolves into waste recovery centres. Construction waste will be managed through contractual requirements outlining the target recycling rate within the main works contract with an indicative target of 90% recycling for the construction and demolition waste produced on this project. A Construction Waste Management Plan will be developed by the waste contractor to address the same.

#### Operational Waste

Operational waste which involves the waste produced in the day-to-day operations of the project can also be minimised through effective sorting methods. A dedicated operational waste management plan will be prepared for the Project which will outline the projected type and sources of waste, number and type of waste and recycling receptacles and other proposed waste management measures.

## 1.4 Contribution to NSW government requirements

### 1.4.1 NSW Government Resource Efficiency Policy

The Project will be required to demonstrate compliance with all applicable policy measures of the NSW Government Resource Efficiency Policy (GREP).

The relevant policy measures include:

- E3- Minimum Standards for New Electrical Appliances and Equipment
- E4- Minimum Standards for New Buildings and Fitouts
- E5- Whole-of-Government Solar Target
- W3- Minimum Standard for New Water-Using Appliances
- A2- Low VOC Materials

These are addressed in their relevant sections throughout this report.

### 1.4.2 NCC Section J – Energy Efficiency

The Project will be required to demonstrate compliance with the NCC 2022 Section J – energy efficiency provisions and is targeting a mandatory 10% improvement on NCC Section J via J1V3 energy modelling protocols, in line with the minimum requirements of HI's DGN 058.

Section J outlines the following minimum performance requirements including:

- Maximum greenhouse gas emisison (GHG) levels and energy consumption;
- Minimum thermal envelope performance for building elements such as walls, floors, roof and external glazing;

- Minimum performance requirements for building sealing;
- Maximum lighting power densities for internal lighting design and lighting control requirements;
- Minimum performance levels for building air-conditioning and ventilation systems;
- Minimum requirements for energy and water metering;
- Minimum requirements for energy and water data collection; and
- Minimum access for maintenance requirements.
- Minimum standby and energy efficiency requirements for lifts

The proposed performance standards for Section J (2019 amendment 1) will outline the thermal performance requirements for code compliant façade deisgns, meaning consideration must be shown for the amount of exposed glazing included within the façade design.

The development will need to seek to optimsie energy efficiency and thermal performance via design elements which improve the building façade performance including façade design, thermal envelope, HVAC system selection and lighting design.

### 1.4.3 Bathurst Regional Development Control Plan (DCP) 2014

The Bathurst Regional Development Control Plan (DCP) 2014 applies to all land in the Bathurst Regional Local Government Area (LGA).

Section **9 Environmental Considerations** of the Bathurst DCP states:

***9.1 Preliminary***

***9.1.2 Strategic priorities and objectives***

*Strategic Priorities*

*f) To identify opportunities to improve the environmental sustainability of building design.*

*Strategic Objectives*

*l) To encourage environmentally sustainable building design and green power.*

***9.9 Sustainable Building Design and Energy Efficiency***

***9.9.1 Objectives***

*a) To encourage environmentally sustainable building design and energy efficient housing opportunities.*

*b) To encourage planning for climate change and reductions in $CO_2$ emissions.*

***9.9.2 Development standards***

*b) All new commercial development is to comply with Section J – Energy Efficiency of the National Construction Code.*

*c) If in the opinion of Council the proposed development should address sustainable building design principles, the statement of environmental effects lodged with Development Applications for buildings is to include a section which addresses how the sustainable building design principles have been incorporated into the development.*

***9.9.3 Sustainable building design principles***

*The construction of buildings using good design principles can save energy, water and money, while creating a more enjoyable and comfortable place to live and work. The following design principles encourage sustainable building design.*

*Council will give consideration to the following principles in the assessment of development applications.*

***Colours***

a) *Light coloured surfaces should be used internally and externally.*

***Lighting***

*a) Maximise the use of natural lighting.*

*b) Design lighting fixtures to suit the purpose of specific rooms (e.g. task or effect lighting in study, general spread of lighting in the family room).*

*c) Provide separate switches for special purpose lights.*

*d) Incorporate energy-efficient lamps (light emitting diode (LED) and compact fluorescent lighting (CFL)), fittings (reflectors) and switches (dimmers, automatic, timed and sensor operated).*

*e) Locate switches at exits to rooms/lobbies etc. to encourage switching off.*

*f) Incorporate dimmers, motion detectors, and automatic turn off switches where appropriate.*

*g) Take note of what is appropriate lighting type (halogen versus CFL) for each area to reduce energy requirements.*

*h) Install exterior lighting only as needed for security and accessibility needs to reduce energy requirements.*

***Water Saving***

*a) Fit water efficient shower heads (at least 4 Star WELS rated).*

*b) Install appropriate taps with aerators to reduce water needs. Mixer taps in showers can reduce the potential for scalding and save large quantities of hot water. Single lever flick mixer models of mixer taps over basins and sinks can waste hot water because they tend to be left in the middle position. Mixer taps with separate controls for hot and cold water are preferable in these locations.*

*c) Install water efficient toilets (at least 4 Star WELS rated).*

*d) Install water efficient washing machines (at least 4 Star WELS rated)*

***Rainwater Tanks***

*a) Rainwater tanks may be connected to individual pipework to supply the toilet and/or washing machine and outside taps for garden irrigation.*

***Photovoltaic Cells (PV Cells or Solar Modules)***

*a) The installation of Solar Modules require approval from Council unless exempt under any relevant SEPP or Council's LEP.*

***Waste***

*The construction of dwellings results in a great deal of waste produced during the construction stage. The design of smaller houses and more effective use of resources will help to reduce the creation of waste. Talk to your designer and builder about maximising the use of materials, reducing building waste (which you pay for) and designing for end of life and reuse of building materials.*

Section **13 Landscaping and Greening** of the Bathurst DCP states:

***13.1.2 Strategic priorities and objectives***

*Strategic Priorities*

*b) To determine the best way to encourage ecologically sustainable development and the protection of urban biodiversity and vegetation resources.*

These requirements are addressed in their relevant sections throughout this report.

### 1.4.4 State Environmental Planning Policy (SEPP) Sustainable Buildings 2022

***3.2 Development consent for non-residential development***

*(1) In deciding whether to grant development consent to non-residential development, the consent authority must consider whether the development is designed to enable the following—*

*(a) the minimisation of waste from associated demolition and construction, including by the choice and reuse of building materials,* - refer to Section 1.3.4 Material Waste Management.

*(b) a reduction in peak demand for electricity, including through the use of energy efficient technology,* - refer to Section 1.3.1 Greenhouse Gas Emissions and Energy Efficiency.

*(c) a reduction in the reliance on artificial lighting and mechanical heating and cooling through passive design,* - refer to Section 1.3.1 Greenhouse Gas Emissions and Energy Efficiency.

*(d) the generation and storage of renewable energy,* - refer to Section 1.3.1 Greenhouse Gas Emissions and Energy Efficiency.

*(e) the metering and monitoring of energy consumption,* - refer to Section 1.3.1 Greenhouse Gas Emissions and Energy Efficiency.

*(f) the minimisation of the consumption of potable water.* - refer to Section 1.3.2 Water Efficiency.

### 1.4.5 The NSW Environmental Planning and Assessment Regulation 2021

Schedule 193 of Division 5 of Part 8 of the Environmental Planning and Assessment Regulation 2021 states:

1. *The principles of ecologically sustainable development are the following:*
    a. *the precautionary principle,*
    b. *inter-generational equity,*
    c. *conservation of biological diversity and ecological integrity,*
    d. *improved valuation, pricing and incentive mechanisms.*
2. *The precautionary principle is that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
3. *In applying the precautionary principle, public and private decisions should be guided by:*
    a. *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
    b. *an assessment of the risk-weighted consequences of various options.*
4. *The principle of inter-generational equity is that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*
5. *The principle of the conservation of biological diversity and ecological integrity is that the conservation of biological diversity and ecological integrity should be a fundamental consideration.*
6. *The principle of improved valuation, pricing and incentive mechanisms is that environmental factors should be included in the valuation of assets and services, such as:*
    a. *polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and*
    b. *the users of goods and services should pay prices based on the full life cycle of the costs of providing the goods and services, including the use of natural resources and assets and the ultimate disposal of waste, and*

c. *established environmental goals should be pursued in the most cost-effective way by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

The following provides a direct response to the specific principles of ecologically sustainable development, as documented within the Schedule 193 of Division 5 of Part 8 of the Environmental Planning and Assessment Regulation 2021.

### The Precautionary Principle

It is recommended that an appropriately qualified professional undertakes investigation to determine if the natural features of this site are habitat to local and native wide-life, and or threatened and endangered species. The proposed new building will be located on a previously developed land within an established urban area. The risk of creating environmental damage to aspects such as waterways, water table, native habitat, and other biological features is considered low.

If the ESD principles set out in the applicable regulatory policies, plans, controls and Australian best-practice guidelines are considered, supported and acted upon to satisfy their objective, serious or irreversible environmental damage is not foreseen.

### Inter-generational equity

The proposed development approaches inter-generational equity with respect to ecological sustainability by minimising the consumption of resources whilst providing both a medical facility and a hotel which will ensure the health and well-being of its occupants into the future. The project has objectives that place lower demand on resources (energy, water, materials) in construction and operation, when compared to standard practice, by introducing Australian best-practice energy, water and materials conservation measures. These objectives and corresponding initiatives set-out to use today's resources in a manner that enables future generations to meet their own needs using equivalent resources.

### Conservation of biological diversity and ecological integrity

Because the proposed development is situated on previously developed land it can be assumed there is limited biological diversity present. However, the sustainability targets to be set for the project will aim to improve conservation of resources. As such, the proposed development is likely to have a smaller gross biological and ecological footprint than equivalent projects in standard practice.

### Improved valuation, pricing, and incentive mechanisms

This project will integrate several initiatives which aim to internalise pollution and other undesirable environmental outcomes. Contractors will be requested to provide and abide by an Environmental Management Plan and Environmental Management System which are in accordance with NSW Environmental Management Systems Guidelines or a similar standard. This places a value on environmentally responsible building practices and places a form of "polluter pays" onto the contractors to ensure they are held responsible for the environmental management of the building site as they complete their work.

The costs associated with the construction waste will be borne by the project team. They shall be required to target 90% recycling of construction waste. This may have a greater financial cost to the project; however, it provides a more accurate reflection of the full life cycle costs of the materials which were on the site, and the waste from the new materials as a result of the construction.

The costs of producing the following pollution: sewage, landfill waste, and $CO_2$ emissions are partially borne by the project team and accounted for in the project's sustainability initiatives. The project has voluntarily elected to:

- Improve water consumption efficiency, thereby paying to reduce production of sewage;
- Reduce energy consumption, which means solutions to reducing $CO_2$ emissions will be paid to be investigated during the design phase;
- Recycle waste streams in the construction and operation of the project, which may cost more than standard practice where all material waste is directed to landfill as some recycling centres are located a greater distance from the project site compared to the landfill sites.

## 1.5 Sustainability opportunities and risks

### 1.5.1 Opportunities

The Project has to benchmark itself against a sustainability framework which reflects 'national best practice sustainable building principles' as a minimum performance requirement. Historically, project teams have responded to this requirement by benchmarking their performance against Green Star Design & As Built, published by the Green Building Council of Australia.

This development is proposing to use HI's ESD Evaluation Tool pathway, developed by HI NSW to ensure the facility meet the standards with a targeted point requirement of 60 points.

As per HI DGN 058 Rev C, a minimum of 60 points is required to be achieved for all projects. However, a score between 45 and 60 points may be accepted outside metropolitan areas, acknowledging that point scoring is sometimes more challenging or impractical in regional or remote areas. This must be notified to the ESC and endorsed by the HI Executive Director, Development and Commercial, which is consistent with any departure from the minimum sustainability requirements.

HI's ESD Evaluation Tool uses some of the key ESD initiatives included in the GBCA Design and As-Built v1.3 rating tool however does not produce a "Green Star" rating, but instead prescribes a minimum number of points to be achieved. During the design phase of works HI requires a 5-point buffer within the ESD evaluation tool be maintained.

#### 1.5.1.1 HI ESD Evaluation Tool

DGN058 includes HI's ESD Evaluation Tool which is similar to GBCA's Green Star Design and As Built v1.3. It is noted that whilst the Green Star equivalence approach is commonly used across the industry, this approach is not endorsed by the GBCA. DGN058 states that the ESD Evaluation Tool is not a version of Green Star and has undergone a number of variations and exclusions to be tailored for the HI context.

Green Star is widely considered as the benchmark environmental assessment tool within the Australian property industry, Green Star is an independent accreditation framework which delivers sustainable built outcomes throughout the project lifecycle. Green Star is a credits-based star rating system ranging from one through to six stars.

The project is currently pursuing a 60 points pathway assessed under the HI ESD Framework. This benchmark demonstrates "Best Practice" Sustainability through the design, construction and operation.

#### 1.5.1.2 HI's ESD Evaluation Pathway

HI's ESD Evaluation Tool lists the initiatives demonstrating the project's ability to achieve sustainable performance. It uses some of the key ESD initiatives included in the GBCA rating tools, however, does not produce a "Green Star" rating, but instead prescribes a minimum number of "points" to be achieved.

As per the HI ESD Evaluation Tool, the minimum requirement and targets for the design are as follows:

- A minimum of 60 points to be achieved by the design in accordance with HI's ESD Evaluation Tool.
- A Net Zero Plan including full electrification analysis, energy efficiency measures, embodied carbon and solar or renewable energy assessment has been carried out to design and deliver an infrastructure that is net zero ready. Refer to *Appendix C Net Zero Plan*.
- An EV charging infrastructure plan is required to support the implementation of electric vehicle infrastructure to meet NSW Government passenger vehicle fleet procurement targets.
- A climate risk assessment is required to support design and delivery of infrastructure that is climate risk ready and resilient to climate change.
- A climate adaptation plan is required if the climate risk assessment identifies risks rated high or above. It responds to any identified risks and will develop adaptation actions through design, development and delivery. The plan must be updated progressively to ensure the adaptation measures are implemented.

- An operational waste management plan is required to identify how the design will impact waste generation and on-site collection and storage.
- A minimum 10% improvement in energy efficiency compared to a baseline of National Construction Code (NCC) 2022 Section J compliance applicable to the development.
- Full electrification is required for all new developments (100% electric).
- A percentage reduction in upfront carbon emissions using the NABERS Embodied Emissions Materials Form.
- A percentage reduction in potable water usage to NCC.
- A percentage reduction in construction waste diverted from landfill.
- A percentage of recycled content in construction materials.

In order to facilitate the above targets, the assessment of the development at the point of procurement of the Head Contractor shall contain a minimum of 5 buffer points. Buffer points are defined as points over and above the minimum 45 points required target. This is to allow for some variation during the construction period.

### 1.5.2 Risks

Following discussions with the project team, certain credits were marked at medium and high risk based on their ease of achievement with the current design and service strategies in place. Refer to section 3.1.1 for list of high and medium risk items.

Key limitations on achieving credits in the ESD Evaluation Tool Pathway were:

- Infection control measures
- Cost
- Project scope boundary
- Project location

## 1.6 Sustainability initiatives list

A list of ESD and environmental initiatives in accordance with HI's ESD Evaluation Tool has been identified below.

- Green Star accredited professionals will be engaged throughout the project to guide the design team and ensure that a high level of environmental performance is achieved.
- Services and maintainability reviews of commissionability, controllability, operability and safety will be conducted by the Head Contractor or the owner's representative.
- A Climate Change Risk Assessment and Adaptation Plan has been developed to identify the risks posed by climate change, and solutions will be included in the building design and construction that specifically addresses the risk assessment component of the plan. Refer to *Appendix D Climate Change Risk Assessment & Adaptation Plan*.
- Energy and water will be metered for single use floors and will be sub-metered for multi-use floors for effective monitoring and demand reduction.
- An Environmental Management Plan (EMP) will be developed by the Head Contractor to manage the environmental impacts during construction and an Environmental Management System (EMS) will be in place to ensure that the site works are carried out as per the EMP. Contractors will be requested to provide and abide by the EMP and EMS that is in accordance with NSW Environmental Management Systems Guidelines.
- A qualified waste auditor will prepare an Operational Waste Management Plan (OWMP) in line with best practice approaches. The Project's waste management facilities and operational waste procedures including defined streams for effective material recycling will be based off the requirements and recommendations made in the OWMP.

- High WELS rated water fittings will be used ensuring lower building water demand. Refer to 1.3.2 Water Efficiency.
- Efficient and high performing HVAC systems with a focus on energy efficiency will be installed.
- Acoustic performance in terms of internal noise levels, reverberation and acoustic separation will be in accordance with HI guidelines.
- LED lights, which have longer lives, consume less energy and produce a higher quality of light than their counterparts, reducing overall energy demand will be specified.
- Low-VOC paints, sealants, adhesives, carpets (where applicable), which do not emit dangerous volatile components, risking the health of occupants will be specified.
- The steel specified for the Project will be sourced from manufacturers who are members of the Australian Steel Institute Sustainability Charter for sustainable and energy reducing steel manufacture.
- Best practice PVC plastics or non-PVC products in formwork, piping, cables, and conduits will be specified that are in line with GBCA's *Best Practice Guidelines for PVC*. These materials have a reputation for damaging the environment in their production, both upstream and downstream of the manufacturing process.
- All timber products specified in the building and construction will be FSC or PEFC certified.
- Consideration will be made for additional material specifications that select and prefer materials and products which include reused content, environmental product declarations, third party sustainability certifications or product stewardship programs.
- EV charging infrastructure will be provided for 2% of the total number of car parks to future-proof the project as per DGN 046 requirements.
- A 60kL rainwater tank will be provided.
- A draft Green Travel Plan has been developed for the Project by TTW which has defined a holistic approach to reducing the impacts from transport.
- A 200kW rooftop solar PV array has been proposed for on-site renewable energy generation.
- Any identified hazardous materials will be removed and disposed of in accordance with relevant EPA and NSW best practice legislation.
- Light pollution will be managed via effective external lighting design.
- Legionella risks will be managed via air-cooled HVAC systems.
- Additional Green Star innovation challenges will be addressed in line with HI NSW standards for pre-awarded credits.

HI's ESD Evaluation Tool lists initiatives demonstrating the project's ability to achieve 60 points as per the DGN 058 requirements has been included within Appendix A of this report. As per HI's requirement, 4% of the gross construction cost will be allocated to sustainability initiatives which are over and above the minimum requirements.

## 1.7 Change Management

The following are the key change management areas required to realise the benefits for the identified sustainability initiatives:

- **Energy and Water monitoring** – Energy and water consumption is to be monitored by building users on a regular basis and reported to the Local Health District.
- **Post Occupancy Evaluation**- HI/LHD to undertake a post occupancy evaluation.
- **Building User Information Guide (BUIG)**- A BUIG is a source of up-to-date, relevant information for the building user. This guide must address the intended use of all nominated systems within the building. Building user

information must be available to the building owner and facilities management team at the time of practical completion. A BUIG must be prepared by the project team by identifying the relevant user groups and deliver building user information tailored to their needs.

- **Climate Adaptation Plan (CAP)**- A suitably qualified professional has developed a project-specific CAP to address the climate risks rated high and above in accordance with a recognised standard and the solutions have been included into the building design and construction that specifically address the risk assessment component of the plan.
- **Operational Waste Management Plan (OWMP)**- An OWMP is required to be prepared by a qualified waste auditor in accordance with best practice approaches. The requirements or recommendations made in the OWMP must then be reflected in the design of the building's facilities.
- **Green Travel Plan**- A Green Travel Plan is required to be prepared by a suitably qualified professional and a Sustainable Transport Calculator must be completed in accordance with the predicted transport mode split as defined in the Green Travel Plan.

## 1.8 Proposed packages of work

Sustainable procurement firstly involves reducing the quantity of goods purchased to only those that are really needed, and secondly purchasing items or services whose production, use and disposal have minimal negative impacts, and encourage positive outcomes for the environment, economy, and society.

Four key principles have emerged from various bodies including the Green Building Council of Australia (GBCA), British Standards Institution (BSI) and the Australian Procurement and Construction Council (APCC), which are designed to provide a framework for sustainable procurement. The strategies outlined in this guide have been developed in accordance with these principles which are as follows:

- Adopt strategies to avoid unnecessary consumption and manage demand.
- Minimise environmental impacts of the goods and services over the whole life of the goods and services.
- Employ socially responsible practices including compliance with legislative obligations to employees, and
- Value for money over the whole-of-life of the goods and services, rather than just initial cost.

Sustainable Procurement reduces adverse environmental impacts from unnecessary consumption. To reduce environmental impacts, procurement practices must consider the total life-cycle of products (production, use and disposal) and support goods and services which:

- Minimise waste sent to landfill.
- Conserve natural and artificial resources.
- Eliminate over consumption of water and energy, and
- Minimise the emission of pollutants to air and water.

Sustainable procurement has the secondary benefit of reducing costs through greater efficiencies, reduced waste disposal costs and reduced risk, creating a trend of lower costs over the life cycle of a product.

## 1.9 Project Governance

The Bathurst Hospital Redevlopment falls under the jurisdiction of the Western NSW Local Health District (WNSWLHD).

The Western NSW Local Health District Environmental Sustainability Strategy 2023-2027 (ESS) outlines a roadmap towards best practices in environmental sustainability in health service delivery over the next five years. It defines commitments, targets and activities across six key priority areas: Clinical care, Products and Services, Waste, Resources, Infrastructure and Transport and details supporting enablers.

## Vision

The WNSWLHD's vision as per the ESS is healthier rural people and thriving communities, recognising this cannot be achieved without an equally thriving and healthy environment. WNSWLHD will lead by example in supporting the NSW Government's Net Zero Plan to progress environmentally sustainable activities and initiatives to reduce the their carbon footprint while delivering world-class and sustainable rural healthcare that is ready to adapt to climate challenges.

## Goals

WNSWLHD'S goals for achieving their vision aligns with the Project's HI ESD Framework Tool as noted in the table below:

| Western NSW Local Health District Goals as per ESS 2023-2027 | Project Initiatives targeted in the HI ESD Framework Tool |
|---|---|
| Keeping people healthy | • Credit *9 Indoor Air Quality*<br>Targeting this credit ensures that the indoor air quality is maintained at a high level thus aiding human health and wellbeing.<br>• Credit *13 Indoor Pollutants*<br>Targeting this credit ensures occupants' exposure to VOCs and formaldehyde is reduced by means of choosing low-VOC paints, adhesives, sealants and carpets, and low formaldehyde engineered wood products. This helps safeguard occupant health through the reduction in internal air pollutant levels.<br>• Credit *11.2 Surface Illuminance*<br>While addressing surface illuminance is a measure to improve lighting comfort, the strategy used to address this requirement, such as the use of down lights, poses infection control risks in a hospital environment. In consideration of this, this credit is NOT being pursued in the current framework.<br>• Credit *28 Microbial Control*<br>Waterless heat rejection systems are used in this Project, thus eliminating the harmful risks caused of legionella microbes. |
| High value, low carbon health care | • Credit *19 Life Cycle Impacts*<br>Targeting this credit ensures that carbon reduction is achieved through the selection of appropriate concrete mix that reduces the quantity of Portland cement.<br>• Credit *Innovation Challenge- Embodied Carbon Assessment*<br>An iterative embodied carbon assessment will be carried out to identify suitable recommendations and action the feasible ones.<br>• Credit *Innovation Challenge- Circular Economy*<br>An assessment identifying the reuse, refurbishment or repurposing potential of the spaces will be conducted and appropriate recommendations will be actioned to address circular economy. |
| Minimise health service emissions | • Credit *15 Greenhouse Gas Emissions*<br>Targeting this credit ensures a 10% improvement on the reference building's greenhouse gas emissions through building fabric optimisation. |

| | |
|---|---|
| | • Credit *16 Peak Electricity Demand Reduction*<br>Targeting this credit reduces the peak electricity demand and the associated emissions by 30% through the installation of rooftop solar PV systems. |
| Climate resilient health service | • Credit *3 Adaptation and Resilience*<br>Targeting this credit ensures that a project-specific Climate Adaptation Plan is developed, and the building design and construction specifically addresses the risk assessment component of the plan. |

### Targets

WNSWLHD's targets for achieving their net zero vision aligns with the NSW State Government Net Zero Targets, NSW Health's Net Zero Targets and the HI ESD Framework tool as the Project is undertaking several measures as noted in the table below that sets it up to achieve the following targets:

- 50% reduction in emissions by 2030
- 70% reduction by 2035
- Net zero carbon emissions by 2050 (compared to 2020/2021 levels)
- A minimum of 60 points targeted through HI's ESD Evaluation Tool
- Achieve and maintain a 4.5 Star NABERS Energy rating (for all new buildings)

This target aligns with the HI ESD Framework tool as the Project is undertaking several measures as noted below that sets it up to achieve the required targets:

- Credit *15 Greenhouse Gas Emissions*
  Targeting this credit ensures a 10% improvement on the reference building's greenhouse gas emissions through building fabric optimisation.
- Credit *16 Peak Electricity Demand Reduction*
  Targeting this credit reduces the peak electricity demand and the associated emissions by 30% through the installation of rooftop solar PV systems.
- Credit *19 Life Cycle Impacts*
  Targeting this credit encourages and recognises the reduction in greenhouse gas emissions and resource use associated with the use of concrete.
- Credit *Innovation Challenge- Embodied Carbon Assessment*
  An iterative embodied carbon assessment will be carried out to identify suitable recommendations and action the feasible ones.

## 1.10 Stakeholder Engagement

Summary of stakeholders relevant to delivering the sustainability plan and corresponding responsibility for its implementation.

| Project Group | Description of responsibility | Proposed engagement tasks |
|---|---|---|
| Project Management | Accountable for sustainability in the project<br>Resourcing the relevant sustainability staff and contractors to support sustainability throughout the project | Meeting and briefing |

| | | |
|---|---|---|
| Design | Inclusion of relevant sustainability requirements in drawings, reports and specifications | Briefings and workshops |
| Commercial/ Procurement | Including Sustainability in relevant contracts, briefs and tenders | Meeting and briefing |
| Comms and Engagement | Including sustainability in project communications and community engagement | Meeting and briefing |
| Sustainability Working Group | Multi-disciplined LHD team to support decisions and the development of the Sustainability Plan | Meeting and briefing |

# 2. Policy context and Strategic Alignment

## 2.1 NSW Government Sustainability requirements

The Project sustainability vision and objectives align with the NSW Government's priorities and policy requirements through the following initiatives:

### NSW Government Resource Efficiency Policy

| NSW GREP Requirements | Project Initiatives targeted in the HI ESD Framework Tool |
|---|---|
| E3- Minimum Standards for New Electrical Appliances and Equipment | Credit *15E.0 Greenhouse Gas Emissions- Reference Building Pathway-* Minimum standards for new electrical appliances are set to achieve the required reduction in greenhouse gas emissions.<br>The Contractor shall ensure that the selected equipment have the following minimum rating:<br>- Refrigerator- 2.5 star<br>- Dishwashers- 4 star<br>- Fridge- 3.5 star<br>- Freezers- 3 star<br>- Televisions- 5 star<br>- Clothes dryer (up to 10kg)- 3 star<br>- Washing machines- 3.5 star<br>- air-to-air heat pumps and air conditioners- 4 star if less than 4kW, 3 stars if greater than 4kW<br><br>Equipment purchased in the following categories will meet the definition of 'high efficiency' under GEMS:<br>• electric motors – AS1359.51<br>• external power supplies – AS4665.2.<br><br>Equipment purchased in the following categories will meet the following performance benchmarks:<br>• air-cooled liquid chilling packages – IPLV of 5.1<br>• water-cooled liquid chilling packages – IPLV of 9.6<br>• closed-control air-conditioners – AEER of 3.3. |
| E5- Whole-of-Government Solar Target | Credit *16B Peak Electricity Demand Reduction- Performance Pathway* - Solar PV is proposed to reduce the peak electricity demand. |
| W3- Minimum Standard for New Water-Using Appliances | Credit *18A Potable Water- Performance Pathway* – Minimum standard for new water-using appliances are set to achieve the required reduction in potable water use.<br>The Contractor shall ensure that the following fixtures and fittings are within one star of the WELS rating stated below:<br>- Taps- 6 star<br>- Urinals- 6 star<br>- Toilets- 5 star<br>- Showers- 3 star (>4.5 but <=6) |
| A2- Low VOC Materials | Credit *13.1 Paints, Adhesives, Sealants and Carpets*- Low VOC materials are specified as per below:<br>- General purpose adhesives: Max. 50 g/litre VOC<br>- Interior wall and ceiling paint, all sheen levels: Max 16 g/litre VOC<br>- Trim, varnishes and wood stains: Max. 75 g/litre VOC<br>- Primers, sealers and prep coats: Max. 65 g/litre VOC |

- One and two pack performance coatings for floors: Max. 140 g/litre VOC
- Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives: Max. 250 g/litre VOC
- Structural glazing adhesive, wood flooring and laminate adhesives and sealants: Max. 100 g/litre VOC

### NCC Section J- Energy Efficiency

The requirements of NCC Section J Energy Efficiency as outlined in section 1.4.2 are addressed in the HI ESD Evaluation Tool through credit *15E.0 Greenhouse Gas Emissions- Conditional Requirement*. The Project is targeting to achieve a 10% improvement on the reference building's greenhouse gas emissions.

### NSW Strategic Direction Alignment

The following table addresses how the sustainability vision, objectives and initiatives for the Project aligns with the Government's priorities and policy requirements:

| Legislation | Description | Alignment |
|---|---|---|
| Environmental Planning and Assessment Act 1979 | The Environmental Planning and Assessment Act 1979 (the Act) represents the principal legislation regulating land use in NSW. The objects of the Act include:<br>• to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,<br>• to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. | Reduction in resource consumption considered through energy and water efficiency design features. |
| Protection of the Environment Operations Act 1997 | The Protection of the Environment Operations Act 1997 (the Act) represents the principal legislation regulating to protect the environment. The objects of the Act include:<br>• protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development,<br>• to provide increased opportunities for public involvement and participation in environment protection | Project team including stakeholders have been involved in shaping the sustainability strategy of this project. |
| Protection of the Environment Operations (Waste) Regulation 2014 | The Waste Regulation allows the EPA to protect human health and the environment, and provides a platform for a modern and fair waste industry. | The Head Contractor will ensure that a 90% diversion rate is achieved for construction and demolition waste.<br>A waste consultant will be engaged to develop an Operational Waste Management Plan to address waste generation and regulation. |
| Waste Avoidance and Resource Recovery Act 2001 | The Waste Avoidance and Resource Recovery Act 2001 (WARR Act) promotes waste reduction and better use of our resources in NSW. It includes provisions for waste strategies and programs, and for industry actions to reduce waste. | A waste consultant will be engaged to develop an Operational Waste Management Plan to address waste generation and regulation. |

| Legislation | Description | Alignment |
|---|---|---|
| Plastic Reduction and Circular Economy Act 2021 | The Plastic Reduction and Circular Economy Act 2021 is to prohibit certain items and establish a product stewardship framework for brand owners of certain products; and for related purposes. | All PVC products used will meet GBCA's Best Practice Guidelines for PVC. |
| Future Health | The Future Health Strategic Framework is the roadmap for our health system to achieve NSW Health's vision. It will help guide our next decade of care in NSW. Including:<br>• The health system is managed with an outcomes-focused lens to deliver a financially and environmentally sustainable future. | Project team including stakeholders have been involved in shaping the sustainability strategy of this project that aligns with HI ESD Framework Tool. |
| NSW Health Resource Efficiency and Energy Plan (2022)<br>(Draft – pending approval) | NSW Health Resource Efficiency and Energy Plan - Towards a Financially and Environmentally Sustainable Future.<br>The plan outlines action to reduce costs and cut carbon equivalent emissions (CO2-e) using renewable energy sources and resource efficiency. | Solar PV and NCC +10% energy efficiency targets |
| NSW Health Precinct Strategy<br>(Draft – pending approval) | The NSW Health Precincts Strategy will help inform and align precinct activities inside NSW Health to achieve three inter-related outcomes:<br>• Healthy places, by embedding a place-based approach in our capital program<br>• Strong innovation ecosystem, by promoting NSW Health strengths and directing effort towards opportunity<br>• Effective partnerships, by coordinating activity and adopting a collaborative approach to governance | New outdoor landscaping and outdoor areas of respite to be introduced with the new design. |
| NSW Health 20-year Health Infrastructure Strategy | Realising our vision for the future health system. The NSW Health vision is:<br>A sustainable health system that delivers outcomes that matter to patients and the community, is personalised, invests in wellness and is digitally enabled. | The initiatives in the HI ESD Framework Tool addresses the NSW Health Vision. |
| NSW Health Infrastructure Corporate Strategy 2021-2025 | Health Infrastructure's Corporate Strategy 2021-2025, which outlines our key focus areas for the next five years. Vision:<br>We deliver future focused, innovative and sustainable infrastructure and support solutions that enable value-based healthcare delivery in New South Wales. | HI ESD Evaluation Tool 60 points target |
| Premier's Priorities, NSW Government | These Premier's Priorities represent the government's commitment to making a significant difference to enhance the quality of life of the people of NSW. | Provision of staff break rooms with access to high quality views. High quality views for IPUs. |
| NSW Government Resource Efficiency Policy<br>(State of NSW and Office of Environment and Heritage, 2019) | The aim of the NSW Government Resource Efficiency Policy is to reduce the NSW Government's operating costs and lead by example in increasing the efficiency of its resource use. | Refer to Section 1.4.1. |

| Legislation | Description | Alignment |
|---|---|---|
| NSW Climate Change Policy Framework<br>(NSW Office of Environment and Heritage, 2016) | This policy outlines the long-term objectives to achieve net-zero emissions by 2050 and to make New South Wales more resilient to a changing climate. | A Climate Adaptation Plan will be developed identifying the risks posed by climate change and the building design and construction will address the risk assessment component of the plan. |
| Net Zero Plan Stage 1: 2020-2030<br>(Department of Planning, Industry and Environment, 2020) | The plan aims to strengthen the prosperity and quality of life of the people of New South Wales, while helping to achieve the State's objective to deliver a 50% cut in emissions by 2030 compared to 2005 levels. The plan will support a range of initiatives targeting energy, electric vehicles, hydrogen, primary industries, technology, built environment, carbon financing and organic waste. | Reduction in emisisons considered through energy efficiency design features such as installation of solar PV system, optimised building fabric performance, selection of high performing HVAC systems and electrical equipment and use of low embodied carbon materials. |
| Net Zero Plan Stage 1: 2020–2030 Implementation Update<br>(Department of Planning, Industry and Environment, 2021) | This document provides a detailed implementation update on these and other key achievements of the NSW Government under the Plan. Government is aligning its 2030 emissions reduction objective to this projection and updating its objective to reduce emissions by 50% below 2005 levels by 2030. | |
| NSW Electric Vehicle Strategy<br>(Department of Planning, Industry and Environment, 2021) | The NSW Government's plan to accelerate the State's vehicle fleet of the future. It outlines the government's commitments to increasing the uptake of electric vehicles to ensure New South Wales shares in the benefits. | EV charging stations will be provided in accordance with the Project's Green Travel Plan requirements and HI's DGN 046 *Electric Vehicle Charge Points in Hospital Car Parks*. |
| The NSW Climate Change Adaptation Strategy | Sets out an ambitious approach to climate change adaptation. The strategy provides a framework that will strengthen and expand action to adapt to climate change now and over the long term. It builds on the comprehensive suite of climate change policies already in place, such as the Net Zero Plan Stage 1: 2020-2030. | A Climate Adaptation Plan will be developed identifying the risks posed by climate change and the building design and construction will address the risk assessment component of the plan. |
| NSW Circular Economy Policy Statement<br>(NSW Office of Environment and Heritage, 2019). | This policy outlines the long-term objectives to achieve net-zero emissions by 2050 and to make New South Wales more resilient to a changing climate. | Reduction in emisisons considered through energy efficiency design features such as installation of solar PV system, optimised building fabric performance, selection of high performing HVAC systems and electrical equipment and use of low embodied carbon materials. |
| NSW Waste and Sustainable Materials Strategy 2041<br>(Department of Planning, Industry and Environment, 2021) | New South Wales is transitioning to a circular economy over the next 20 years. This means we will minimise what we throw away and use and reuse our resources efficiently, making them as productive as possible. We will end up with less waste, less emissions, less harm to our environment and more jobs. The move will boost innovation and help drive our economy. | The Head Contractor will ensure that a 90% diversion rate is achieved for construction and demolition waste. A waste consultant will be engaged to develop an Operational Waste Management Plan to address waste generation and |

| Legislation | Description | Alignment |
|---|---|---|
| | | regulation. The existing building is reused for the Community Health Centre thus minimising resource utilisation. |
| NSW Plastics Action Plan<br>(Department of Planning, Industry and Environment, 2021) | The aim of the NSW Government Resource Efficiency Policy is to reduce the NSW Government's operating costs and lead by example in increasing the efficiency of its resource use. | All PVC products used will meet GBCA's Best Practice Guidelines for PVC. |
| NSW Water Strategy<br>(Department of Planning, Industry and Environment, 2021) | Takes a strategic and integrated approach to looking after the state's water. This strategy is the first 20-year water strategy for all of NSW to improve the security, reliability, quality and resilience of our water resources over the long term. It sets the priorities and outlines the implementation plan to delivering on these outcomes, including:<br>• Improve the liveability and resilience of our cities<br>a. better capturing and quantifying the contribution of water to economic outcomes at the state and regional level, including the economic value of natural systems, in order to better understand and measure water productivity<br>b. improving water use efficiency and productivity in agriculture, food processing and manufacturing, resources and other industries<br>c. supporting the cost effective development of rainfall independent sources of water supply for key industry sectors, such as desalination and recycling | Reduction in resource consumption considered through several water efficiency design features such as selection of water-efficient fixtures and fittings, rainwater capture and reuse, reuse of RO wanter from the renal dialysis unit and reducing water use in concrete mix through the use of reclaimed water. |
| Greater Sydney Water Strategy<br>(Department of Planning, Industry and Environment, 2021) | Charts a direction for delivering sustainable and resilient water services to Greater Sydney for the next 20 to 40 years. The strategy includes:<br>• Increase our focus on water conservation and efficiency as an immediate and cost- effective response<br>• Invest in upgrades, new connections and leak management to address the risks posed by ageing water and wastewater systems and infrastructure<br>• Integrate our water and land use planning more effectively to incorporate sustainable water use into building and landscaping design | Reduction in resource consumption considered through several water efficiency design features as stated above. Additionally, peak stormwater outflows from the site and pollutants entering the public stormwater system is reduced through effective stormwater management initiatives. |
| Greater Cities Commission – Metropolitan and district plans | The Commission is an independent statutory planning authority, which brings community, industry and government together to identify strategies for improving the liveability, productivity and sustainability of Greater Sydney now and in the future.<br>The Commission aims to make Greater Sydney a metropolis of three liveable, productive and sustainable cities by coordinating and aligning the planning that will shape the future. | Increased healthcare facilities for a regional area as a result of the project. |
| NSW Department of Planning and Environment (DPE) Regional Plans | The regional plans set a 20-year framework, vision and direction for strategic planning and land use to ensure regions have the housing, jobs, infrastructure, a healthy environment, access to green spaces and connected communities to continue to be vibrant places for people to live, work and visit. | Landscaping and high-quality outdoor places of respite provided for patients and staff. |

| Legislation | Description | Alignment |
|---|---|---|
| Sustainability SEPP (to commence on 1 October 2023) (DPE) | The State Environmental Planning Policy (Sustainable Buildings) 2022, also known as the Sustainable Buildings SEPP, aims to simplify and coordinate the way that we plan for and design sustainable buildings in NSW. | SEPP requirements have been applied to this project. |

# 3. Opportunities and Risks

## 3.1 Sustainability considerations/ initiatives

Section 1.6 outlines the sustainability initiatives of the Project which is in accordance with HI's ESD Evaluation Tool. Refer to Appendix A for the summarised list of sustainability initiatives & considerations.

### 3.1.1 Long list of opportunities and risks

#### High risk

| Opportunity | Risks |
|---|---|
| Credit *2.4 Independent Commissioning Agent* | Not targeted due to the time intensive process required to carry out the commissioning and tuning process by the facilities management, or costly ICA. |
| Credit *9.2 Provision of Outdoor Air* | Not targeted as the outdoor air rates are designed in accordance with HI requirements, and increasing the OA design allowance will have an impact on the riser sizing and energy requirements as there will be a greater volume of OA to condition. |
| Credit *11.2 Surface Illuminance* | Not targeted due to the infection control risk that arises from the use of lighting fixtures that are required to address the credit requirements for surface illuminance. |
| Credit *12.1 Daylight* | Not targeted as the current architectural design does not meet the required 40% daylight requirement in the nominated areas. |
| Credit *12.2 Views* | Not targeted as the current architectural design does not meet the required 60% views requirement in the nominated areas. |
| Credit *14.1 Thermal Comfort* | Achieving this credit will be challenging due to the limitations that may arise from the design of the existing building. Compliance maybe demonstrated only for the new build component of works and treat the existing areas as 'Not Applicable'. |
| Credit *14.2 Advanced Thermal Comfort* | Not targeted due to challenges in achieving the credit criteria. |
| Credit *18B.5 Fire System Test Water* | Not targeted due to the risk of achieving given the existing infrastructure arrangement. There is no existing rainwater tank on site for the test water to be discharged into. The new proposed rainwater tank will be very far from the sprinkler valve room making any recapture not possible. Realistically, another tank dedicated for fire test water discharge and new infrastructure for pumping/filtering this water to actually use it will be required. |
| Credit *19B.2 Steel* | Not targeted as the 5% reduction in mass of steel is difficult to achieve using post tensioning slab as opposed to reinforced concrete, as the former is not compliant with Green Star credit requirements. |

| | |
|---|---|
| Credit *22B Construction and Demolition Waste- Percentage Benchmark* | Achieving this credit is dependent on the Head Contractor's commitment to divert 90% of construction and demolition waste from landfill. This is a challenging target for sites outside the metropolitan centre. |
| Credit *25.0 Heat Island Effect Reduction* | Achieving this credit is challenging as it is also dependent on the solar reflectance properties of the existing roof. |

**Medium risk**

| Opportunity | Risks |
|---|---|
| Credit *9.1 Ventilation System Attributes* | Achieving this credit is dependent on the mechanical design wherein the design is in accordance with ASHRAE Standard 62.1:2013 in terms of the minimum separation distances, ease of maintenance and cleaning through the provision of access to both sides of all moisture and debris catching components within the air distribution system and cleaning of the ducts and systems prior to use. These parameters are to be confirmed following review of the final mechanical drawings. |
| Credit *10.1 Internal Noise Levels* | Achieving this credit is dependent on the acoustic testing results at project practical completion wherein the project team should demonstrate that the internal ambient noise levels in the nominated area are no more than 5dB above the lower figure in the range recommended in Table 1 of AS/NZS2107:2016. |
| Credit *10.3 Acoustic Separation* | Achieving this credit is dependent on the design of the partitions between spaces by the acoustic consultant such that it achieves a weighted sound reduction index ($R_w$) of at least 45 for all partitions which are fixed without a door and/or glazed partitions without a door, or an $R_w$ of at least 35 for all partition types that contain a door. |
| Credits *15E.1 Greenhouse Gas Emissions- Reference Building Pathway* and *16B Peak Electricity Demand Reduction- Performance Pathway* | The number of points achieved in these credits is dependent on the location and size of the solar PV system that is to be confirmed by the electrical engineer and architect following review of the changes to the helicopter flight path. Potential limitations may also arise due to the use of existing mechanical equipment, and this may limit the achievement of the 10% target only on the new building. |
| Credit *18B.2 Rainwater Reuse* | Achieving this credit is dependent on the final size and location of the rainwater tank. |
| Credit *21.1 Product Transparency and Sustainability* | Achieving this credit is dependent on the various product specifications by the services consultants. |
| Credit *26 Stormwater* | Achieving this credit is dependent on the stormwater modelling results and post-development peak event stormwater discharge rate. |

### 3.1.2 Feasibility

The feasibility of targeting the credits in the HI ESD Framework Tool was assessed based on a value engineering and cost-benefit analysis exercise by the project management team. The credits which required a considerable cost uplift to achieve the requirements were dropped following this assessment.

## 3.2 Final list of endorsed initiatives

### 3.2.1 Selection of Sustainability initiatives

| Sustainability Initiatives | Anticipated Outcome (Environment/Social/Economic) | Approved for Inclusion (above minimum requirements)/ Included as an Option |
|---|---|---|
| Engagement of GSAP | Environment | Minimum requirement |
| Commitment to environmental performance targets | environment | Minimum requirement |
| Services and maintainability review, building commissioning | Economic | Approved for inclusion |
| Development and implementation of Climate Change Risk Assessment and Adaptation Plan | Environment | Minimum requirement |
| Energy and water metering | Economic | Minimum requirement |
| Development and implementation of Environmental Management Plan (EMP) and Environmental Management System (EMS) | Environment, Social | Minimum requirement |
| Preparation and implementation of Operational Waste Management Plan | Environment, Social | Minimum requirement |
| Installation of water efficient fixtures and fittings | Environment | Approved for inclusion |
| Installation of energy efficient and high performing HVAC systems | Environment, Economic | Approved for inclusion |
| Installation of blinds and shading devices for glare control | Environment | Minimum requirement |
| Enhanced acoustic performance strategies and initiatives | Social | Approved for inclusion |
| Installation of energy efficient light fixtures | Environment, Economic | Minimum requirement |
| Net Zero Statement | Environment | Minimum requirement |
| Future proofing infrastructure for EV charging | Environment, Economic | Minimum requirement |
| Use of low VOC paints, sealants, adhesives and carpets, and low formaldehyde engineered wood products | Environment | Approved for inclusion |
| Sourcing steel from Responsible Steel Manufacturers | Environment | Approved for inclusion |
| Use of Best Practice PVC | Environment | Approved for inclusion |
| Development of a Green Travel Plan | Environment, Economic | Approved for inclusion |
| Construction and demolition waste diversion from landfill rate of 90% | Environment | Included as an option |
| Use of materials with sustainability certifications or reuse content | Environment | Approved for inclusion |
| Identification and removal of hazardous materials | Environment | Minimum requirement |
| Management of external light pollution | Environment | Approved for inclusion |

| Sustainability Initiatives | Anticipated Outcome (Environment/Social/Economic) | Approved for Inclusion (above minimum requirements)/ Included as an Option |
|---|---|---|
| Management of legionella risks | Environment | Approved for inclusion |
| Addressing Green Star Innovation Challenges (Ultra-Low VOC paints, Circular Economy, Net Zero/ Electrification, Embodied Carbon Assessment, Connection to Country) | All | Approved for inclusion |

## 3.2.2 Development of Sub-plans

### 3.2.2.1 Climate Adaptation Plan

A project-specific Climate Adaptation Plan has been completed following consultation with relevant stakeholders. A project-specific Climate Adaptation Plan will be prepared for any climate risks rated high or extreme to address HI Sustainability Priority on *Climate Risk Ready Sustainability Priority*.

The Climate Adaptation Plan includes the following:

- A summary of the project's characteristics (site, location, climatic characteristics).
- Assessment of climate change scenarios and impacts on the project using at least two time scales (e.g., 2030, 2040, 2050 or 2070), relevant to the project's anticipated lifespan. This will include a summary of potential direct and indirect climate change impacts (environmental, social and economic) on the project.
- Identification of the potential risks (likelihood and consequence) for the project and the potential risks to people. This risk assessment will be based on a GBCA recognised standard.
- A list of actions and responsibilities for all 'high' and 'extreme' risks identified.
- Details of stakeholder consultation that was undertaken during plan preparation and how the issues raised will be incorporated.

### 3.2.2.2 Net Zero Energy Plan

A project-specific Net Zero Energy Plan has been developed to align with the requirements of HI's DGN 058 Net Zero Plan requirements and Sustainable Buildings SEPP requirements.

# 4. Resourcing and funding

Refer to documents provided by the Cost Planner and Project Manager for cost plan and funding information.

## 4.1 Sustainability resourcing and funding

### 4.1.1 Resourcing Plan for Sustainability

Refer to cost planner or quantity surveyor documents for the capital cost plan for implementation of sustainability initiatives.

## 4.2 Whole-of-life cost considerations

Sustainability initiatives have been selected which require minimal maintenance & ongoing costs. Initiatives such as greywater treatment and recycling, cooling towers, onsite organics biodigestion or composting and untested innovative solutions have not been selected.

# 5. Sustainability in Design

## 5.1 Precinct / place issues and context (if applicable)

The Project is proposed as a mix of refurbishments of the existing hospital and an element of new build(s) on the existing site. The design of the existing buildings and existing infrastructure may pose issues in achieving certain credit requirements in terms of building envelope and services design.

The following credits may be affected by the design of the existing building:

- 15E.2 Greenhouse Gas Emissions
- 25.0 Heat Island Effect Reduction

The following credits are being dropped as a result of the issues posed by the existing infrastructure:

- 18B.5 Fire System Test Water

## 5.2 Major Medical Equipment Strategy

No major medical equipment strategy has been proposed for the Project yet.

## 5.3 ICT and Digital Strategy

As per the current HI ESD Framework Tool, the following digital strategies have been incorporated:

- **Metering** - Floor-by-floor metering if the entire floor has a single use. If a floor has multiple uses, the different uses shall be metered.

# 6. Project Delivery

Sustainability will be delivered as a part of the contract and construction through the following initiatives in the HI ESD Framework Tool:

| Initiative | Outcome |
|---|---|
| Credit *2.0 Environmental Performance Targets* | WNSWLHD is required to sign a commitment to monitor performance against the documented targets for environmental performance of the Project. |
| Credit *2.3 Building Systems Tuning* | WNSWLHD is required to provide a commitment to a tuning process for all nominated building systems, which at a minimum must include quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties. |
| Credit *5.1 Environmental Building Performance* | WNSWLHD is required to provide a commitment to set, measure and report on building performance metrics for at least two of the following: Greenhouse gas emissions, Potable water usage, Operational waste, Indoor environment quality. |
| Credit *5.2 End of Life Waste Performance* | The Project Manager and the architects are required to conduct an asset audit to assess the reuse potential of any equipment identified at the end-of-life of the Project. |
| Credit *7.0 Environmental Management Plan* | Head Contractor to ensure that a project-specific Environmental Management Plan (EMP) is developed and implemented to assist the sub-contractors to manage the environmental performance, conditions and impacts arising from demolition, excavation, and construction. The EMP must cover the environmental impacts arising from construction works and it must be site-specific. |
| Credit *7.1 Environmental Management System* | Head Contractor to ensure that the EMP is implemented by the responsible parties with a formal environmental management system (EMS) in place. EMS is a formalised systematic and methodical approach to planning, implementing and auditing during construction to ensure compliance with the EMP. |
| Credit *7.2 High Quality Staff Support* | Head Contractor to ensure that high quality staff support practices are in place that:<br>- Promote positive mental and physical health outcomes of site activities and culture of site workers, through programs and solutions on site.<br>- Enhance site workers' knowledge on sustainable practices through on-site, off-site, or online education programs. |
| Credit *24.2 Contamination and Hazardous Materials* | Head Contractor to conduct a comprehensive contamination and hazardous materials survey and remove or stabilise the contaminants and hazardous materials identified through best practice site remediation strategies. |

## 6.1 Town Planning Strategy alignment

The Project falls under the jurisdiction of Western New South Wales Local Health District (WNSWLHD). The HI ESD Framework tool was developed such that it addresses WNSWLHD's Environmental Sustainability Strategy 2023-2027 vision, goals and targets (Refer to section 1.9).

## 6.2 Proposed Phases of Work

### 6.2.1 Early and Enabling Works

Sustainability initiatives to be carried out in accordance with the HI ESD Framework Tool where practical for the limited scope of work in early and enabling works.

### 6.2.2 Main Works

The main works will be carried out in accordance with the HI ESD Framework Tool.

### 6.2.3 Refurbishment Works

Refurbishment works will be carried based on the assessment of the reuse potential of the different spaces.

## 6.3 Delivery and Contractor Procurement Strategy

The contractor procurement strategy is a Design and Construct Contract.

## 6.4 Post Implementation Evaluation Plan

The initiatives that will be subject to Post Implementation Evaluation are building commissioning and tuning as per the requirements of credit *2 Commissioning and Tuning*.

# 7. Mitigation Measures

Summary of mitigation measures identified within this report.

| Project Stage<br><br>Design (D)<br>Construction (C)<br>Operation (O) | Mitigation Measures | Relevant Section of Report |
|---|---|---|
| O | Change Management | 1.7 |
| D | Commitment to environmental performance targets | 2.1 |
| C | Services and maintainability review, building commissioning | 1.6 |
| D | Development and implementation of Climate Change Risk Assessment and Adaptation Plan | 3.2.2.1 |
| C/O | Energy and water metering | 5.3 |
| C | Development and implementation of Environmental Management Plan (EMP) and Environmental Management System (EMS) | 1.6 |
| D/O | Preparation and implementation of Operational Waste Management Plan | 1.3.4 |
| C/O | Installation of water efficient fixtures and fittings | 1.3.2 |
| C/O | Installation of energy efficient and high performing HVAC systems | 1.3.1 |
| C/O | Installation of blinds and shading devices for glare control | 1.3.1 |
| D/C | Enhanced acoustic performance strategies and initiatives | 8 |
| C/O | Installation of energy efficient light fixtures | 1.3.1 |
| D | Net Zero Statement | 3.2.2.2 |
| D/C | Future proofing infrastructure for EV charging | 1.3.1 |
| C | Use of low VOC paints, sealants, adhesives and carpets, and low formaldehyde engineered wood products | 1.3.3 |
| C | Sourcing steel from Responsible Steel Manufacturers | 1.3.3 |
| C | Use of Best Practice PVC | 1.3.3 |

| | | |
|---|---|---|
| D | Development of a Green Travel Plan | 1.6 |
| C | Construction and demolition waste diversion from landfill rate of 90% | 1.3.4 |
| C | Use of materials with sustainability certifications or reuse content | 1.3.3 |
| C | Identification and removal of hazardous materials | 1.3.4 |
| D | Management of external light pollution | 8 |
| D | Management of legionella risks | 8 |

# 8. Appendix A HI ESD Evaluation Tool

| | |
|---|---|
| Project Name: | Bathurst Hospital Redevelopment |
| HI Delivery Part: | 4 |

| | |
|---|---|
| Update by Name: | Madhu Muthumalai |
| Date Last Updated: | 21-01-25 |

| | |
|---|---|
| Total Points | 105 |
| Total - Minimum requirements | 18 |
| Total - Recommended | 32 |

## HI Environmentally Sustainable Development (ESD) Evaluation Tool

| Category/Credit | Aim of the Credit / Selection | Code | Credit Criteria | Points available | Points Targeted | Type | Input | Stakeholders | Overlaps HI ESG, AusHFG, NCC, SSDA, Design Guide | Notes: (including Healtcare relevant initiatives which are primarily for IPU type spaces) | Risk Level | Credit Requirements | Consultant Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Management** | | | | **12** | **63.5** | | | | | | | | |
| **ESD Consultant (Accredited Professional)** | To recognise the appointment and active involvement of an Accredited Professional in order to ensure that the ESD tool is applied effectively and as intended. | 1.0 | Accredited Professional | 1 | 1 | Minimum requirement | ESD | HI / LHD, ESD, Head Contractor | | | Low | | |
| **Commissioning and Tuning** | To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential. | 2 | Environmental Performance Targets | - | C | Minimum requirement | HI | HI / LHD, Mechanical, Electrical, Lighting, V. Transport, ESD, Fire, Hydraulics, Acoustics, Civil, Landscape | | | Low | | |
| | | 2.1 | Services and Maintainability Review | 1 | 1 | Recommended | ICA | HI / LHD, Façade, Mechanical, Electrical, Lighting, V. Transport, Fire, Hydraulics, Civil, Head Contractor, ICA | | | Low | Provide document records (e.g. meeting minutes) demonstrating the project design has considered:<br>• Commissionability;<br>• Controllability;<br>• Maintainability;<br>• Operability, including 'Fitness for Purpose'; and<br>• Safety. | **STN (MECH):** To be included within the specification. |
| | | 2.2 | Building Commissioning | 1 | 1 | Recommended | ICA | Mechanical, Electrical, V. Transport, Fire, Hydraulics, ICA | | | Low | PM: Provide extract from construction tender documents that will require a Commissioning Plan that includes the following:<br>• Objectives, or basis, of the design;<br>• Scope of the commissioning plan;<br>• Commissioning team list, the individual responsibilities and interface matrix;<br>• General sequence of commissioning;<br>• Proposed commissioning procedures;<br>• Witnessing requirements;<br>• Commissioning program; and<br>• Requirements for subcontractor commissioning manuals.<br><br>ARCH, MECH, ELEC, STERILE, HYD, FIRE: Provide extracts for tender documents that list the commissioning requirements, including the following:<br>• List the design parameters for each system;<br>• List the required commissioning activities;<br>• Define how each system is intended to operate; and<br>• List the acceptable tolerances during commissioning.<br><br>CONTR: Air Permeability Performance Testing (optional) | **STN (ESD):** HI have confirmed commissioning requirements are sufficient to target this credit (24/07) |
| | | 2.3 | Building Systems Tuning | 1 | 1 | Recommended | ICA | Mechanical, Electrical, V. Transport, Fire, Hydraulics, Head Contractor, ICA | | | Low | | |
| | | 2.4 | Independent Commissioning Agent | 1 | 0 | Optional | ICA | HI / LHD, Project Manager, ICA | | May require additional consultant. HI may support and undertake a similar role to ICA. Contact HI Sustainability team | High | HI: Provide confirmation that HI or a facility manager will be reviewing the commissioning plan and commissioning results. | Time intensive to carry out the assessment. Can be reviewed at a later stage if the facilities manager is familiar with all the nominated systems to carry out the assessment. |
| **Building Information** | To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance and sustainable outcomes. | 4.1 | Building Information | 1 | 1 | Recommended | ARCH | Façade, Mechanical, Electrical, V. Transport, Fire, Hydraulics, Landscape, Structrural, Head Contractor | | | Low | All Disciplines: Provide extract from construction tender documents that requires the provision of operations and maintenance information, including operating parameters and procedures and preventive maintenance requirements, including procedures and schedules. | |
| **Commitment to Performance** | To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way. | 5.1 | Environmental Building Performance | 1 | 1 | Recommended | HI | HI / LHD | | | Low | HI: Environmental building performance targets as per DGN 058. | |
| | | 5.2 | End of Life Waste Performance | 1 | 1 | Recommended | WASTE | HI / LHD | | | Low | ARCH: Asset audit | **TSA (PM):** MME and FFE Audit Reports have been completed. MME provided to STN and is endorsed through LHD. FFE Final report is due Friday 21st Jun. MME has been endorsed. Reusable items identified and those reused in this project. |
| **Metering and Monitoring** | To recognise the implementation of effective energy and water metering and monitoring systems. | 6 | Metering | - | C | Minimum requirement | MECH | Mechanical, Electrical, Hydraulics, Landscape | | | Low | MECH, ELEC: Provide floor-by-floor metering if the entire floor has a single use. If a floor has multiple uses, the different uses shall be metered. Therefore, should a floor be composed of office space and a seminar room, both spaces shall be separately sub-metered. If a floor has multiple tenants, each tenancy shall also be separately sub-metered. Where an energy load for a single item exceeds 5% of the total energy use for the building, or 100kW, it must be independently metered.<br><br>HYD: Provide floor-by-floor water & gas (if relevant) metering if the entire floor has a single use. If a floor has multiple uses, the different uses shall be metered. Where a common water use consumes 10% of the project's water use, these must be independently metered e.g. cooling towers. | **STN (ELEC):** Confirmed that the electricity metering meets the requirements.<br><br>**STN (MECH):** Confirmed that the major mechanical equipment will be metered as per the requirements. This will be defined in DD.<br><br>**STN (HYD):** Confirmed that metering requirements will be met. |
| | | 6.1 | Monitoring Systems | 1 | 0 | Minimum requirement | MECH | Mechanical, Electrical | | | Low | MECH: Specify a monitoring system which is capable of:<br>• Collecting data from all meters;<br>• Alerting to missing data due to failures;<br>• Recording energy use and water consumption, and providing a reporting capability at user adjustable intervals;<br>• Raising an alarm when the energy or water use increase beyond certain parameters and automatically and instantly issue an alert the facilities manager.<br>• Providing a breakdown of the information by building system (mechanical, electrical, etc.), or by space (or by tenanted floor);<br>• Including the consumption water or energy, the load versus time (load profile), and the power factor (in the case of energy); and<br>• Producing, as a minimum, a quarterly report that is automatically emailed to the facilities manager responsible for the building. | **STN (ESD):** Credit dropped.<br>Existing BMS doesn't monitor energy and water consumption (Aconex reference number: StantecA-GCOR-000005). |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction Environmental Management** | To reward projects that use best practice formal environmental management procedures during construction and support staff sustainability awareness and education. | 7 | Environmental Management Plan | - | C | Minimum requirement | CONTR | Head Contractor | | | Low | CONTR: Provide Environmental Management Plan. | |
| | | 7.1 | Formalised Environmental Management System | 1 | 1 | Recommended | CONTR | Head Contractor | | | Low | CONTR: Provide Environmental Management System. | |
| | | 7.2 | High Quality Staff Support | 1 | 1 | Optional | CONTR | Head Contractor | | Construction related credit for contractor to consider. | Low | CONTR: Provide mental health and physical wellbeing programs and initiatives to sub-contractors. Provide sustainability education in site inductions. | |
| **Operational Waste** | Operational Waste Management Plan | 8A | Performance Pathway - Specialist Plan | 1 | 1 | Optional | WASTE | HI / LHD, ARCH, Waste Consultant | | | Low | HNE/HI: Provide Operational Waste Management Plan | **TSA (PM):** Consultant was engaged and the final OWMP Report has been provided. |
| | | 8A(i) | Operational Waste Management Plan | - | C | Minimum requirement | WASTE | HI / LHD, ARCH, Waste Consultant | | | Low | As above | |
| | | 8B | Prescriptive Pathway - Facilities | - | | Optional | WASTE | | | | | | |
| **Total** | | | | **12** | **10** | | | | | | | | |
| **Indoor Environment** | | | | **17** | | | | | | | | | |
| **Indoor Air Quality** | To recognise projects that provide high air quality to occupants and safeguard occupant health through the reduction in internal air pollutant levels. | 9.1 | Ventilation System Attributes | 1 | 1 | Recommended | MECH | Mechanical | | Healthcare relevant initiative | Medium | MECH: Design minimum separation distances in accordance with ASHRAE Standard 62.1:2013. Provide access to both sides of all moisture and debris-catching components, within the air distribution system.<br>ARCH: Coordinate locations of access panels or a tiled ceiling with mech. | **STN (MECH):** Intakes and exhausts have being designed taking into consideration the separation distances. The locations have been finalised and the design is compliant with the separation distance requirements.<br>Access upstream and downstream will be provided for maintenance. All ductwork will be cleaned. |
| | | 9.2 | Provision of Outdoor Air | 2 | 0 | Optional | MECH | Mechanical | ESG requirements request 2.0 ACH to IPU spaces. | Healthcare relevant initiative | High | MECH: Provide outdoor air at a rate 50% greater than the minimum required by AS 1668.2:2012. | **STN (ESD):** OA rates designed to HI requirements.<br><br>**STN (MECH):** OA rates designed to HI requirements. Increasing OA design allowance will have an impact on riser sizing and energy as there will be a greater volume of OA to condition. |
| | | 9.3 | Exhaust or Elimination of Pollutants | 1 | 1 | Recommended | MECH | ARCH, Mechanical | | Healthcare relevant initiative | Low | MECH: All kitchens must be ventilated in accordance with AS 1668.2:2012. A separate exhaust system must be provided for the kitchen exhaust.<br>ARCH: All kitchens must be physically separated from adjacent spaces or have an opening no larger than an area of 2.5m2.<br>HI: printing and/or photocopying equipment must be certified in accordance with one of the following test standards:<br>• ECMA-328;<br>• RAL-UZ 171; or<br>• GGPS.003 | **STN (MECH):** Kitchen ventilation to compy with AS 1668.2:2012.<br>Kitchens are being designed as cold shelll spaces. Coordination of kitchen exhaust systems will happen with kitchen designers. |
| | | 9.4 | Paints, Adhesives, Sealants and Carpets | 1 | 1 | Recommended | ARCH | ARCH, Façade, Mechanical, Electrical, V. Transport, Fire, Hydraulics, Acoustics, Head Contractor | | Healthcare relevant initiative | Low | ARCH: Specify low VOC paints and carpets. | **BLP (ARCH):** Draft specification will be provided and will include request for ultra low VOC paints, adhesives, sealants and carpets. |
| | | 9.5 | Engineered Wood Products | 1 | 1 | Optional | STRUC | ARCH, Structrural, Head Contractor | | Healthcare relevant initiative | Low | ARCH: Specify low formaldehyde engineered wood produts: particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels | **BLP (ARCH):** Low formaldehyde added to joinery etc in the Draft Specification |
| **Acoustic Comfort** | To reward projects that provide appropriate and comfortable acoustic conditions for occupants. | 10.1 | Internal Noise Levels | 1 | 1 | Recommended | ACOUS | ARCH, Façade, Mechanical, Acoustics | | Healthcare relevant initiative | Medium | HI: Engage an acoustic consultant<br>ACOUS: Design internal ambient noise levels in the nominated area to be no more than 5dB(A) above the lower figure in the range recommended in Table 1 of AS/NZS2107:2016. | **STN (ACOUS):** Design report complies with credit requirements. |
| | | 10.2 | Reverberation | 1 | 1 | Optional | ACOUS | ARCH, Acoustics, Structrural | | Healthcare relevant initiative | Low | HI: Engage an acoustic consultant<br>ACOUS: Reverberation time in the nominated area to be below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZ 2107:2016. | **STN (ACOUS):** Design report complies with credit requirements. |
| | | 10.3 | Acoustic Separation | 1 | 1 | Optional | ACOUS | ARCH, Mechanical, Acoustics, Structrural | | Healthcare relevant initiative | Medium | HI: Engage an acoustic consultant<br>ACOUS: The partitions between spaces to be constructed to achieve a weighted sound reduction index (Rw) of:<br>• At least 45; for all partitions which are:<br>• Fixed without a door; and/or<br>• Glazed partitions without a door.<br>• At least 35; for all partition types that contain a door. | **STN (ACOUS):** Design report complies with credit requirements. |
| **Lighting Comfort** | To encourage and recognise well-lit spaces that provide a high degree of comfort to users. | 11 | Minimum Lighting Comfort | - | C | Minimum requirement | LIGHT | Electrical, Lighting | Artificial lighting initiatives can also utilise typical spaces. | Healthcare relevant initiative | Low | | |
| | | 11.1 | General Illuminance and Glare Reduction | 1 | 1 | Recommended | LIGHT | Electrical, Lighting | | Healthcare relevant initiative | Low | ELEC: Specify electronic drivers that feature 12-bit or greater resolution for all light emitting Diode (LED) lighting. Specify lighting with a minimum CRI of 80. Lighting levels comply with Table F1 of AS/NZS 1680.2.2. All bare light sources are specified to be fitted with baffles, louvers, translucent diffusers, ceiling design, or other means that obscures the direct light source from all viewing angles of occupants, including occupants looking directly upwards. | **STN (ELEC):** Inherent within electrical design. Lighting calculations have been conducted and compliance with AS1680 has been demonstrated. |
| | | 11.2 | Surface Illuminance | 1 | 0 | Optional | ARCH | ARCH, Electrical, Lighting | | Healthcare relevant initiative | High | ARCH: Surface reflectance for ceilings to be at least 0.75.<br>ELEC: Design a direct/indirect lighting system present such that the ceiling area has an average surface illuminance of at least 30% of the lighting levels on the working plane. | **STN (ESD):** Unlikely to achieve this requirement in hospitals due to the type of lighting design required to address spatial requirements. |
| | | 11.3 | Localised Lighting Control | 1 | 1 | Optional | LIGHT | Electrical, Lighting | | Healthcare relevant initiative | Medium | ELEC: Provide direct lighting control for patients and staff. | **STN (ELEC):** Inherent within electrical design. Lighting control details has been provided in the electrical details and specification. |
| **Visual Comfort** | To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants. | 12 | Glare Reduction | - | C | Minimum requirement | ESD | ARCH, Façade | | Healthcare relevant initiative | Low | ARCH: Provide blinds with a visual light transmittance of <10%. | **BLP (ARCH):** Room layout sheets will have the rooms with blinds, and the specification will include blinds. Final detail around type of blinds (single, double, sheer & blackout). |
| | | 12.1 | Daylight | 2 | 0 | Optional | ESD | ARCH, Façade, ESD | Modelling of typical spaces for the daylighting initiative is acceptable, provided a | Healthcare relevant initiative | High | ESD: Prescriptive methodology assessment. | **STN (ESD):** <40% achieved. |
| | | 12.2 | Views | 1 | 0 | Optional | ARCH | ARCH | Views can also be assessed using typical spaces. | Healthcare relevant initiative | High | ESD: Prescriptive methodology assessment. | **BLP (ARCH):** Optimising primary views to the north (Bathurst plains) and east (Victoria Park). Introducing courtyards to provide access and view to green spaces from the centre of the hospital. |
| **Thermal Comfort** | To encourage and recognise projects that achieve high levels of thermal comfort. | 14.1 | Thermal Comfort | 1 | 1 | Optional | MECH | Mechanical | NCC 2022 JV3 requires a PMV assessment to be undertaken | Healthcare relevant initiative | High | MECH / ESD: Provide thermal comfort modelling results to achieve PMV +-1. | **STN (ESD):** Demonstrate compliance only for new build areas and treat exisiting areas as N/A. |
| | | 14.2 | Advanced Thermal Comfort | 1 | 0 | Optional | MECH | Mechanical | | Healthcare relevant initiative | High | MECH: Provide thermal comfort modelling results to achieve PMV +-0.5. | **STN (MECH):** Challenging to achieve. |
| **Total Line** | | | | **17** | **10** | | | | | | | | |

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| **Energy & Carbon** | | | | **17** | | | | | | | | | |
| **Greenhouse Gas Emissions** | To encourage and recognise projects to reduce their carbon footprint through design and construction and to ensure projects are net zero ready. | 15E.0 | Conditional Requirement: Reference Building Pathway | - | C | Minimum requirement | MECH | Façade, Mechanical, Electrical, Hydraulics | | | Low | | **STN (ELEC):** Typical to achieve HI ESG + 10% improvement PV system installed. Dependent on available roof space. |
| | | 15E.1 | Comparison to a Reference Building Pathway. | 10 | 4.5 | Minimum requirement | MECH | Façade, Mechanical, Electrical, Hydraulics | | | Medium | MECH: Provide energy modelling results. Economy cycle<br>ARCH: Provide a 15% increase in insulation and glazing thermal performance compared to minimum compliance.<br>ELEC: Provide illumination power density 15% lower than maximum allowance under J6. Include rooftop PV system. | **STN (ESD):** Providing energy modelling.<br><br>**STN (MECH):** Outdoor air economy cycle will be provided to all AHUs. |
| | | 15E.1 | Conditional Requirement: Net zero plan | - | C | Minimum requirement | ESD<br>MECH<br>ELEC<br>HYD | | | | Low | | **STN (ESD):** Net Zero Plan is complete. |
| | | 15E.1(i) | 100% electric in operation | 1 | 0 | Minimum requirement | ELEC | Mechanical, Electrical | Aligns with Sustainable Buildings SEPP - A Net Zero Statement describes how a project will avoid dependence on fossil fuels and be capable of operating at net zero emissions by 2035. | | High | | **STN (ESD):** Net Zero Plan has been developed as part of SSDA to address 100% electric operation. Noting that exisiting gas-fired heating and DHW systems will be used for refurbished areas. |
| | | 15E.1(ii) | 10% energy performance beyond NCC requirement, or GREP | 1 | 1 | Minimum requirement | ELEC | Mechanical, Electrical | | | Medium | As per 15E.1 | |
| | | 15E.1(iii) | Measurement of Embodied Carbon | 1 | 1 | Minimum requirement | STRUC | ARCH, Structrural, Head Contractor, Façade | Aligns with Sustainable Buildings SEPP - use the Embodied Emissions Materials Form in line with the Embodied Emissions Technical Note | | Low | ESD: Embodied Carbon assessment to be undertaken. | **MBM (QS):** Upfront Embodied Carbon assessment has been completed for SSDA in response to Sustainable Buildings SEPP |
| | | 15E.1(iv) | Target reduction in upfront carbon emissions | 1 | 1 | Minimum requirement | ELEC | Mechanical, Electrical | | | Low | ESD: Provide reccomendations to reduce upfront carbon<br>ARCH: Maximise reuse. Select lightweight building materials and reduce aluminium.<br>STRUCT: Min 30% portland cement reduction | **STN (ESD):** An iterative upfront embodied carbon calculation has been undertaken at masterplanning, schematic and tender stages, and appropriate recommendations have been identified. |
| **Peak Electricity Demand Reduction** | To encourage projects to consider Peak electricity reduction through energy efficiency or on-site energy generation | 16A(i) | Solar or Renewable energy assessment | - | C | Minimum requirement | ELEC | Mechanical, Electrical | | | Medium | ELEC: Solar PV array capacity to be determined. | **STN (ESD):** A 200 kW solar PV array has been proposed. There is a possibility to increase the capacity based on available roof area. |
| | | 16A(ii) | Solar or Renewable energy generation | 1 | 0 | Recommended | ELEC | Mechanical, Electrical | | | | | |
| | | 16B | Performance Pathway - Reference Building | 2 | 1 | Optional | ELEC | Mechanical, Electrical | | Healthcare relevant initiative | Medium | ELEC: Solar PV array capacity to be determined. | **STN (ELEC):** A 200 kW solar PV array has been proposed. |
| **Total Line** | | | | **17** | **8.5** | | | | | | | | |

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| **Climate risk and resilience** | | | | **2** | | | | | | | | | |
| **Adaptation and Resilience** | To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters. | 3.1 | Climate risk assessment | 1 | 1 | Minimum requirement | ESD | ARCH, Façade, Mechanical, Electrical, Fire, Hydraulics, Civil, Landscape, Structrural, CAP Consultant,LHD | | | Low | PM: Engage an ESD consultant to undertake a Climate Change Risk Assessment and Adaptation Plan. | **STN (ESD):** Stantec has prepared the Climate Change Risk Assessment and Adaptation Plan, and a stakeholder engagement workshop was conducted. |
| | | 3.2 | Implementation of a Climate Adaptation Plan | 1 | 1 | Recommended | ENV | ARCH, Façade, Mechanical, Electrical, Fire, Hydraulics, Civil, Landscape, Structrural, CAP Consultant | SEARS condition: Credit can be used to demonstrate CSIRO project climate Impacts | | Low | QS: Allow for implementation of adaptive measures. | **STN (ESD):** All design responses required to address the high and extreme climate risks have been addressed through architectural and building services design. |
| **Total Line** | | | | **2** | **2** | | | | | | | | |

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| **Transport** | | | **Points available** | **10** | | | | | | | | | |
| **Sustainable Transport** | To encourage projects to consider sustainable transport options through design | 17A.1 | Performance Pathway | 9 | 4 | Optional | TRANS | HI / LHD, Project Manager, ARCH, Electrical, ESD, Travel Planner | | Hospitals are usually well connected to public transport nodes. Large percentage of patients require access to hospsitals via vehicles. Expansion of exisitng hospital also require additional carparking. | Low | PM: Engage a transport consultant<br>TRANS: Complete the Sustainable Transport Calculator; Green Travel Plan | **TTW (Traffic):** TTW has been engaged as the Traffic Consultant.<br>Draft Green Travel plan is complete.<br>TTW has provided preliminary mode share target changes. |
| | | 17B.1 | Access by Public Transport | 0 | 0 | Optional | | ESD | | | | | |
| | | 17B.2 | Reduced Car Parking Provision | 0 | 0 | Optional | | ARCH, Travel Planner | | | | | |
| | | 17B.3 | Low Emission Vehicle Infrastructure | 1 | 1 | Minimum requirement | | ARCH, Electrical | Consistent with DGN 46 and NSW Government Fleet Strategy requirements | | | ARCH: Provide electric vehicle chargers for 5% of all parking spaces i.e. 2 EV chargers. | **TTW (Traffic):** No EV chargers<br>**STN (ELEC)**: Power and comms has been provided for 2% for future proofing. Power allowance has been provided for 1%. |
| | | 17B.4 | Active Transport Facilities | 0 | 0 | Optional | | Project Manager, ARCH | | | | ARCH: Provide end-of-trip facilities and protected bike parking for 7.5% of building occupants & 5% of visitors. 1.2 lockers per occupant bicycle space. | |
| | | 17B.5 | Walkable Neighbourhoods | 0 | 0 | Optional | | ESD | | | | 8 amenities provided within 400m. | |
| **Total Line** | | | | **10** | **5** | | | | | | | | |

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| **Water** | | | | **12** | | | | | | | | | | |
| **Potable Water** | Potable Water - Performance Pathway | 18A.1 | Potable Water - Performance Pathway | 0 | 0 | Optional | HYDR | ESD, Fire, Hydraulics, Civil, Landscape | | Hospitals require extensive use of potable water and typically lower use for recycled water. AusHFG requirements limit use of rainwater systems, limiting the use to primarily landscaping. | Medium | | |
| | | 18B.1 | Sanitary Fixture Efficiency | 1 | 1 | Recommended | HYDR | Hydraulics | AusHFG Requirements limit use of RW systems (maintenance / Payback | Healthcare relevant initiative | Low | HYDR: Specify minimum WELS ratings - Taps 5 Star, Urinals 4 Star, Toilets 4 Star, Showers 3 Star (6.0 but <=7.5L/min), Clothes | |
| | | 18B.2 | Rainwater Reuse | 1 | 1 | Optional | HYDR | Hydraulics, Landscape | AusHFG Requirements limit use of RW systems | | Medium | HYDR: Provide rainwater capture and reuse infrastructure for irrigation and other end uses as possible. | **STN (HYD):** A 60 kL rainwater tank has been provided. Location in the lower ground floor level is proposed. |
| | | 18B.3 | Heat Rejection | 2 | 2 | Optional | MECH | | | Healthcare relevant initiative | Low | MECH: Provide waterless heat rejection systems. | **STN (MECH):** Water-based heat rejection system that includes measures for Legionella control and risk management are proposed.<br><br>**STN (ESD):** New build has air-cooled heat rejection. Hence credit requirement can be met. |
| | | 18B.4 | Landscape Irrigation | 1 | 1 | Recommended | LAND | Hydraulics, Landscape | | | Low | LAND: Drip irrigation with moisture sensor override or no potable water is used for irrigation. | |
| | | 18B.5 | Fire System Test Water | 1 | 0 | Recommended | FIRE | Fire | | | High | FIRE: Reuse of 80% of the sprinkler system test water for application on landscaping. Recirculation closed-loop system can be considered too. | **STN (FIRE):** Very difficult to achieve given existing infrastructure arrangement, so suggest we do not target this.<br>No existing rainwater tank on site for this test water to discharge to. And even the new proposed rainwater tank will be very far from the sprinkler valve room making any recapture not possible. We would realistically need another tank dedicated for fire test water discharge and new infrastructure for pumping/filtering this water to actually use it.<br><br>**STN (ESD):** Point being dropped following need for additional rainwater tank in new location for this point. |
| **Total Line** | | | | **6** | **5** | | | | | | | | | |
| **Materials & Waste** | | | | **14** | | | | | | | | | | |
| **Life Cycle Impacts** | Prescriptive Pathway - Life Cycle Impacts | 19A.1 | Comparative Life Cycle Assessment | 6 | | Optional | | ARCH, Façade, Mechanical, Electrical, Lighting, V. Transport, Hydraulics, Civil, Structrural, LCA Consultant, Head Contractor | | Life Cycle Assessor (additional consultant) required | | | |
| | | 19A.2 | Additional Life Cycle Impact Reporting | 4 | | Optional | | LCA Consultant | | Life Cycle Assessor (additional consultant) required | | | |
| | | 19B.1 | Concrete | 3 | 2 | Optional | ARCH | Civil, Structrural | | Healthcare relevant initiative | Low | STRUC: Specify that a 30% reduction of the absolute quantity by mass of Portland cement across all concrete used in the project shall be achieved by substitution with fly-ash and/or blast furnace slag. | **TTW (STRUC):** 30% target for portland cement replacement with SCMs is achievable. Credits 19.B.1.2 Water and 19.B.1.3 Aggregates (2 x 0.5 points) may be achievable as well. |
| | | 19B.2 | Steel | 1 | 0 | Optional | ARCH | Civil, Structrural | | | High | STRUC: For a steel framed building, achieve a reduction in the mass of steel framing through the use of high strength steel. A minimum of 95% of category A products and 25% of category B products must meet the strength grades specified in Table 19B.2.1 and Table 19B.2.2 of the Green Star Design & As Built Steel Credit.<br>For a concrete framed building, a 5% reduction in mass of reinforcing steel used in the building shall be achieved by optimal fabrication or by innovative structural design. STRUC to provide a paragraph demonstrating how this has been achieved in accordance with Section 19.B.2B of the Green Star Design & As Built Steel Credit. | **TTW (STRUC):** The proposed expansion is a concrete frame building with some structural steel in the ED expansion. The 5% reduction in mass of steel rienforcement is difficult to achieve as using PT instead of RC is not accepted. TTW does not recommend pursuing this point. |
| | | 19B.3 | Building Reuse | 4 | 1 | Optional | | ARCH, Civil, Structrural | | Healthcare relevant initiative | Low | | **STN (ESD):** 14% of the external façade is being reused.<br>26% of the existing slabs (floors and roof) and 43% of the existing columns are being reused. |
| | | 19B.4 | Structural Timber | 4 | 0 | Optional | STRUC | | | | | | **TTW (STRUC):** No structural timber proposed on project. |
| **Responsible Building Materials** | To reward projects that include materials that are responsibly sourced or have a sustainable supply chain. | 20.1 | Structural and Reinforcing Steel | 1 | 1 | Recommended | STRUC | | | | Low | STRUC: Specify that 95% of the building's steel (by mass) is to be sourced from a Responsible Steel Maker. For a steel framed building, at least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute. For a concrete framed building at least 60% of all reinforcing bar and mesh is produced using energy-reducing processes in its manufacture. | **TTW (STRUC):** Achievable for a concrete frame building but reinforcement can only be sourced from OneSteel. |
| | | 20.2 | Timber Products | 1 | 1 | Recommended | ARCH | | | | Low | ARCH, SRUC: Specify that all timber used in the building and construction works is FSC or PEFC certified. Timber products include: formwork, hoardings, structural timber, internal walls, cladding, flooring, wall and ceiling finishes, furniture items, plywood. | **TTW (STRUC):** Achievable. To be addressed in specifications. |
| | | 20.3 | Permanent Formwork, Pipes, Flooring, Blinds and Cables | 1 | 1 | Recommended | HYDR MECH ELEC ARCH STRUC | | | | Low | HYDR, MECH, ARCH, STRUC: All products containing PVC are to hold a Best Practice PVC Certificate, a JAS-ANZ audit verification certificate stating the GBCA's Best Practice Guidelines for PVC, or a product accreditation certificate from a GBCA accredited scheme. | **STN (ELEC):** Inherent within electrical design. To be included within specification.<br><br>**STN (MECH):** To be included within specification. |
| **Sustainable Products** | To encourage sustainability and transparency in product specification. | 21.1 | Product Transparency and Sustainability | 3 | 3 | Optional | | | | | Medium | Targeting a total of 3% of the cost of all products to have sustainability credentials.<br>ARCH: Specify approximately 30% of all products to have Environmental Product Declarations (EPDs) or third party certifications e.g. GECA or GreenTag.<br>STRUC: Specify any precast concrete and all steel to have Environmental Product Declaration (EPDs) | **STN (ELEC):** Inherent within electrical design. To be included within specification.<br><br>**STN (MECH):** To be included within specification. |
| | | 22A | Fixed Benchmark | 1 | | Optional | | | | | | | |

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| **Construction and Demolition Waste** | | 22B | Percentage Benchmark | - | 1 | Recommended | CONTR | | | | Medium | 1 point is awarded where the contractor can demonstrate that at least 90% of the waste generated during construction and demolition has been diverted from landfill. Waste shall be reported in kilograms.<br>CONTR: To calculate the amount of waste diverted from landfill, the project team is required to report the total amount of waste generated and the total amount of waste diverted from landfill, and report on the proportion diverted as a percentage. | **STN (ESD):** Encycle has proposed that a 98% construction and demolition waste recovery can be achieved by recycling concrete and gypsum. Encycle has proposed that concrete can be recycled for road base and gypsum can be used as a clay breaker for farming applications. |
| **Total Line** | | | | **14** | **10** | | | | | | | | |
| **Land Use & Ecology** | | | | **6** | | | | | | | | | |
| **Ecological Value** | To reward projects that improve the ecological value of their site. | 23 | Endangered, Threatened or Vulnerable Species | - | | Minimum requirement | ECO | Project Manager, ESD | | Hospitals usually built on brown field sites | | Upgrade of an existing building. | |
| | | 23.1 | Ecological Value | 3 | 0 | | | ARCH, Landscape | | Hospital sites are usually mainly buildings with minimal landscape area. | | Limited landscaping | |
| **Sustainable Sites** | To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land. | 24 | Conditional Requirement | - | | Minimum requirement | LAND | Project Manager, ESD | | Healthcare relevant initiative | Low | | |
| | | 24.1 | Reuse of Land | 1 | 1 | | | HI / LHD | | Most hospital and healthcare projects are located within exisitng hospital sites. For most projects, this credit would be considered achieved. | Low | Upgrade of an existing building. | |
| | | 24.2 | Contamination and Hazardous Materials | 1 | 1 | | CONTR | Project Manager, Head Contractor | | Healthcare relevant initiative | Low | ENV: Provide a Contamintation and Hazardous Materials Survey<br>CONT: Remove or stabilise contamintants and hazardous materials in accordance with best practice. | |
| **Heat Island Effect** | To encourage and recognise projects that reduce the contribution of the project site to the heat island effect. | 25.0 | Heat Island Effect Reduction | 1 | 1 | Recommended | ARCH | ARCH, Landscape | | | High | ARCH: Specify roof materials to have a minimum Solar Reflectance Index of 82. | **STN (ESD):** Existing building with sloped roof has Dune color (SRI 60). This meets the requirements of SRI >=34 for roof pitch >15deg.<br>All new flat roof with pitch <15deg shall have SRI>=82. Dover White or Whitehaven. White waterproofing sheet to be specified over concrete roof. |
| **Total Line** | | | | **6** | **3** | | | | | | | | |
| **Discharge to Environment** | | | | **5** | | | | | | | | | |
| **Stormwater** | To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure. | 26.1 | Stormwater Peak Discharge | 1 | 1 | Recommended | CIVIL | Hydraulics, Civil, Landscape | | | Medium | CIVIL: Ensure the post-development peak event stormwater discharge from the site does not exceed the pre-development peak event stormwater discharge, using a 5 year ARI. | **TTW (CIVIL):** Drains modelling has been completed and it has been determined that on-site detention will be required to mitigate 5-year ARI flows back to pre-development scenario. A summary of the detention tanks is as below:<br>> Eastern Extension, Vegetation Corridor, and ED drop off- 20.1m3<br>> Western Staff Carpark redesign- 14.8m3<br>Existing carparking is considered out of scope for these and existing stormwater for these will not be changed. |
| | | 26.2 | Stormwater Pollution Targets | 1 | 1 | | CIVIL | Civil, Landscape | | | Medium | CIVIL: Achieve pollution reduction in accordance with column A from "Table Emi-5.1: Pollution Reduction Targets". | **TTW (CIVIL):** The following stormwater quality measures will be implemented into the stormwater drainage system:<br>- Bioretention (16 m2) collecting generated stormwater runoff from the eastern extension, new vegetation corridor, and a portion of the redesigned ED drop off. |
| **Light Pollution** | To reward projects that minimise light pollution. | 27.0 | Light Pollution to Neighbouring Bodies | - | C | Recommended | | Electrical, Lighting | | Neighbouring buildings are usually the hospital buildings. Consider impacts to surrounding residential if any. | Low | LANDSCAPE, ELEC: Confirm compliance with AS 4282 Control of the obtrusive effects of outdoor lighting | **STN (ELEC):** Inherent within electrical design. Lighting calculation has demonstrated compliance with AS4282.2019. |
| | | 27.1 | Light Pollution to Night Sky | 1 | 1 | Recommended | | Electrical, Lighting | | | Low | LANDSCAPE, ARCH, ELEC: No external luminaire may have an upward light output ratio greate than 5% i.e. no uplights. | **STN (ELEC):** Inherent in electrical design. Lighting calculation has demonstrated compliance with AS4282.2019. No uplights have been specified. |
| **Microbial Control** | To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems. | 28.0 | Legionella Impacts from Cooling Systems | 1 | 1 | Recommended | MECH | | | Healthcare relevant initiative | Low | MECH: Water-based heat rejection system is to be built in accordance with AS/NZS 3666.1:2011. The system is to be designed and built to maintain constant movement to prevent water stagnation in the system;  The water contained in the system is never to be at a temperature between 20°C and 50°C while not moving.<br>CONT: Provide a Legionella Risk Management Plan including:<br>Monthly inspectionsand maintenance of the system(s) as per AS/NZS 3666.2:2011 or as per a performance based maintenance program developed in accordance with AS/NZS 3666.3:2011;<br>• Flushing of the system(s) where the system(s) is not in operation for more than three days; and<br>• Inspection, cleaning and flushing of the system(s) prior to reactivation. | **STN (MECH):** To be included within specification. |
| **Refrigerant Impacts** | To encourage operational practices that minimise the environmental impacts of refrigeration equipment. | 29.0 | Refrigerants Impacts | 1 | 1 | | MECH | | | | Medium | | **STN (MECH):** Leak detection system will be provided with the chillers. |
| **Total Line** | | | | **5** | **5** | | | | | | | | |
| **Innovation** | | | | **10** | | | | | | | | | |
| **Innovative Technology or Process** | The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world. | 30A | Innovative Technology or Process | | | | | | | | | | |
| **Market Transformation** | The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world. | 30B | Market Transformation | | | | ARCH<br>HYDR<br>MECH<br>STRUC<br>CONT | | | | | | |
| **Improving on Benchmarks** | The project has achieved full points in a credit and demonstrates a substantial improvement on the benchmark required to achieve full points. | 30C | Improving on Benchmarks | | 1 | | ARCH | | | | Low | ARCH: Specify ultra low VOC (<5g/L) paints. | **BLP (ARCH):** Draft specification will be provided which will include request for ultra low VOC paints. |
| | Supplementary or tenancy fitout systems review | 30C | Commissioning and Tuning | | | | ICA | | | | | PM: Facilitate a services and maintainability review of tenancy fitout systems to ensure they are properly integrated with the base building systems. | |

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| | Daylight See credit | 30C | Visual Comfort | | | | ESD | | | | | | |
| **Innovation Challenge** | Where the project addresses an sustainability issue not included within any of the above Credits. | 30D | Innovation Challenge | | | | HI | | | | | ARCH/HI/Contractor: Reconciliation Action Plan and action/activity. | |
| | Where the project addresses an sustainability issue not included within any of the above Credits. | 30D | Innovation Challenge | | | | PM | | | | | PM: Soft Landings: Facilitate at least 3 workshops between design/constructions teams and facility managers. Maintain a register with design gateways. | |
| | Where the project addresses an sustainability issue not included within any of the above Credits. | 30D | Innovation Challenge | 10 | | | HNE | | | | | | |
| | Circular Economy | 30D | Innovation Challenge | | 1 | | PM<br>ARCH | | | | Low | PM/ARCH: Provide evidence of spaces selected for reuse. | **TSA (PM):** Assessment of reuse potential for each space reuse/refurb/repurpose %. TSA has identified in the Business Case reuse table. |
| | Net Zero/ Electrification | 30D | Innovation Challenge | | 1 | | ESD<br>HYD<br>MECH<br>ELEC | | | | Low | ESD/HYD/MECH/ELEC: Provide evidence of the electrification strategy. | **STN (ESD):** A Net Zero Plan has been prepared for the development. Innovation Challenge confirmed by HI 24/07. |
| | Embodied Carbon Assessment | 30D | Innovation Challenge | | 1 | | ESD | | | | Low | ESD: Provide embodied carbon assessments & recommendations. | **STN (ESD):** An Iterative embodied carbon assessment has been completed and appropriate recommendations have been proposed. Innovation Challenge confirmed by HI 24/07. |
| **Global Sustainability** | Community, Heritage and Identity- Connection to Country | 30E | Global Sustainability | | 1 | | PM | | | | Low | PM: Connection to Country report to be developed. | **STN (ESD):** HI has provided a draft Connection to Country report. This has been endorsed. Initiatives include connection to sky through skylight. Some initiatives may be VE'd but overall strategy will be maintained. |
| | Project teams may adopt a credit from a globally recognised sustainability ratings tool not included within any of the above Credits. | 30E | Global Sustainability | | | | | | | | | | |
| **Total Line** | | | | **10** | **5** | | | | | | | | |
| **Project Score** | | | | | **63.5** | | | | | | | | |

# 9. Appendix B NCC Section J J1V3 Energy Modelling Report

# Bathurst Hospital Redevelopment

# Sustainability Report

# NCC Section J J1V3 Energy Modelling

**30 September 2024**

**Ref: 301351221**

**PREPARED FOR:**

Health Infrastructure C/ TSA Management
Bathurst Hospital

**PREPARED BY:**

Juhi Banerji, Rebecca Dracup

Stantec

# Revision Schedule

| Revision No. | Date | Description | Prepared by | Quality Reviewer |
|---|---|---|---|---|
| 01 | 05/02/2024 | Draft Schematic Design Report | JBA | RD |
| 02 | 28/02/2024 | Draft 70% Design Development | JBA | RD |
| 03 | 30/09/2024 | 70% Design Development | JBA | RD |

**Name:** **Rebecca Dracup**

**Signature:**

# Disclaimer

Stantec was instructed to provide a reduced scope for Health Infrastructure NSW Part 4. All aspects are provided to a 70% level of completion, for example, design is based on the 70% DD architectural drawings, design is provided to a 70% level of design, 70% of the coordination has been undertaken. There is still 30% of the design to be resolved for the 70% Design Development Architectural drawings and additional design updates to bring it up to the same level of design as the latest architectural drawings.

The conclusions in the Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. 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 Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or any other project or purpose, and any unauthorized 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 Report 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 Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report 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 report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

The results generated from this analysis are based on specific criteria outlined in the NCC Volume One and are not considered to be a true representation of the actual operation of the building. The intent of these criteria is to permit the comparison of the estimated annual greenhouse gas emissions of a Proposed Building against that of a Reference Building and therefore determine if a specific building has the ability to be energy efficient and thermally comfortable as defined by Section J of the NCC.

The thermal properties described in the following report are to meet the minimum energy efficiency requirements stated by the NCC provisions only. It does not directly account for any requirements for the following aspects:

- Thermal Comfort – Thermal Comfort requirements of Section J are inherently meet under the Deemed to Satisfy verification method. This does not however assure thermally comfortable conditions in reality. Mechanical engineer to confirm any specific requirements for Air-Conditioning Systems
- Vapour Barriers and Condensation – Architect to ensure appropriate details for waterproofing and condensation risk management
- Impact and Structural – Structural engineer to confirm requirements
- Acoustic requirements – Acoustic engineer to confirm requirements

- Fire Requirements – Fire Engineer or Building Surveyor to confirm requirements.
- Wind, Safety, Aesthetic- relevant consultant to confirm requirements, as required.

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# Qualifications to this Report

The following qualifications apply to this report:

- Information has been based on our understanding of the proposed building and documentation provided, as noted. Architect to review & confirm any assumptions where required.
- This report outlines the scope of works required for NCC Section J Part J4 Building Fabric compliance only.

  The project design team (including the Architect) will be required to review and consider the implications of these recommendations on their design for the project.

  For example:

  - Glazing and insulation nominations have considered the thermal performance only. The design team should also coordinate these recommendations with any specific acoustic, wind, fire, condensation, structural, safety (during design and installation) or aesthetic considerations.
  - Estimations have been made regarding thermal bridging elements that require confirmation and possibly updating as design progresses. In some instances, this may not be until shop drawings are issued.
  - Different insulation products will have varying spatial allowances. The design team should coordinate the proposed insulation types, with specified R-values required throughout this report and ensure compliance is maintained throughout the project.
- As this project involves no detailed design or site supervision by Stantec, we advise that we will not prepare a Safety in Design report for this project. As detailed in our scope of work we will review the Safety in Design report prepared by the project designer and make comment as appropriate. We confirm that the responsibility for complying with the requirements of the state OS&H legislation remains with the project designer in conjunction with the project team and the client. We note that the OS&H legislation places particular obligations on the developers and owners of property with respect to the management of OS&H issues arising from the construction, use, maintenance and demolition of plant and buildings.

# File Records

For records the files used in this report are as follows:

- All modelling completed on the basis of the following documents:

| Drawing # | Drawing Name | Revision |
|---|---|---|
| BHR-BLP-DRW-ARC-GEN-100-00002 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 00 - PART 2 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-01001 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 01 - PART 1 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-01002 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 01 - PART 2 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-01003 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 01 - PART 3 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-02001 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 02 - PART 1 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-02002 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 02 - PART 2 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-02003 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 02 - PART 3 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-03001 [J] | PLAN - GENERAL ARRANGEMENT -LEVEL 03 - PART 1 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-03002 [J] | PLAN - GENERAL ARRANGEMENT -LEVEL 03 - PART 2 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-03003 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 03 - PART 3 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-04001 [H] | PLAN - GENERAL ARRANGEMENT -LEVEL 04 - PART 1 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-04002 [I] | PLAN - GENERAL ARRANGEMENT -LEVEL 04 - PART 2 | I - 14/06/2024 |
| BHR-BLP-DRW-ARC-GEN-100-04003 [H] | PLAN - GENERAL ARRANGEMENT -LEVEL 04 - PART 3 | I - 14/06/2024 |

**J1V3**

- The following inputs and outputs are the basis of assessment for this report:

| Record | Reference | Intermediate | Proposed |
|---|---|---|---|
| **IES Thermal Model:** | 301351221_REF_VE23_NCC 2022_012 | 301351221_INT_VE23_NCC 2022_007 | 301351221_PROP_VE23_NCC 2022_006 |
| **Apache Vista File:** | 301351221_REF_VE23_NCC 2022_011.aps | 301351221_INT_VE23_NCC 2022_006.aps | 301351221_PROP no ERV_VE23_NCC 2022_005.aps |
| **Energy Analysis Results** | 301351221_VE23_Master Template_NCC 2022_015.xlsm | | |
| **Reference Façade Calculators** | 301351221_Bathurst_Volume_One_2019 - 9a Health Care .xlsm<br>301351221_Bathurst_Volume_One_2019 - 9a Ward.xlsm | | |

# 1. Executive Summary

This report has been prepared at the instruction of Health Infrastructure (HI) for the proposed Bathurst Hospital Redevelopment located in 361-365 Howick Street, West Bathurst.

The purpose of this investigation is to review the development against the NCC (2022) Volume 1 Section J Part J1P1 Energy use Performance Requirement using the Performance Solution Assessment Method detailed below:

- Confirm compliance with Parts J1P1 of Section J of the NCC Volume One (2022) utilizing the J1V3 – Verification using a Reference Building method.
- Confirm compliance requirements with Part J4 Section J of the NCC Volume One (2022)

Subject to the conditions and requirements noted in this report, the proposed development has been found to be compliant with the NCC 2022 Volume One, Section J Part J4 and J6D4 requirements.

It is noted that any variation to the conditions and requirements noted herein may impact the performance outcomes and impact the level of compliance.

The following table summarises the results of the estimated Greenhouse Gas Emissions analysis:

**Table 1 Greenhouse Gas Emissions and Comparison**

| Model Revision | Annual GHG Emissions (kgCO2e) | Percentage Comparison | Compliance |
|---|---|---|---|
| Reference Building with Reference Services | 1,798,839 | - | - |
| Proposed Building with Reference Services | 1,761,847 | 2.1% | Compliant |
| Proposed Building with Proposed Services | 1,764,794 | 1.9% | Compliant |

This analysis has been carried out to confirm the estimated Greenhouse Gas Emissions (calculated in accordance with Specification 33, Specification 34 and Specification 35) is compliant with NCC 2022 Volume One Section J1 Energy Efficiency Requirements J1V3 Verification using a reference building.

Energy usage of domestic hot water and lifts has been omitted from the J1V3 greenhouse gas emissions calculation as per Specification 34 Modelling parameters Clause 4. h).

## 1.1 Construction Thermal Performance

### 1.1.1 Building Fabric

Overall thermal performance of the building fabric is shown below. Refer to Appendix B for the locations of insulation. Total system R values are provided below to give flexibility in meeting NCC 2022 requirements, particularly the need to account for thermal bridging.

**Table 2 NCC 2022 J1V3 Part J4 Specific Building fabric thermal performance requirements**

| Building Element that is part of the Section J Envelope | Minimum Total R-value* thermal performance requirement ($m^2K/W$), where noted as required | Additional Notes | Comments |
|---|---|---|---|
| Flat Concrete Roof/Ceilings | $R_T$ 3.87 | Solar absorptance of the upper surface of a roof assumed to be 0.45.<br><br>Total R-value must be calculated in accordance with AS/NZS 4859.2 (including thermal bridging) | Refer to Appendix B for location of Section J envelope insulation |
| Lightweight Roof/Ceilings | $R_T$ 4.06 | Solar absorptance of the upper surface of a roof assumed to be 0.45.<br><br>Total R-value must be calculated in accordance with AS/NZS 4859.2 (including thermal bridging) | |
| External Walls | $R_T$ 1.40 | Total R-value must be calculated in accordance with AS/NZS 4859.2 (including thermal bridging) | |
| Spandrel Walls | $R_T$ 1.00 | Total R-value must be calculated in accordance with AS/NZS 4859.2 (including thermal bridging) | |
| Internal Walls | $R_T$ 1.40 | Total R-value must be calculated in accordance with AS/NZS 4859.2 (including thermal bridging) | |
| Floor – Suspended Slab | $R_T$ 2.00<br><br>(Heat Flow Downwards) | Total R-value must be calculated in accordance with AS/NZS 4859.2 (including thermal bridging) | |
| Floor – Slab on ground | Nil | No additional insulation is required. The R-value of the floor and soil is sufficient. | |

*The Total R-value (RT) ($m^2K/W$) means the sum of the R-values of the individual component layers in a composite element including any building material, insulating material, airspace, thermal bridging, and associated surface resistances.

When selecting insulation types, the fire properties of the product shall comply with the NCC Deemed-to-Satisfy Provisions for fire hazard properties and a non-combustible material, as required and as nominated by the Building Surveyor.

Building Fabric Notes:

Internal walls refer to walls separating conditioned and non-conditioned internal zones.

The Total R-value shall be calculated, including allowance for thermal bridging, in accordance with:

- AS/NZS 4859.2 for a roof or floor;
- AS/NZS 4859.2 for wall components or Specification J4D6 (NCC 2022 Volume One) for spandrel panels.

The following glazing thermal properties will need to be met to achieve compliance, note these are whole of window properties, i.e. glass and frame combined:

**Table 3 Glazing Thermal Performance Requirements**

| Vision Glazing | U-value ($W/m^2K$) | Total System SHGC* | Notes |
|---|---|---|---|
| All Section J Envelope Façade Glazing (Glazed Windows and Glazed Doors) | 3.10 | 0.30 | High-performance double glazed system |
| Skylight glazing | 3.40 | 0.55 | High-performance double glazed system |

*The Total System performance requirements above are for combined effect of glass + frame in accordance with Australian Fenestration Rating Council (AFRC) requirements

Compliance is verified when it is determined that the estimated annual greenhouse gas emissions of the Proposed Building with its services is not more than the estimated annual greenhouse gas emissions of a (deemed to satisfy compliant) Reference Building.

The information contained in this report has been based on the following information:

- Architectural drawings by Billard Leece Architects dated 14/06/2024.

***The architect is required to review and approve details contained in the tables above as changes to the building fabric will result in variations to the modelling results.***

# 2. Introduction

The redevelopment of the Bathurst Health Service is a project undertaken by Health Infrastructure (HI) in collaboration with Stantec, TSA Riley and BLP Architecture. The project aims to address the growing and ageing population needs in the Bathurst Community & Region, as outlined in the Integrated Clinical Services Plan 2020 –2030. The plan proposes to expand the existing service by adding 31 acute inpatient beds, as well as increasing the capacity of ED, Ambulatory Care, Rehabilitation, Pre-operative service, and diagnostic services.

Bathurst is a town in the Central Tablelands of NSW, within the Western NSW Local Health District. It has a population of about 36,000 people, which is expected to rise in the future. The town also has a higher proportion of older people than the regional average.

Bathurst Base Hospital is situated 1.5 km away from the town centre, which is a short drive or a moderate walk. The hospital serves as the main health facility for the region, with Orange Base Hospital being the primary referral hospital for more complex cases. NSW Ambulance is located nearby, as well as two private hospitals: St Vincent's and Bathurst Private.

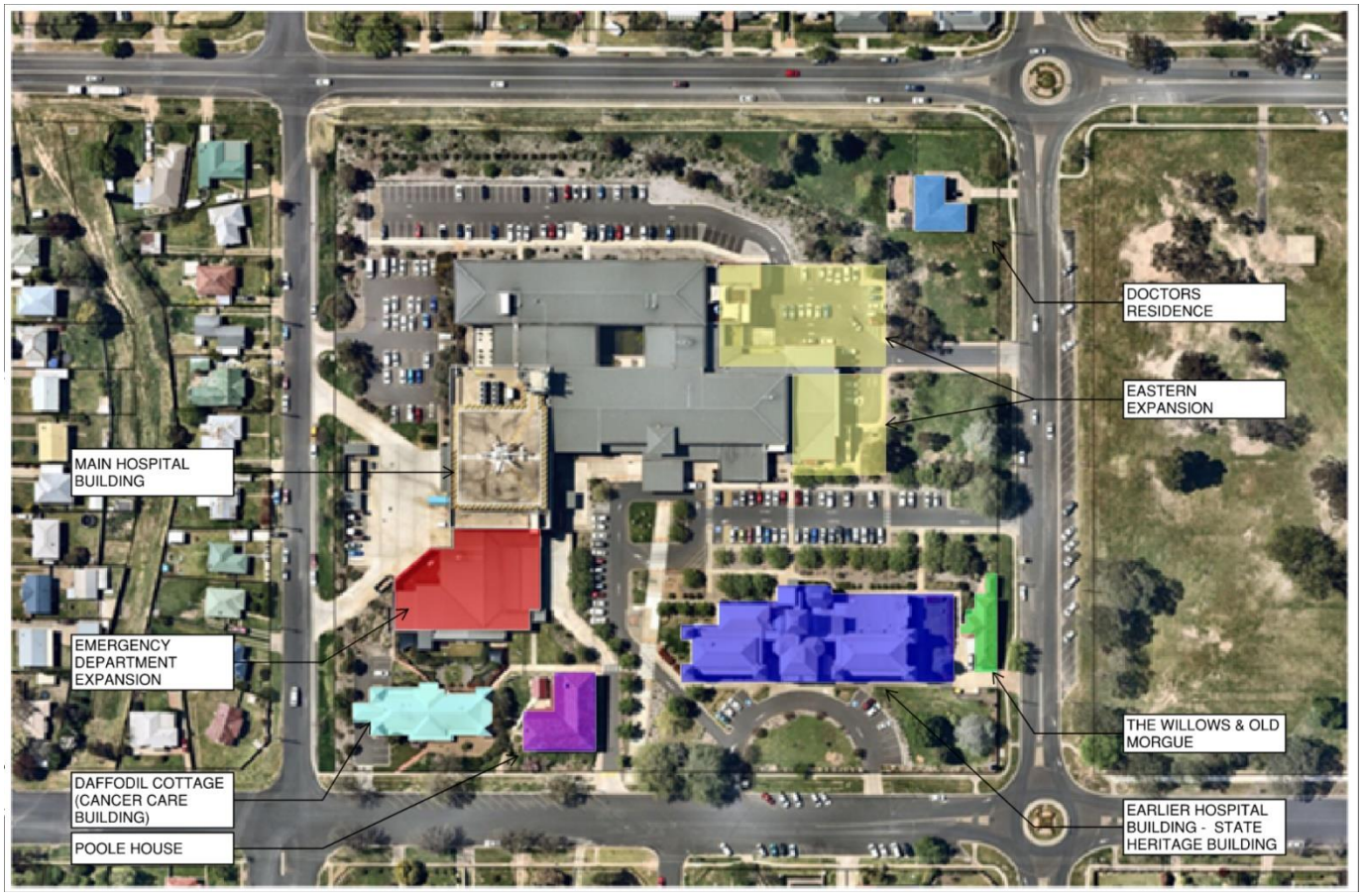
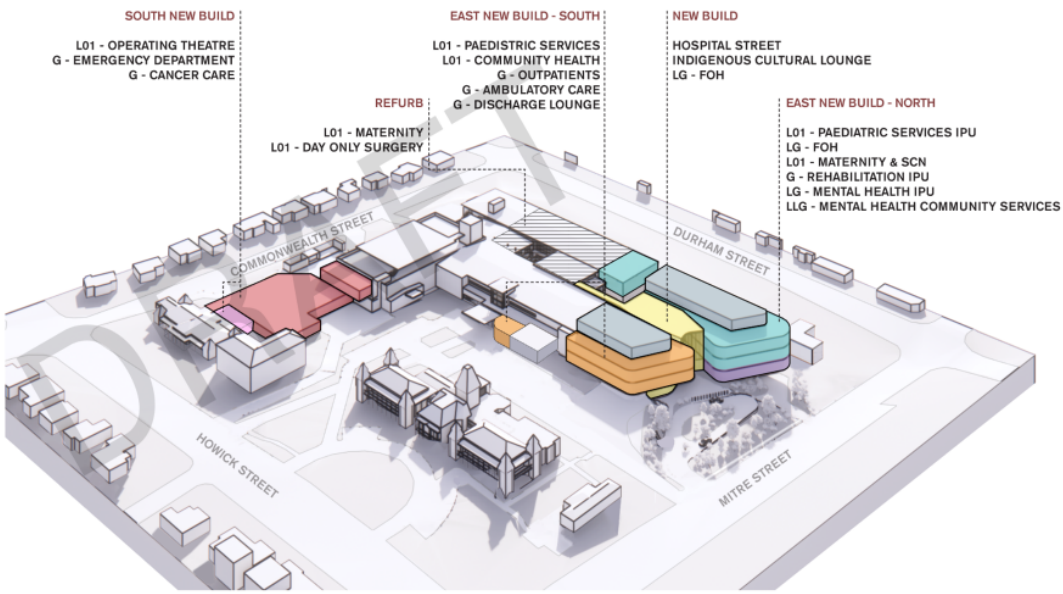



**Figure 1 - Existing site location of the Bathurst Health Service**

The Hospital will contain major redevelopment of the Emergency Department, Birthing & Maternity, Paediatrics, a number of in-patient and out-patients' departments as well as mental health departments, ambulatory care services as shown in the block and stack diagram.




This modelling report is for the new structures of Bathurst hospital and sets out the proposed design parameters by which the building will be assessed with respect to the NCC 2022 Volume One compliance for the project.

It is understood that the Client's aim is to meet the following goal:

- Confirm compliance with the Parts J4 & J6D4 of Section J of the NCC Volume One using Verification Method J1V3.

This report / energy analysis should be read in conjunction with all relevant plans and specifications and any supplementary regulatory information.

**Table 4 General Project Information Summary**

| | |
|---|---|
| Property Title | Bathurst Hospital |
| Address | 361-365 Howick Street, West Bathurst. |
| Building Class and Use | It is understood that the building(s) for this development have been deemed to be NCC classification 9a Health Care and 9a Health Care Ward |
| Number of storeys | 4 |
| Verification Method | This building has been assessed under the NCC Volume One Energy Efficiency J1V3 – Verification using a Reference Building |
| NCC Volume One Climate Zone | Climate 7 |
| Climate Data | NSW_Orange_87_TRY.fwt |
| Name and Version of the Software used in the Analysis | The design of the buildings has been assessed utilising the IES Virtual Environment energy modelling software. This software included the ModelIT, SunCast, Apache, Vista and ApacheHVAC range of tools. The version of the tool used within this modelling report was IES Virtual Environment 2023, feature pack 2. |

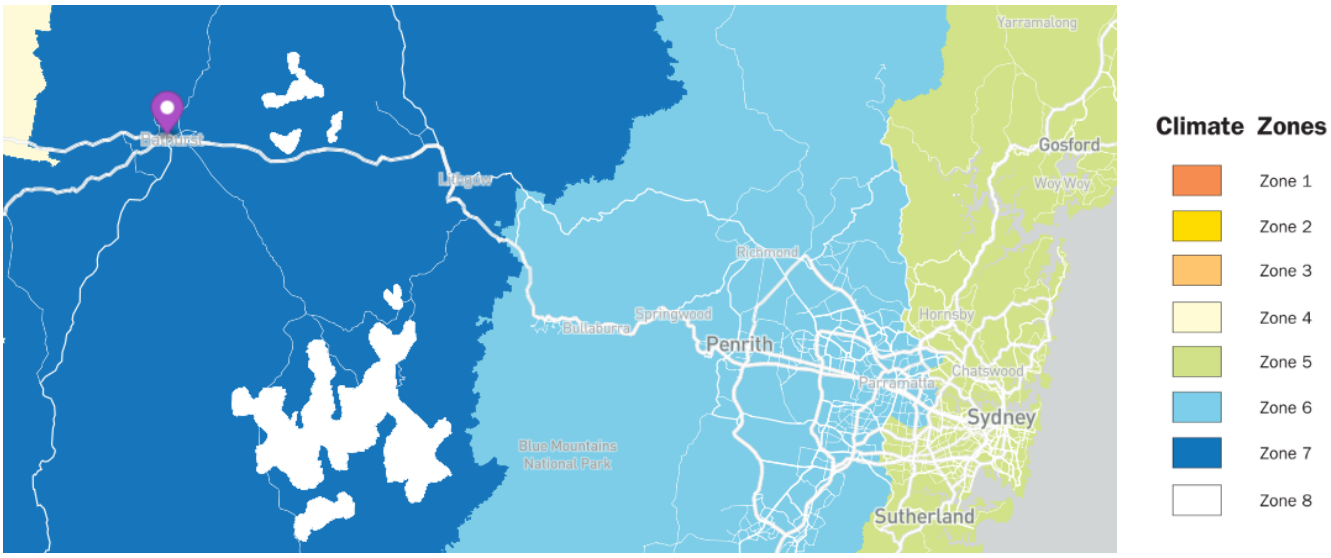



Figure 2 BCA Climate Map (abcb.gov.au)

## 2.1 Building Function and BCA Classification

The following Building Classifications (as defined by NCC 2022) have been identified for this development:

**Table 5: BCA Building Function and BCA Classification**

| BCA Class | Included/Excluded |
|---|---|
| **1a** | |
| **1b** | |
| **2** | |
| **3** | |
| **4** | |
| **5 (Office)** | ✓ |
| **6** | |
| **7a** | |
| **7b** | |
| **8 (Process Type)** | |
| **9a** | ✓ |
| **9b** | |
| **9c** | |
| **10** | |

## 2.2 Performance Based Design Brief

The National Construction Code 2022 Volume One requires all Performance Solutions to be accompanied by a Performance Based Design Brief (PBDB). This section serves as the PBDB for the Performance Solution proposed for this project.

Section A2G2 of NCC 2022 outlines the requirements for Performance Solutions. The Performance Solution presented in this report adheres to the requirements of Section J1 “J1V3 Verification using a reference building” and as such satisfies the requirement of A2G2 (2)(b)(i) being a “Verification Method provided in the NCC”. The overall complexity and risks associated with this performance solution is hence considered low.

To manage these risks, the following methodology is proposed:

- Assessment Method for Part J4 and Part J6D4 evaluation is a Performance Solution
- Carry out analysis as detailed in Assessment Methodology
- Evaluate results as detailed in Modelling Results and Section 5 Conclusion
- Prepare a final report (this document)

The key stakeholders for this process are considered to be: Building Owner or Owners Representative, Builder or Project Manager, Architect, Mechanical Engineer, Structural Engineer and Building Surveyor/Certifier.

The above stakeholders have been made aware of this PDBD via distribution of this report. Additional requirements for the above stakeholders are outlined in Appendix B, Appendix C and Appendix D.

### 2.2.1 Performance Requirements - Façade

The façade elements included in the mandatory compliance against current NCC 2022 Section J shall comply with the performance requirements outlined within this report.

- Location of insulation and the building fabric thermal performance requirements
- Glazing thermal performance requirements (whole of system)

The thermal performance of all construction materials associated with this specification has been summarised in Section 1.1.1.

Reference is made to Appendix B for mark-up indicating extent of any added insulation included within the construction specifications.

### 2.2.2 Performance Requirements - HVAC

The HVAC elements included in the mandatory compliance against current NCC 2022 Section J shall comply with the performance requirements outlined within this report.

- 4-pipe heat pumps with heat recovery
- Integrated Part-Load Values
- Economy cycle to AHUs

The HVAC performance of the above associated with this specification has been summarised in Section 3.1.5.

### 2.2.3 Prescriptive Requirements

In addition to the performance related compliance requirements outlined above, there are further prescriptive Section J elements which must be complied with. These are outlined below and shall be complied with during the delivery phase of the project.

- Appendix C - Part J4 – Building Fabric
- Appendix D - Part J5 – Building Sealing

***To assist with compliance with Specification 33 of the NCC 2022, general construction notes as contained in Appendix C are to be included in the Architectural Specification or Architectural drawings.***

### 2.2.4 Conditions and Requirements

The following assumptions are made regarding the PBDB:

1. Thermal comfort in the proposed building is taken to be the proposed fabric and reference services
2. Thermal comfort between -1 and +1 is achieved in all regularly conditioned spaces, as opposed to all occupied zones. In many instances, occupancy of these zones may be highly intermittent, thermal comfort requirements may be minimal and as a result air conditioning would not be provided (ie storage rooms). In these instances, the Predicted Mean Vote metric will not remain within +1 and -1 for a large period of the year but should not indicate poor performance overall.
3. An average calculation of predicted mean vote is not acceptable. Simulated areas must satisfy the PMV requirements for 98% of the year in order to contribute to the 95% area threshold. This ensures that poor performing (thermally uncomfortable) areas within zones are not hidden or obscured by better performing areas elsewhere.
4. Due to the low degree of risk or impact to life safety, a safety factor of 0.0% is proposed as suitable.

# 3. Assessment Methodology

Compliance is verified when it is determined that the estimated annual greenhouse gas emissions of the Proposed Building with its services is not more than the estimated annual greenhouse gas emissions of a Deemed-to-Satisfy compliant Reference Building when:

- The Proposed Building is modelled with the proposed services; and
- The Proposed Building is modelled with the same services as the Reference Building.

Estimates have been made where sufficient detail is not yet available. Assumptions used in the following analysis are detailed below and require confirmation prior to the Building Permit issue of this report. Due care has been taken to ensure these assumptions are relevant and practical though inherently provide some degree of inaccuracy. As such, report outcomes can only be indicative until such a time when all required details are available and input into the models. Simplified systems have been used where necessary.

This J1V3 analysis concerns building fabric (including glazing) thermal performance and assumes that the proposed building services are DTS compliant and have the same DTS services as the Reference Building. It is also assumed that the building envelope is limited to areas conditioned for occupant comfort only.

## 3.1 Modelling Assumptions

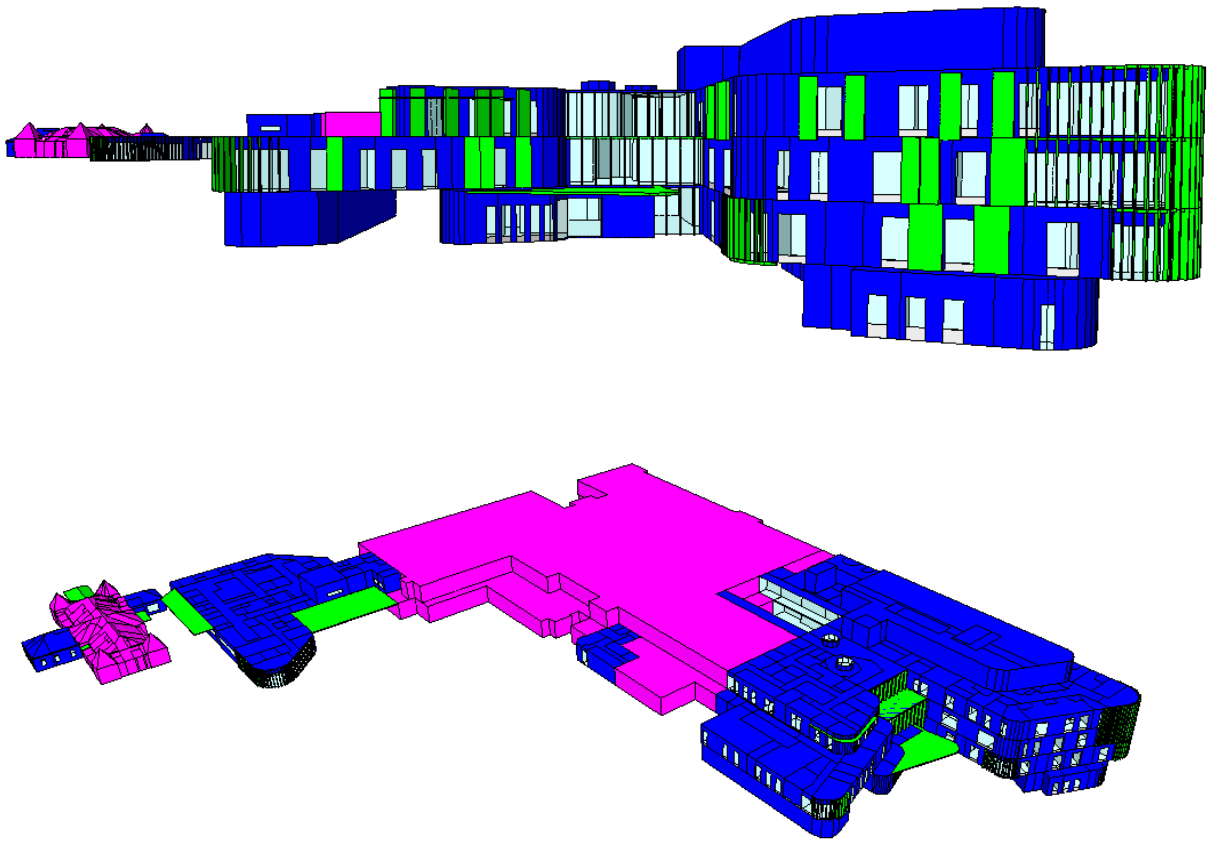


**Figure 1 Images from J1V3 model**

### 3.1.1 Building Scope and Boundary

The project encompasses a mix of existing building and new building. The façade of the existing building has been modelled in both the reference and proposed models using a construction which is representative of the existing construction and materials. This ensures a fair comparison and consistent approach to the new building's thermal envelope requirements. Existing building areas which are not part of the project's scope have been treated as adjacent space, meaning any energy consumption associated with these areas is not included in this Section J J1V3 assessment.

### 3.1.2 Internal Loads

The internal loads for both the Proposed and Reference Buildings are as per the design requirements stipulated in the NCC 2022 Volume One Section J.

Occupancy, lighting, equipment and HVAC plant throughout the site were estimated to operate in accordance with the NCC Volume One JV Specifications.

### 3.1.3 Reference Building with Reference Services

**Construction Thermal Performance**

The "Deemed-to-Satisfy" requirements for NCC Volume One Section J2 compliance were used to calculate the total thermal performance levels required for the opaque building elements. The following building fabrics were used to model the Reference Building.

**Table 5 Deemed-to-Satisfy Building Fabric Summary**

| Element | R-value ($m^2$.k/W) |
|---|---|
| External Wall | R1.4 |
| Spandrel Wall | R1.0 |
| Roof/Ceiling (Upper surface solar absorptance 0.7) | R3.7 |
| Internal Wall (between conditioned and non-conditioned zones) | R1.4 |
| Exposed Floor | R2.0 |

**Glazing Thermal Performance**

The glazed areas used for the Reference Building were calculated using the NCC Volume One Section J4 Glazing Calculator (Method 2). A maximum allowance for glazing was reached using the calculator based on an assessment of conditioned zones only.

| Vision Glazing | U-value ($W/m^2K$) | Total System SHGC* |
|---|---|---|
| General hospital areas - Section J Envelope Façade Glazing (Glazed Windows and Glazed Doors) | 4.85 | 0.36 |
| Ward area - Section J Envelope Façade Glazing (Glazed Windows and Glazed Doors) | 1.7 | 0.19 |
| Skylight | 3.4 | 0.55 |

*The Total System performance requirements above are for combined effect of glass + frame in accordance with Australian Fenestration Rating Council (AFRC) requirements

**Building Services**

Heating and Air Conditioning

The following attributes for the HVAC system are in accordance with the Deemed-to-Satisfy requirements in NCC Volume One Specifications J6D10 J6D11 and J6D12:

Cooling COP: 4.669

Heating Efficiency: 2.6

Cooling Fuel: Electricity

Heating Fuel: Electricity

Air Supply System: Zoned supply system with remote fan

In accordance with Specification 34C2 (c) the space temperature of the Reference Building is within the range of 18°C DB to 25°C DB for 98% of the plant operation time for spaces with transitory occupancy, and 21°C DB to 24°C DB in all other conditioned areas.

Space Temperature Range

- Cooling Load Set-point: 24
- Heating Load Set-point: 21

Mechanical Ventilation Rate – Outside Air

- Mechanical ventilation has been modelled at the rates of introduction of outside air as per the design requirements stipulated in AS 1668.2.

Infiltration Air Change Rate

- Infiltration air change rates have been modelled in accordance with NCC Volume One Section J Specification 34C2 (d).

Domestic Hot Water, Lifts, and Escalators

- Domestic hot water energy consumption, lifts, and escalators have been excluded from the J1V3 calculation in accordance with the NCC Volume One Specification 34 Modelling parameters C4 (h). They have been included only in the HI energy target compliance report.

### 3.1.4 Proposed Building with Reference Services

**Construction Thermal Performance**

Overall thermal performance of the building fabric is shown below:

**Table 6 Proposed Building Fabric**

| Element | R-value ($m^2$.k/W) |
|---|---|
| External Wall | R1.40 |
| Spandrel Wall | R1.00 |
| Lightweight Roof | R4.06 |
| Concrete Roof | R3.87 |
| Internal Wall (between conditioned and non-conditioned zones) | R1.40 |
| Exposed Floor (below ground level office and lobby) | R2.00 |

Refer to Appendix B for the locations of insulation.

### Glazing Thermal Performance

The following table summarises the glazing thermal performance requirements to achieve compliance. Note these are whole of window properties, i.e. glass and frame combined:

| Vision Glazing | U-value (W/m²K) | Total System SHGC* | Notes |
|---|---|---|---|
| All Section J Envelope Façade Glazing (Glazed Windows and Glazed Doors) | 3.10 | 0.30 | High-performance double glazed system |
| Skylight glazing | 3.40 | 0.55 | High-performance double glazed system |

***The architect is required to review and approve details contained in the tables above as changes to the building fabric will result in variations to the modelling results.***

### Building Services

All attributes and parameters remain consistent with those detailed in Building Services section of 3.1.3 of this report for the J1V3 Proposed Building.

## 3.1.5 Proposed Building with Proposed Services

### Construction Thermal Performance

Overall thermal performance of the building fabric is per 3.1.4 Proposed Building with Reference Services.

### Glazing Thermal Performance

The glazing thermal performance requirements is per 3.1.4 Proposed Building with Reference Services.

### Building Services

Mechanical Services

The following attributes for the HVAC system are in accordance with the proposed system:

| | |
|---|---|
| System type: | 4-pipe heat pump with heat recovery |
| Cooling IPLV: | 4.929 |
| Heating Efficiency: | 2.6 |
| Cooling Fuel: | Electricity |
| Heating Fuel: | Electricity |
| Air Supply System: | Zoned supply system with remote fan |
| Mechanical Ventilation System Control: | DCV to Front of House department with an 800ppm setpoint |

The following improvements in mechanical plant have been calculated for the proposed services:

| Selection | Reference Chiller IPLV | Proposed Chiller IPLV | % improvement |
|---|---|---|---|
| Air cooled chiller 1 | 4.669 | 4.929 | 6% |
| Air cooled chiller 2 | 4.669 | 4.929 | 6% |
| Air cooled chiller 3 | 4.669 | 4.929 | 6% |

# 4. Modelling Results

This Performance Solution is deemed to be acceptable when the J1V3(1)(a) and J1V3(1)(b) criteria are achieved.

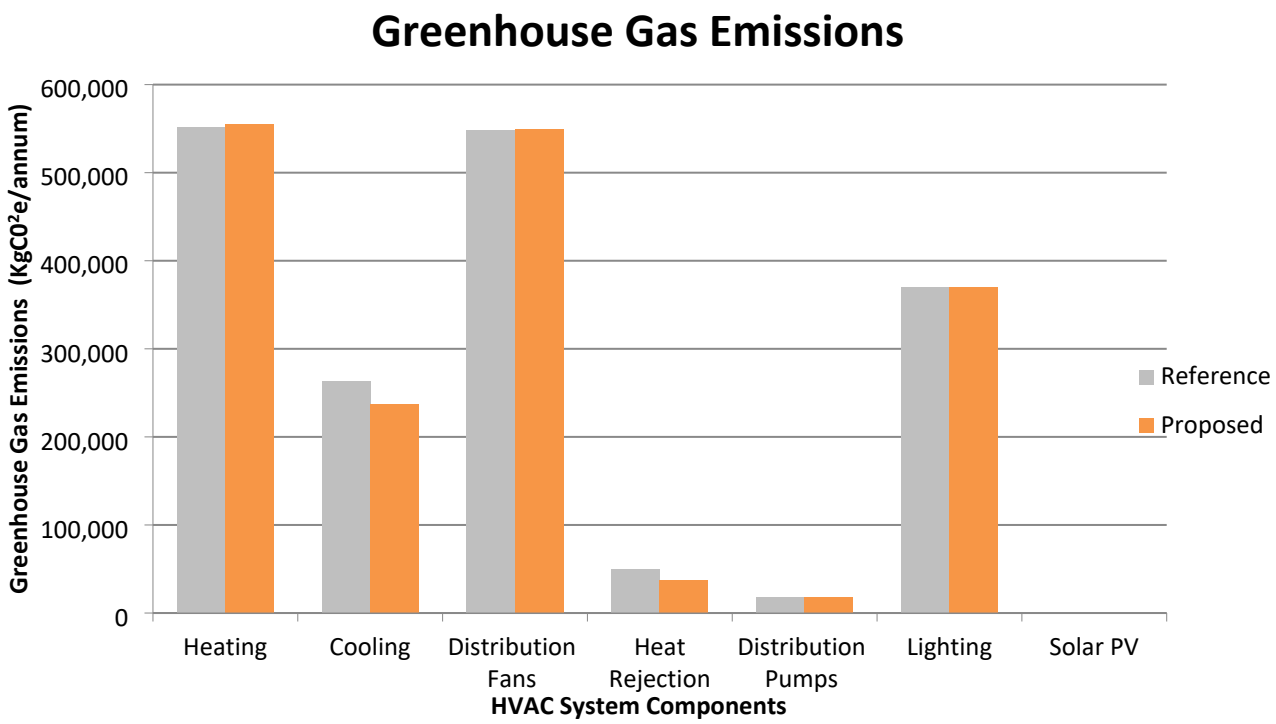
## 4.1 NCC 2022 Section J – J1V3

Greenhouse gas emissions factors of 236 $kgCO_2e/GJ$ for electricity and 51.53 $kgCO_2e/GJ$ for natural gas have been assumed for the project located in NSW, as per the Australian National Greenhouse Account Factors dated 2022.

The following annual greenhouse gas emissions production has been taken from the IES Virtual Environment Vista results file for the site in combination with the relevant prescribed greenhouse gas emissions intensities:

**Table 7 Modelling Results – Building GHG production Results.**

| Energy Consumption | Greenhouse Gas Emission (kgCO2e/annum) | | Greenhouse Gas Demand Improvement on Reference |
|---|---|---|---|
| | REFERENCE PROJECT | PROPOSED PROJECT | |
| Heating | 550,812 | 520,016 | 5.6% |
| Cooling | 262,829 | 259,678 | 1.2% |
| Distribution Fans | 548,243 | 547,586 | 0.1% |
| Heat Rejection | 49,748 | 47,785 | 3.9% |
| Distribution Pump | 17,354 | 16,929 | 2.4% |
| Lighting | 369,854 | 369,854 | 0.0% |
| Total | 1,798,839 | 1,761,847 | 2.1% |




## 4.2 Thermal Comfort Level – Predicted Mean Vote

In accordance with Specification 34 Clause 3 J1V3 (1)(b) the proposed building must achieve a thermal comfort level of a Predicted Mean Vote (PMV) between -1 to +1 across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building.

In order to verify this requirement, IES Virtual Environment's Vista analysis software module utilises thermal results from the proposed model to calculate thermal comfort. Results for conditioned spaces during occupied hours are presented below:

**Table 8 Modelling Results – Model Verification Results**

| | PMV range | % Of Nominated floor area with a min 98% of hours within PMV range | Compliant |
|---|---|---|---|
| **Transitory Spaces** | -1 to 1 | 100% | Yes |
| **Occupied Spaces** | -1 to 1 | 98.9% | Yes |

# 5. Conclusion

A performance solution has been undertaken to meet the performance requirement of Section J1P1 of NCC 2022. This performance solution is in all instances in accordance with the prescribed parameters as outlined in Section J1V3 “J1V3 Verification Using a Reference Building”. This performance-based design brief has outlined the overall process, associated risks, evaluation methods and acceptance criteria to relevant stakeholders. The performance solution undertaken has met all acceptance criteria, and specification of this proposed solution are found as Section 2.4.1 Performance Requirements – Façade Section and 2.4.3 Conditions and Requirements in the body of this report.

Conditions related to the use of this performance solution are outlined in the Disclaimer and Qualifications to this Report sections, as well as Section 2.4.1 Conditions and Requirements

The modelling results indicate that the proposed building with the reference services (case 2) and the proposed building with proposed services (case 3) will perform better than the reference (DTS) scenario. Therefore, it can be confirmed that the proposed building with the design specification outlined within this report meets the requirements of the NCC 2022 Volume One Section J1V3 the “J1V3 – Verification using a Reference Building” method.

Additional requirements in order to comply with NCC Section J are detailed throughout the report and require implementation by the architect and design team.

Compliance with prescriptive requirements outlined in Appendix C and Appendix D are also required in order for compliance to be achieved under the J1V3 verification method.

**Professional Engineer**

**Name: Rebecca Dracup**

**Date: 30/09/2024**

# Appendix A Example Constructions

Wall and roof constructions, along with their overall thermal performance, are shown below. Refer to Appendix B for the locations of insulation.

## External Wall – Lightweight

| Item Description | Construction Thickness (mm) | Framing | Frame Percentage (%) | Thermal break R-value | Effective R-Value (m2K/W) |
|---|---|---|---|---|---|
| Outdoor Air Film (7m/s) | N/A | | | | 0.03 |
| Metal sheeting | 1 | | | | 0.00 |
| Airspace (non-reflective/unventilated) | 46 | | | | 1.78 |
| Bradford Glasswool Wall Batts – Gold HP | 90 | Steel | 17% | | |
| Plasterboard Gypsum | 13 | | | | 0.08 |
| Indoor Air Film (Still Air) - Vertical | N/A | | | | 0.12 |
| Total Thickness | 111 | Calculated Overall R-Value | | | 2.00 |

## Flat Concrete Roof/Ceilings

| Item Description | Construction Thickness (mm) | Framing | Frame Percentage (%) | Thermal break R-value | Effective R-Value (m2K/W) |
|---|---|---|---|---|---|
| Outdoor Air Film (7m/s) | N/A | | | | 0.03 |
| Concrete (Upper surface solar absorptance less than 0.45) | 125 | | | | 0.09 |
| Kingspan kooltherm K10 FM Soffit Board | 80 | | | | 3.65 |
| Indoor Air Film (Still Air) - Horizontal | N/A | | | | 0.11 |
| Total Thickness | 100 | Calculated Overall R-Value | | | 3.87 |

## Lightweight Roof/Ceilings

| Item Description | Construction Thickness (mm) | Framing | Frame Percentage (%) | Thermal break R-value | Effective R-Value (m2K/W) |
|---|---|---|---|---|---|
| Outdoor Air Film (7m/s) | N/A | | | | 0.03 |
| Metal Deck (Solar Absorptance less than 0.45) | 1 | | | | 0.00 |
| Bradford Anticon Faced Glasswool Blanket | 145 | Steel | 8% | 0 | 1.54 |
| Airspace (0.2 reflective/unventilated flat roof) | 20 | No | 0% | - | 0.43 |
| Bradford Acoustigard 11kg/m3 | 90 | - | - | - | 1.90 |
| Plasterboard Gypsum | 10 | | | | 0.06 |

| Item Description | Construction Thickness (mm) | Framing | Frame Percentage (%) | Thermal break R-value | Effective R-Value (m2K/W) |
|---|---|---|---|---|---|
| Indoor Air Film (Still Air) - Horizontal | N/A | | | | 0.11 |
| Total Thickness | 266 | Calculated Overall R-Value | | | 4.06 |

# Exposed Floor

| Item Description | Construction Thickness (mm) | Framing | Frame Percentage (%) | Thermal break R-value | Effective R-Value (m2K/W) |
|---|---|---|---|---|---|
| Indoor Air Film (7m/s) | N/A | | | | 0.04 |
| Solid Concrete | 150 | | | | 0.10 |
| Kingspan Kooltherm K10 FM Soffit Board | 40 | - | - | - | 1.75 |
| Outdoor Air Film (Still Air) - Vertical | N/A | | | | 0.16 |
| Total Thickness | 253 | Calculated Overall R-Value | | | 2.06 |

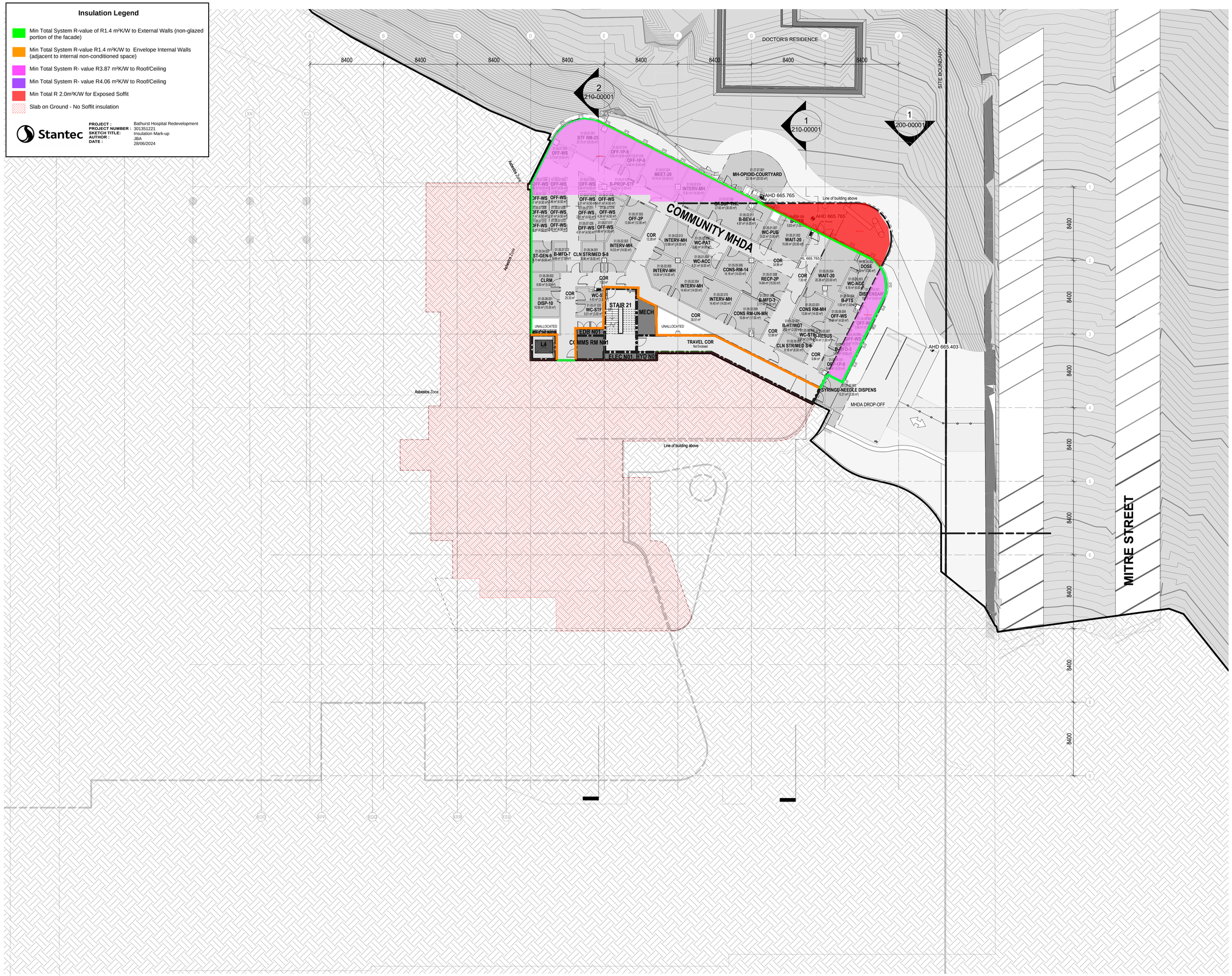
# Appendix B Insulation Markups

## Insulation Legend

- Min Total System R-value of R1.4 m²K/W to External Walls (non-glazed portion of the facade)
- Min Total System R-value R1.4 m²K/W to Envelope Internal Walls (adjacent to internal non-conditioned space)
- Min Total System R- value R3.87 m²K/W to Roof/Ceiling
- Min Total System R- value R4.06 m²K/W to Roof/Ceiling
- Min Total R 2.0m²K/W for Exposed Soffit
- Slab on Ground - No Soffit insulation

Stantec

| | |
|---|---|
| **PROJECT :** | Bathurst Hospital Redevelopment |
| **PROJECT NUMBER :** | 301351221 |
| **SKETCH TITLE:** | Insulation Mark-up |
| **AUTHOR :** | JBA |
| **DATE :** | 28/06/2024 |

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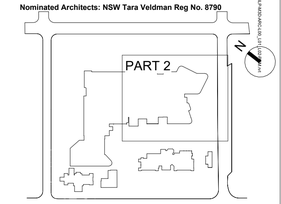


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### Department Legend

- MH D&A
- MH D&A CORRIDOR
- TRAVEL

**LEGEND :**

- SITE BOUNDARY
- DENOTES LIGHT REFURBISHMENT
- EXISTING TO REMAIN
- 120/120/120 FRL & SMOKE
- EX. 120/120/120 FRL & SMOKE
- 60/60/60 FRL & SMOKE
- EX. 60/60/60 FRL & SMOKE
- SMOKE WALL
- EX. SMOKE WALL

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## Insulation Legend

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- Min Total System R- value R4.06 m²K/W to Roof/Ceiling
- Min Total R 2.0m²K/W for Exposed Soffit
- Slab on Ground - No Soffit insulation

Stantec

| | |
|---|---|
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| PROJECT NUMBER : | 301351221 |
| SKETCH TITLE: | Insulation Mark-up |
| AUTHOR : | JBA |
| DATE : | 28/06/2024 |

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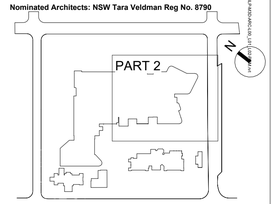


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**LEGEND :**

- SITE BOUNDARY
- DENOTES LIGHT REFURBISHMENT
- EXISTING TO REMAIN
- 120/120/120 FRL & SMOKE
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- 60/60/60 FRL & SMOKE
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PROJECT : Bathurst Hospital Redevelopment
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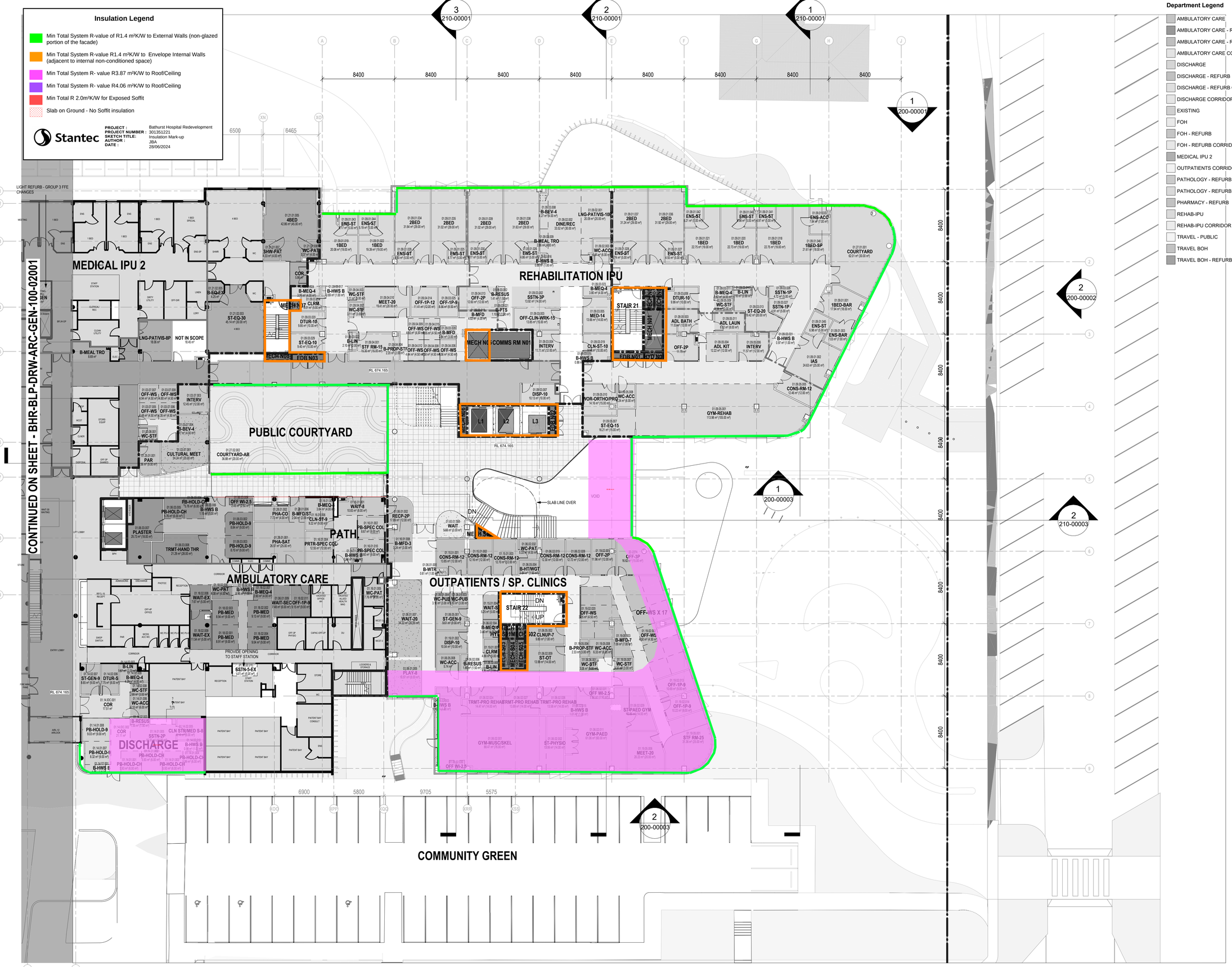


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## Department Legend

- AMBULATORY CARE
- AMBULATORY CARE - REFURB
- AMBULATORY CARE - REFURB CORRIDOR
- AMBULATORY CARE CORRIDOR
- DISCHARGE
- DISCHARGE - REFURB
- DISCHARGE - REFURB CORRIDOR
- DISCHARGE CORRIDOR
- EXISTING
- FOH
- FOH - REFURB
- FOH - REFURB CORRIDOR
- MEDICAL IPU 2
- OUTPATIENTS CORRIDOR
- PATHOLOGY - REFURB
- PATHOLOGY - REFURB CORRIDOR
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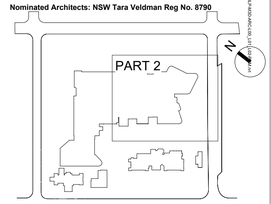


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PROJECT : Bathurst Hospital Redevelopment
PROJECT NUMBER : 301351221
SKETCH TITLE: Insulation Mark-up
AUTHOR : JBA
DATE : 28/06/2024

## Department Legend

- COMMUNITY HEALTH
- COMMUNITY HEALTH CORRIDOR
- MATERNITY
- MATERNITY - REFURB
- MATERNITY - REFURB CORRIDOR
- MATERNITY CORRIDOR
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- PAEDIATRICS IPU CORRIDOR
- PAEDS OUTPATIENTS
- PAEDS OUTPATIENTS CORRIDOR
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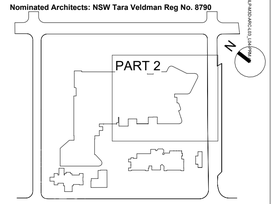


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**LEGEND :**

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- DENOTES LIGHT REFURBISHMENT
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- 120/120/120 FRL & SMOKE
- EX. 120/120/120 FRL & SMOKE
- 60/60/60 FRL & SMOKE
- EX. 60/60/60 FRL & SMOKE
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Facade Engineer
Greycat Consulting

Landscape Architect
Arcadia
ARCADIA

Services Engineers/Acoustic/Vertical Transport/ESD
Stantec

Structural/Civil/Traffic
TTW

Project Manager
TSA

Client
Health Infrastructure

0 2 4 6 10m
1:200 @A1

Project Name
Bathurst Hospital Redevelopment

Drawing Name
PLAN - GENERAL ARRANGEMENT - LEVEL 03 - PART 2

| Project No | Revision Date |
|---|---|
| 22086 | 14/06/2024 |

| Scale | Drawn by | Checked by |
|---|---|---|
| As indicated @A1 | TL | AL |

**FOR INFORMATION**

Drawing No.
BHR-BLP-DRW-ARC-GEN-100-03002 [J]

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1 A10 - GA PLAN - LEVEL 03 - PART 02
1 : 200

CONTINUED ON SHEET - BHR-BLP-DRW-ARC-GEN-100-03001
CONTINUED ON SHEET - BHR-BLP-DRW-ARC-GEN-100-03003

## Insulation Legend

- Min Total System R-value of R1.4 m²K/W to External Walls (non-glazed portion of the facade)
- Min Total System R-value R1.4 m²K/W to Envelope Internal Walls (adjacent to internal non-conditioned space)
- Min Total System R- value R3.87 m²K/W to Roof/Ceiling
- Min Total System R- value R4.06 m²K/W to Roof/Ceiling
- Min Total R 2.0m²K/W for Exposed Soffit
- Slab on Ground - No Soffit insulation

Stantec

| | |
|---|---|
| PROJECT : | Bathurst Hospital Redevelopment |
| PROJECT NUMBER : | 301351221 |
| SKETCH TITLE: | Insulation Mark-up |
| AUTHOR : | JBA |
| DATE : | 28/06/2024 |

CONTINUED ON SHEET - BHR-BLP-DRW-ARC-GEN-100-04001

3 210-00001 | 2 210-00001 | 1 210-00001 | 1 200-00001 | 2 200-00002 | 1 200-00003 | 2 210-00003 | 2 200-00003

8400 | 8400 | 8400 | 8400 | 8400 | 8400 | 8400 | 8400

6500 | 6465

6900 | 5800 | 9705 | 5575

UNENCLOSED PLANT 364.33 m²
MECH N07
STAIR 2
STAIR 1
HYDRAULIC DHW PLANT
MECH N08
MECH PLANT ROOM 748.22 m²
MECH N05
DAS RM N01
DAS RM N02
STAIR 21
MECH N02
MECH N04
MECH N01
EDB N01
HYD N01
RL 682.565
MECH N06
L1
EXTERNAL MAINTENANCE WALKWAY

GA PLANS LEGEND
1 : 500

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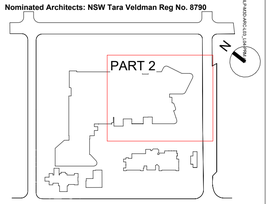


| Rev | Date | Revision | By | Chk. |
|---|---|---|---|---|
| E | 20/12/2023 | FOR APPROVAL | | |
| F | 02/02/2024 | SID ISSUE | | |
| G | 15/03/2024 | FOR COORDINATION | | |
| H | 03/05/2024 | 70% DD ISSUE | | |
| I | 14/06/2024 | 90% DD ISSUE | | |

ENGINEERING

**LEGEND :**

- SITE BOUNDARY
- DENOTES LIGHT REFURBISHMENT
- EXISTING TO REMAIN
- 120/120/120 FRL & SMOKE
- EX. 120/120/120 FRL & SMOKE
- 60/60/60 FRL & SMOKE
- EX. 60/60/60 FRL & SMOKE
- SMOKE WALL
- EX. SMOKE WALL

Facade Engineer
Greycat Consulting
GCC

Landscape Architect
Arcadia
ARCADIA

Services Engineers/Acoustic/Vertical Transport/ESD
Stantec

Structural/Civil/Traffic
TTW

Project Manager
TSA
TSA Projects

Client
Health Infrastructure
NSW GOVERNMENT | Health Infrastructure

0 2 4 6 10m
1:200 @A1

Project Name
Bathurst Hospital Redevelopment

Drawing Name
PLAN - GENERAL ARRANGEMENT - LEVEL 04 - PART 2

| Project No | Revision Date |
|---|---|
| 22086 | 14/06/2024 |

| Scale | Drawn by | Checked by |
|---|---|---|
| As indicated @A1 | TL | AL |

**FOR INFORMATION**

Drawing No.
BHR-BLP-DRW-ARC-GEN-100-04002 [I]

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1 A10 - GA PLAN - LEVEL 04 - PART 02
1 : 200

CONTINUED ON SHEET - BHR-BLP-DRW-ARC-GEN-100-01001

## Insulation Legend

- Min Total System R-value of R1.4 m²K/W to External Walls (non-glazed portion of the facade)
- Min Total System R-value R1.4 m²K/W to Envelope Internal Walls (adjacent to internal non-conditioned space)
- Min Total System R- value R3.87 m²K/W to Roof/Ceiling
- Min Total System R- value R4.06 m²K/W to Roof/Ceiling
- Min Total R 2.0m²K/W for Exposed Soffit
- Slab on Ground - No Soffit insulation

Stantec

| | |
|---|---|
| PROJECT : | Bathurst Hospital Redevelopment |
| PROJECT NUMBER : | 301351221 |
| SKETCH TITLE: | Insulation Mark-up |
| AUTHOR : | JBA |
| DATE : | 28/06/2024 |

AHD 669.965

LOADING DOCK

COMMONWEALTH STREET

MED GAS STORE TBC

HYDRANT PUMP ROOM

SPRINKLER PUMP ROOM

1 210-00004

3 210-00002

2 210-00002

1 210-00002

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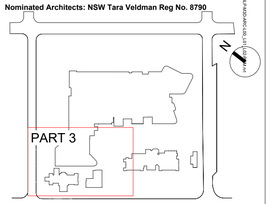
**Nominated Architects: NSW Tara Veldman Reg No. 8790**

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| F | 02/02/2024 | SD ISSUE | | |
| G | 15/03/2024 | FOR COORDINATION | | |
| H | 03/05/2024 | 70% DD ISSUE | | |
| I | 14/06/2024 | 90% DD ISSUE | | |

### Department Legend

No colors defined

**LEGEND :**

- SITE BOUNDARY
- DENOTES LIGHT REFURBISHMENT
- EXISTING TO REMAIN
- 120/120/120 FRL & SMOKE
- EX. 120/120/120 FRL & SMOKE
- 60/60/60 FRL & SMOKE
- EX. 60/60/60 FRL & SMOKE
- SMOKE WALL
- EX. SMOKE WALL

Facade Engineer
Greycat Consulting

Landscape Architect
Arcadia

Services Engineers/Acoustic/Vertical Transport/ESD
Stantec

Structural/Civil/Traffic
TTW

Project Manager
TSA

Client
Health Infrastructure

0 2 4 6 10m
1:200 @A1

Project Name
Bathurst Hospital Redevelopment

Drawing Name
PLAN - GENERAL ARRANGEMENT - LEVEL 01 - PART 3

| Project No | Revision Date |
|---|---|
| 22086 | 14/06/2024 |

| Scale | Drawn by | Checked by |
|---|---|---|
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**FOR INFORMATION**

Drawing No.
BHR-BLP-DRW-ARC-GEN-100-01003 [I]

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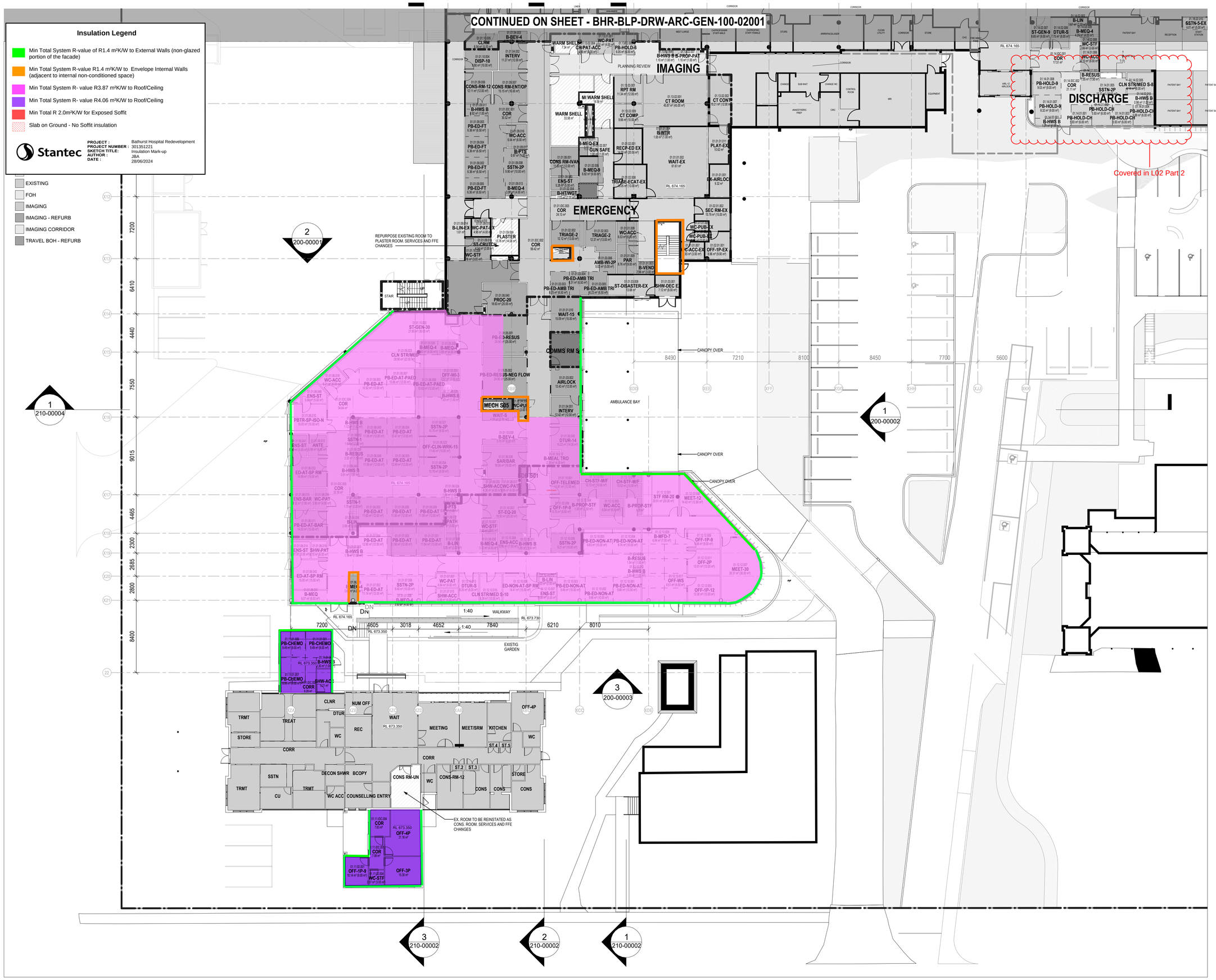
1 A10 - GA PLAN - LEVEL 01 - PART 03
1 : 200

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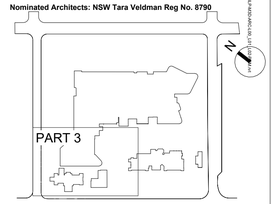


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| F | 02/02/2024 | SID ISSUE | | |
| G | 15/03/2024 | FOR COORDINATION | | |
| H | 03/05/2024 | 70% DD ISSUE | | |
| I | 14/06/2024 | 90% DD ISSUE | | |

**LEGEND :**

- SITE BOUNDARY
- DENOTES LIGHT REFURBISHMENT
- EXISTING TO REMAIN
- 120/120/120 FRL & SMOKE
- EX. 120/120/120 FRL & SMOKE
- 60/60/60 FRL & SMOKE
- EX. 60/60/60 FRL & SMOKE
- SMOKE WALL
- EX. SMOKE WALL

Facade Engineer
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GCC

Landscape Architect
Arcadia
ARCADIA

Services Engineers/Acoustic/Vertical Transport/ESD
Stantec
Stantec

Structural/Civil/Traffic
TTW
TTW

Project Manager
TSA
TSA Projects

Client
Health Infrastructure
NSW GOVERNMENT Health Infrastructure

0 2 4 6 10m
1:200 @A1

Project Name
Bathurst Hospital Redevelopment

Drawing Name
PLAN - GENERAL ARRANGEMENT - LEVEL 02 - PART 3

| Project No | Revision Date |
|---|---|
| 22086 | 14/06/2024 |

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|---|---|---|
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**FOR INFORMATION**

Drawing No.
BHR-BLP-DRW-ARC-GEN-100-02003 [I]

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www.blp.com.au

1 A10 - GA PLAN - LEVEL 02 - PART 03
1 : 200

CONTINUED ON SHEET - BHR-BLP-DRW-ARC-GEN-100-03001

## Insulation Legend

- Min Total System R-value of R1.4 m²K/W to External Walls (non-glazed portion of the facade)
- Min Total System R-value R1.4 m²K/W to Envelope Internal Walls (adjacent to internal non-conditioned space)
- Min Total System R- value R3.87 m²K/W to Roof/Ceiling
- Min Total System R- value R4.06 m²K/W to Roof/Ceiling
- Min Total R 2.0m²K/W for Exposed Soffit
- Slab on Ground - No Soffit insulation

Stantec

**PROJECT :** Bathurst Hospital Redevelopment
**PROJECT NUMBER :** 301351221
**SKETCH TITLE:** Insulation Mark-up
**AUTHOR :** JBA
**DATE :** 28/06/2024

OPERATING THEATRE
STAIR 23
EXTERNAL WALKWAY
FUTURE OR EXPANSION
RL 678.365
COR
MED-9
OFF-WI-3
ST-SS
CLNUP-SH
OFF-WI-5
OFF-2P
B-EXIT
ANAE-16
OR GEN-60
SCRB-2P
C-MEQ-2
OFF-WI-4
SCRUBS RM S
OPERATING ROOM GENERAL
ANAES INDUCTION
EXIT
SCRB-8
BMEQ
STERILE STOCK
RECUP
CLEAN UP
MALE CHANGE
FEMALE CHANGE
MINOR EQUIP STORE
MAJOR EQUIP STORE
ROOM STAFF
TUTORIAL MEETING ROOM
LINEN
NCHRS-A
PIETR-RS1
BHRS-A
BHRS-B
OFFICE 2 PERSON
OFF-S12 DIETICS

2 200-00001
1 210-00004
1 200-00002
3 200-00003
3 210-00002
2 210-00002
1 210-00002

7200 6410 4440 7550 9015 4465 2300 2685 2800 8400
7390 6300 8490 7210

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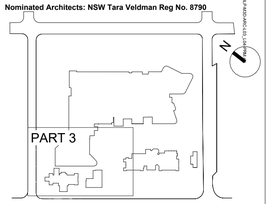


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| G | 15/03/2024 | FOR COORDINATION | | |
| H | 03/05/2024 | 70% DD ISSUE | | |
| I | 14/06/2024 | 90% DD ISSUE | | |

### Department Legend

- OPERATING SUITE
- OPERATING SUITE CORRIDOR

**LEGEND :**

- SITE BOUNDARY
- DENOTES LIGHT REFURBISHMENT
- EXISTING TO REMAIN
- 120/120/120 FRL & SMOKE
- EX. 120/120/120 FRL & SMOKE
- 60/60/60 FRL & SMOKE
- EX. 60/60/60 FRL & SMOKE
- SMOKE WALL
- EX. SMOKE WALL

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Greycat Consulting
GCC

Landscape Architect
Arcadia
ARCADIA

Services Engineers/Acoustic/Vertical Transport/ESD
Stantec
Stantec

Structural/Civil/Traffic
TTW
TTW

Project Manager
TSA
TSA Projects

Client
Health Infrastructure
NSW GOVERNMENT Health Infrastructure

0 2 4 6 10m
1:200 @A1

Project Name
Bathurst Hospital Redevelopment

Drawing Name
PLAN - GENERAL ARRANGEMENT - LEVEL 03 - PART 3

| Project No | Revision Date |
|---|---|
| 22086 | 14/06/2024 |

| Scale | Drawn by | Checked by |
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| As indicated @A1 | TL | AL |

**FOR INFORMATION**

Drawing No.
BHR-BLP-DRW-ARC-GEN-100-03003 [I]

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1 A10 - GA PLAN - LEVEL 03 - PART 03
1 : 200

# Appendix C Part J4 Building Fabric

The following prescriptive performance requirements for the façade must be adhered to, as per the NCC 2022 – Volume One:

## J4D3 – Thermal Construction General

***For compliance with Section J4D3 of the NCC 2022, we recommend the following general construction notes to be included in the Architectural Specification or Architectural drawings.***

(1) Where required, Insulation must comply with AS/NZS 4859.1 and be installed so that it:

(a) Abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must butt against the member; and

(b) Forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and

(c) Does not affect the safe or effective operation of a service or fitting.

(2) Reflective insulation must be installed with:

(a) The necessary airspace to achieve the required R-value between a reflective side of the reflective insulation and a building lining or cladding; and

(b) The reflective insulation closely fitted against any penetration, door or window opening; and

(c) The reflective insulation adequately supported by framing members; and

(d) Each adjoining sheet of roll membrane being:

i. Overlapped not less than 50mm; or

ii. Taped together.

(3) Bulk insulation must be installed so that:

*(a)* It maintains its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling, or the like; and

*(b)* In a ceiling, where there is no bulk insulation or reflective insulation in the wall beneath, it overlaps the wall by not less than 50mm

(4) The required Total R-Value and Total System U-Value, including allowance for thermal bridging, must be:

(a) Calculated in accordance with AS/NZS 4859.2 for a roof or floor; or

(b) Determined in accordance with Specification J1.5a for wall-glazing construction; or

(c) Determined in accordance with Specification J1.6 or Section 3.5 of CIBSE Guide A for soil or sub-floor spaces.

## J4D6 – Walls and Glazing

The Total system U-Value of the wall component of a wall-glazing construction must be calculated as the inverse of the Total R-Value, including allowance for thermal bridging, in accordance with—

- AS/NZS 4859.2; or
- Specification 38 for spandrel panels.

## Specification 38 – Spandrel Panel R-Value

Spandrel panels are deemed to have the thermal properties nominated in Table 2 below, where:

- Configuration 1 consists of—
  - a thermally unbroken (bridged) frame; and
  - a centre of spandrel panel consisting of—
    i. a single-glazed opaque or clear face; and
    ii. a 100 mm air gap; and
    iii. a 3 mm aluminium, 0.8 mm galvanised steel or zinc back pan; and
- Configuration 2 consists of—
  - a thermally unbroken (bridged) frame; and
  - a centre of spandrel panel consisting of—
    i. a double-glazed opaque face; and
    ii. a 50 mm air gap; and
    iii. a 3 mm aluminium, 0.8 mm galvanised steel or zinc back pan; and
- Configuration 3 consists of—
  - a thermally broken (unbridged) frame; and
  - a centre of spandrel panel consisting of—
    i. a double-glazed clear face; and
    ii. a 50 mm air gap; and
    iii. a 3 mm aluminium, 0.8 mm galvanised steel or zinc back pan; and
- Configuration 4 consists of—
  - a thermally broken (unbridged) frame; and
  - a centre of spandrel panel consisting of—
    i. a double-glazed low-e clear face; and
    ii. a 50 mm air gap; and
    iii. a 3 mm aluminium, 0.8 mm galvanised steel or zinc back pan.

**Table 9 Spandrel Panel Configuration R-value**

| Type | No insulation | R0.5 insulation | R1.0 insulation | R1.5 insulation | R2.0 insulation |
|---|---|---|---|---|---|
| Configuration 1 | 0.3 | 0.39 | 0.42 | 0.44 | 0.45 |
| Configuration 2 | 0.35 | 0.41 | 0.43 | 0.44 | 0.45 |
| Configuration 3 | 0.84 | 0.96 | 1.03 | 1.07 | 1.09 |
| Configuration 4 | 0.91 | 1.00 | 1.05 | 1.09 | 1.11 |

## J4D7 – Floors

(3) A floor must be insulated around the vertical edge of its perimeter with insulation having an R-Value greater than or equal to 1.0 when the floor—

i. is a concrete slab-on-ground in climate zone 8; or

ii. has an in-slab or in-screed heating or cooling system, except where used solely in a bathroom, amenity area or the like.

(c) Insulation required by (3) for a concrete slab-on-ground must—

(i) be water resistant; and

(ii) be continuous from the adjacent finished ground level—

(A) to a depth not less than 300 mm; or

(B) for the full depth of the vertical edge of the concrete slab-on-ground.

# Appendix D Part J5 – Building Sealing

The following prescriptive performance requirements for the façade must be adhered to, as per the NCC:

## J5D4 – Roof Lights

***For compliance with Section J5D4 of the NCC 2022, we recommend the following general notes to be included in the Architectural Specification or Drawings.***

(a) A roof light must be sealed, or capable of being sealed, when serving—

(i) a conditioned space; or

(ii) a habitable room in climate zones 4, 5, 6, 7 or 8.

(b) A roof light required by (a) to be sealed, or capable of being sealed, must be constructed with—

(i) an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or

(ii) a weatherproof seal; or

(iii) a shutter system readily operated either manually, mechanically or electronically by the occupant.

## J5D5 – External Windows and Doors

***For compliance with Section J5D5 of the NCC 2022, we recommend the following general notes to be included in the Architectural Specification or Drawings.***

a) A door, openable window or the like must be sealed—

(i) when forming part of the envelope; or

(ii) in climate zones 4, 5, 6, 7 or 8.

(b) The requirements of (a) do not apply to—

(i) a window complying with AS 2047; or

(ii) a fire door or smoke door; or

(iii) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security.

(c) A seal to restrict air infiltration—

(i) for the bottom edge of a door, must be a draft protection device; and

(ii) for the other edges of a door or the edges of an openable window or other such opening, may be a foam or rubber compression strip, fibrous seal or the like.

(d) An entrance to a building, if leading to a conditioned space must have an airlock, self-closing door, rapid roller door, revolving door or the like, other than—

(i) where the conditioned space has a floor area of not more than 50 m2; or

(ii) where a café, restaurant, open front shop or the like has—

(A) a 3 m deep un-conditioned zone between the main entrance, including an open front, and the conditioned space; and

(B) at all other entrances to the café, restaurant, open front shop or the like, self-closing doors.

(e) A loading dock entrance, if leading to a conditioned space, must be fitted with a rapid roller door or the like.

## J5D6 – Exhaust Fans

(a) An exhaust fan must be fitted with a sealing device such as a self-closing damper or the like when serving—

(i) a conditioned space; or

(ii) a habitable room in climate zones 4, 5, 6, 7 or 8.

This requirement will be documented by the Mechanical Consultant

## J5D7 – Construction of roofs, walls and floors

***For compliance with Section J5D7 of the NCC 2022, we recommend the following general notes to be included in the Architectural Specification or Drawings.***

(a) Ceilings, walls, floors and any opening such as a window frame, door frame, roof light frame or the like must be constructed to minimise air leakage in accordance with (b) when forming part of—

(i) the envelope; or

(ii) in climate zones 4, 5, 6, 7 or 8.

(b) Construction required by (a) must be—

(i) enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or

(ii) sealed at junctions and penetrations with—

(A) close fitting architrave, skirting or cornice; or

(B) expanding foam, rubber compressible strip, caulking or the like.

(c) The requirements of (a) do not apply to openings, grilles or the like required for smoke hazard management.

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# 10. Appendix C Net Zero Plan

# Bathurst Hospital Redevelopment

# Net Zero Statement

**06/09/2024**

**Ref: 301351221**

**PREPARED FOR:**

Andrew Neill

**PREPARED BY:**

Stantec

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.

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# 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:<br>• has been prepared in accordance with the following policy, guidelines, or legislative requirements:<br>- Net Zero Statement Technical Note<br>• contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the Net Zero Statement relates;<br>• does not contain information that is false or misleading;<br>• identifies and addresses the relevant Planning Secretary's environmental assessment requirements (SEARs) for the project;<br>• 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;<br>• 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<br>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

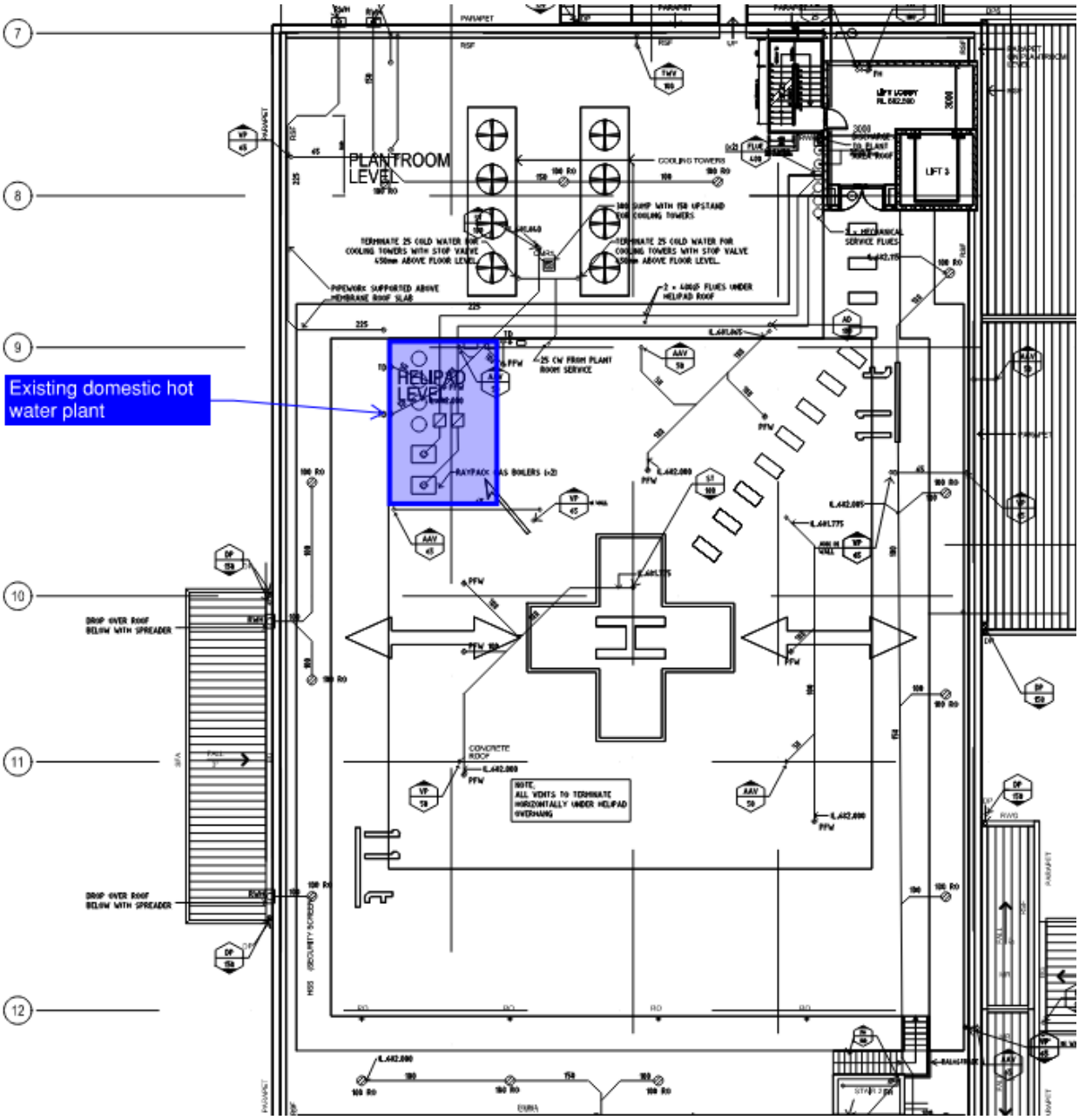
### 4.1.1 Existing Building Systems

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.

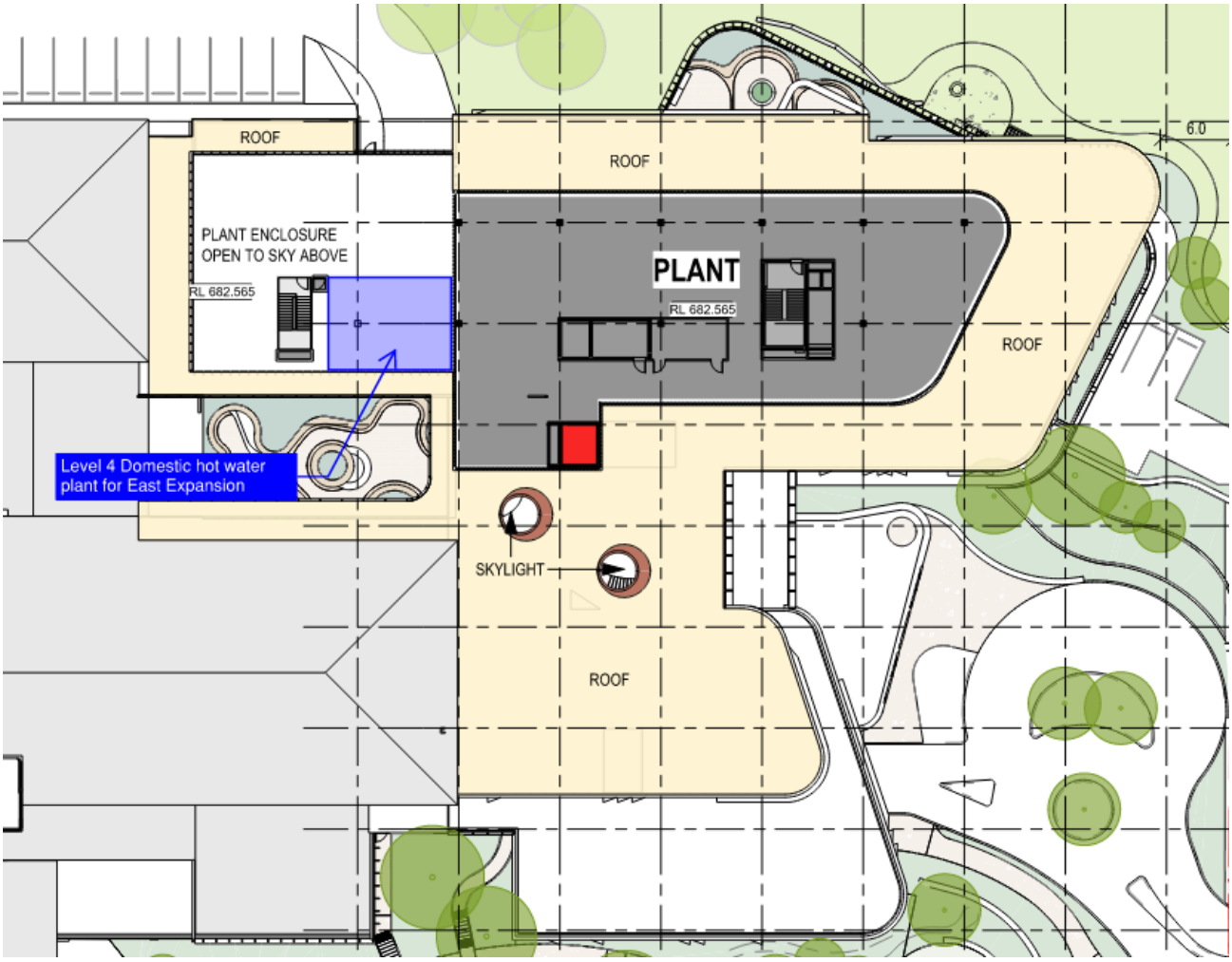
### 4.1.3 East Expansion Electric Systems

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**

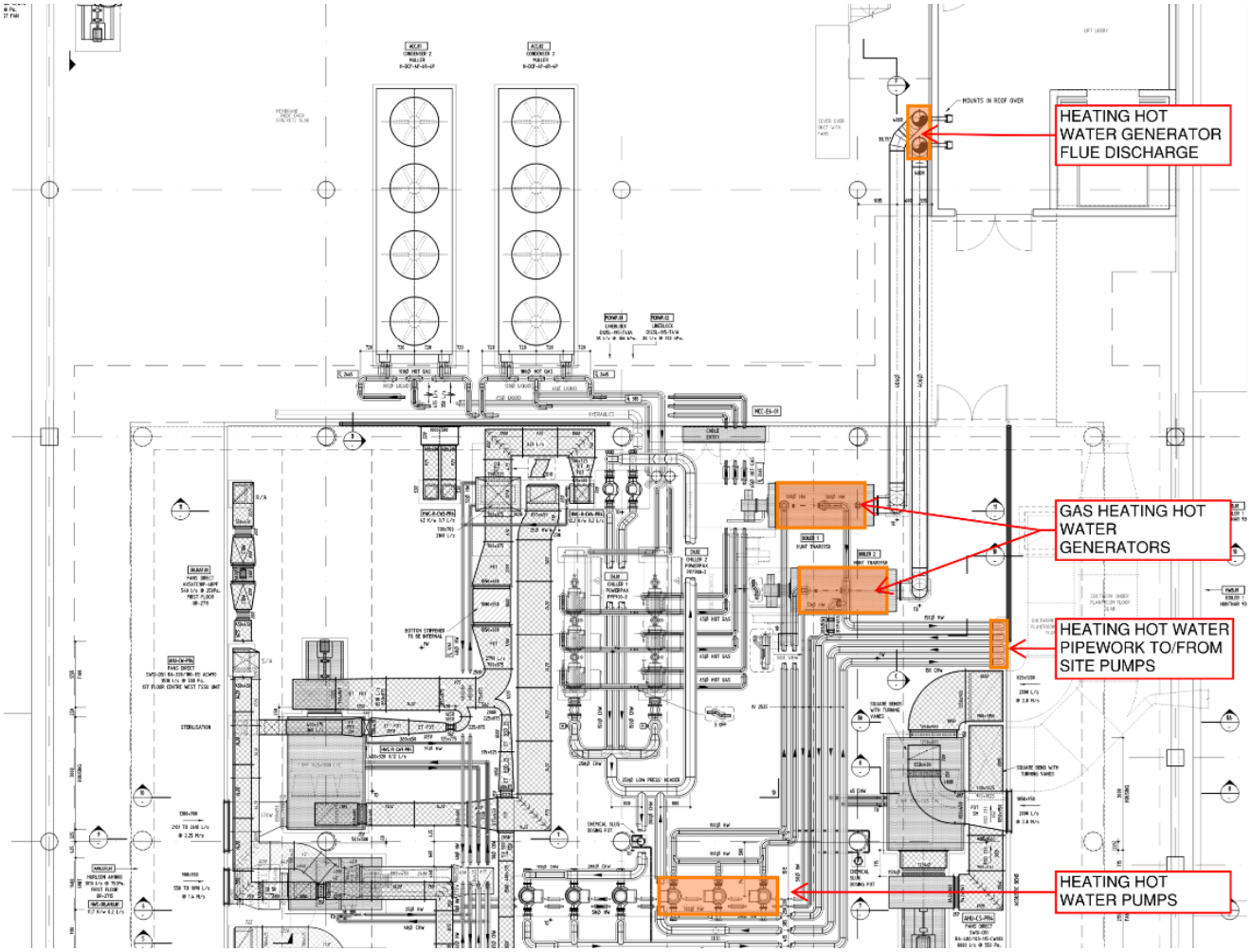



**Figure 2 Current Central Heating Hot Water Plant**

**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)**

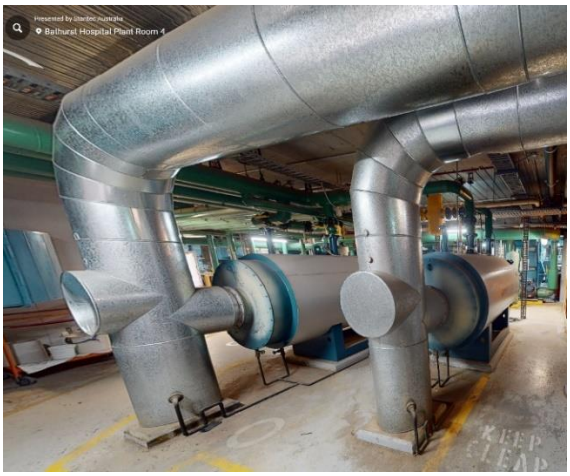


**Figure 4 Heating Hot Water Generators (PR4)**

#### 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)**

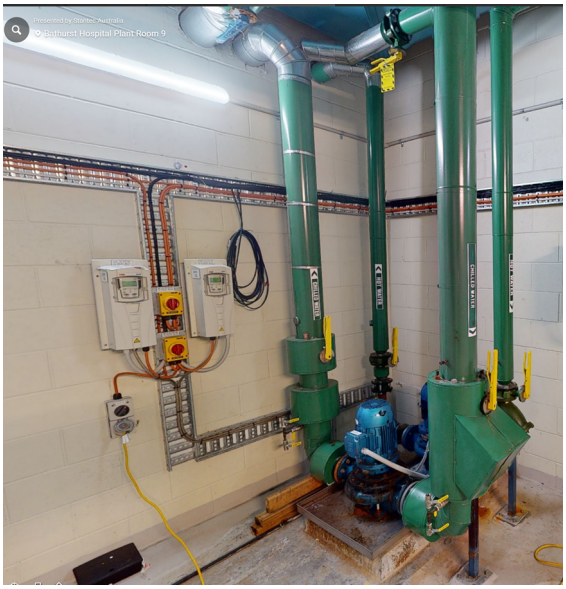


**Figure 6 Booster HHW Pumps (PR9)**

#### 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<br>• High temperature differential for better efficiency up to 20°C dT<br>• 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<br>• Large external plant area ~160 m$^2$<br>• Large power consumption ~ 1300kw<br>• 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<br>• The system can maintain the current temperature differential and water flow, enabling the reuse of the existing pipework<br>• Less plant area compared with option 1. Approximate 36 m$^2$ plant area<br>• Low power consumption compared to options 1&3 ~800kw<br>• There is enough existing spare capacity in the substation to cover the additional electrical demand<br>• Total external plant area ~90 m$^2$ | • Medium supply water temperature ~55°C<br>• Water temperatures will be different from the current. This will mean that AHU, FCU and HHW reheat coils should be replaced throughout the hospital<br>• 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<br>• High-temperature differential for better efficiency up to 20°C dT<br>• Better reliability via design simplicity.<br>• Higher total overall plant COPs – those can be further enhanced via hot water reset strategy.<br>• Internal plant area can replace existing HHWG ~60 m$^2$ required | • New technology, only a few suppliers can offer this option<br>• More power consumption than options 1 & 2 ~1470kw<br>• A new substation may be required to cater to the additional electrical load. Pending confirmation on the redevelopment final equipment selection.<br>• 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.

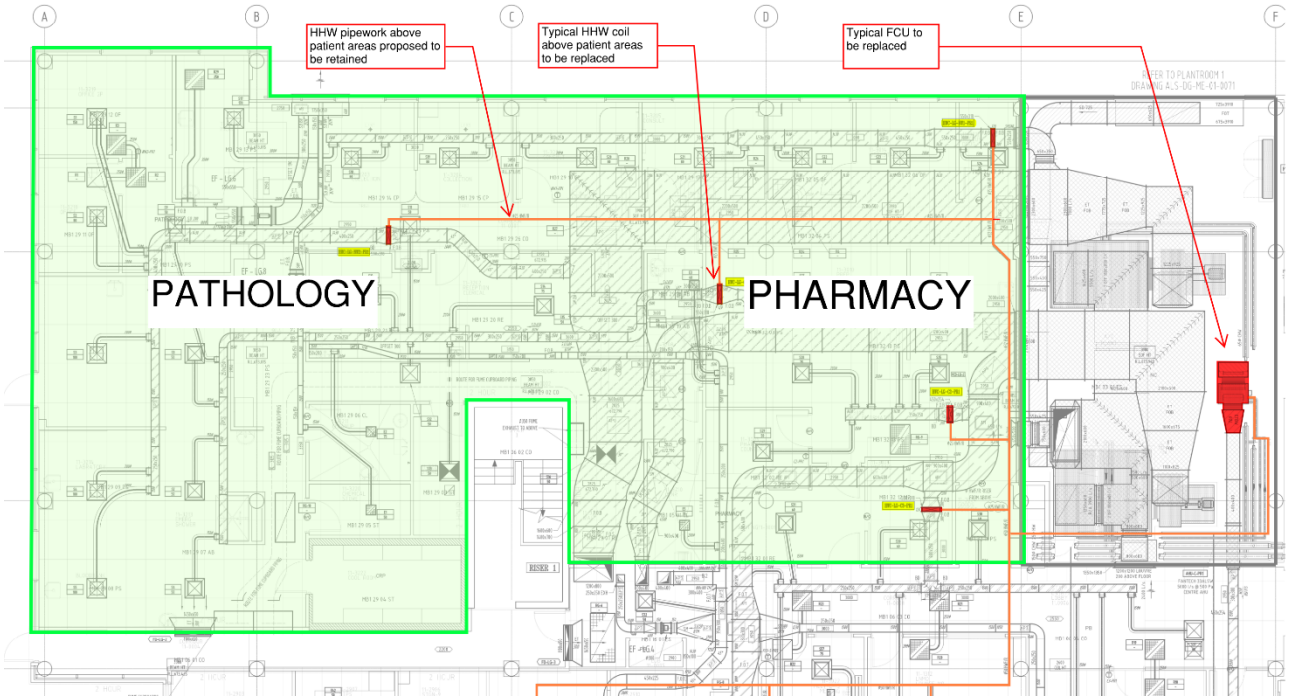



**Figure 7 Typical impact of HHW equipment replacement on existing areas - Level 1 Zone 1 (Pharmacy & Pathology)**

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

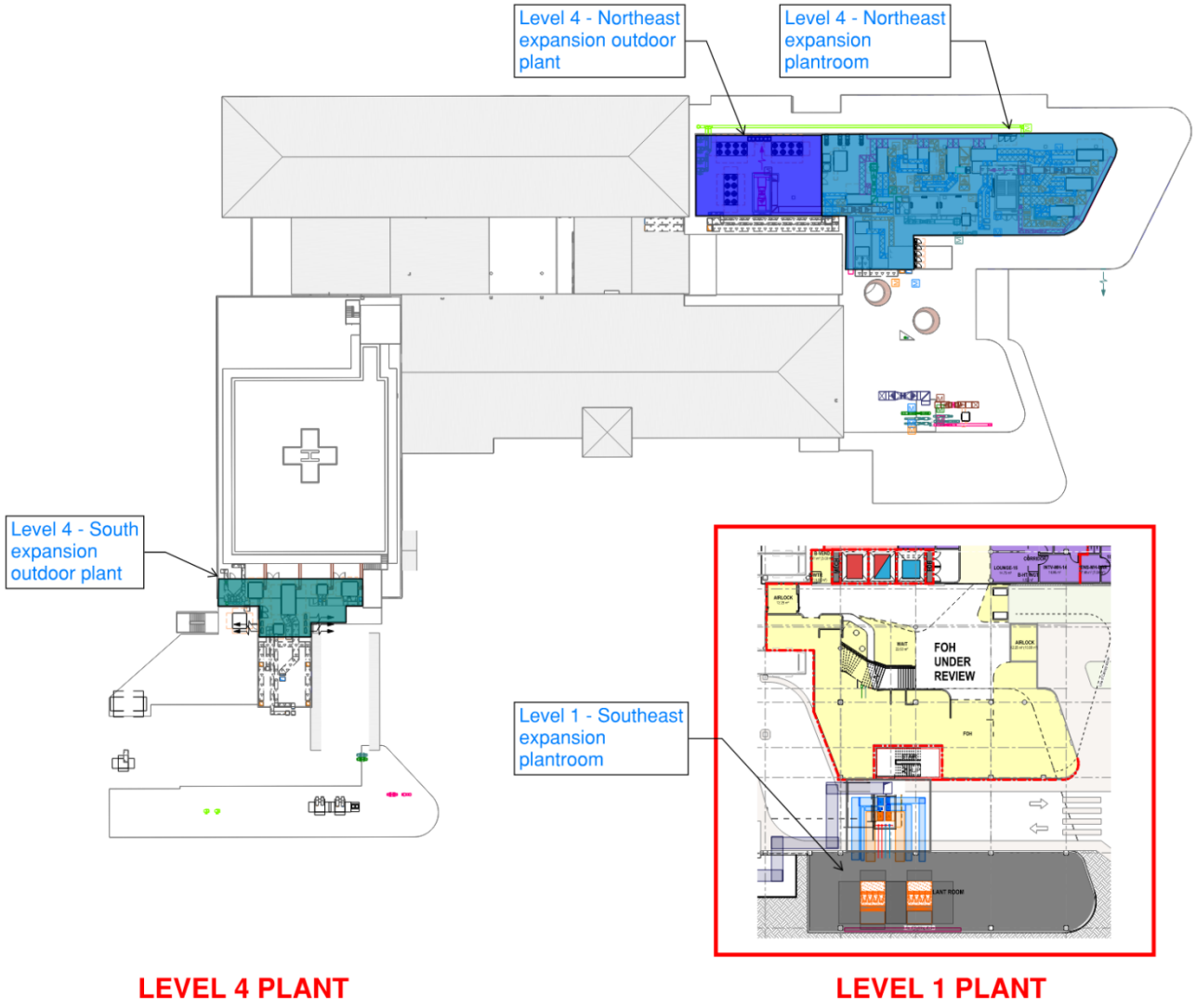



**Figure 8 Main Mechanical Plants**

#### 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 |

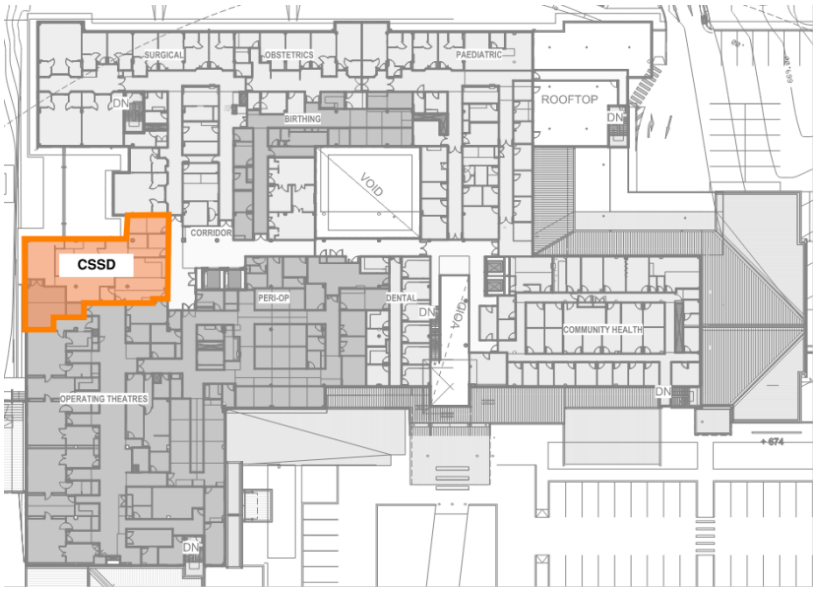



**Figure 9 Existing CSSD**

**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).

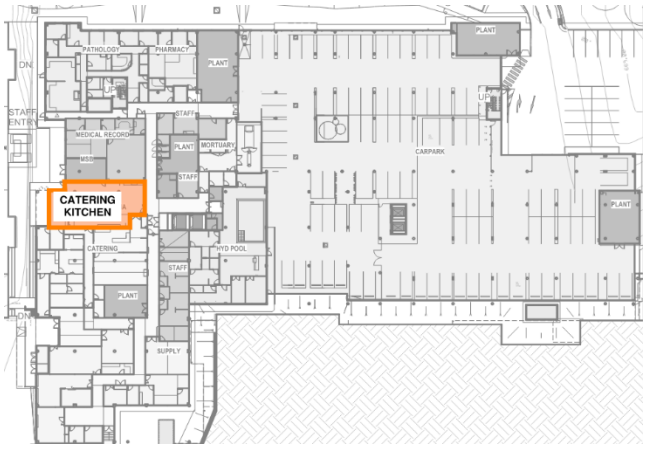



**Figure 13 Catering Kitchen**

**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 | |

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# 11. Appendix D Climate Change Risk Assessment & Adaptation Plan

# Bathurst Hospital Redevelopment

# Climate Change Risk Assessment and Adaptation Plan

**28/10/2024**

**Ref: 301351221**

**PREPARED FOR:**

Marty Smith
Health Infrastructure C/- TSA Management

**PREPARED BY:**

Rebecca Dracup

Stantec

# Revision

| Revision No. | Date | Description | Prepared by | Quality Reviewer | Project Manager Final Approval |
|---|---|---|---|---|---|
| P01 | 01/02/2024 | Preliminary Issue | AP | RD | RD |
| C01 | 04/04/2024 | Design Development Issue | AP | RD | RD |
| C02 | 21/10/2024 | Review Comments Update | RD | RD | RD |
| | | | | | |

**Disclaimer**

This Climate Change Adaptation and Resilience Plan provides an estimate of the risks to the building as a result of climate change. The climate change impacts adopted in the plan are from the Climate Change in Australia website or 'Site' (URL http://www.climatechangeinaustralia.gov.au/). These were developed through the Centre for Australian Weather and Climate Research and were supported by funding from the Commonwealth of Australia. The Climate Change Adaptation and Resilience Plan represents an interpretation of the potential impacts on the building only.

No guarantee or warrantee of building performance in practice can be based on these risk projections alone.

# Glossary

| | |
|---|---|
| ARI | Annual Recurrence Interval i.e., a 1:100-year flood event has a probability of 1% of occurring in any given year |
| Likelihood | The likelihood (probability and frequency) of an event occurring |
| Consequence | The consequence of an event (Financial, OH&S, Environmental, and Regulatory) |
| CMIP | Coupled Model Intercomparison Project |
| Driver | The main climate forcing contributing to the risk (Extreme rainfall, Extreme wind, Temperature etc.) |
| Site | The geographic area |
| Site Details | Key infrastructure on site |
| Consequence Descriptor | The likely consequence resulting from occurrence of risk event |
| Approximate Projected ARI | The design ARI |
| Risk Level | The risk level is the product of likelihood and consequence. See Section 5: Risk Rating Guide |
| Adaptation Option | The broad level of options in terms of establishing responses to the identified risks |
| Adaptation Action | The specific actions to undertake in terms of mitigating the identified risks |
| Benefit to Building Objectives | The ability of the control / adaptation to mitigate the identified risk and fulfill the objectives of the building |
| Timeframe | The timeframe for implementing control / adaptation as determined by the organisation |
| Risk Owner | The person or organisation responsible for implementing the control/Adaptation |

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# 1. Executive Summary

Climate change in Australia has potential impacts on the ability for the built environment to continue providing the current levels of amenity into the future. Natural disasters such as bushfires, floods or cyclones constitute real threats to buildings in operation, and the long-term effects of climate change are likely to increase the frequency of these events. Rychetnik, L et.al. (2018) identified several climate change risks facing Sydney's metropolitan health districts. This report builds on Rychetnik's paper to identify building-specific risks and adaptation measures.

The Climate Change Risk Assessment and Adaption Plan is intended to:

- Identify any risks to the site posed by climate change, and
- Determine possible risk mitigation actions.

The Bathurst Hospital Redevelopment is located at 361-365 Howick Street, West Bathurst, NSW 2795. The proposed development was assessed for its exposure to current and future climate-related hazards. The representative concentration pathway (RCP) of 8.5 for the years 2030 and 2090 are the selected climate change scenarios for this risk assessment. The projected climate impacts for these two scenarios were used to identify potential risks to the site using best-practice climate change risk assessment methodologies. This report highlights the risk considerations, site constraints, and strategies employed to reduce the site's climate risk profile. Based on the climate risks identified in this report, the proposed development was determined to have an **EXTREME** risk rating across the selected climate change scenarios, before mitigatory actions.

## 1.1 Extreme-Risk Items

| Discipline | Risk | Example Mitigation Response |
|---|---|---|
| Mechanical- Heating and air conditioning | Increased intensity and frequency of peak temperature events leading to failure or reduction in effectiveness of A/C systems | Air-conditioning system will be sized to accommodate future climate change. Short- and long-term climate projections and their effects on the HVAC plants has been reviewed and cooling systems are sized above the minimum requirements for critical and non-critical zones.<br><br>The project implements double glazing throughout the development which alleviates mechanical stress to maintain thermal comfort in habitable spaces.<br><br>Mechanical selection is done based on 30+ year projection as they are more accurate. Increased temperature (dry bulb) will be proposed based on it. |
| Architectural | Increase in temperature / temperature extremes causing discomfort to occupants indoors | All windows will be double glazed.<br><br>Two types of blinds will be provided- Normal roller blinds for most of the rooms and internal venetian blinds for special rooms. Most of the rooms have blinds. Patient rooms have semi-transparent UV blinds.<br><br>Sun shading has been proposed for facades. |



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## 1.2 High-Risk Items

| Discipline | Risk | Example Mitigation Response |
|---|---|---|
| Architectural | Increase in temperature / temperature extremes / high wind causing discomfort to the occupants & pedestrians in outdoor areas | All windows will be double glazed.<br><br>Normal roller blinds for most of the rooms and integral blinds for special rooms e.g. isolation rooms, mental health rooms, clean rooms, pediatrics.<br><br>Sun shading has been proposed for facades. |
| | High allergy or thunderstorm asthma risk | Operable windows to wintergarden and gym/outpatient areas to suit brief/performance requirements. Inpatient areas to be fully sealed to the external conditions. Mixed mode areas to be further developed with mechanical engineer. |
| Mechanical | Poor indoor air quality & smoke as a result of bushfires (this occurred in 2019/20 and in 2006/07) | Critical clinical areas will be provided with a combination of G4 and F8 filters and all non-critical clinical areas will be provided with G4 filters to prevent ingress of smoke. |
| Electrical | Increased risk of power outages during peak times, leaving occupants without a safe and well-lit environment. | Emergency lighting (egress & illuminated signage/pathway) and lighting in common areas will be on a 2-hour battery backup as mandated by standards. |
| | Increased risk of power outages during peak times, leaving occupants without power and shut down of essential services (for example: lifts, fire protection). | Backup diesel generators will be provided for backup power for specific services and rooms during a power outage. |
| Hydraulics | Under-designed pipes & gutters unable to cope with extreme rainfall events. | The proposed stormwater infrastructure strategy for the development will be connected directly into the existing stormwater network to discharge water in the possibility of a major flood event.<br><br>Landscaping will be introduced wherever possible to retain and slow surface water to mitigate peak flows/ flooding.<br><br>The stormwater system will be designed to cope with a 1% AEP plus 5 minutes. |

**In response to the climate risk assessment, the following design and/or operational responses will be implemented in the current design:**

- All design FFLs will be above flood planning levels per the Flood Risk Assessment by Water Technology (dated 10/09/2024). DRAINS modelling (including a 20% climate change adjustment factor) has been completed for stormwater drainage and OSD sizing.
- The ground floor of the building will be designed to structurally withstand the hydrostatic pressure/stormwater inundation from the 1% AEP flood level. The structural design will be in accordance with the Australian Standards for wind loading, earthquakes, and structural vibrations.
- All windows will be double glazed.
- Normal roller blinds for most of the rooms and integral blinds for special rooms e.g. isolation rooms, mental health rooms, clean rooms, paediatrics
- Sun shading has been proposed for facades.
- Existing building has Dune colour - SRI 60, which meets Green Star requirement of SRI of ≥ 34 for sloped roof pitch >15°.
- All new flat roof with pitch <15°shall have SRI ≥ 64, and sloped roof with pitch >15° shall have SRI ≥ 34.
- Building form has concealed flat roofs to minimise potential glare.
- Building entry and exits to be provided with airlocks and sheltered with canopies which shelter the user as they move in and out of the building.
- Critical clinical areas will be provided with a combination of G4 and F8 filters and all non-critical clinical areas will be provided with G4 filters with space for F9 filters to prevent ingress of smoke. Outdoor air is modulated through BMS and it can be done accordingly during the bushfire season.
- Backup diesel generators and Uninterruptible Power Supplies will be provided for backup power for specific services and rooms during a power outage.
- Lighting controls, such as motion sensors to the staff areas and infrequently used spaces, will be provided to minimise energy use. High efficiency LED lighting will be used.
- The proposed stormwater infrastructure strategy for the development will be connected directly into the existing stormwater network to discharge water in the possibility of a major flood event.
- As a result of the development, peak flows have increased, requiring On-Site Detention (OSD) to meet Green Star requirements. Two OSD systems, with volumes of 20.1 and 14.8 cubic meters respectively, have been proposed to manage and limit these flows. Landscaping will reduce peak flows draining off the proposed development and therefore reduce the peak flows draining into the OSD. This will in turn reduce the OSD size. The OSD has not been used to mitigate flooding but is instead used to maintain the downstream drainage network capacity.
- Reliance on potable water will be reduced through the use of water efficient fixtures, fittings and appliances, and landscaping.
- Use of endemic low water use plant species will be proposed to the project for longevity in green landscaping.
- HINSW requires minor drainage to be designed to the 5% AEP and major flows to the 1% AEP. Additionally, detention systems must comply with Council/authority requirements. Bathurst Regional Council does not stipulate detention requirements for any development other than future subdivisions within the Laffling Waters Master Plan. Therefore, detention requirements revert back to the Green Star initiative. Climate change has been incorporated into the stormwater and OSD design by applying a 20% adjustment factor in DRAINS modelling. This adjustment is based on ARR Book 1, Chapter 6, which states that projections for Greater Sydney indicate the 1% AEP for the 24-hour duration IFD may increase by up to 20% by 2050.



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**In response to the climate risk assessment, the following design and/or operational responses are recommended to be implemented as a <u>future provision</u>:**

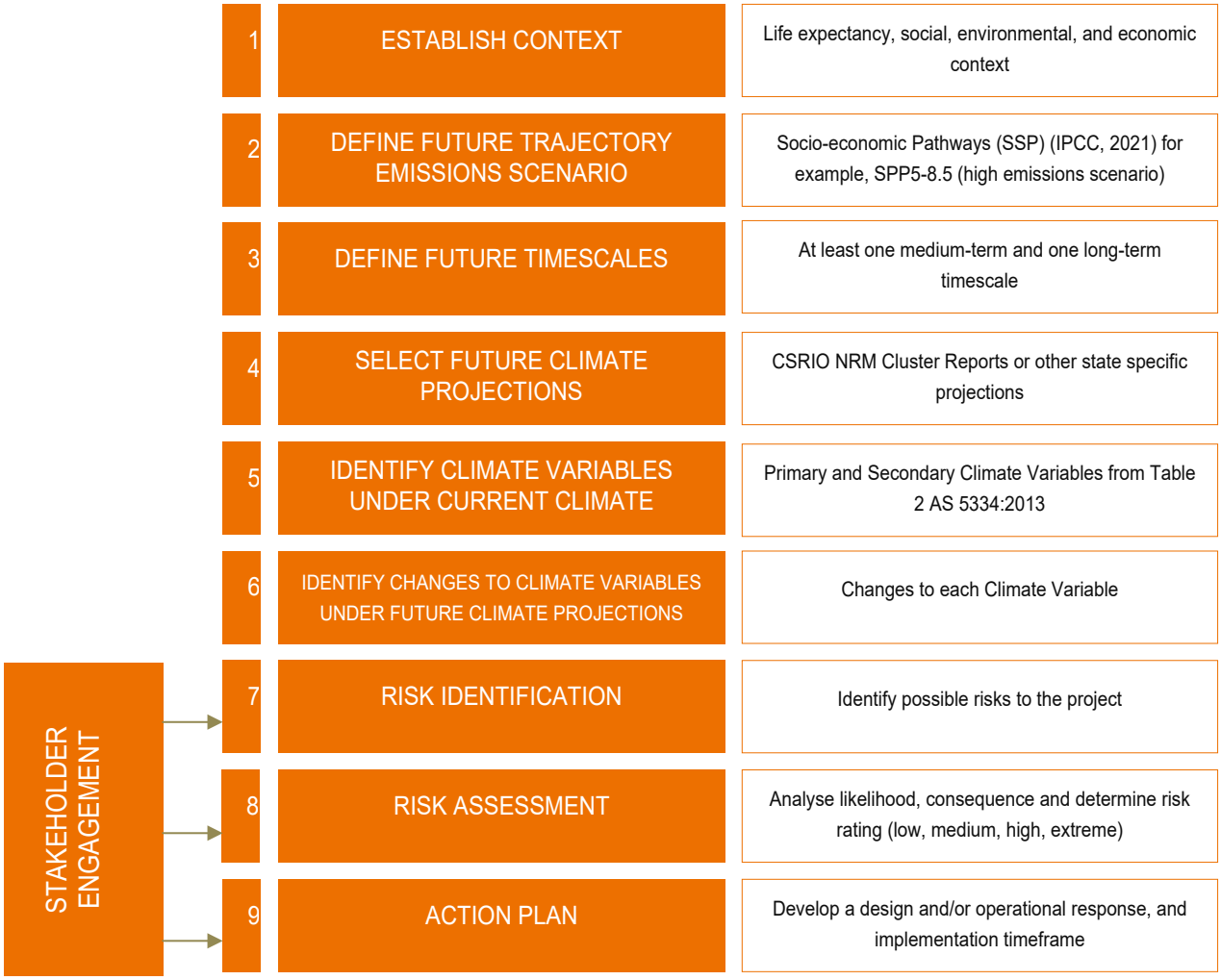
- Air-conditioning system will be sized to accommodate future climate change. Short- and long-term climate projections and their effects on the HVAC plants has been reviewed and cooling systems are sized above the minimum requirements for critical and non-critical zones. Mech selection is done based on 30+ year projection as they are more accurate. Increased temperature (dry bulb) will be proposed based on it.
- Mechanical plant is sheltered behind the weather louvres to minimize noise egress and visual aspects. The louvres also prevent the plant from impacts of the extreme winds and objects carried by wind. Items of potential risk are isolation discharges and localized small roof vents. Mitigation for these items is for secure mounting and locating where some sheltering possible.
- Mechanical equipment will be located in ventilated protected structures.
- Provision of solar photovoltaic systems (~900 numbers of 540W panels for existing TBD+new build hospital, exact capacity and number TBD) to alleviate extra load on electricity supply and reduce risk of power outages.
- The stormwater system will be designed to cope with a 1% AEP, plus 5 minutes.

# 2. Introduction

The purpose of this Climate Change Risk Assessment and Adaption Plan is to assess the risks associated with climate change and the external surroundings of the proposed Bathurst Hospital Redevelopment. Based on the current and projected climate conditions of the site, several risks specific to the project are identified and are evaluated using methods from recognised standards. Ultimately, recommendations are developed to address these risk items through potential design responses (i.e., to improve its resilience to climate hazards and be considered climate adaptive).

This assessment is developed to address the NSW Health Infrastructure's ESD Framework which aims to encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.

The following diagram depicts the process of undertaking this assessment as documented in this Climate Change Risk Assessment and Adaption Plan.



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# 3. Project Information

## 3.1 Project Background

The proposed Bathurst Hospital is located at 361-365 Howick Street, West Bathurst, NSW 2795. The site is bound by Durham Street to the north-east, Mitre Street to the south-east, Howick Street to the south-west, and the Commonwealth Street to the north-west.

The Bathurst Hospital redevelopment project is a mix of refurbishments of the existing hospital and expansion on the existing site. The Project will provide for a range of new clinical and non-clinical facilities to support capacity issues and existing infrastructure deficiencies on the campus.

The current site includes a state significant heritage building however the Project is not expected to deliver upgrades to this building.

Bathurst hospital has been on the current site since 1880 when the original hospital building was constructed on the corner of Howick and Mitre streets. A major new hospital building to the north of the site which was completed in 2007. The existing hospital is within the Western NSW Local Health District and provides several services including ambulatory care, coronary care, emergency medicine, intensive care, general medicine, mental health drug & alcohol, obstetrics & gynaecology, oncology, paediatrics, pathology, radiology, rehabilitation, and surgery services. The proposed development aims to increase beds capacity, Emergency Department expansion, Ambulatory Care, Rehabilitation, Pre-operative service, and diagnostic capacity.

In pursuit of ESD design principles across the development, the Project will pursue Ecological Sustainable Development (ESD) excellence benchmarks to deliver a sustainable project outcome.

These include best practice design initiatives from:

- NSW Environmental Planning and Assessment Regulation 2021
- NSW Government Resource Efficiency Policy
- National Construction Code (NCC) 2019 Amendment 1
- Health Infrastructure Design Guidance Note No.058 – Environmentally Sustainable Development
- Health Infrastructure (HI) ESD Evaluation Tool
- Bathurst Regional Development Control Plan (DCP) 2014

Please refer to Appendix A which further summarizes the project characteristics (site, location, climatic characteristics).



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## 3.2 Project Site

The project site is shown in the figure below:

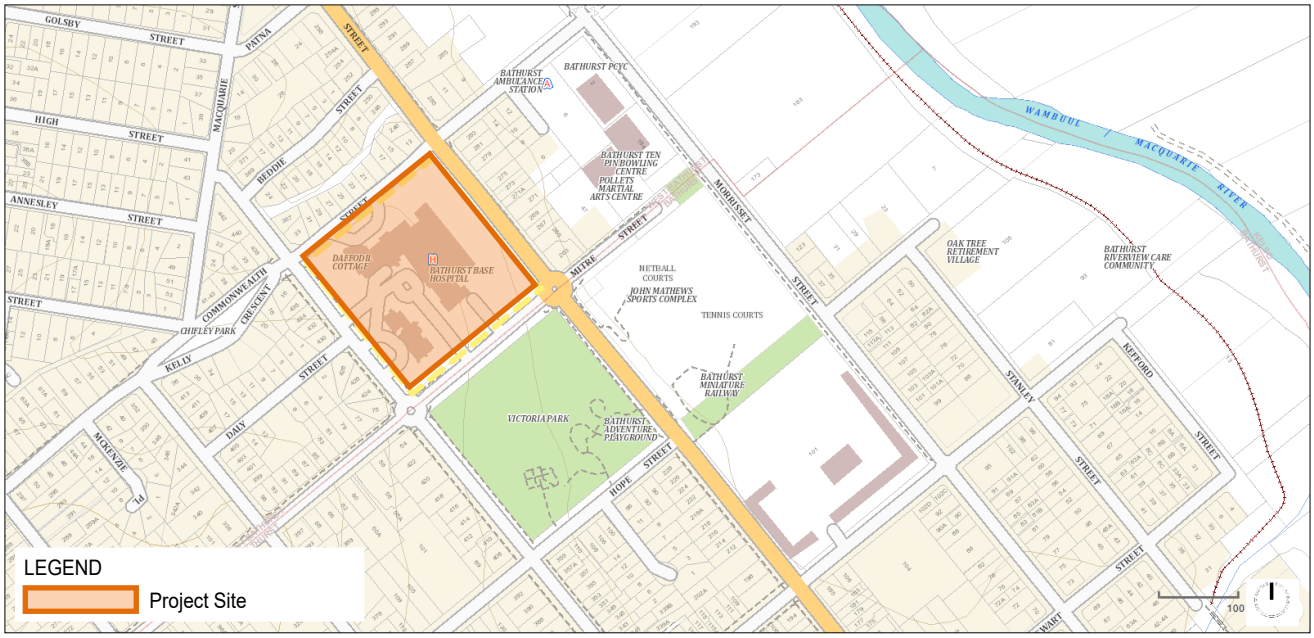


**Figure 1- Location of site (Source: NSW Planning Portal Spatial Viewer)**

## 3.3 Current Climate Exposures

### 3.4.1. Local Climate Context

The project is located in West Bathurst. The climate data of Bathurst Airport (site number- 063291, sourced from the Bureau of Meteorology) has been selected to closely describe the project's climate characteristics and is used to determine the potential future climate risks. Bathurst Airport bureau station is the closest comparable site with reliable and robust climate data as it is located approximately 8.7km from the Bathurst Hospital redevelopment.

Table 1 presents the annual means of key drivers of the local climate conditions such as temperature and rainfall, using recent observations across the years 1988 to 2024 for Bathurst Airport's weather station (Bureau of Meteorology, 2024).

**Table 1: Current Climate Exposures of Bathurst (Source: Bureau of Meteorology, 2024)**

| Climate Drivers | Annual Average (1988 – 2024) |
|---|---|
| Mean Maximum Temperature (°C) | 20.4 (Summer: 28.9°C; Winter: 12.1°C) |
| Mean Minimum Temperature (°C) | 6.9 (Summer: 14.0°C; Winter: 0.9°C) |
| Mean number of days over 30°C | 35.2 |
| Mean number of days below 2°C | 84 |



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| | |
|---|---|
| Mean annual rainfall | 620.3 mm |
| Mean number of days of rain | 126.4 |
| Mean number of days of rain ≥ 10mm | 20.7 |

### 3.4.2. Extreme Temperature (Current)

As indicated in Table 1, the local temperatures of Bathurst Airport have historically experienced a rise in mean annual temperatures which translates to more frequent and hotter days (with temperatures beyond 30°C) peaking up to 42.1°C (2017). The Bureau of meteorology has reported that year 2019 has been Australia's warmest year on record to date with annual national mean temperature 1.52°C above average (Bureau of Meteorology, 2024).

As Bathurst has been extensively developed for mixed usage (commercial, residential, cultural and institutional), the local temperatures of the site are anticipated to be less tempered than that of Bathurst Airport (in which the climate data above refers to) as it is located away from the residential areas and is more prone to urban heat island effects caused by the large proportion of dark road and parking surfaces and hard-surfaced buildings. Therefore, the site may experience elevated local temperatures which may be considered in the design of mechanical systems or building fabric for this project.

The site is located 2.5km Northeast from the nearest risk bushfire prone area (Figure 2), there has been no bushfire instances recorded in past years. Both 2019/ 2020 and 2023 bushfires affected regions are more than 50km East and North of the site respectively.

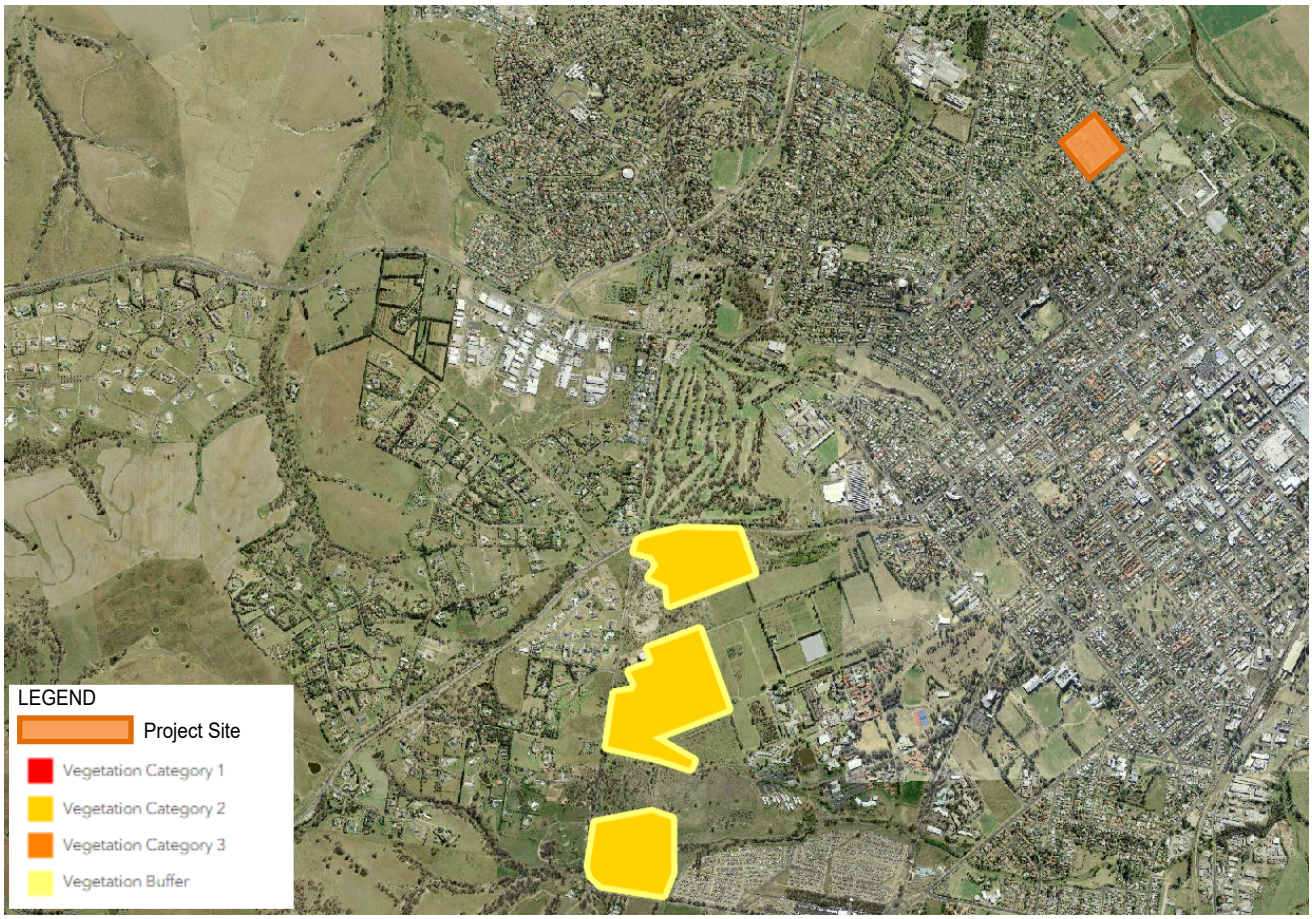




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**Figure 2: Bushfire risk around the site (Source: NSW Planning Portal Spatial Viewer)**

### 3.4.3. Extreme Rainfall (Current)

Over the years, most of Australia has progressively received less annual rainfall which has led to drier climates (Bureau of Meteorology, 2024). Central slopes regions which include Bathurst has experienced notable prolonged periods of extensive drying in early 20th century. Since 2020 rainfall was above average for the region with accompanying storm hail and flood. Bathurst recently experienced intense rainfall, storm, and hail during September 2021 (ABC.net.au, 2023), February 2023 (ABC.net.au, 2023) and December 2023 (Western Advocate, 2023). The Bureau of Meteorology has reported that year 2019 has been Australia's driest year on record since 1900 with national total rainfalls being 40% below the 1961 – 1990 average (Bureau of Meteorology, 2020c). That being said, the likelihood for moderate and/or heavy rainfalls remains unchanged. Therefore, flood-affected regions induced by intense rainfalls will likely expect to experience the same level of severity of flood impacts.

### 3.4.4. Extreme Floods (Current)

NSW has recently experienced periods of heavy rainfall, and the Bathurst Hospital Redevelopment site is located close to flood planning areas (Figure 3, Figure 4 and Figure 5). The below maps are an indication of the 1% Annual Exceedance Probability (AEP) flood plus 0.5 m freeboard in Macquarie River. The site is located such that the Macquarie River flood planning area is to its west. The site is not considered as a flooding hotspot. Bathurst Regional Council identifies properties as affected by flooding when inundated in the 1% AEP flood event. The flood inundation maps shown in below, Figure 3 and Figure 4 has shown that the subject site is located outside the 1% AEP flood extend. Figure 3 below shows the 1% AEP flood extent in relation to Bathurst Hospital Redevelopment. It can be seen that the maximum flood depth is roughly 650m AHD which is 10m below the lowest level on the subject site (eastern corner).

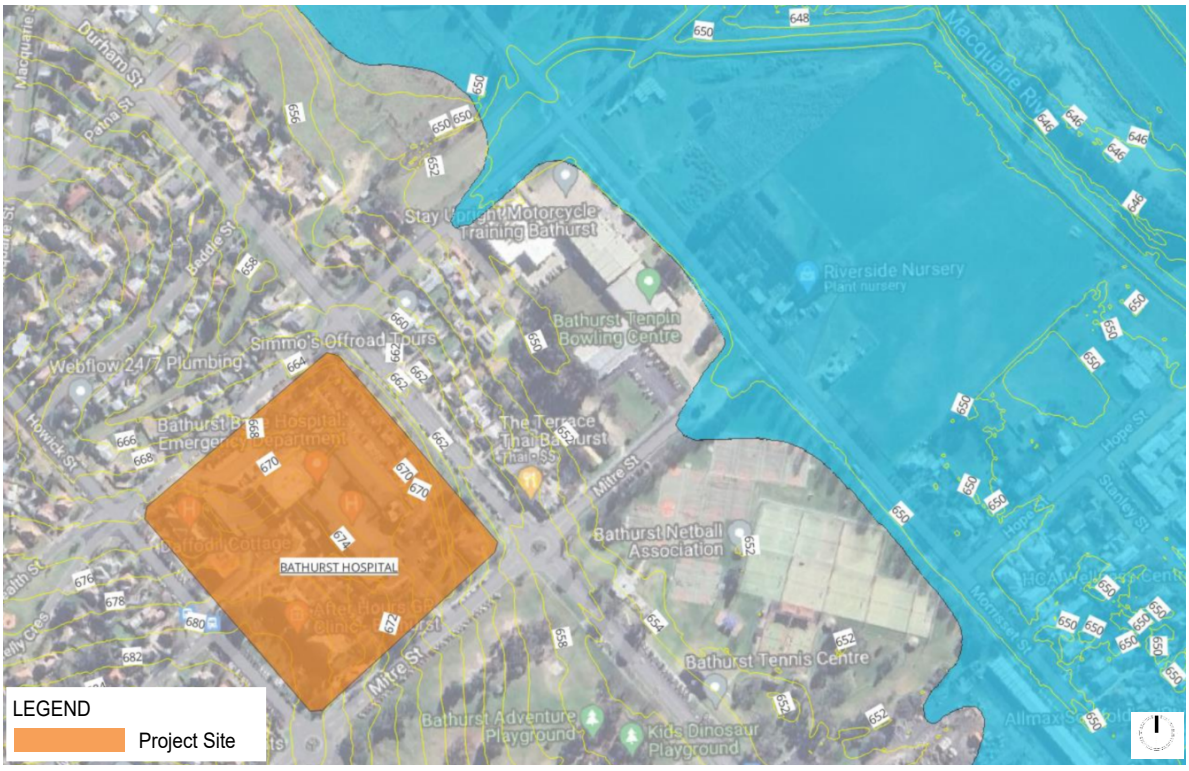


**Figure 3 - Bathurst flood inundation map (Source: TTW's Structural and Civil Concept Design report)**



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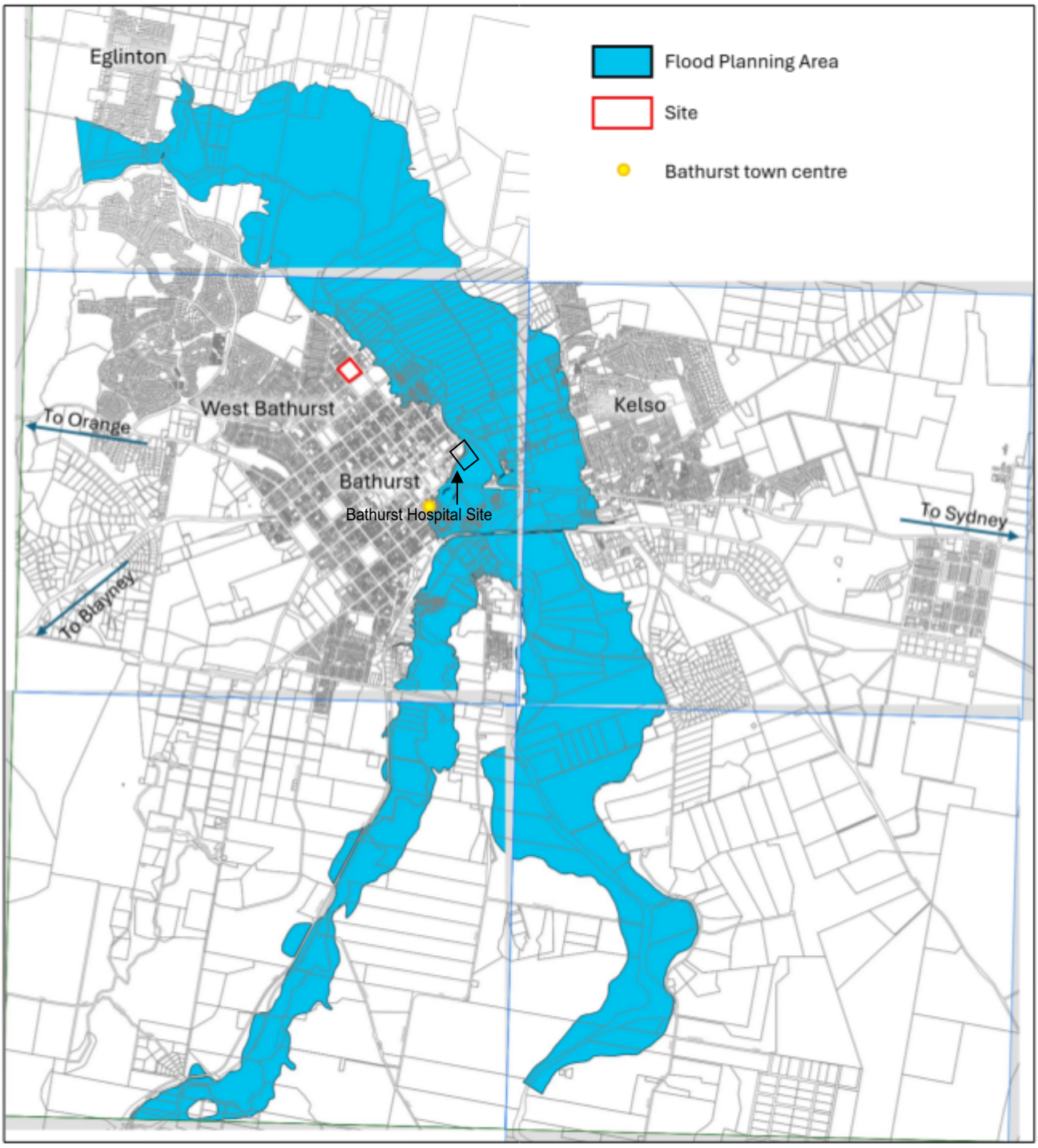


**Figure 4- Bathurst flood planning area (Source: Water Technology's Flood Risk Assessment dated 10/09/2024)**



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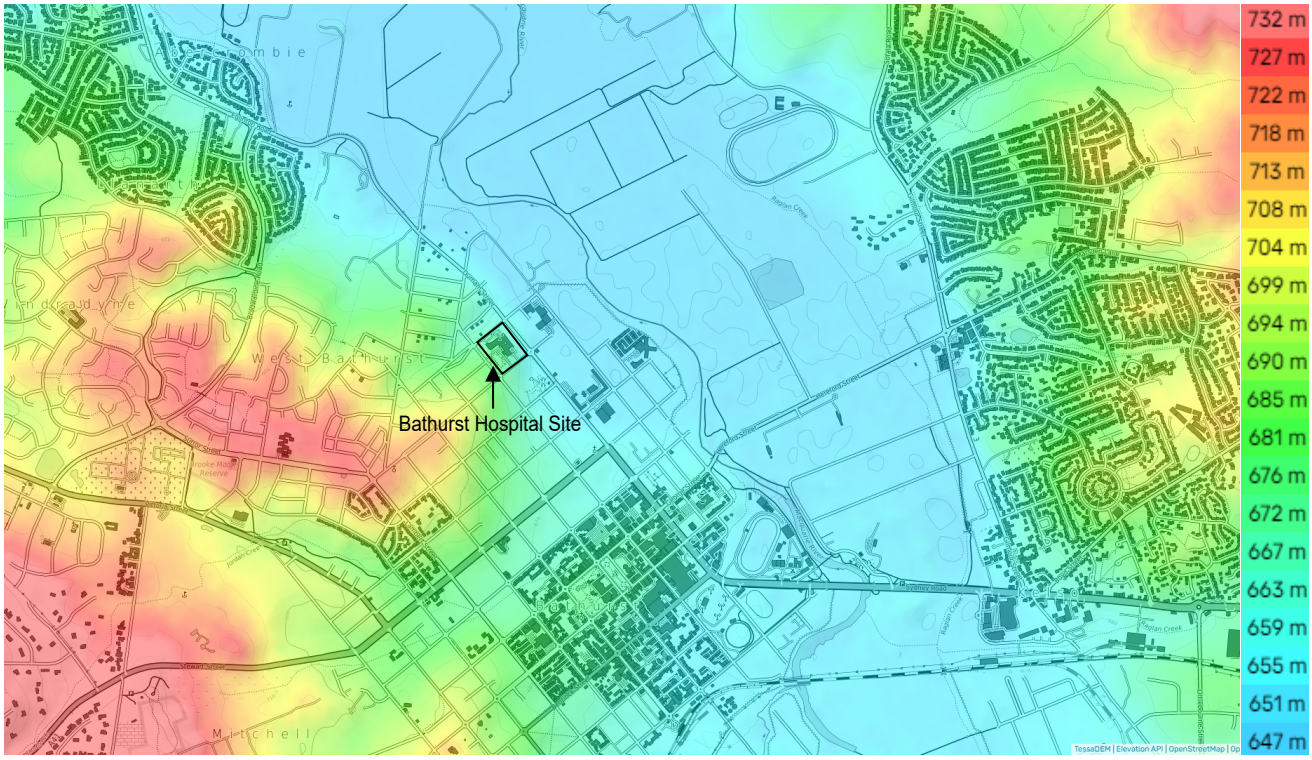


**Figure 5- Bathurst topographic map (Source: topographic-map.com)**

### 3.4.5. Current Climate Assessment

Based on the current climate conditions as well as the sensitivity of its geographical area, it is determined that:

- The location of the project is deemed to have a **LOW** risk rating.
- The exposure to current hazards is deemed to carry a **LOW** risk rating.
- The overall exposure and hazard rating is deemed to be **LOW.**

These risk ratings indicate the climate risk that the project is under based on the sensitivity of its geographical location and its exposure to current climate hazards. Each risk item of consideration is scored based on the likelihood of the risk occurring for the key climate variables, which will contribute to determining the overall risk level of the project site itself.

Please refer to Appendix B which assesses the likelihood of risks associated with the key climate variables.

## 3.4 Projected Climate Change

### 3.4.1. Projected Scenarios

According to the IPCC Sixth Assessment Report (IPCC, 2021), Australia is already experiencing impacts from recent climate change, including greater frequency and severity of extreme weather events. Therefore, it is important to understand the climate change impacts under the 'most likely' and 'worst' case for the proposed development.

Two future timescales have been adopted for this climate adaptation plan, 2030 and 2090. These timescales have been chosen based on the expected lifespan of a building of 60 years, which should fall within these two years. The Southern Slopes cluster climate projections, developed by CSIRO and the Bureau of Meteorology, presents future climate projects across these two timescales for the development assessed in this report (CSIRO and BOM, 2015).



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The greenhouse gas emissions discussed are those influenced by human activities (anthropogenic). Anthropogenic greenhouse gas emissions could be increased, reduced, or remain constant into the future. The scenarios are called Shared Socio-economic Pathways (SSP) (IPCC, 2021) or Representative Concentration Pathways (RCP) (IPCC, 2014). These reflect different concentrations of global greenhouse gas emissions and socio-economic trajectories. Although no particular scenario is deemed more likely than the others, this report focuses on the SSP5-8.5 (high emissions) scenario, which is the trajectory that current GHG emissions are tracking closest to.

**SPP5-8.5** – a future with little curbing of emissions, with a $CO_2$ concentration continuing to rapidly rise, reaching 940 ppm by 2100. Equivalent to RCP8.5 in in the IPCC Fifth Assessment Report (IPCC, 2014).

**SSP3-7.0** – a high greenhouse gas emissions scenario where the 1.5°C global warming level is likely to be exceeded in the near term (2021-2040) (IPCC, 2021).

**RCP6.0** – lower emissions, achieved by application of some mitigation strategies and technologies. $CO_2$ concentration rising less rapidly (than RCP8.5), but still reaching 660 ppm by 2100 and total radiative forcing stabilising shortly after 2100.

**SSP2-4.5** - $CO_2$ concentrations are slightly above those of RCP6.0 until after mid-century, but emissions peak earlier (around 2040), and the $CO_2$ concentration reaches 540 ppm by 2100. Compared to 1850–1900, global surface temperature averaged over 2081–2100 is very likely to be higher by 2.1°C to 3.5°C. Equivalent to RCP4.5 in in the IPCC Fifth Assessment Report (IPCC, 2014).

**SSP1-2.6** - the most ambitious mitigation scenario, with emissions peaking early in the century (around 2022), then rapidly declining. Such a pathway would require early participation from all emitters, including developing countries, as well as the application of technologies for actively removing carbon dioxide from the atmosphere. The $CO_2$ concentration reaches 440 ppm by 2040 then slowly declines to 420 ppm by 2100). Equivalent to RCP2.5 in in the IPCC Fifth Assessment Report (IPCC, 2014).

**SSP1-1.9** – Compared to 1850–1900, global surface temperature averaged over 2081–2100 is very likely to be higher by 1.0°C to 1.8°C. The 1.5°C global warming level is more likely than not to be reached. Furthermore, it is more likely than not that global surface temperature would decline back to below 1.5°C toward the end of the 21st century, with a temporary overshoot of no more than 0.1°C above 1.5°C global warming (IPCC, 2021).

There are many Global Circulation Models, which provide climate projections based on the above RCPs (results from global circulation models based on the SSPs have not yet been released by CSIRO). Variations between models may be attributed to the use of different global data sets, or the ability to represent certain interactions, such as those between the ocean, atmosphere, and land. The Global Circulation Models applied in this report are from the fifth Climate Model Intercomparison Project (CMIP5), which form part of the Fifth IPCC Assessment Report (IPCC, 2014).

**Future emissions cause future additional warming, with total warming dominated by past and future $CO_2$ emissions.**

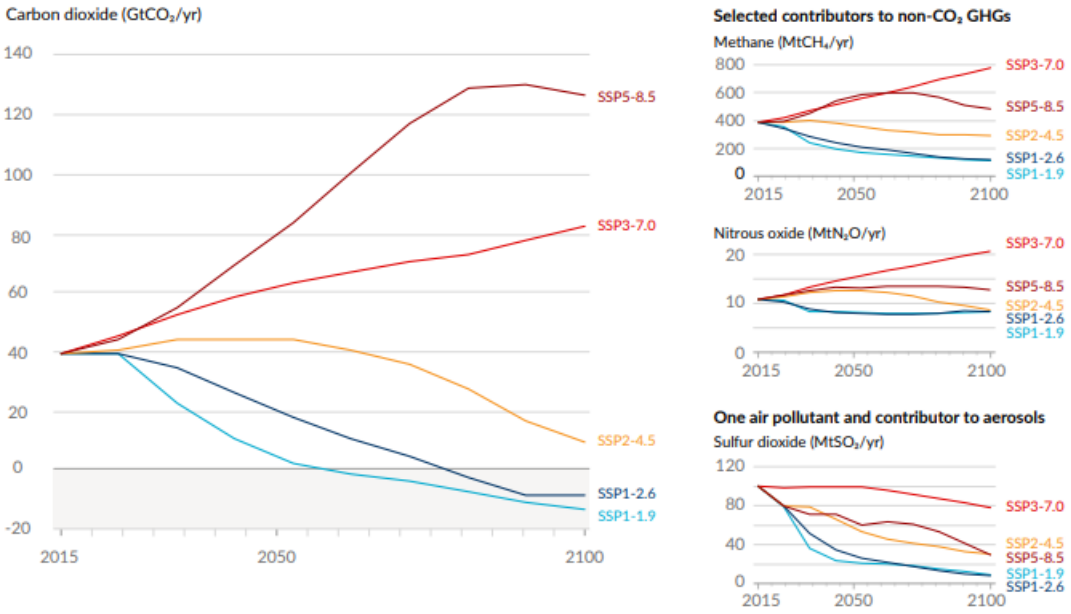


**Figure 6: Future annual emissions of $CO_2$ (left) and of a subset of key non-$CO_2$ drivers (right), across five illustrative scenarios (IPCC, 2021)**

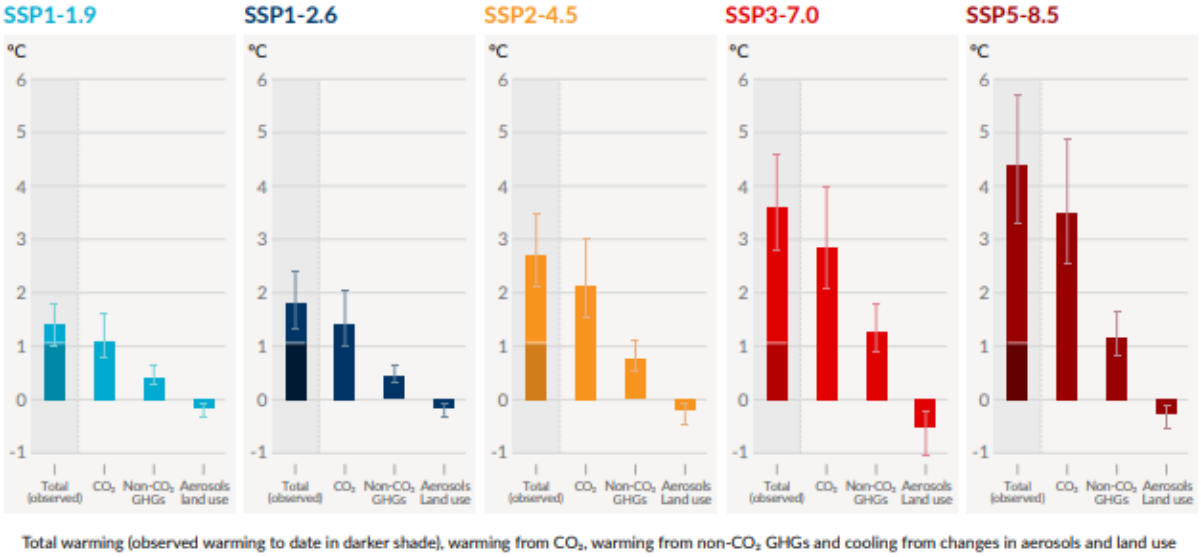


**Figure 7: Contribution to global surface temperature increase from different emissions, with a dominant role of $CO_2$ emissions (IPCC, 2021)**

### 3.4.2. Climate Projections

Table 2 summarizes the projected impacts of climate change across two timelines for RCP 8.5: the near future 2030 and far future 2090. These projections are generalized for the Central Slopes Cluster region as defined by the CSIRO and BOM (2015) and is taken as the most representative of the proposed site's future climate-change enhanced conditions.

**Table 2: Projected climate change across 2030 & 2090, Mean and range based on one standard deviation (Climate Futures Tool, 2021)**

| Climate Variable | Climate Projections (change relative to 1986 – 2005 baseline) | |
|---|---|---|
| | 2030 | 2090 |
| | RCP8.5 | RCP8.5 |
| Mean daily temperature (°C) | 1.1 (0.7 to 1.5) | 4.2 (3.0 to 5.4) |
| Maximum daily temperature (°C) | 1.2 (0.5 to 1.6) | 4.2 (3.2 to 5.5) |
| Minimum daily temperature (°C) | 1.0 (0.7 to 1.4) | 4.1 (3.0 to 5.3) |
| Extreme temperature (days per year over 35°C) | Substantial increase in intensity and frequency of extreme temperature days | |
| Mean annual rainfall change (%) | -1.0 (-13 to 8.0) | -6.0 (-23.0 to 18.0) |
| Extreme rainfall | Extreme rainfall events to increase in intensity | |
| Drought | Time spent in drought conditions to increase | |
| Bushfire weather (Number of severe fire danger days; FFDA > 50) | Severity of fire-weather climate to increase | |
| Solar radiation (%) | 0.6 (-0.7 to 2.1) | 0.9 (-1.7 to 3.3) |
| Relative humidity (%, absolute) | -0.8 (-2.8 to 1.6) | -2.4 (-7.4 to 1.1) |
| Wind Speed (%) | 0.2 (-1.9 to 3.5) | 1.4 (-3.5 to 6.8) |

#### 3.4.2.1. Mean temperature

Continued substantial warming is projected with very high confidence. For the near future (2030), the mean warming is around 0.7 to 1.5 °C relative to the climate of 1986–2005, with only a minor difference between RCPs. For late in the 21st century (2090) 3 to 5.4 °C under RCP8.5. This projection is in line with the current rising trend of local mean temperatures as described in Section 3.3 which has resulted in the year 2021 being Australia's warmest year on record (Bureau of Meteorology, 2020b). This warming is expected to continue and, as a result, temperatures in Bathurst will also increase.

#### 3.4.2.2. Extreme temperature

A substantial increase in the temperature reached on the hottest days, the frequency of hot days, and the duration of warm spells, is projected by 2090. As a consequence of rising temperatures, peak temperature events will become more frequent whereby the number of days above 35°C are expected to nearly triple and days over 40°C are expected to increase nearly six times under RCP8.5 by 2090 (CSIRO and BOM, 2015).

### 3.4.2.3. Solar radiation

The intensification of peak temperature events will result in the solar radiation showing a significant increase across the two timeframes of consideration (CSIRO and BOM, 2015).

### 3.4.2.4. Relative humidity

A decrease in relative humidity away from coasts is expected because of an increase in the moisture holding capacity of a warming atmosphere and the greater warming of land compared to sea, leading to increases in relative humidity over ocean and decreases over land. There will be little change for 2030 generally smaller than -5% under RCP8.5, with high confidence. For 2090, reductions are more marked, particularly in winter and spring with projected ranges of about -10 to 0 % under RCP8.5 consideration (CSIRO and BOM, 2015).

### 3.4.2.5. Mean rainfall

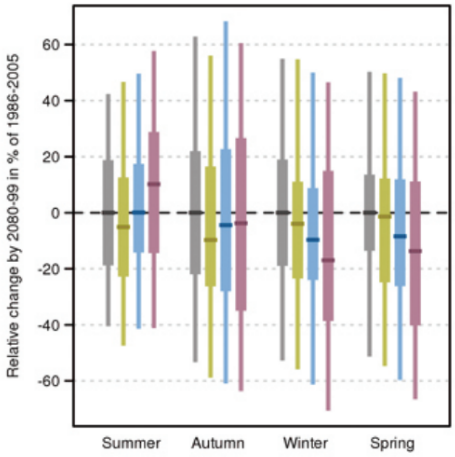


**Figure 8: Projected seasonal rainfall changes for Bathurst (Central slopes cluster) for 2090. Rainfall anomalies are given in per cent with respect to the 1986 – 2005 mean for RCP2.6 (Green), RCP4.5 (Blue) and RCP8.5 (Purple) scenarios. Natural climate variability is represented by the grey bar. (CSIRO & BOM, 2015)**

The cluster experienced prolonged periods of extensive drying in the early 20th century, but annual rainfall shows no long-term trend throughout the 20th century. The seasonal rainfall characteristics are determined by complex interactions of rain-bearing systems from the east, southwest and sub-tropical north. Year to year variability is strongly influenced by the El Niño Southern Oscillation.

In the near future (2030) natural variability is projected to predominate over trends due to greenhouse gas emissions in the Central Slopes cluster. Decreases in winter rainfall are projected to become evident by 2090. There is high confidence that natural climate variability will remain the major driver of rainfall changes in the next few decades (20-year mean changes of +/- 10 % annually, and +/-25 % seasonally), as it has been in the recent past (CSIRO & BOM, 2015).

The winter rainfall is predicted to see -40 to +15 % variability under RCP8.5 relative to the climate of 1986–2005. Decreases are also projected for spring, but with medium confidence only (CSIRO & BOM, 2015).

Overall, the magnitude of possible seasonal changes, range from around -40 to +30 % under RCP8.5. Such contrasting model simulations highlight the potential need to consider the risk of both a drier and wetter climate in impact assessments (CSIRO & BOM, 2015).



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### 3.4.2.6. Extreme rainfall

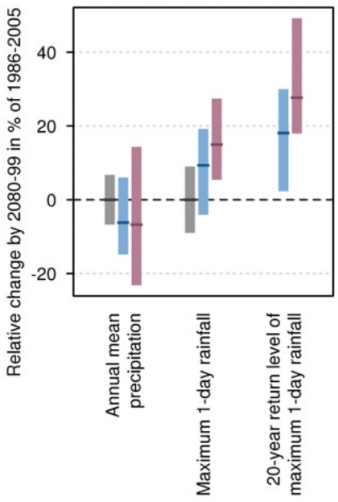


**Figure 9: Projected changes in Bathurst (Central slopes cluster) mean rainfall, magnitude of annual maximum 1-day rainfall and magnitude of the 20-year return value for the 1-day rainfall for 2090. Changes are given in percentage with respect to the 1986-2005 mean for RCP4.5 (Blue) and RCP8.5 (Purple).Natural climate variability is represented by the grey bar. (CSIRO & BOM, 2015)**

In a warming climate, heavy rainfall events are expected to increase in magnitude mainly due to a warmer atmosphere being able to hold more moisture (Sherwood et al., 2010). While the projections for mean rainfall are tending towards a decrease in the cluster, the extremes are projected to increase (and more so for the rare extremes). This pattern (change in mean relative to extremes) is found throughout other regions of Australia. Projections show an increase in the annual maximum 1-day value between 7 to 28% and the 20-year return value (equivalent to a 5 % chance of occurrence within any one year) between 18 to 55% for the period 2080 to 2099 relative to the baseline period 1986 to 2005 for RCP 8.5 (CSIRO & BOM, 2015).

### 3.4.2.7. Drought & bushfire weather

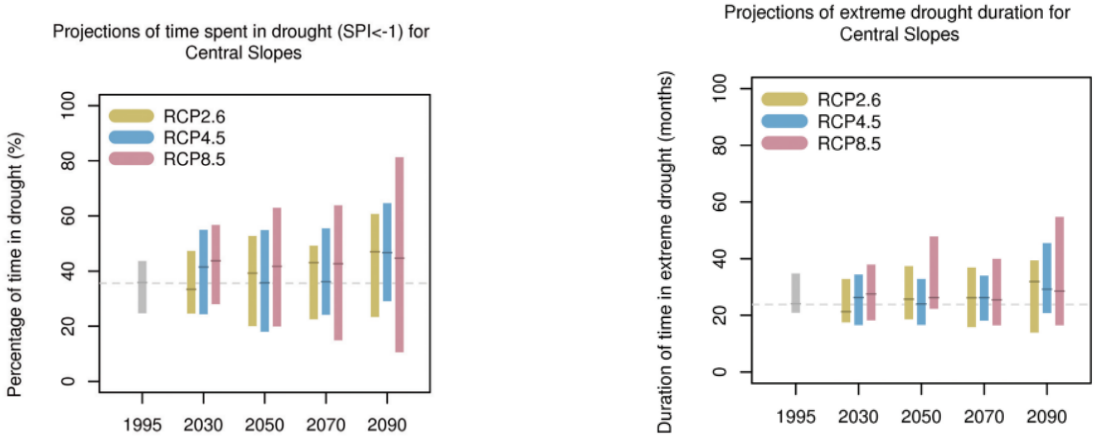


**Figure 10: Projected changes in Bathurst (Central slopes cluster) drought based on the Standardised precipitation Index (SPI). The multi-model ensemble results for Bathurst (Central Slopes) show the percentage of time in drought (SPI less than -1) [Left]. Duration of extreme drought [Right]. RCP8.5 (Purple). Natural Climate variability is represented by the Grey bar. (CSIRO & BOM, 2015)**

The frequency and duration of harsher fire-weather climate and drought events could possibly increase under RCP8.5 but will be heavily dictated by the amount of rainfall events (CSIRO and BOM, 2015). With Year 2019 being Australia's driest

year on record since 1900 (Bureau of Meteorology, 2020b), droughts & bushfire events are anticipated to become more frequent, under RCP8.5, based on the amount of annual rainfall received over the recent years as described in Section 3.3.

#### 3.4.2.8. Storm events, wind and hail

According to global and regional studies, tropical cyclones are foreseen to become less frequent but with increases in the proportion of the most intense storms (CSIRO and BOM, 2015).

#### 3.4.2.9. Sea level rise

Sea levels will continue to rise during the 21st century. In the near future, the projected range of sea level rise at the coastline is 0.08 to 0.18 m above the 1986 – 2005 level, with only minor differences between RCPs. As the century progresses, the projections are sensitive to RCPs. By 2090 RCP8.5 gives a rise of 0.45 to 0.88 m. (CSIRO and BOM, 2015). The site of the Bathurst Hospital Redevelopment is located inland and will not be subject to any direct risks from sea level rise.

# 4. Climate Change Risk Assessment

A risk assessment has been undertaken to identify the possible risks associated with the project due to climate change and its external surroundings. Based on the current and projected climate conditions of the site, several risks specific to the project are identified and assessed using the following relevant standards and guidelines:

- The risk management of climate change as well as the implementation of plans for suitable and effective adaptation in accordance with *AS 5334:2013 Climate change adaptation for settlements and infrastructure*.
- The risk assessment approach set out in *ISO 31000:2009 Risk management – Principles and Guidelines* to assess climate change risks.
- The climate change risks to the project have been assessed in line with the methods recommended in the Australian Greenhouse Office (AGO) *Climate Change Impacts and Risk Management: A Guide for Business and Government.*

The identification of the risk level for each risk item specific to the project is dictated by the likelihood of the risk occurring, which is mainly influenced by the impacts of worsened climate conditions, as well as the severity of the risks if it were to occur. Once identified, the risk level is determined using AGO's risk assessment criteria to indicate the level of attention a risk requires to be addressed. Upon completion of the risk assessment, a climate action plan is developed to provide recommended adaptation design to respond to the climate hazards and improve the project's resilience to climate change.

For more details about the Risk Assessment Criteria, please refer to Appendix C and D.

# 5. Risk Assessment

This section identifies the possible risks that the Bathurst Hospital Redevelopment site may be subjected to across two timeframes (2030 and 2090). Risk items are evaluated based upon the likelihood of the risk occurring and the severity of the risk if it were to occur. These results are combined using the AGO's Risk Assessment Criteria to determine the risk level for a given risk item and the level of attention it requires to address this risk. For more details about the Risk Assessment Criteria, please refer to Appendix C and D. Maximum consequence reflects the Consequence Descriptors in Appendix C, a description of the potential impact of the risk is provided in the Comments column.

| Discipline | Key Elements | Risk | Maximum Consequence | 2030 Likelihood of Risk | 2030 Risk Level | 2090 Likelihood of Risk | 2090 Risk Level | Comments |
|---|---|---|---|---|---|---|---|---|
| Civil | Access to site | Access to site blocked by flood, resulting in restricted access and egress to the site. | Major | Unlikely | Medium | Unlikely | Medium | *Blocking of the site due to flooding may result in significant remedial actions to deal with site damage, and possibly minor injuries. The site is located near Macquarie River flood prone zone which can possibly cause flooding and restrict access.* |
| Civil | Access to site | Access to site blocked, preventing or restricting access and egress to the site caused by natural disasters (e.g. bushfires) | Major | Rare | Low | Unlikely | Medium | *May result in serious health consequences or potential loss of occupancy lives. The site is not subject to bushfires based on its location.* |
| Civil | Below ground drainage | Drainage may be under designed given increased likelihood of extreme rainfall events | Moderate | Possible | Medium | Possible | Medium | *The site is in slope, it will be susceptible to flooding if drainage is incapable of handling significant levels of rain and flooding. Only possible during heavy rain and floods.* |
| Civil | Stormwater detention | Breakdown of on-site stormwater detention and treatment facility | Moderate | Possible | Medium | Possible | Medium | *The site is in slope, it will be susceptible to flooding if drainage is incapable of handling significant levels of rain and flooding. Only possible during heavy rain and floods.* |

| Discipline | Key Elements | Risk | Maximum Consequence | 2030 Likelihood of Risk | 2030 Risk Level | 2090 Likelihood of Risk | 2090 Risk Level | Comments |
|---|---|---|---|---|---|---|---|---|
| Structural | Building structure | Flooding of lift wells & basements | Major | Possible | Medium | Likely | Medium | *The site is in slope, stormwater may flood of lift wells compromising the ability of the occupants to move in, out and through the building. The site is located close to flood zone which might affect drainage of stormwater.* |
| Structural | Building structure | Structural integrity of building undermined by extreme weather events (e.g., flood, cyclones, etc.) | Major | Possible | Medium | Possible | Medium | *Given the height and size of the building, the structure is likely to be resilient to flood and cyclones.* |
| Structural | Building structure | Disintegration of foundations due to acid sulfate soils | Major | Rare | Low | Rare | Low | *Wear of foundations is unlikely to happen as the soil is relatively free from acid, salinity and moisture.* |
| Architectural | Building structure | Increased wear of building materials due to greater gross solar radiation | Moderate | Unlikely | Medium | Possible | Medium | *Wear of building elements can cause additional financial impact on the building and aesthetic issues.* |
| Architectural | Building form and aspect | Increase in temperature / temperature extremes causing discomfort to occupants indoors | Major | Possible | High | Almost Certain | Extreme | *Temperature extremes can cause heat stress to the occupants and resulting in the spaces being un-inhabitable. Architecture impacts internal heat loads and the operation of air-conditioning systems.* |
| Architectural | Building form and aspect | Heat island effect | Moderate | Possible | Medium | Possible | Medium | *Increased temperatures will make the heat island effect more severe which will increase temperatures on site - increasing risks associated with higher temperatures* |



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| Discipline | Key Elements | Risk | Maximum Consequence | 2030 Likelihood of Risk | 2030 Risk Level | 2090 Likelihood of Risk | 2090 Risk Level | Comments |
|---|---|---|---|---|---|---|---|---|
| Architectural | Building form and aspect | Increase in temperature / temperature extremes / high wind causing discomfort to the occupants & pedestrians in outdoor areas | Moderate | Possible | Medium | Likely | High | *Rising outdoor temperatures may cause health risks and discomfort to outdoor occupants. Depending on the intensity of peak temperatures, occupants may experience fatigue or heat strokes under long-term sun exposure. High speed wind can occur in the region and potentially cause distress to patients and visitors, in addition to equipment damage.* |
| Architectural | Building form and aspect | Hail causing disruptions to patients and hospital services entry and exit | Moderate | Possible | Medium | Possible | Medium | *Hailstorms can occur in the region and potentially cause distress to patients and visitors, in addition to property damage.* |
| Mechanical | Heating and air conditioning | Increased intensity and frequency of peak temperatures events leading to failure or reduction in effectiveness of A/C systems. | Major | Likely | High | Almost certain | Extreme | *Increased temperatures will cause heat stroke and general discomfort of majority of occupants and vulnerable people for extended periods.*<br><br>*Increased temperatures will lead to increased demand on HVAC systems, increasing the risk of these systems breaking down.*<br><br>*In addition, should the AC systems need to be replaced prior to the scheduled replacement at the end of their life expectancy, it would have significant economic consequences.* |
| Mechanical | Indoor air quality | Poor outdoor air quality & smoke as a result of bushfires (this occurred in 2019/20 and in 2006/07) | Major | Possible | High | Possible | High | *Poor indoor air quality due to ingress of smoke pollution in the building can cause health issues to the occupants and can results in some of the internal spaces to be un-inhabitable.* |



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| Discipline | Key Elements | Risk | Maximum Consequence | 2030 Likelihood of Risk | 2030 Risk Level | 2090 Likelihood of Risk | 2090 Risk Level | Comments |
|---|---|---|---|---|---|---|---|---|
| Architectural | Indoor air quality | High allergy or thunderstorm asthma risk | Major | Possible | High | Possible | High | *Poor indoor air quality due to ingress of high level of pollutants within the building can lead to distress and health issue to occupants who are prone to asthma* |
| Mechanical | Equipment | External wind influences on the AHUs, causing tripping and enter into fault mode | Major | Unlikely | Medium | Rare | Low | *Raised by Health Infrastructure NSW from their experience.* |
| Mechanical | Equipment | Hail causing damage to mechanical equipment | Major | Rare | Low | Unlikely | Medium | *Air intakes and rooftop equipment can be damaged resulting in greater energy consumption or failures of the system.* |
| Electrical | Lights | Increased risk of power outages during peak times, leaving occupants without a safe and well-lit environment. | Major | Possible | High | Likely | High | *Power outage will cause HVAC system to shut off and the building to lose lighting, compromising the health and safety of the occupants.* |
| Electrical | Power | Increased risk of power outages during peak times, leaving occupants without power and shut down of essential services (for example: lifts, fire protection). | Major | Possible | High | Possible | High | *Power outage will cause HVAC system and essential services to shut off, compromising the health and safety of the occupants.* |
| Electrical | Power | Increased costs due to greater use of power | Moderate | Possible | Medium | Possible | Medium | *Electricity prices will depend on energy policy and infrastructure, among other factors and are thus difficult to predict with certainty.* |
| Hydraulics | Roof drainage, pipes & gutters | Under-designed pipes & gutters unable to cope with extreme rainfall events. | Moderate | Possible | Medium | Likely | High | *Gutters and drains being blocked could cause flooding or overflow that may damage the appearance or integrity of the façade and other building elements* |



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| Discipline | Key Elements | Risk | Maximum Consequence | 2030 Likelihood of Risk | 2030 Risk Level | 2090 Likelihood of Risk | 2090 Risk Level | Comments |
|---|---|---|---|---|---|---|---|---|
| Hydraulics | Water supply | Increased costs of mains potable water due to reduction in rainfall | Moderate | Possible | Medium | Possible | Medium | *Operational costs could increase leading to reductions in other services provided by the hospital, or a drop in outdoor amenity if landscaping isn't irrigated.* |
| Hydraulics | Water supply | Water shortages as the rainfall decreases and population increases | Moderate | Unlikely | Medium | Possible | Medium | *Actual water shortages in the area expected to be unlikely, though actual shortages would have major consequences on HVAC and drinking water availability, as well as fire safety.* |
| Landscape | Landscaping | Reduced amenity (death of flora / plant damage) due to flooding, prolonged droughts periods and extreme heat | Minor | Possible | Medium | Possible | Medium | *Damage to green landscaping may incur replacement costs.* |
| Landscape | Landscaping features | Metal surfaces exposed to direct sun on hot days become hot enough to cause burns | Moderate | Unlikely | Medium | Possible | Medium | *Heat island effect is exacerbated by rising temperatures. Hot surfaces can cause radiant discomfort and/or minor burns to the occupants.* |
| Landscape | Landscaping features | Loose outdoor furniture or other items blowing around in high winds | Minor | Likely | Medium | Possible | Medium | *Loose outdoor furniture can cause serious injuries to the occupants or passers-by.* |

# 6. Climate Action Plan

Based on the climate risks identified in Section 5, the proposed development was determined to have an **EXTREME** risk rating across the selected climate change scenarios. This project specific Climate Action Plan below outlines the adaptation actions that are integrated into the project design to address each corresponding climate risk items. Several recommendations have been provided for future considerations to further improve the project's resilience to climate change.

| Legend | Economic | Environmental | Social |
|---|---|---|---|
| **3** | Significant improvement in net present value of the project. | Significant environmental benefits as a result of the action | Significant social benefits |
| **2** | Minor change in net present value of the project. | Minor environmental impacts | Minor social impact |
| **1** | Significant reduction in net present value of the project. | Significant negative impacts | Significant negative social impact |

| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| Civil | Access to site | Access to site blocked by flood, resulting in restricted access and egress to the site. | **Medium** | **Medium** | In the past, flooding in Macquarie River resulted in blockage of access through the bridge to the West of the river although the facility itself wasn't impacted. The subject site is not susceptible to flooding and is located outside the 1% AEP flood extent. The maximum flood depth is roughly 650m AHD which is 10m below the lowest level on the subject site, eastern corner. All design FFLs will be above flood levels. DRAINS modelling -plus a 20% climate change factor- has been completed. | **2** | **2** | **2** | **Neutral** | **Now** |
| Civil | Access to site | Access to site blocked, preventing or restricting access and egress to the site caused by natural disasters (e.g. bushfires) | **Low** | **Medium** | The site is not subject to bushfires as it is away from densely vegetated areas. Nevertheless, the development will consider provisions for compliant fire and life safety design strategies (e.g., provisions of exits and egress, fire sprinkler and hydrant systems, smoke hazard management, etc). | **2** | **2** | **2** | **Neutral** | **Now** |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| Civil | Below ground drainage | Drainage may be under designed given increased likelihood of extreme rainfall events | Medium | Medium | Minor stormwater drainage pipes and design are sized to accommodate a 5% AEP event and major drainage to the 1% AEP. Climate change has been incorporated into the stormwater and OSD design by applying a 20% adjustment factor in DRAINS modelling. This adjustment is based on ARR Book 1, Chapter 6, which states that projections for Greater Sydney indicate the 1% AEP for the 24-hour duration IFD may increase by up to 20% by 2050. | 2 | 3 | 2 | Desirable | Now |
| Civil | Stormwater detention | Breakdown of on-site stormwater detention and treatment facility | Medium | Medium | On-site detention will be designed to mitigate 5-year ARI flows back to pre-development scenario. | 2 | 3 | 2 | Desirable | Now |
| Structural | Building structure | Flooding of lift wells & basements | Medium | Medium | All lift wells are above the 1:100-year flood level. The retaining wall at the back of the site will drain the rainwater and hence there will be no risk of rainwater infiltration into the building. It is very unlikely for lifts to get flooded. Subsoil drainage also in place. | 2 | 2 | 2 | Neutral | Now |
| Structural | Building structure | Structural integrity of building undermined by extreme weather events (e.g., flood, cyclones, etc.) | Medium | Medium | The ground floor of the building will be designed to structurally withstand the hydrostatic pressure/stormwater inundation from floodwater. The structural design will be in accordance with the Australian Standards for wind loading, earthquakes, and structural vibrations. | 3 | 3 | 2 | Desirable | Now |
| Structural | Building structure | Disintegration of foundations due to acid sulphate soils | Low | Low | No acid sulphate soils found on-site. If this occurs in deeper foundations due to long-term water-logged soils due to increase sea levels / changes in the water table, it requires exposure to atmosphere to release acid - this is unlikely to occur as atmosphere only reacts with top soils. If sulfuric acid does corrode concrete / steel, this might impact on design life and maintenance, requiring patching to areas of the building. All concrete | 2 | 2 | 2 | Neutral | Future Provision |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | in the project will be plastic wrapped to minimise risk and interaction with soil. | | | | | |
| Architectural | Building structure | Increased wear of building materials due to greater gross solar radiation | Medium | Medium | No degradation in functionality which impacts life safety is anticipated.<br><br>Concrete/masonry/aluminium/glazed façade is expected to be robust with on-going maintenance regime rather than requiring re-finishing. | 2 | 2 | 2 | Neutral | Future Provision |
| Architectural | Building form and aspect | Increase in temperature / temperature extremes causing discomfort to occupants indoors. | High | Extreme | All windows will be double glazed.<br><br>Normal roller blinds for most of the rooms and integral blinds for special rooms e.g. isolation rooms, mental health rooms, clean rooms, paediatrics<br>Blind type TBC.<br><br>Sun shading has been proposed for facades. | 3 | 3 | 2 | Desirable | Now |
| Architectural | Building form and aspect | Heat island effect | Medium | Medium | The roof of the building will be either a light-coloured protected membrane or roof sheeting to minimise urban heat island effect.<br><br>Existing building has Dune colour - SRI 60 (meets requirement of SRI of $\geq$ 34 for roof pitch >15° ).<br><br>All new flat roof with pitch <15°shall have SRI $\geq$ 64, and sloped roof with pitch >15° shall have SRI $\geq$ 34.<br><br>No landscaping proposed on roofs.<br><br>Building form is for concealed flat roofs to minimise potential glare. | 2 | 3 | 2 | Desirable | Now |
| Architectural | Building form and aspect | Increase in temperature / temperature extremes / high wind causing | Medium | High | Outdoor zones will be provided with shading opportunities where applicable thus reducing the effects of radiant heat transfer. | 3 | 3 | 2 | Desirable | Now |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| | | discomfort to the occupants & pedestrians in outdoor areas | | | Integrated sun hood and shading devices where required. | | | | | |
| Architectural | Building form and aspect | Hail causing disruptions to patients and hospital services entry and exit | Medium | Medium | Building entry and exits to be provided with airlocks and sheltered with canopies which shelter the user as they move in and out of the building | 2 | 2 | 1 | Undesirable | Future Provision |
| Mechanical | Heating and air conditioning | Increased intensity and frequency of peak temperatures events leading to failure or reduction in effectiveness of A/C systems. | High | Extreme | Air-conditioning system will be sized to accomodate future climate change. Short and long term climate projections and their effects on the HVAC plants has been reviewed and cooling systems are sized above the minimum requirements for critical and non-critical zones. Mech selection is done based on 30+ year projection as they are more accurate. Increased temperature (dry bulb) will be proposed based on it. | 2 | 2 | 3 | Desirable | Now |
| Mechanical | Indoor air quality | Poor outdoor air quality & smoke as a result of bushfires (this occurred in 2019/20 and in 2006/07) | High | High | Critical clinical areas will be provided with a combination of G4 and F8 filters and all non-critical clinical areas will be provided with G4 filters with space for F9 filters to prevent ingress of smoke.<br><br>Outdoor air is modulated through BMS and it can be done accordingly during the bushfire season. | 3 | 2 | 2 | Desirable | Now |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| Mechanical | Indoor air quality | High allergy or thunderstorm asthma risk | High | High | Operable windows to wintergarden and gym/outpatient areas to suit brief/performance requirements. Inpatient areas to be fully sealed to the external conditions. Mixed mode areas to be further developed with mechanical engineer. | 3 | 2 | 2 | Desirable | Now |
| Mechanical | Equipment | External wind influences on the AHUs, causing tripping and enter into fault mode | Medium | Low | Mechanical plant is sheltered behind the weather louvres to minimize noise egress and visual aspects. The louvres also prevent the plant from impacts of the extreme winds and objects carried by wind. Items of potential risk are isolation discharges and localized small roof vents. Mitigation for these items is for secure mounting and locating where some sheltering possible. | 3 | 1 | 1 | Undesirable | Future Provision |
| Mechanical | Equipment | Hail causing damage to mechanical equipment | Low | Medium | Mechanical equipments will be located in ventilated protected structures. | 2 | 2 | 1 | Undesirable | Now |
| Electrical | Lights | Increased risk of power outages during peak times, leaving occupants without a safe and well-lit environment. | High | High | Emergency lighting (egress & illuminated signage/pathway) and lighting in common areas will be on a 2 hour battery back up as mandated by standards. | 2 | 2 | 2 | Neutral | Now |
| Electrical | Power | Increased risk of power outages during peak times, leaving occupants without power and shut down of essential services (for example: lifts, fire protection). | High | High | Backup diesel generators and Uninterruptible Power Supplies will be provided for backup power for specific services and rooms during a power outage. | 3 | 2 | 2 | Desirable | Now |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| Electrical | Power | Increased costs due to greater use of power | Medium | Medium | Lighting controls, such as motion sensors to the staff areas and infrequently used spaces, will be provided to minimise energy use. High efficiency LED lighting will be used.<br>Provision of solar photovoltaic systems (~900 numbers of 540W panels for existing TBD+new build hospital, exact capacity and number TBD) to alleviate extra load on electricity supply and reduce risk of power outages. | 3 | 3 | 3 | Desirable | Now |
| Hydraulics | Roof drainage, pipes & gutters | Under-designed pipes & gutters unable to cope with extreme rainfall events. | Medium | High | The proposed stormwater infrastructure strategy for the development will be connected directly into the existing stormwater network to discharge water in the possibility of a major flood event.<br>Landscaping will be introduced wherever possible to retain and slow surface water to mitigate peak flows/ flooding.<br>The stormwater system will be designed to cope with a 1% AEP, plus 5 minutes. | 2 | 3 | 2 | Desirable | Now |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| Hydraulics | Water supply | Increased costs of mains potable water due to reduction in rainfall | Medium | Medium | A rainwater tank will be provided for rainwater reuse for landscape irrigation. This will reduce potable water consumption and its associated costs.<br>Water efficient fixtures and fittings will be selected. | 2 | 3 | 3 | Desirable | Now |
| Hydraulics | Water supply | Water shortages as the rainfall decreases and population increases | Medium | Medium | Reliance on potable water will be reduced through the use of water efficient fixtures, fittings and appliances, and landscaping. | 3 | 2 | 2 | Desirable | Now |
| Landscape | Landscaping | Reduced amenity (death of flora / plant damage) due to flooding, prolonged droughts periods and extreme heat | Medium | Medium | Subsoil drainage will be implemented, doing so will help remove excess water from surrounding soils, avoiding floods and provide protection from water damage, especially under extreme storm events.<br>A rainwater tank will be provided for rainwater reuse for landscape irrigation. Use of endemic low water use plant species will be proposed to the project for longevity in green landscaping, A fully programmable drip irrigation system will be implemented with rain sensors and moisture sensor override for prolonging the availability of rainwater reuse during drought periods. | 2 | 3 | 2 | Desirable | Now |
| Landscape | Landscaping features | Metal surfaces exposed to direct sun on hot days become hot enough to cause burns | Medium | Medium | The seating in the public spaces can be made of composite timber materials.<br>The selected paving will have low SRI for balancing heat absorption and glare.<br>If BBQs are provided, stainless steel benchtops will be avoided.<br>Metal fixing will be powder coated. | 2 | 3 | 2 | Desirable | Now |



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| Discipline | Key Elements | Risk | Risk Level 2030 | Risk Level 2090 | Design and/or Operational Response Examples (TBC by stakeholders) | Social | Environmental | Economic | Overall benefit to Building Objectives | Recommended Implementation Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| Landscape | Landscaping features | Loose outdoor furniture or other items blowing around in high winds | Medium | Medium | An operational process will be in place to bring in furniture and storing it inside or furniture will be stacked/tied together in the event of high winds or storms. All public spaces will have fixed furniture and seating.<br>Flexible indoor/outdoor seating may be added to the cultural courtyard, which will generally be stored indoors and subject to operational procedures. | 2 | 2 | 2 | Neutral | Future Provision |

# 7. Conclusion

This report presents a Climate Change Risk Assessment and Adaption Plan for the Bathurst Hospital Redevelopment to support the Green Star strategy for the project and is anticipated to inform the ongoing development of the project's design and operation.

The Bathurst Hospital Redevelopment was assessed for its exposure to current and future climate related hazards. The 2030 (RCP8.5) and 2090 (RCP8.5) are the selected climate change scenarios for this risk assessment. These projected climate impacts were used to identify potential risks to the site using best-practice climate change risk assessment methodologies. This report highlights the risk consideration, site constraints and strategies employed to reduce the site's climate risk profile. Based on the climate risks identified in this report, the proposed development was determined to have an **EXTREME** risk rating across the selected climate change scenarios.

As a result, to improve the project's resilience to climate hazards, the project design team has provided the climate adaptation design solutions presented in Section 6 Climate Action Plan.

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# Appendix A Project Characteristics

| Site Location | |
|---|---|
| **Street Address** | 361-365 Howick Street, West Bathurst, NSW 2795 |
| **City** | Bathurst |
| **State** | NSW |
| **GPS Coordinates** | -33.40695, 149.57468 |

| Climate Characteristics | |
|---|---|
| BCA Climate Zone | Zone 7- Cool Temperate |

| Building Sector | Hospital |
| --- | --- |

| Building Sector | Hospital | |
|---|---|---|
| **Building Objectives** | Social (Type, use, function) | The Bathurst Hospital Redevelopment project is a mix of refurbishments of the existing hospital and expansion on the existing site. The Project will provide for a range of new clinical and non-clinical facilities to support capacity issues and existing infrastructure deficiencies on the campus. The development will include the following:<br><br>• Ambulatory care<br>• Coronary care,<br>• Emergency medicine,<br>• Intensive care,<br>• General medicine,<br>• Mental health drug & alcohol,<br>• Obstetrics & gynecology,<br>• Oncology,<br>• Pediatrics,<br>• Pathology,<br>• Radiology,<br>• Rehabilitation and<br>• Surgery services |
| | Environmental | The use of the building is not to negatively impact the local environment. The development will have a high regard for environmentally sustainable outcomes through management of energy, water, indoor air quality, landscape, and construction.<br><br>The sustainable framework helps this project achieve best practice, by targeting the following sustainability and energy efficiency targets:<br><br>• NSW Environmental Planning and Assessment Regulation 2021<br>• NSW Government Resource Efficiency Policy<br>• National Construction Code (NCC) 2019 Amendment 1<br>• Health Infrastructure Design Guidance Note No.058- Environmentally Sustainable Development<br>• Health Infrastructure (HI) ESD Evaluation Tool<br>• Bathurst Regional Development Control Plan (DCP) 2014 |
| | Economic | The hospital plays a significant role in the Bathurst community's economy. This facility will enhance the public health infrastructure of the community. |
| **Services and quality** | The Bathurst Hospital Redevelopment is a local health facility and district hospital within the broader network of hospitals in the WSLHD. It acts as the hub for some specialist services for its wider catchment population such as maternity, surgery, renal dialysis, and chemotherapy. The redevelopment will reduce the need to travel out of the area and ensure the community has first class care well into the future. The hospital will serve Bathurst, Blayney, Oberon and Rylstone communities. | |
| Is the continuity of the service of this building during an extreme climate event critical for the community? | | Yes |
| Is the project's success critically dependent on the climate? | | No |
| Project expected building lifetime. | | 60 years |

# Appendix B Current Climate Assessment

| Is the Project located in any of the following types of sensitive geographical areas? | | Score<br>No = 0<br>Yes = 2 | Source of Information |
|---|---|---|---|
| Coastal regions | No | 0 | https://www.coastalrisk.com.au/viewer |
| Flood plains | No | 0 | https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address |
| Mountainous region with steep slopes | No | 0 | https://en-au.topographic-map.com/ |
| | TOTAL | 0/6 | |

| Is the anticipated outcome of the Project likely to be exposed to the following current climate hazards? | | Source of Information |
|---|---|---|
| Legend: Not at all = 0 A little = 1 Somewhat = 2 A lot = 3 | | |
| Sea - Sea level rise | 0/7 | http://www.coastalrisk.com.au |
| Sea - Storm surge and storm tide | 0/7 | http://www.coastalrisk.com.au |
| Rainfall - Extreme rainfall events (flooding) | 1/7 | http://www.bom.gov.au/climate/current/annual/aus/#tabs=Rainfall |
| Rainfall - Drought | 1/7 | http://www.bom.gov.au/climate/drought/ |
| Temperature - Extreme temperature events | 2/7 | http://www.bom.gov.au/climate/current/annual/aus/#tabs=Temperature |
| Temperature - Solar radiation | 2/7 | http://www.bom.gov.au/climate/current/annual/aus/#tabs=Temperature |
| Wind - Gales and extreme wind events | 0/7 | BOM Annual Climate Statement 2020_Notable Events |
| Wind - Storms (snow, hail, dust, lightning) | 0/7 | BOM Annual Climate Statement 2020_Notable Events |
| Wind - Cyclones | 0/7 | http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/history/tracks/ |
| Relative Humidity - Annual average humidity | 0/7 | http://www.bom.gov.au/jsp/ncc/climate_averages/relative-humidity/index.jsp |
| Soil - Moisture | 0/7 | http://www.bom.gov.au/climate/drought/#tabs2=Soil-moisture |
| Soil - Salinity | 0/7 | https://www.asris.csiro.au/themes/AcidSulfateSoils.html |
| Bush fire risk - Fire danger index | 1/7 | BOM Annual Climate Statement 2020_Notable Events<br>http://www.bom.gov.au/jsp/ncc/climate_averages/ffdi/index.jsp |

| Do the hazards above significantly endanger the achievement of the project outcome? | Total Score | Assessment matrix Low | Medium | High | Score |
|---|---|---|---|---|---|
| Sensitive Location | 0 | 0 to 2 | 3 to 4 | Over 5 | **LOW** |
| Exposure to current hazards | 18% | Less than or equal to 33% of total potential score | Between 33% and 66% of total potential score | Greater than or equal to 66% of total potential score | **LOW** |
| **Overall Exposure & Hazard Rating** | | | | | **LOW** |

# Appendix C Consequence Descriptors

The following table outlines which consequence categories were considered in this report. Risks are a combination of the consequences and are rated according to the impact each risk was expected to have on each consequence. Risks were rated with the ratings in the left-hand column.

| **Ratings** | Safety | Environmental & sustainability | Service quality | Thermal comfort | Financial | Functional Continuity |
|---|---|---|---|---|---|---|
| Catastrophic | Large numbers of serious injuries or loss of lives | Major widespread loss of environmental amenity and progressive irrecoverable environmental damage | Services would fall well below acceptable standards threatening loss of life | Heat stroke and death of vulnerable | Costs expected to bankrupt the organization. | Complete loss of function, continuity, service, business. |
| Major | Isolated instances of serious injuries or loss of lives | Severe loss of environmental amenity and a danger of continuing environmental damage | Services would fall well below acceptable standards and the general public would regard services as unsatisfactory | Heat stroke and general discomfort of majority of occupants for extended periods | Costs cause financial stress to the organization resulting in redundancies or asset sales etc. | High degree of remedial action / management required to maintain functional continuity, service, and business. |
| Moderate | Small numbers of injuries | Isolated but significant instances of environmental damage that might be reversed with intensive efforts | Services would be regarded as barely satisfactory by the general public and the organization's personnel | General discomfort of majority of occupants for extended periods | Costs expected to increase noticeably | Some remedial actions required to maintain functional continuity, service, and business. |
| Minor | Serious near misses or minor injuries | Minor instances of environmental damage that could be reversed | Services are regarded as satisfactory by the general public, but personnel would be aware of deficiencies | Minor discomfort for short periods of time | Costs expected to increase to a minor extent | Minor disruptions to functional continuity, service, business. |
| Insignificant | Appearance of a threat but no actual harm | No environmental damage | Minor deficiencies in principle that would pass without comment | Minor discomfort for short periods of time | No change in costs expected | No significant disruptions to functional continuity, service, business. |

# Appendix D Risk Rating Guide

The Risk Rating Guide explains the likelihood rating given to each of the identified risks and the final risk level which is a combination of the likelihood of the risk, and most severe consequence of the risk.

## Likelihood Matrix

| Rating | Recurrent Risks | Single events |
|---|---|---|
| Almost certain | Could occur several times per year | More Likely than not - Probability greater than 50% |
| Likely | May arise about once per year | As likely as not - 50/50 chance |
| Possible | May arise once in ten years | Less likely than not but still appreciable - Probability less than 50% but still quite high |
| Unlikely | May arise once in ten years to 25 years | Unlikely but not negligible - Probability low but noticeably greater than zero |
| Rare | Unlikely during the next 25 years | Negligible - Probability very small, close to zero |

## Risk Level

| | Consequences | | | | |
|---|---|---|---|---|---|
| **Likelihood** | **Insignificant** | **Minor** | **Moderate** | **Major** | **Catastrophic** |
| Almost certain | Medium | Medium | High | Extreme | Extreme |
| Likely | Low | Medium | High | High | Extreme |
| Possible | Low | Medium | Medium | High | High |
| Unlikely | Low | Low | Medium | Medium | Medium |
| Rare | Low | Low | Low | Low | Medium |



REF: \\AU2012-PPNTAP01.CORP.ADS\SHARED_PROJECTS\301351221\PROJECT DOCUMENTATION\SUSTAINABILITY\GREEN STAR\04 WORKING DOCUMENTATION\01 MANAGEMENT\03 ADAPTATION AND RESILIENCE\3013551221-STN-XX-XXX-RE-SU-000001_C02.DOCX

The interpretation of the risk levels is as follows:

**Extreme** risks demand urgent attention at the most senior level and cannot be simply accepted as a part of routine operations without executive sanction

High risks are the most severe that can be accepted as part of routine operations without executive sanction, but they will be the responsibility of the most senior operational management and reported upon at the executive level.

**Medium** risks can be expected to form part of routine operations, but they will be explicitly assigned to relevant managers for action, maintained under review and reported upon at senior management level.

**Low** risks will be maintained under review, but it is expected that existing controls will be sufficient, and no further action will be required to treat them unless they become more.

# Appendix E Stakeholder Engagement

The purpose of a stakeholder engagement is to raise awareness of the current and future climate risks associated with the site itself. Based on the climate risk assessment, these issues have been addressed through a variety of design implementations with a focus in making the project become climate resilient.

Through extensive comments and review with each stakeholder, this section describes their contribution towards the project's resilience to future climate change by employing design strategies to mitigate the site's climate risk profile.

| **Stakeholder engagement** | | |
|---|---|---|
| **Stakeholder** | **Contact Name** | **Email** |
| ESD Consultant | Stantec | rebecca.dracup@stantec.com<br>madhu.muthumalai@stantec.com |
| **Query and Response** | What climate change risks items were of concern with the development and what were the adaptation measures being considered or implemented within the ESD design to allow the site to be climate change ready?<br><br>The following risks have been identified:<br>• Increased intensity and frequency of peak temperature events leading to failure or reduction in effectiveness of A/C systems.<br><br>Response: Air-conditioning systems should be sized with sufficient spare capacities for efficient operation whilst providing thermal comfort to conditioned spaces. Use a predictive weather file to size HVAC systems. Climate change considerations should be considered in the sizing of mechanical systems. The project can should opt for high-performance glazed facade systems (predominantly double glazing throughout the development) which alleviates mechanical stress to maintain thermal comfort in habitable spaces. Prepare for replacement of HVAC equipment in-line with best-practice time frames to ensure it will be able to maintain design standards under long-term future climate change.<br><br>• Increase in temperature / temperature extremes causing discomfort to occupants indoors.<br><br>Response: Air-conditioning will be provided throughout the building. All windows will be double glazed. Two types of blinds will be provided- Normal roller blinds for most of the rooms and internal venetian blinds for special rooms. Sun shading has been proposed for facades. Most of the rooms have blinds. Patient rooms have semi-transparent UV blinds.<br><br>• Increase in temperature / temperature extremes / high wind causing discomfort to the occupants & pedestrians in outdoor areas.<br>Response: At a larger scale, the outdoor zones will be provided with appropriate shading opportunities such as shade structures, vegetation thus reducing the effects of radiant heat transfer. Light coloured wall materials will be selected. • Poor outdoor air quality & smoke as a result of bushfires: Critical clinical areas will be provided with a combination of G4 and F8 filters and all non-critical clinical areas will be provided with G4 filters to prevent ingress of smoke.<br><br>• High allergy or thunderstorm asthma risk.<br>Response: Ability to close windows and shelter indoors, provide guidance on accessing Pollen Count apps which forecast high pollen days so preventative measures can be taken.<br><br>• Under-designed pipes & gutters unable to cope with extreme rainfall events.:<br><br>Response: The proposed stormwater infrastructure strategy for the development will be connected directly into the existing stormwater network to discharge water in the possibility of a major flood event. Gutters will be designed with 100% additional overflow. Landscaping will be introduced wherever possible to retain and |



REF: \\AU2012-PPNTAP01.CORP.ADS\SHARED_PROJECTS\301351221\PROJECT DOCUMENTATION\SUSTAINABILITY\GREEN STAR\04 WORKING DOCUMENTATION\01 MANAGEMENT\03 ADAPTATION AND RESILIENCE\3013551221-STN-XX-XXX-RE-SU-000001_C02.DOCX

| | | |
|---|---|---|
| | slow surface water to mitigate peak flows/ flooding. The stormwater system will be designed to cope with a 1% AEP, plus 5 minutes, plus a 10% climate change factor.<br><br>• Increased risk of power outages during peak times, leaving occupants without a safe and well-lit environment.<br>Response: Emergency lighting (egress & illuminated signage/pathway) and lighting in common areas will be on a 2-hour battery backup as mandated by standards.<br><br>• Increased risk of power outages during peak times, leaving occupants without power and shut down of essential services (for example: lifts, fire protection).<br>Response: Backup diesel generators will be provided for backup power for specific services and rooms during a power outage. | |
| Structural/ Civil Consultant | TTW | nishmin.hallam@ttw.com.au<br>ben.stephenson@ttw.com.au |
| **Query and Response** | What climate change risks items were of concern with the development and what were the adaptation measures being considered or implemented within the civil design to allow the site to be climate change ready?<br><br>The following risks have been identified:<br>• Access to site blocked by flood, resulting in restricted access and egress to site:<br>Response: The maximum flood depth is roughly 650m AHD which is 10m below the lowest level on the subject site, eastern corner. All design FFLs will be above flood levels. DRAINS modelling has been completed and it has been determined that on-site detention and reduction of impervious areas will be required to mitigate 5-year ARI flows back to the pre-development scenario.<br>• Drainage may be under designed given increased likelihood of extreme rainfall events:<br>Response: Stormwater drainage pipes and design are sized to accommodate a 5% AEP event. On-site detention will be designed to mitigate 5-year ARI flows back to pre-development scenario. During extreme storm events up to 1% AEP will be conveyed via overland in a controlled manner including swale sized to convey all flows up to the 1% AEP. | |
| Electrical Consultant | Stantec | allan.wong@stantec.com |
| **Query and Response** | What climate change risks items were of concern with the development and what were the adaptation measures being considered or implemented within the electrical design to allow the site to be climate change ready?<br><br>The following risks have been identified:<br>• Increased risk of power outages during peak times, leaving occupants without a safe and well-lit environment):<br>Response: Emergency lighting (egress & illuminated signage/pathway) and lighting in common areas will be on a 2-hour battery backup as mandated by standards.<br>• Increased costs due to greater use of power:<br>Response: Lighting controls, such as motion sensors to the staff areas and infrequently used spaces, will be provided to minimise energy use. High efficiency LED lighting will be used. Provision of solar photovoltaic systems (~900 numbers of 540W panels for existing TBD+new build hospital, exact capacity, and number TBD) to alleviate extra load on electricity supply and reduce risk of power outages. | |
| Hydraulic Consultant | Stantec | dominika.sala@stantec.com |

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| **Query and Response** | What climate change risks items were of concern with the development and what were the adaptation measures being considered or implemented within the hydraulic design to allow the site to be climate change ready?<br><br>The following risks have been identified:<br>• Under-designed pipes and gutters unable to cope with extreme rainfall events:<br>Response: The proposed stormwater infrastructure strategy for the development will be connected directly into the existing stormwater network to discharge water in the possibility of a major flood event. Landscaping will be introduced wherever possible to retain and slow surface water to mitigate peak flows/ flooding. The stormwater system will be designed to cope with a 1% AEP, plus 5 minutes. | |
| Mechanical Consultant | Stantec | Marta.Talarska@stantec.com |
| **Query and Response** | What climate change risks items were of concern with the development and what were the adaptation measures being considered or implemented within the mechanical design to allow the site to be climate change ready?<br><br>The following risks have been identified:<br>• Increased intensity and frequency of peak temperature events leading to failure or reduction in effectiveness of A/C systems:<br>Response: Air-conditioning system will be sized to accommodate future climate change. Short- and long-term climate projections and their effects on the HVAC plants has been reviewed and cooling systems are sized above the minimum requirements for critical and non-critical zones. Mech selection is done based on 30+ year projection as they are more accurate. Increased temperature (dry bulb) will be proposed based on it.<br>• Poor indoor air quality and smoke as a result of bushfires:<br>Response: Critical clinical areas will be provided with a combination of G4 and F8 filters and all non-critical clinical areas will be provided with G4 filters with space for F9 filters to prevent ingress of smoke. Outdoor air is modulated through BMS and it can be done accordingly during the bushfire season.<br>• Hail causing damage to mechanical equipment:<br>Response: Mechanical equipment will be located in ventilated protected structures. | |
| Architect | Billard Leece Partnership Pty Ltd | tracyl@blp.com.au<br>ryan@blp.com.au |
| **Query and Response** | What climate change risks items were of concern with the development and what were the adaptation measures being considered or implemented within the architectural design to allow the site to be climate change ready?<br><br>The following risks have been identified:<br>• Increase in temperature/temperature extremes causing discomfort to occupants indoor, especially in spaces with no mechanical cooling/reliant on natural ventilation:<br>Response: All windows will be double glazed. Normal roller blinds for most of the rooms and integral blinds for special rooms e.g. isolation rooms, mental health rooms, clean rooms, paediatrics. Sun shading has been proposed for facades.<br>• Increase in temperature/temperature extremes causing discomfort to occupants and pedestrians in outdoor areas:<br>Response: Outdoor zones will be provided with shading opportunities where applicable thus reducing the effects of radiant heat transfer.<br><br>Integrated sun hood and shading devices where required. | |



REF: \\AU2012-PPNTAP01.CORP.ADS\SHARED_PROJECTS\301351221\PROJECT DOCUMENTATION\SUSTAINABILITY\GREEN STAR\04 WORKING DOCUMENTATION\01 MANAGEMENT\03 ADAPTATION AND RESILIENCE\3013551221-STN-XX-XXX-RE-SU-000001_C02.DOCX

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