

Wagga Wagga Base Hospital  
Stage 3  
Ambulatory Care Building  
HEALTH INFRASTRUCTURE  
ESD Statement

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## Executive Summary

This Energy Sustainable Development (ESD) statement has been prepared for the Wagga Wagga Base Hospital Stage 3. The statement is intended to provide an overview of the proposed project's environmentally sustainable development response in response to Secretary's Environmental Assessment Requirements and support the project Environmental Impact Statement (EIS)

Specifically, this statement seeks to:

- Detail how ESD principles (as defined within Clause 7(4) of Schedule 2 of the Environmental Planning & Assessment Regulation 2000) will be incorporated in the design and ongoing operation phase of the development;
- Demonstrate that the development has been assessed against suitably accredited rating scheme to meet industry best practice; and
- Include a description of the measures that would be implemented to minimise consumption of water and energy.

Information contained within this statement has been prepared in accordance with:

- NSW Health Infrastructure Engineering Service Guidelines, August 2016;
- Green Star - Holistic Environmental Certification scheme, Green Building Council of Australia; and
- Recognised best practice principles of Ecological Sustainable Design including relevant legislation, standards & industry tools.

Water supply ESD considerations are also included within the Integrated Water Management Plan prepared by have been issued by Acor Consultants Pty Ltd within the SSD – 18\_9033 submission.

Stormwater flow and Water quality management are included within a separate report prepared by Bonacci Civil Engineers.

ESD initiatives related to Materials are documented with the Architectural package. These initiatives are further detailed in this report and include material selection and material resources are used efficiently through projects via consideration of:

- Low embodied energy products;
- Preference for locally sources materials;
- Material selection which contain either reused or contain high recycled content;
- Give preference to materials manufactured using renewable energy sources; and
- Design to minimise unnecessary material usage.

# 1. Introduction

## 1.1 Project Description

This report covers the schematic design for Stages 3 which form part of the overall refurbishment at the Wagga Wagga Base Hospital redevelopment.



**Figure 1 : Overall Wagga Wagga Base Hospital site plan showing the location of Stage 3 work**

The Wagga Wagga Base Hospital Stage 3 consists of a six storey Ambulatory Care Building, including a rooftop Plant Room, all above an undercroft parking level. The Ambulatory Care Building will provide the following Units:

- 28 flexible Aged Care Beds, including 4 dedicated beds for Acute Delirium.
- 24 Rehabilitation beds, including inpatient therapy and ADL facilities shared with the Aged Care and Older Persons Health inpatient units.
- A 24 bed Older Person's Mental Health Inpatient Unit, including 8 T-BASIS beds.
- A 20 chair Renal Dialysis Unit plus 4 training chairs (2 x HD and 2 x peritoneal) collocated with other Extended Hours Services.
- Ambulatory Clinics, Rehabilitation and Allied Health, comprising 60 bookable (electronic patient flow management system) Interview / Consult rooms and Gym / Allied Health treatment spaces. Services

accessing this area will include Primary and Community Health, Outpatients, Prosthetics and Orthotics, Mental Health, Drug and Alcohol, and Oral Health services (8 Dental Chairs).

- An education area including library, conference rooms (60 seats total) and a lecture theatre (100 seats).
- Extended Hours Services including Hospital in the Home, Integrated Care, Rapid Assessment Clinic, After Hours GP, and Infusions using 10 treatment spaces and 6 consultation rooms and shared support areas with renal dialysis.
- Workforce and office accommodation will be provided for staff associated with Stage 3, refined through New Ways of Working (NWW).
- The NWW assessment will be also extended to Support Services staff, including Patient Flow, IT, Health Share, Health Information Services, Pastoral Care and Volunteer Services.

## 1.2 Acronyms

The following acronyms used in the report are:

Acronym	Description
BMS	Building Management System
EIS	Environmental Impact Statement
ESD	Energy Sustainable Design
GBCA	Green Building Council Australia
HI	Health Infrastructure
LED	Light Emitting Diode
MEPS	Minimum Energy Performance Standard
NWW	New Ways of Working
PFC	Power Factor Correction
UPS	Uninterruptible Power Supply
VVVF	Variable Voltage Variable Frequency

## 2. General ESD considerations

### 2.1 Statutory Requirement

Clause 7(4) – Schedule 2 – Environmental Planning & Assessment Regulation (2000) identifies the Principles of ecological sustainable development as follows:

(a) the **precautionary principle**, namely, 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. In the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
- (ii) an assessment of the risk-weighted consequences of various options,

(b) **inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

(c) **conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) **improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as:

- (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
- (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
- (iii) environmental goals, having been established, 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.

### 2.2 Project's initiatives

Wagga Wagga Base Hospital – Stage 3 Redevelopment response includes the following

NSW Health Infrastructure (NSWHI) has taken a fundamentally responsible approach to ensuring the principles of ESD are incorporated into all of its new and refurbishment projects regardless of project value or size. The position of NSWHI is documented within the Engineering Service Guidelines (2016) and includes several reference clauses aimed at ensuring effective & environmentally responsive ESD initiatives are incorporated into each project. Specifically:

- NSW HI Guidelines Clause 2.3 states "Integrated built-environment sustainability must be considered, including appropriate designs for energy and water, using appropriate materials."
- Green Star – All new facilities target a Green Star Health Care 4 Star equivalency rating – noting Green Star 4 Star is considered 'Australian Best Practice'
- Energy Targets – All new standalone buildings will have a mandatory required of delivering a 10% improvement on national construction code (NCC) Section J.

### 2.3 Further improvement

HI is committed to delivering projects which deliver the best value energy performance and will commit funding to implement initiatives and schemes which are economically responsible and deliver proven and significant energy improvements.

## 2.4 Green Star

### 2.4.1 Application

The project will be assessed against the industry recognised Green Star scheme. The target is aspirational, no formal submission will be made to GBCA.

Green Star, developed by the Green Building Council of Australia (GBCA), is widely recognised by the Australian development industry as representative of 'environmental best practice' in property design & construction. A holistic environmental rating tool, Green Star aims to improve environmental performance of buildings, communities and tenancies across nine assessment categories. These include:

- Building Management
- Indoor Environmental Quality
- Energy
- Transport
- Potable Water
- Materials
- Land use & ecology
- Emissions; and
- Innovation

4 Star Green Star equivalent, as nominated within the NSWHI Engineering Services Guidelines is considered consistent with Australian Best Practice in design & construction for a hospital facility.

The design integration of Green Star will ensure the project meets industry best practice standard via the inclusion of ESD initiatives such as:

- Comprehensive building commissioning & building systems tuning;
- Dedicated commitments to environmental building performance targets;
- Metering & monitoring systems for improved operational energy & water efficiency;
- Formalised environmental management practices during construction;
- Improved operational waste management practices;
- Improved indoor air quality;
- Improved Acoustic, lighting & visual comfort;
- Reduced indoor pollutants such as volatile organic compounds & formaldehyde emissions;
- Improved thermal comfort for occupants;
- Reduced greenhouse gas emissions via energy efficiency initiatives – LED lighting, automated; controls, variable speed fans, economy cycle on air-conditioning, high efficiency MEPS rated equipment, optimised HVAC zoning, energy metering & BMS controls;
- Potable water savings
- Responsible building materials
- Recycling & diversion from landfill of construction & demolition waste;
- Maintained ecological value of the project site;
- Redevelopment of previously developed urban project site will have minimised impact on the local ecology & ecosystem;
- Effective stormwater management to ensure post-development water quality & control does not exceed pre-development levels;
- Control of light pollution beyond the site boundary;
- Effective design & operation strategies to protect against legionella risk;
- Reduce environmental impacts from HVAC refrigerants; and
- ESD Innovations.

In addition to the information nominated within the above sections, the project will ensure suitable measures which achieve positive environmental outcomes are incorporated into the project design. This will be achieved via a combined approach to both the NSWHI Engineering Service Guidelines and the design intent of Green Star.

#### **2.4.2 Targets**

The project targets in principle the following:

- Materials - credits 19 – 22.
- Water - credits 18.

The specific credits for Energy, Transport, Management and other key areas will be developed in the detailed design.

## 3. Electrical Services

### 3.1 Description

The installation comprises two substations and back-up generator to supply the main switchboards.

Power is reticulated to the building via two separate risers, with each riser providing supply to lighting and power within its area of coverage.

### 3.2 Lighting ESD Initiatives

The Electrical installation will target the use of motion sensors for lighting control where their use does not compromise safety. As such, ensuites will include motion sensor control, but fire stairs will be ON 24 hours. A dedicated lighting control drawing will be prepared detailing the lighting control methodology for each area.

Lighting distribution and levels will comply with Green Star requirements.

### 3.3 Power ESD Initiatives

The electrical components part of the installation include the following:

- PFC: the installation includes power factor correction which minimises the energy required from the grid for the project.
- UPS: the UPS will use an energy saving mode where power line energy is passed to the load when it is within acceptable quality. The UPS includes high speed transfer to protect the assets in case of peaks, without causing power outage.
- Lifts: these use VVVF control which achieve the highest efficiency and will include energy monitoring software.
- Metering: the switchboards and distribution boards include energy metering.

### 3.4 Additional ESD Initiatives

The use of photovoltaic system has been considered and not included in this project due to financial constraints.

## 4. Mechanical

### 4.1 Description of the Installation

This summary below outlines the Mechanical (HVAC, Medical Gas and Pneumatic Tube) services proposed for the new Ambulatory Care Building (ACB) at the Wagga Wagga Base Hospital (WWBH).

The mechanical services for the new facility will broadly include the following:

#### 4.1.1 Primary mechanical plant

Standalone central plant systems (heating, cooling) located in the Level 5 roof plant room of the Stage 3 building. Includes:

- Two (2) equal sized water cooled chillers matched to the building load.
- Two (2) cooling towers to match the heat rejection of the above chillers.
- Heating Hot Water system including two (2) high efficiency gas fired hot water heaters
- Associated water reticulation systems, including all pumps, pipework, vessels, valves, water treatment systems, etc.

#### 4.1.2 Ventilation systems

- Air handling units located in the Level 5 roof plant room
- Air handling units located in the Basement Level west plant room
- Air handling units located in the Basement Level east plant room
- General / dirty exhaust systems for toilets/ensuites and dirty utility rooms (allowed 1 per riser)
- Mechanical exhaust for the undercroft car parking area.
- Additional ventilation supply and exhaust systems will be provided if required to suit any special areas/specific user equipment and activities.

#### 4.1.3 DX refrigerant systems serving 24-hour critical electrical rooms

- Variable Refrigerant Flow (VRF) systems will be provided to serve the following critical electrical rooms:
  - Main Switch Board (MSB) room.
  - UPS room.
  - Comms / ICT Building Distributor Rooms.

#### 4.1.4 Smoke management systems

- Stair pressurisation and lobby relief systems to be provided for each egress stair

#### 4.1.5 Building Management and Control System (BMCS)

- Building Management and Control System (BMCS) system to be extended to serve new building areas, integrated with other building services controls and the existing site BMS facility for monitoring purposes.
- BMCS including automatic controls for air conditioning and ventilation systems.

#### 4.1.6 Medical gases

Medical gas services will be provided to the new building, including:

- Oxygen
- Medical Air
- Medical Suction

- Tool Air
- Nitrous Oxide
- Scavenging.

#### **4.1.7 Pneumatic Tube**

New pneumatic tube services to the Stage 3 ASB are to integrate with the existing Wagga campus pneumatic tube system.

## **4.2 ESD Initiatives**

The following energy efficiency features have been considered and will be incorporated into the mechanical services design:

- Mandatory energy target of 10% improvement over the NCC Section J requirement, as demonstrated by the JV3 modelling methodology.
- High efficiency chillers;
- Condensing heating hot water units;
- Variable speed drives on fans and pumps, to modulate air and water flow during part load conditions; and
- High efficiency or EC motors;
- Energy management systems integrated with a direct digitally controlled Building Management and Control System (BMCS) allowing monitoring, targeting and load management of selected plant.
- Free cooling – economy cycles on air handling plant over 35kW<sub>r</sub>.

## 5. Water

### 5.1 Description

The potable water installation for Stage 3 comprises direct connection to the health campus potable water supply provision, constructed under Stage 2 Acute Services Building contract.

Existing 50,000 litre water storage tank with associated filters and pumps (connected to essential electrical supplies) and equipment provide approximately 8 hours of managed supply to the hospital during a potential utility mains failure.

Additionally, Riverina Water have completed recent watermain upgrade works within Docker Street, which now provide improved reliability to the Health Campus with a Grade 2 Water supply

### 5.2 Water ESD Initiatives

The Hydraulic and fire services installation will incorporate the following ESD initiatives:-

- Minimum 4 star WELS equivalent fixtures and fitting selections (showers minimum 3 star)
- Water flow monitoring for Stage 3 building, each floor level, mechanical plant, hot water plant, renal dialysis water treatment plant and each retail area
- Recyclable construction materials with low embodied energy and environmental best practice manufacture, to match those installed under Stage 2 project

### 5.3 ESD Initiatives Considered

Rain water and fire services test water collection and re-use, for non-potable purposes, for Stage 3 has been considered, however rejected based on:-

- Preference to maintain r flows to the Murrumbidgee River eco system for communities downstream.
- Capital / life cycle cost, ESD analysis does not represent value for money.
- Additional maintenance and management during frequent inland Australia Westerly dust storms
- Additional treatment and disinfection of potable water for building occupants and patient safety.
- Limited available additional landscape area.

## 6. Materials

### 6.1 Description

The design integration of Green Star will ensure the project meets industry best practice standards via the inclusion of ESD initiatives for the selection of the building materials, such as:

- Responsible building materials – best practice PVC products, steel sourced from sustainable supply chains
- Recycling and diversion from landfill of construction and demolition waste
- Maintained ecological value of the project site
- Reduced indoor pollutants such as volatile organic compounds and formaldehyde emissions
- Redevelopment of previously developed urban project site will have minimised impact on the local ecology and ecosystem
- Procurement of materials from regional suppliers for the building fabric to reduce travel and the carbon footprint



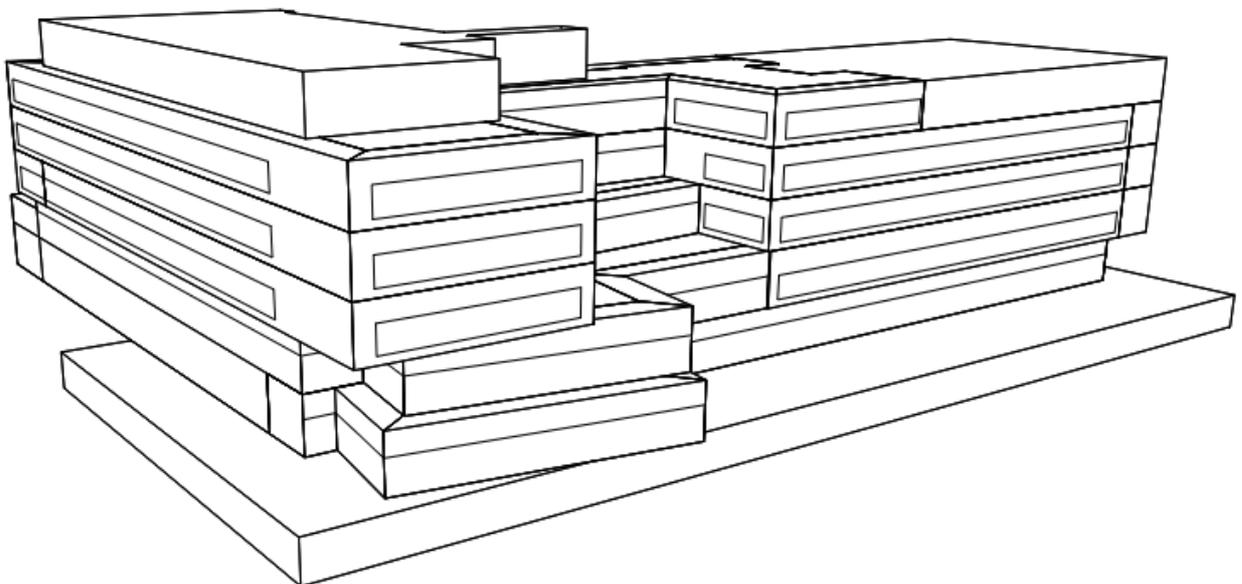
# Wagga Wagga Rural Referral Hospital Stage 3

NSW Health

NCC 2016 Section J JV3

IA172200-ESD-RPT-0001 | B

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## Wagga Wagga Rural Referral Hospital Stage 3

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## Executive Summary

This NCC 2016 Section J JV3 report confirms that the currently proposed design for Wagga Wagga Rural Referral Hospital Stage 3 is tracking for compliance with the following Parts of Section J:

- Part J1 Building Fabric; and
- Part J2 Glazing.

Other parts of Section J cannot be assessed at this early stage.

The JV3 verification method has been used as the proposed design does not comply with Section J2 – Glazing Deemed-to-Satisfy provisions.

This summary report will be updated at each subsequent design phase. At completion of the design phases, a detailed compliance report will be provided for building permit based on 'Issued for Construction' (IFC) documentation.

The results of the JV3 assessment are presented below:

**Table 1: JV3 Modelled Annual Energy Consumption**

Energy End Use	Model 1 <i>DTS Building Fabric</i> <i>DTS Mechanical and Lighting</i> (MWh/annum)	Model 2 <i>Proposed Building Fabric</i> <i>DTS Mechanical and Lighting</i> (MWh/annum)	Compliance
Boilers	1,266	525	
Chillers	75	119	
Fans and Pumps	654	654	
Lighting	433	433	
<b>Total</b>	<b>2,428</b>	<b>1,731</b>	

## 1. Introduction

### 1.1 Project Description

The Wagga Wagga Base Hospital, Stage 3 Development forms the final suite of services for the hospital campus and provides the elements necessary to meet the guiding principles of the MLHD delivery of sub-acute, ambulatory and community based care.

The Wagga Wagga Stage 3 Services Statement states:

- Models of care delivery and management processes will enhance integration and sharing of resources across all providers of care.
- The key goal of the NSW Health system Leading Better Value Care (LBVC) Program will be delivered.
- Telehealth and eHealth technology should be embedded into all service models and be an integrated component of service delivery
- Services will ensure equity of access (i.e. timely and appropriate access to services).
- Services will be planned on a collaboration model which supports co-location and/or physical integration where there is service or patient synergy.
- Services will be planned to meet the population health needs of the area, with a view to responding to and encouraging change in service demand.

The site is bound to the North by the Hume highway, known as Edward Street and by Docker Street to the West. The Eastern and Southern boundaries abut built forms, typically domestic. The site slopes approximately 3.7 metres from a high point at the South eastern corner of the site to a low point in the North Western corner. In its existing state the site within the hospital campus comprises an on-grade car park located to the north and East of the site. The car park to the East is separated from the site by Lewis Drive which forms the main access to the hospital and through the site. To the South the site sits adjacent the six, (6) storey Acute services building and the two, (2) storey Support Services building. A two storey, red brick building, known as Harvey House sits adjacent the South Western corner of the site.

### 1.2 NCC Classification

The building is a mix of the following NCC building classifications:

- Class 5 Office
- Class 5 Ancillary
- Class 6 Retail
- Class 7a Carpark
- Class 9a Ward Area
- Class 9a Clinic, Day Surgery or Procedure Unit
- Class 9b Education

### 1.3 Climate Zone

The project is located in BCA climate zone 4, refer to Appendix A for BCA Climate Zone Map for NSW.

### 1.4 Scope

The NCC BCA Section J aims to reduce greenhouse gas emissions. The scope of Section J is:

- Part J1 Building Fabric;
- Part J2 Glazing;

- Part J3 Building Sealing;
- Part J4 (Blank)
- Part J5 Air-conditioning and Ventilation Systems;
- Part J6 Artificial Lighting and Power;
- Part J7 Heated Water Supply and Swimming Pool and Spa Pool Plant; and
- Part J8 Facilities for Energy Modelling.

This NCC 2016 Section J JV3 report confirms that the currently proposed design for Wagga Wagga Rural Referral Hospital Stage 3 is tracking for compliance with the following Parts of Section J:

- Part J1 Building Fabric; and
- Part J2 Glazing.

Other parts of Section J cannot be assessed at this early stage.

## **1.5 Reference Information**

This assessment is based on the 'Schematic Design' (SD) documentation.

## **1.6 Limitations and Disclaimers**

This report does not consider all performance criteria required for selection of suitable insulation and glazing systems such as structural properties, fire resistance, condensation, acoustics, thermal expansion, reflectiveness and aesthetics.

This assessment addresses minimum compliance with the NCC BCA 2016 Section J only. This report does not make recommendations on broader ESD issues such as 'best practice' energy efficiency, thermal comfort, glare, or external views.

'Energy use' for the proposed building as mentioned this report does not provide a prediction of operational energy use, but a comparative assessment to establish compliant building fabric and building services performance.

## 2. JV3 Verification

### 2.1 Methodology

Modelling has been undertaken in accordance with:

- JV3 – Verification using a reference building; or
- Specification JV – Annual energy consumption criteria.

The JV3 modelling protocol requires energy models as follows, assuming that building services are designed to comply with Deemed-to-Satisfy provisions.

**Table 2: JV3 Modelling Scenarios**

Scenario	Insulation	Glazing	Infiltration	HVAC	Lighting
<b>Model 1</b> <i>Reference building with deemed-to-satisfy building services</i>	DTS	DTS	DTS	DTS	DTS
<b>Model 2</b> <i>Proposed building with deemed-to-satisfy building services</i>	Proposed	Proposed	DTS	DTS	DTS

### 2.2 Software

The software that has been used to undertake the dynamic thermal modelling is IES <VE> (Integrated Environmental Solutions Virtual Environment) 2015. IES <VE> is an integrated building performance modelling software package which is able to simulate the thermal environment of the building. Climatic data, building geometry, layout, occupancy, fabric information and HVAC usage informs a detailed mathematical simulation. The simulation captures the heat transfer process into and through the building as well as its thermal capacity.

This software is validated in accordance with the following standards:

- ASHRAE 140:2001, 2004, 2007
- BESTEST

### 2.3 Weather data

The modelling was undertaken using the TRY (Test Reference Year) weather file for Wagga Wagga (NSW).

## 2.4 Geometry and External Shading

The image below is taken from the modelling software.

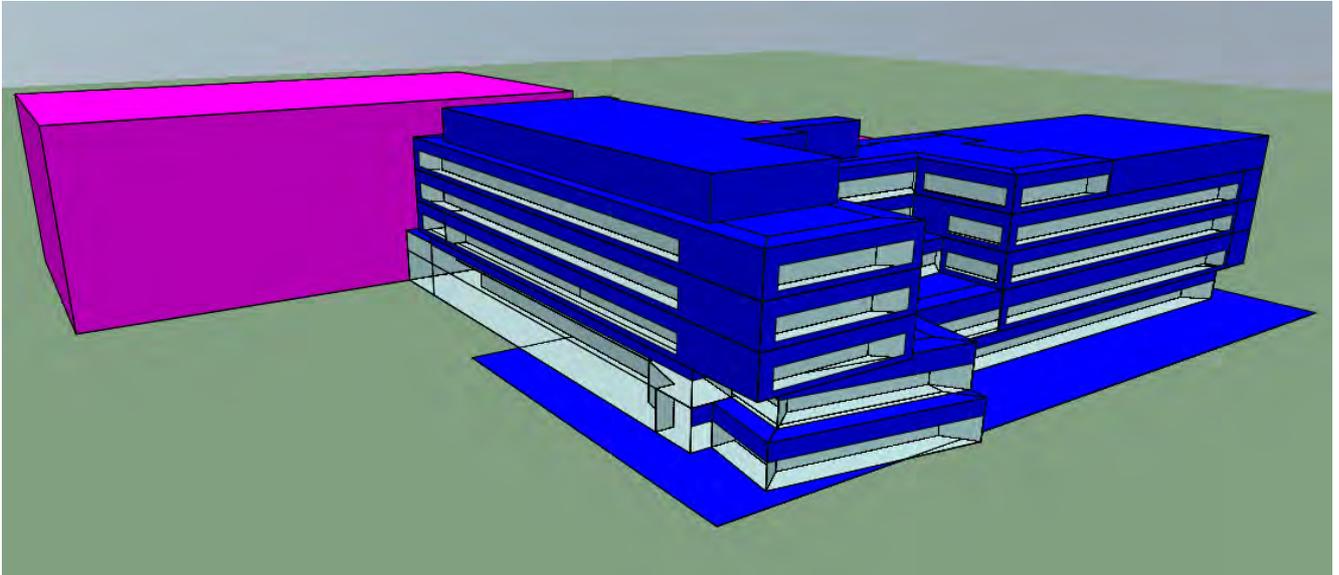


Figure 1: Dynamic Thermal Model Geometry

Thermal zoning is shown in the mark-ups provided in Appendix B.

Glazing has been modelled as shown in the mark-ups provided in Appendix C.

## 2.5 Building Fabric

Table 3: Reference Building Fabric

Construction Type	Construction Type Details	Thermal Performance
Roof	DTS Roof	R4.2, solar absorptance 0.7
External walls	DTS Wall	R2.8, solar absorptance 0.6
Internal walls between conditioned/unconditioned spaces	DTS Internal Wall	R1.8
Suspended slab	DTS Suspended Slab	R2.0

Table 4: Proposed Building Fabric

Construction Type	Construction Type Details	Thermal Performance
Roof	DTS Roof	R4.2, solar absorptance 0.7
External walls	DTS Wall	R2.8, solar absorptance 0.6
Internal walls between conditioned/unconditioned spaces	DTS Internal Wall	R1.8
Suspended slab	DTS Suspended Slab	R2.0

## 2.6 Glazing

**Table 5: Reference Glazing**

Construction Type	Construction Type Details	Thermal Performance
External glazing	Varies	See BCA glazing calculator in Appendix D

**Table 6: Proposed Glazing**

Construction Type	Construction Type Details	Thermal Performance
External glazing	Viridian EnergyTech Insulating Glass Units with Low E - Clear #2 (coating on the second face of the glazing) toughened safety glass – 6mm + 12mm gap + 6mm. Non-thermally broken aluminium frames (assumed 10% of window area)	U2.9, SHGC 0.59

## 2.7 Infiltration

**Table 7: Air Infiltration Rates**

Zone	Schedule	Infiltration Rate
Perimeter zone	HVAC system on	1.0 ACH
Whole building	HVAC system off	1.5 ACH

## 2.8 Roof Lights

There are no roof lights in the proposed design.

## 2.9 Internal Loads

In accordance with the NCC BCA 2016 JV3 methodology, occupants have been modelled at 75 Watts sensible and 55 Watts latent heat gain.

**Table 8: Internal Loads**

Space	Operating Profile	Occupancy (m <sup>2</sup> /person)	Lighting (W/m <sup>2</sup> )	Equipment (W/m <sup>2</sup> )	Temp. Control
Office	Class 5	10	9	15	20 – 24
Retail	Class 6	5	22	5	20 – 24
Clinic, Day Surgery or Procedure Unit	Class 9a	10	10	15	20 – 24
Ward Area	Class 9a	10	7	5	20 – 24
Education	Class 9b	5	8	5	20 – 24

## 2.11 Operating Profiles

The JV3 modeling uses the specification JV profiles as follows:

- Class 5 Office
- Class 6 Retail
- Class 9a Clinic, Day Surgery or Procedure Unit
- Class 9a Ward Area
- Class 9b Education

## 2.12 Heating, Ventilation and Cooling (HVAC)

The Building will be air-conditioned by air handling equipment served by central water cooled chillers and gas water heaters.

**Table 9: HVAC Efficiencies**

Mode	Efficiency	Source
Boilers	83%	NCC Section J5
Cooling	IPLV 5.2	NCC Section J5

## 2.14 Results

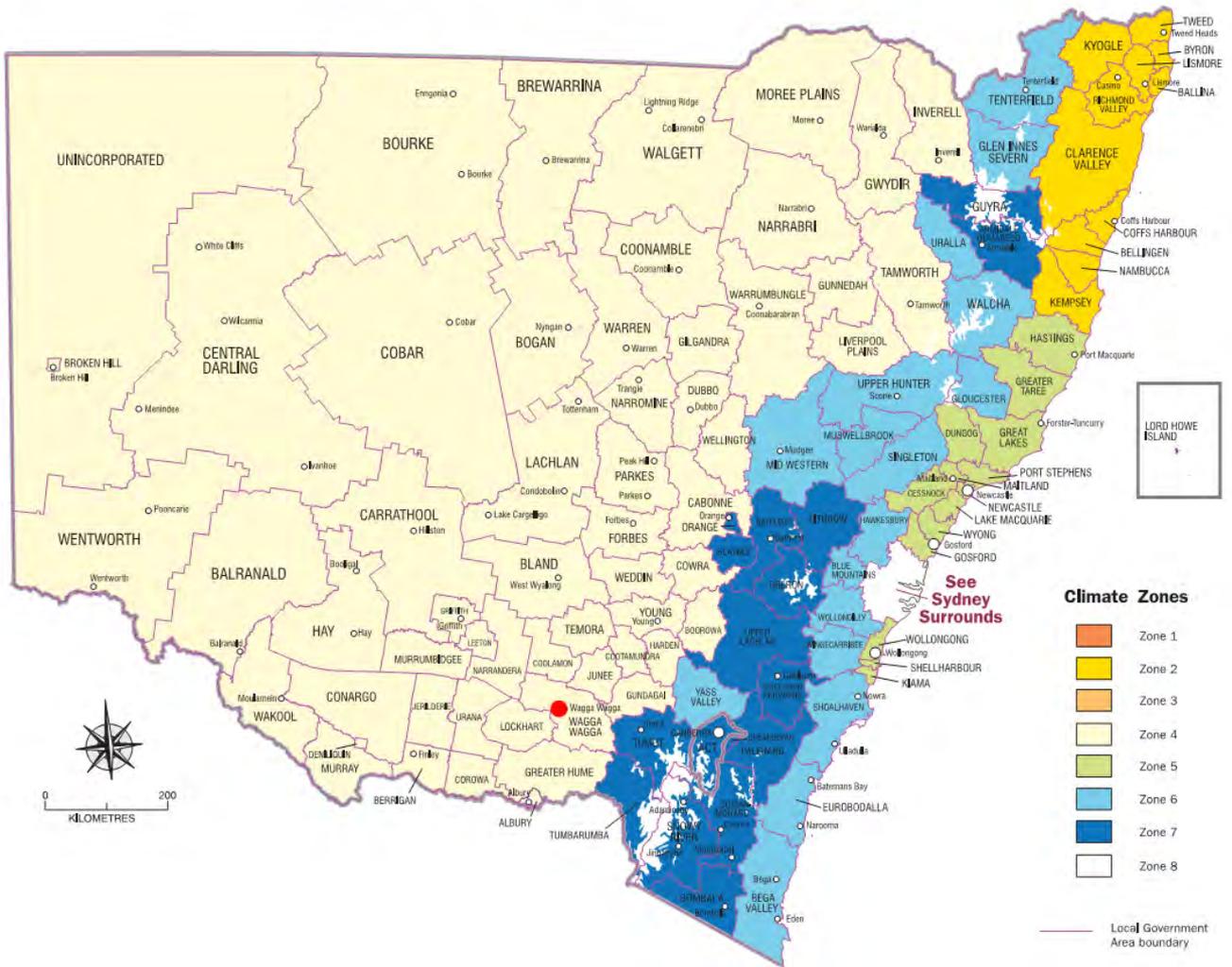
The results of the JV3 assessment confirming compliance are presented below:

**Table 10: JV3 Modelled Annual Energy Consumption**

Energy End Use	Model 1 <i>DTS Building Fabric DTS Mechanical and Lighting</i> (MWh/annum)	Model 2 <i>Proposed Building Fabric DTS Mechanical and Lighting</i> (MWh/annum)	Compliance
Boilers	1,266	525	
Chillers	75	119	
Fans and Pumps	654	654	
Lighting	433	433	
<b>Total</b>	<b>2,428</b>	<b>1,731</b>	<b>Achieved</b>

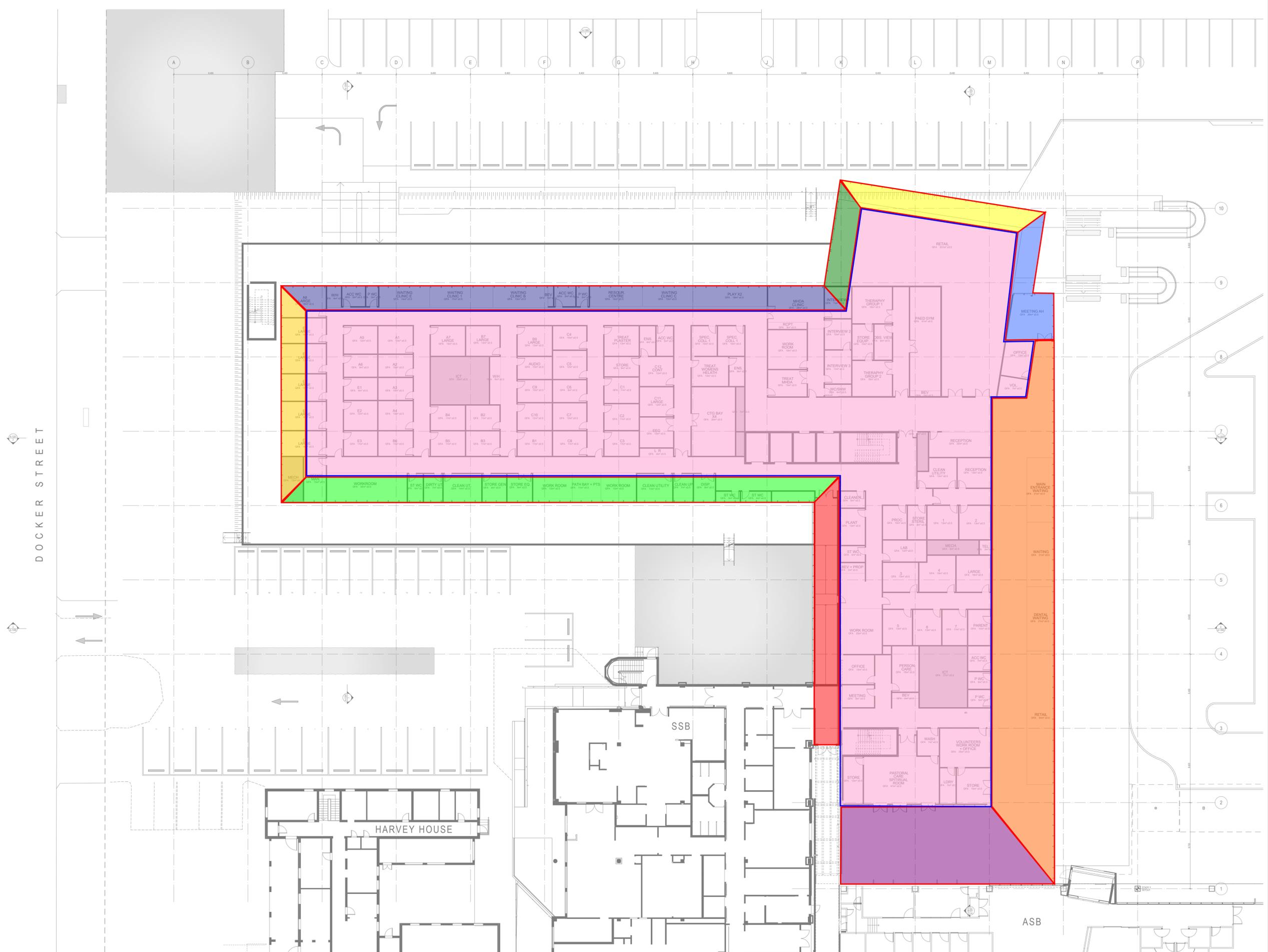
## Appendix A. BCA Climate Zone Map

### NEW SOUTH WALES



Source: [www.abcb.gov.au](http://www.abcb.gov.au)

## Appendix B. Thermal Zones



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**LEGEND:**

- Perimeter Zone
- Internal Zone

DOCKER STREET

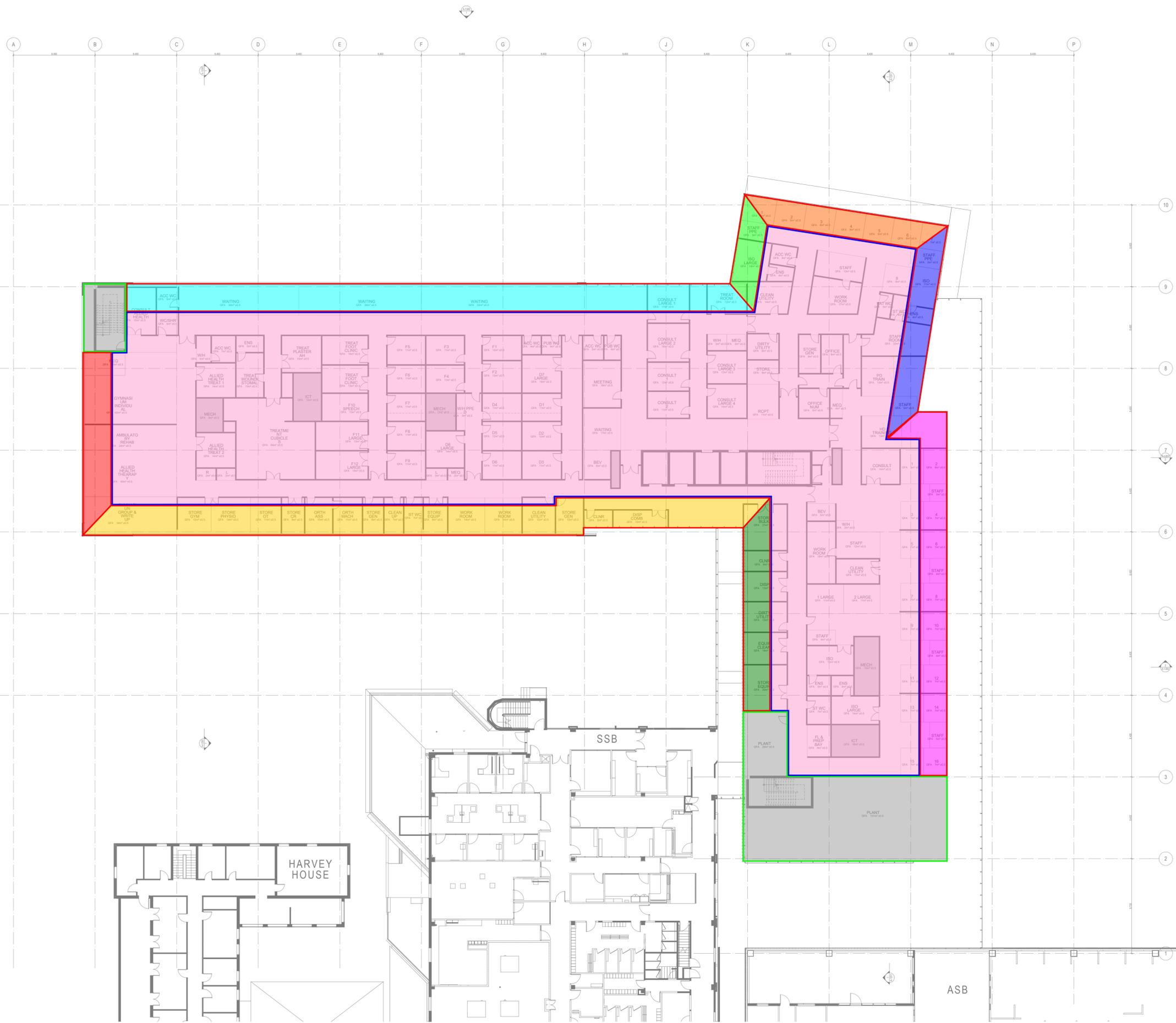
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PROJECT:			
<b>WAGGA WAGGA HEALTH SERVICE REDEVELOPMENT</b> Changing more than the buildings			
STAGE 3 DEVELOPMENT DOCKER STREET WAGGA WAGGA NSW 2650			
DRAWING TITLE: <b>GENERAL ARRANGEMENT - GROUND FLOOR</b>			
SCALE:	DRAWN BY:	QA:	ISSUE DATE:
1:200&A1			23/02/2018
PROJECT NUMBER:	DRAWING NUMBER:	ISSUE:	
<b>17022</b>	<b>A-1120</b>	<b>01</b>	

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LEGEND:

- Perimeter Zone
- Internal Zone
- Unconditioned Space

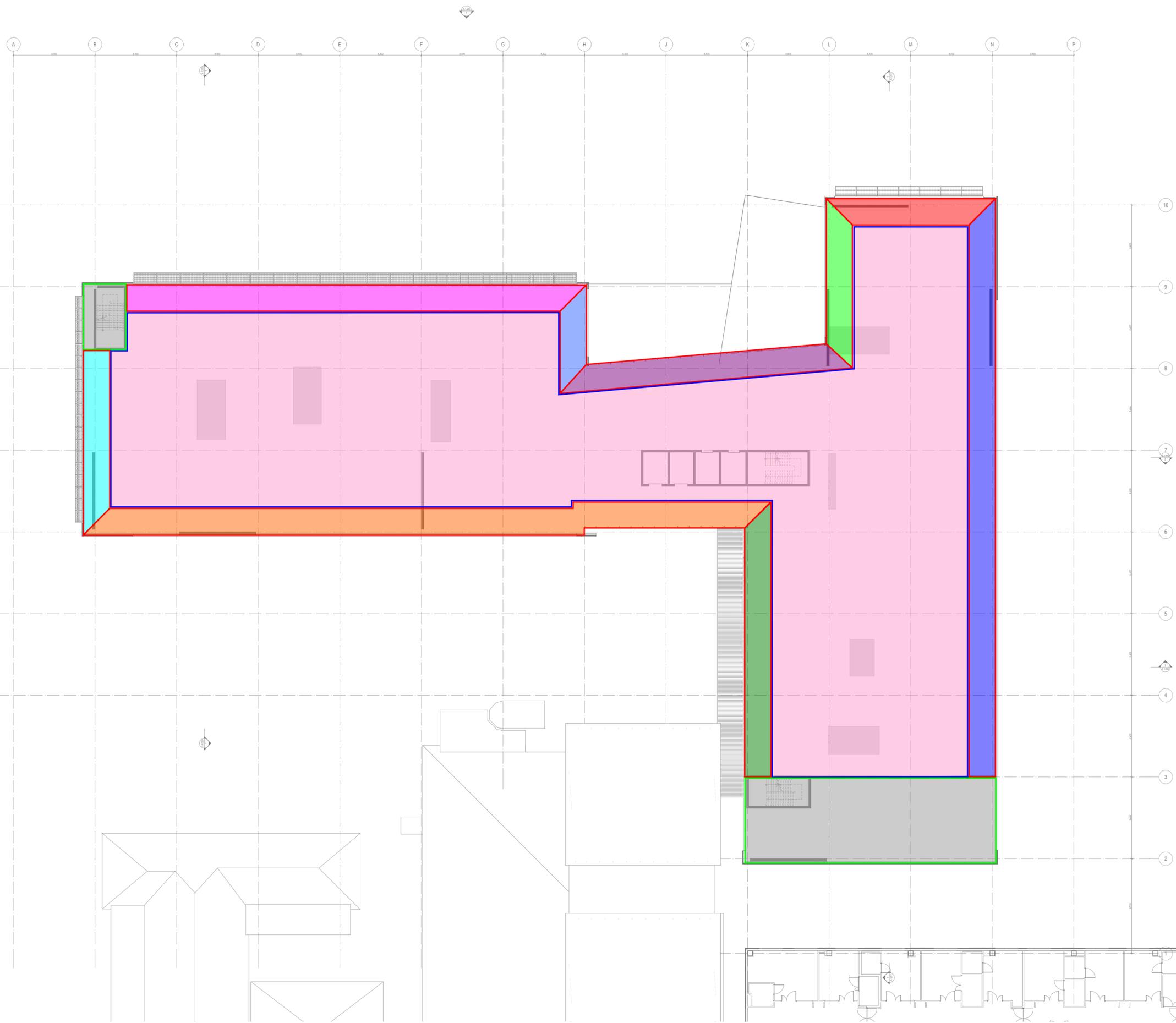


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DRAWING TITLE: <b>GENERAL ARRANGEMENT - FIRST FLOOR</b>			
SCALE:	DRAWN BY: QA:	ISSUE DATE:	
1:200/A1		23/02/2018	
PROJECT NUMBER:	DRAWING NUMBER:	ISSUE:	
<b>17022</b>	<b>A-1130</b>	<b>01</b>	

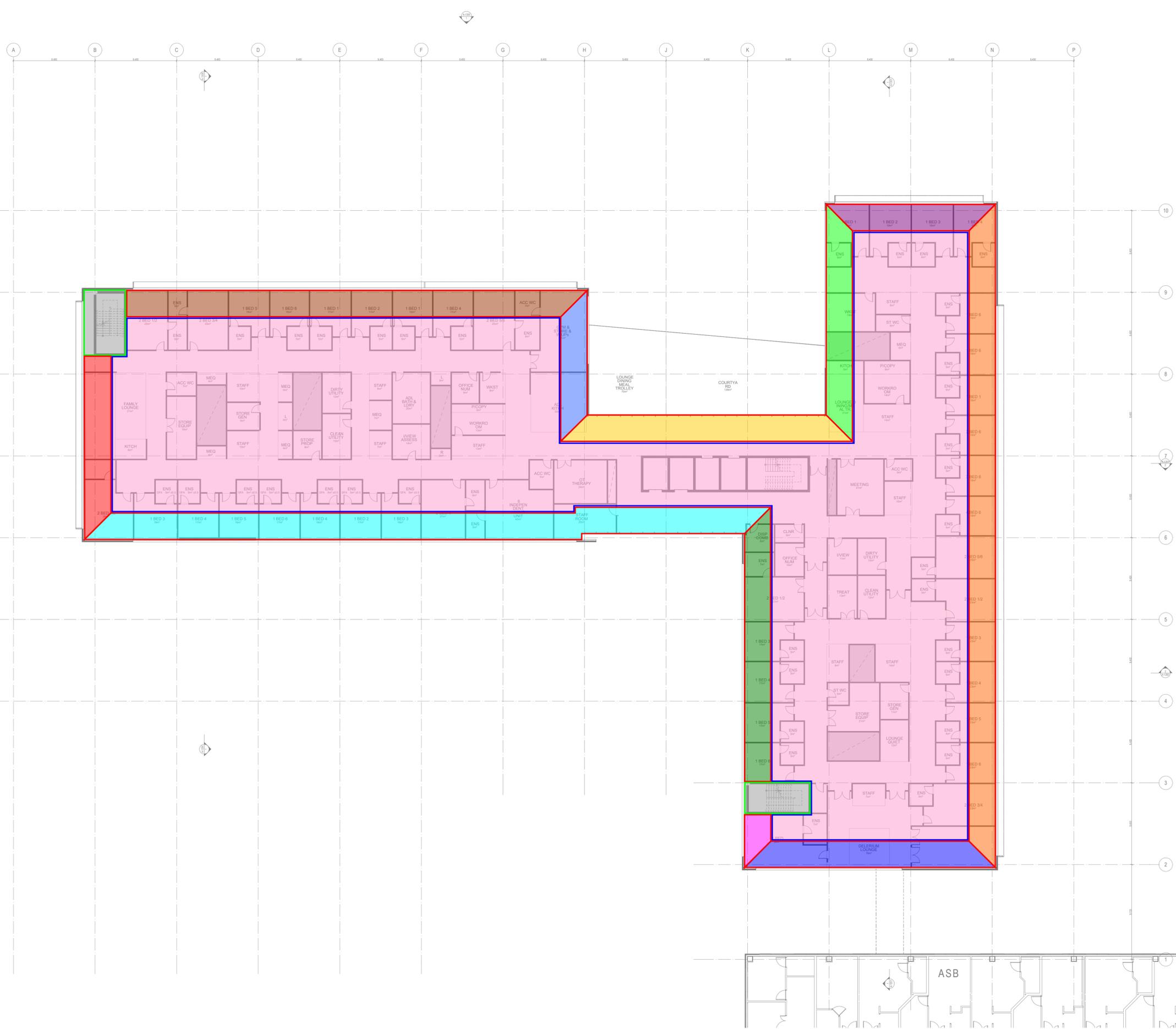
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LEGEND:

- Perimeter Zone
- Internal Zone
- Unconditioned Space



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<b>WAGGA WAGGA HEALTH SERVICE REDEVELOPMENT</b> Changing more than the buildings			
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DRAWING TITLE: <b>GENERAL ARRANGEMENT - SECOND FLOOR</b>			
SCALE:	DRAWN BY:	QA:	ISSUE DATE:
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**LEGEND:**

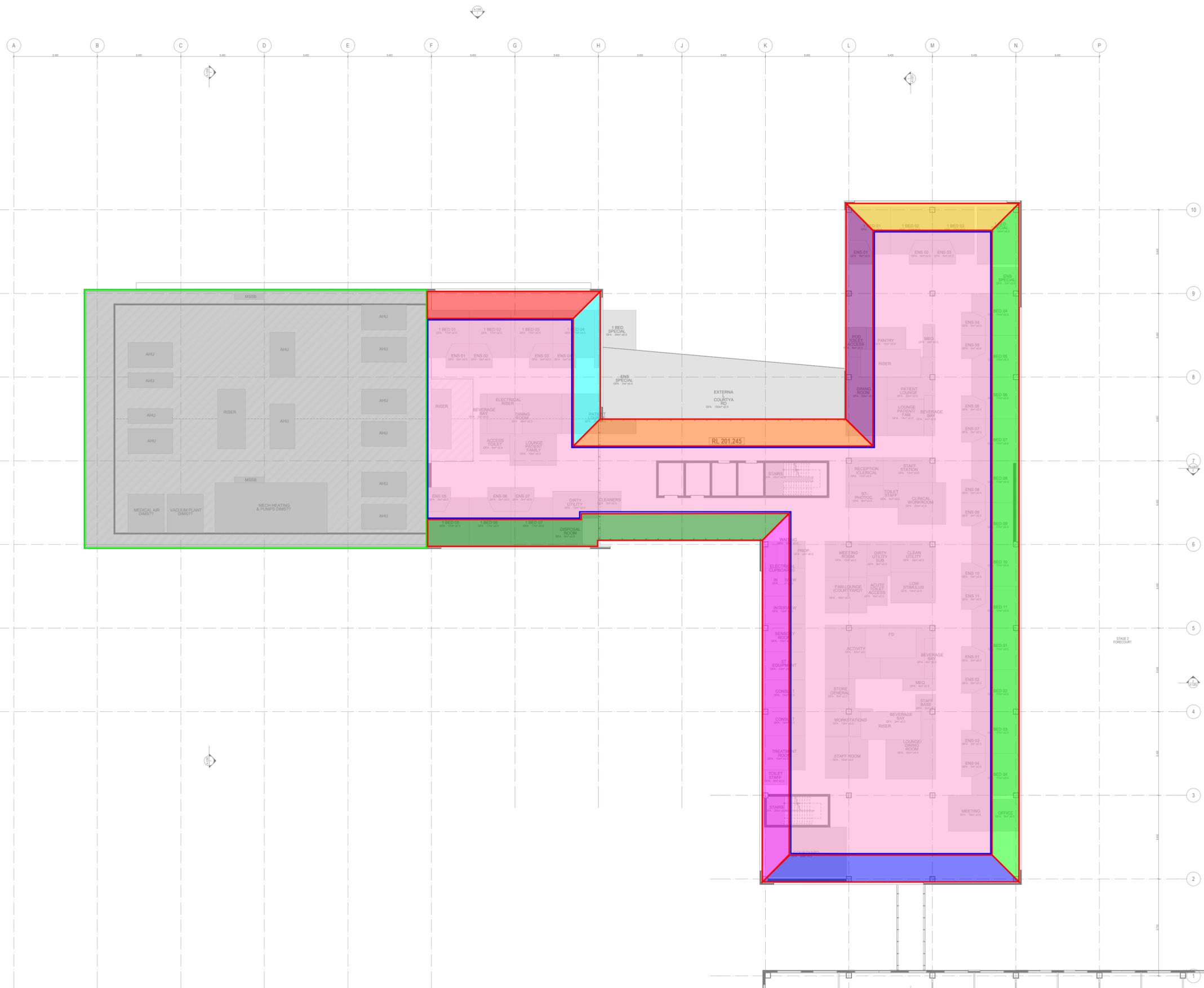
- Perimeter Zone
- Internal Zone
- Unconditioned Space

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<b>STAGE 3 DEVELOPMENT</b> DOCKER STREET WAGGA WAGGA NSW 2650			
DRAWING TITLE: <b>GENERAL ARRANGEMENT - THIRD FLOOR</b>			
SCALE:	DRAWN BY:	QA:	ISSUE DATE:
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**LEGEND:**

- Perimeter Zone
- Internal Zone
- Unconditioned Space

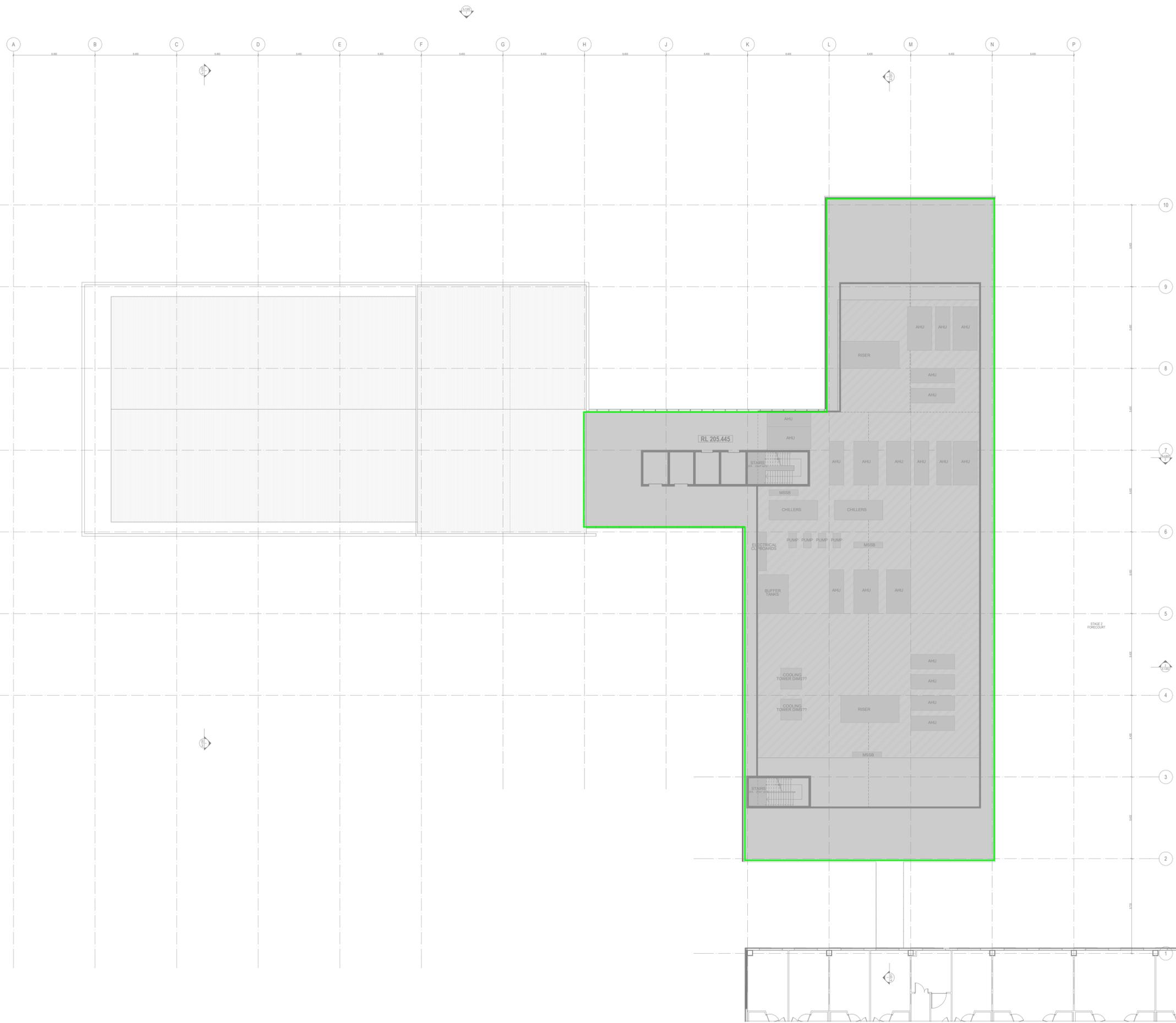


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PROJECT:			
<b>WAGGA WAGGA HEALTH SERVICE REDEVELOPMENT</b> Changing more than the buildings			
STAGE 3 DEVELOPMENT DOCKER STREET WAGGA WAGGA NSW 2650			
DRAWING TITLE: <b>GENERAL ARRANGEMENT - FOURTH FLOOR</b>			
SCALE:	DRAWN BY:	QA:	ISSUE DATE:
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**LEGEND:**

- Perimeter Zone
- Internal Zone
- Unconditioned Space



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 Changing more than the buildings

**STAGE 3 DEVELOPMENT**  
 DOCKER STREET  
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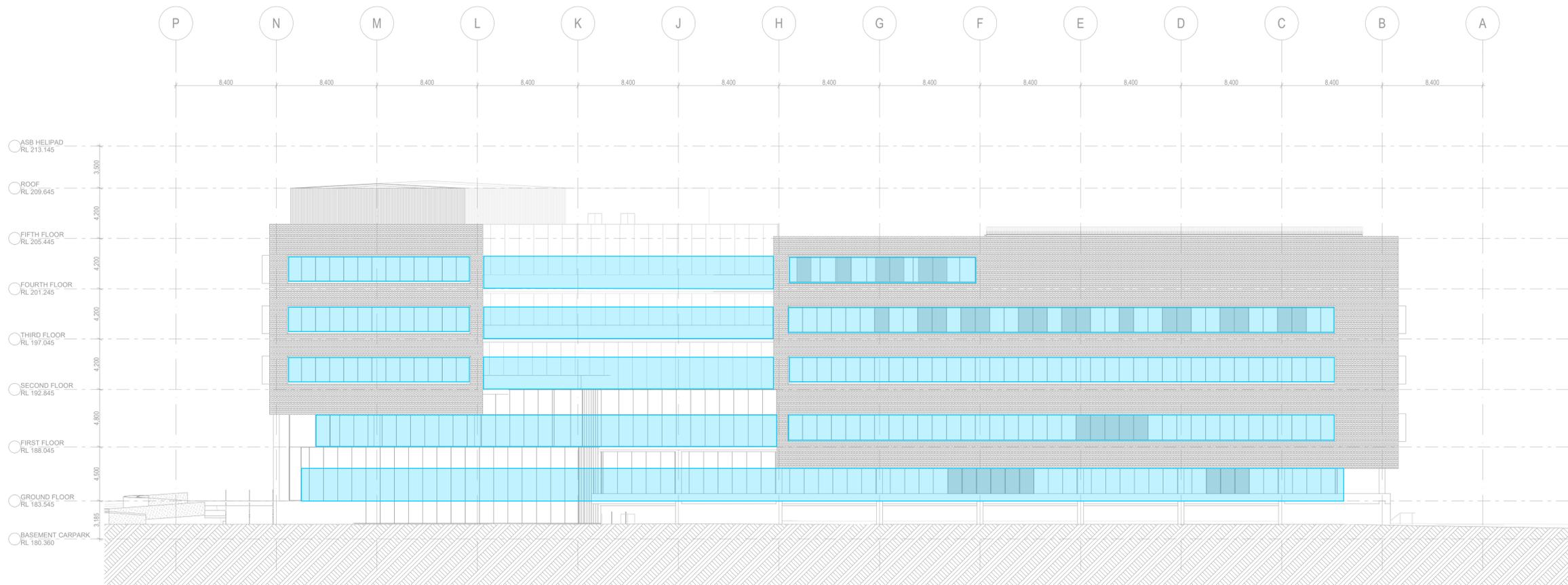
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SCALE: 1:200/A1 DRAWN BY: QA: ISSUE DATE: 23/02/2018

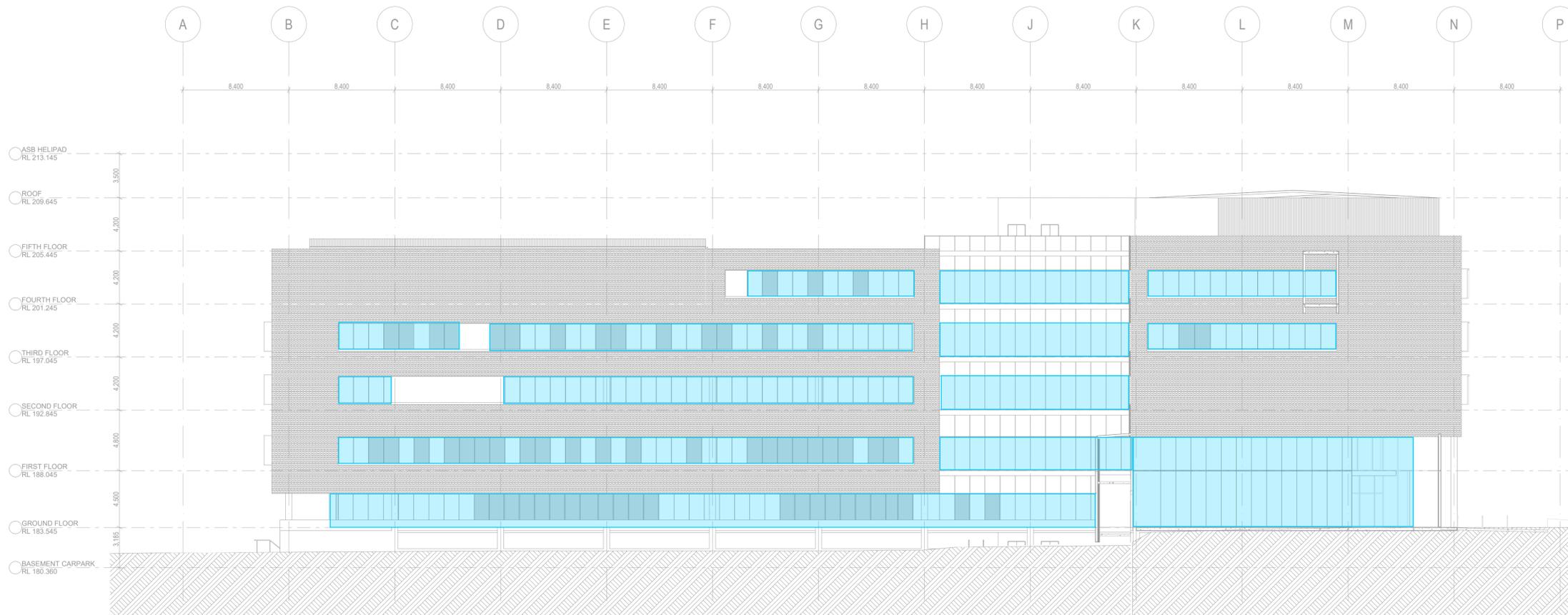
PROJECT NUMBER: 17022 A-1170 ISSUE: 01

HPA/BA Server: BMSERVER - Box Server 2/1/2019 8:00pm Wagga Wagga Health Stage 3/17022 CH/01 1/200 CH/01

## Appendix C. Glazing



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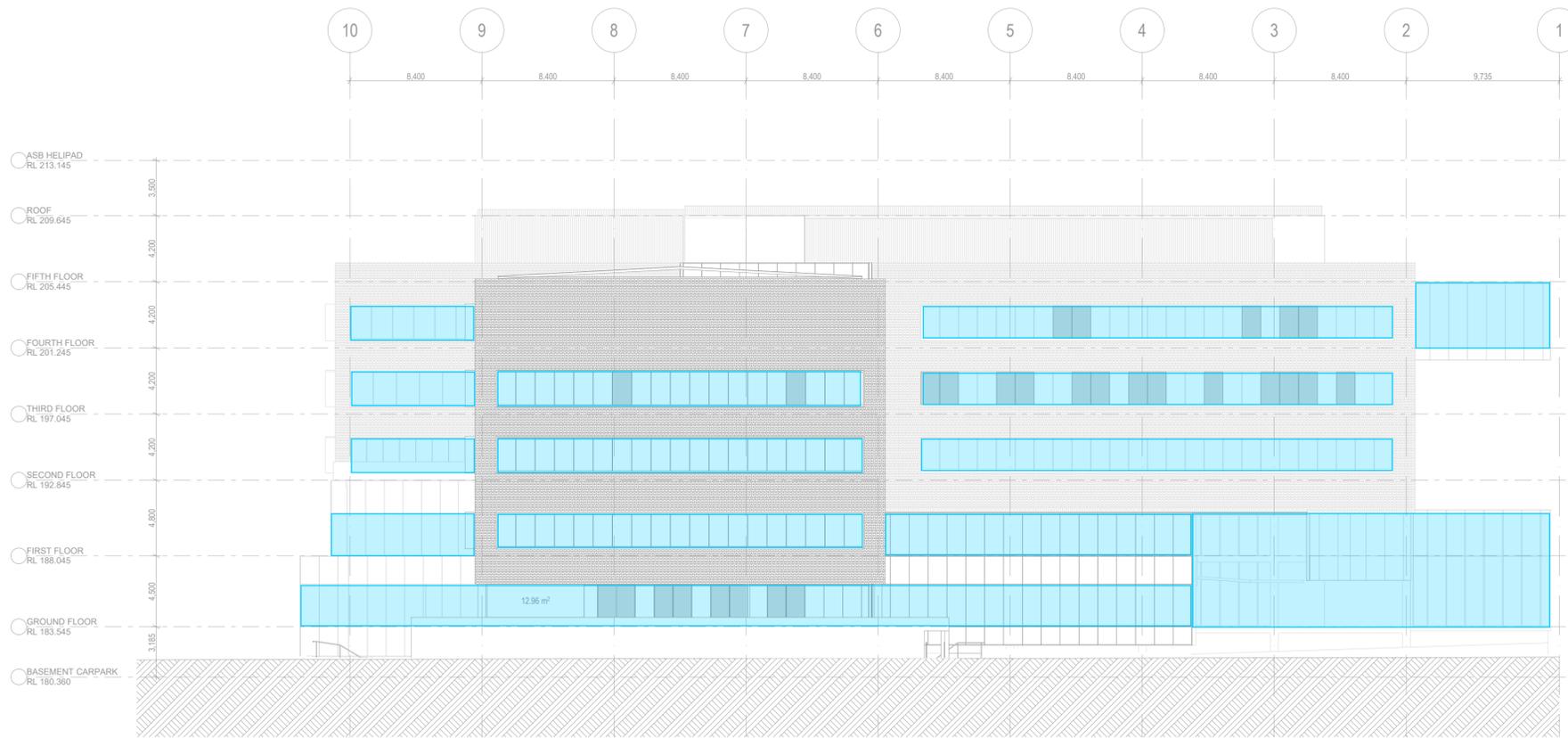
2 SOUTH  
SCALE

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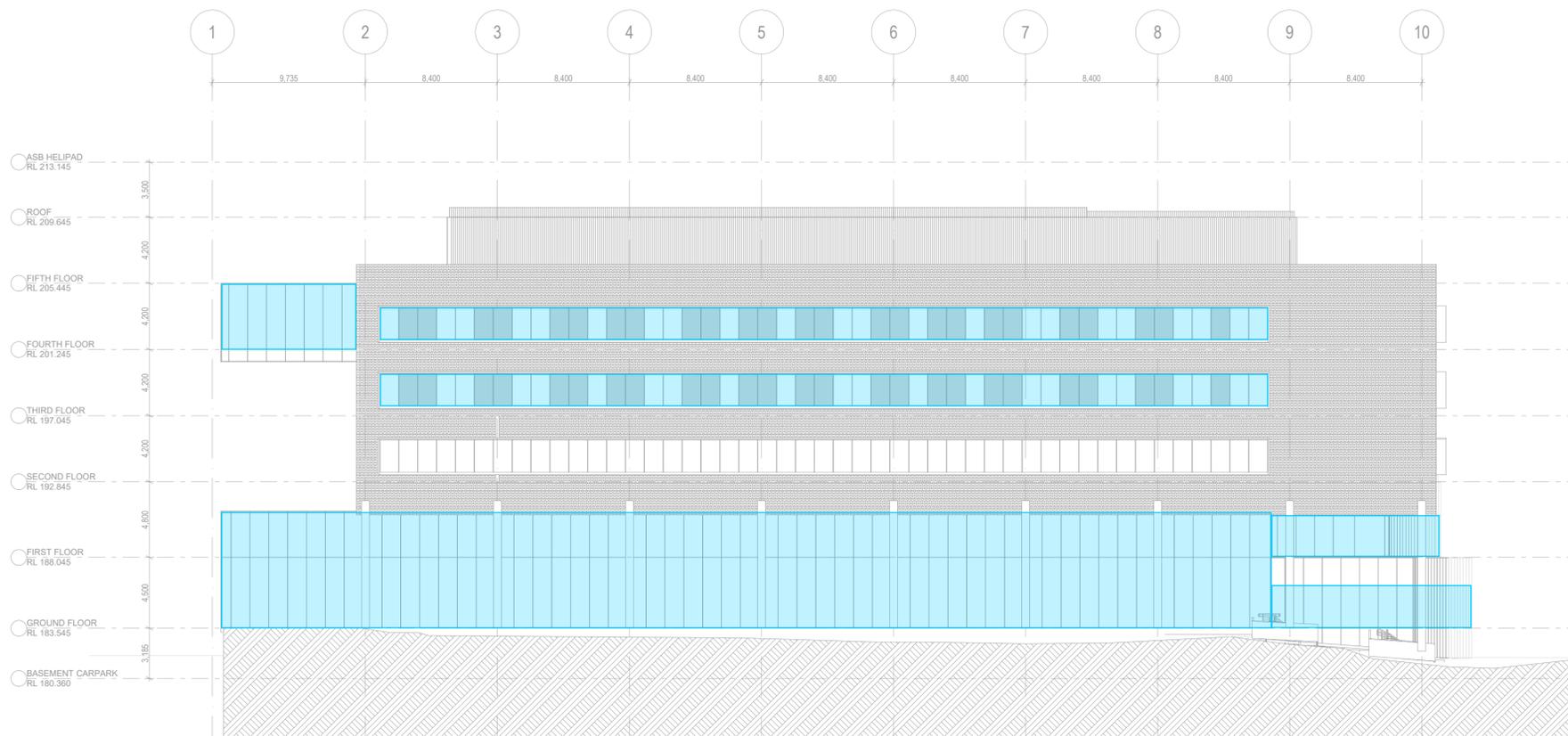
LEGEND:

Glazed Areas

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PROJECT:			
 <b>WAGGA WAGGA HEALTH SERVICE REDEVELOPMENT</b> Changing more than the buildings			
STAGE 3 DEVELOPMENT CNR EDWARD & DOCKER STREET WAGGA WAGGA NSW 2650			
DRAWING TITLE:			
<b>NORTH &amp; SOUTH ELEVATIONS</b>			
SCALE:	DRAWN BY:	QA:	ISSUE DATE:
1:200(A1)	JR	CM	###/##/####
PROJECT NUMBER:	DRAWING NUMBER:	ISSUE:	
<b>17022</b>	<b>AR-ACB-A-1300</b>	<b>00</b>	



1 WEST  
SCALE 1:200



2 EAST  
SCALE 1:200

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LEGEND:  
 Glazed Areas

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No	Initial	DATE	REVISION DETAILS
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T +61 2 8339 8622 E: info@martin-ollmann.com www.martin-ollmann.com			
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14/77 PACIFIC HIGHWAY NORTH SYDNEY NSW 2060 phone: (02) 9978 5402 email: hi-info@health.nsw.gov.au			
PROJECT:			
 <b>WAGGA WAGGA HEALTH SERVICE REDEVELOPMENT</b> Changing more than the buildings			
STAGE 3 DEVELOPMENT CNR EDWARD & DOCKER STREET WAGGA WAGGA NSW 2650			
DRAWING TITLE: <b>EAST &amp; WEST ELEVATIONS</b>			
SCALE:	DRAWN BY:	QA:	ISSUE DATE:
1:200&A1	JR	CM	##/##/####
PROJECT NUMBER:	DRAWING NUMBER:	ISSUE:	
17022	AR-ACB-A-1301	00	

## Appendix D. NCC Vol. 1 Glazing Calculations

# NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description

**Wagga Wagga Rural Referral Hospital Stage 3**

Application

**other**

Climate zone

**4**

Storey

**Ground**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	402m <sup>2</sup>		336m <sup>2</sup>		403m <sup>2</sup>		302m <sup>2</sup>		
Option B									n/a

Glazing area (A) 231m<sup>2</sup> ..... 311m<sup>2</sup> ..... 240m<sup>2</sup> ..... 197m<sup>2</sup>

Number of rows preferred in table below **10** (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)						
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m <sup>2</sup> )	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S <sub>H</sub> )	Cooling (S <sub>C</sub> )	Area used (m <sup>2</sup> )	Element share of % of allowance used
1	Strip Window	N		3.00	77.00		8.0	0.23				0.00	1.00	1.00	231.00	100% of 100%
2	Strip Window	S		3.00	80.00		3.8	1.00				0.00	1.00	1.00	240.00	100% of 100%
3	Strip Window	E		3.00	103.67		4.8	0.01				0.00	1.00	1.00	311.00	100% of 100%
4	Strip Window	W		3.00	65.50		4.0	0.10				0.00	1.00	1.00	196.50	100% of 100%
5																
6																
7																
8																
9																
10																

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*if inputs are valid*



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# NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description

**Wagga Wagga Rural Referral Hospital Stage 3**

Application

**other**

Climate zone

**4**

Storey

**Level 1**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	434m <sup>2</sup>		347m <sup>2</sup>		448m <sup>2</sup>		336m <sup>2</sup>		
Option B									n/a

Glazing area (A) 191m<sup>2</sup> ..... 203m<sup>2</sup> ..... 180m<sup>2</sup> ..... 170m<sup>2</sup>

Number of rows preferred in table below **10** (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)						
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m <sup>2</sup> )	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S <sub>H</sub> )	Cooling (S <sub>C</sub> )	Area used (m <sup>2</sup> )	Element share of % of allowance used
1	Strip Window	N		3.00	63.65		8.0	0.30				0.00	1.00	1.00	190.95	100% of 100%
2	Strip Window	S		3.00	60.00		5.0	1.00				0.00	1.00	1.00	180.00	100% of 100%
3	Strip Window	E		3.00	67.67		7.8	0.01				0.00	1.00	1.00	203.00	100% of 100%
4	Strip Window	W		3.00	56.60		5.6	0.10				0.00	1.00	1.00	169.80	100% of 100%
5																
6																
7																
8																
9																
10																

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Building name/description

**Wagga Wagga Rural Referral Hospital Stage 3**

Application

**other**

Climate zone

**4**

Storey

**Level 2**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	397m <sup>2</sup>		324m <sup>2</sup>		396m <sup>2</sup>		308m <sup>2</sup>		
Option B									n/a

Glazing area (A) 191m<sup>2</sup> ..... 131m<sup>2</sup> ..... 116m<sup>2</sup> ..... 146m<sup>2</sup>

Number of rows preferred in table below

**10** (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)						
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m <sup>2</sup> )	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S <sub>H</sub> )	Cooling (S <sub>C</sub> )	Area used (m <sup>2</sup> )	Element share of % of allowance used
1	Strip Window	N		3.00	63.70		8.0	0.27				0.00	1.00	1.00	191.10	100% of 100%
2	Strip Window	S		3.00	38.50		6.5	1.00				0.00	1.00	1.00	115.50	100% of 100%
3	Strip Window	E		3.00	43.58		8.0	0.13				0.00	1.00	1.00	130.74	100% of 100%
4	Strip Window	W		3.00	48.77		6.0	0.10				0.00	1.00	1.00	146.31	100% of 100%
5																
6																
7																
8																
9																
10																

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# NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description

**Wagga Wagga Rural Referral Hospital Stage 3**

Application

**other**

Climate zone

**4**

Storey

**Level 3**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	396m <sup>2</sup>		344m <sup>2</sup>		396m <sup>2</sup>		343m <sup>2</sup>		
Option B									n/a

Glazing area (A) 191m<sup>2</sup> ..... 131m<sup>2</sup> ..... 146m<sup>2</sup> ..... 143m<sup>2</sup>

Number of rows preferred in table below

**10** (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)						
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m <sup>2</sup> )	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S <sub>H</sub> )	Cooling (S <sub>C</sub> )	Area used (m <sup>2</sup> )	Element share of % of allowance used
1	Strip Window	N		3.00	63.60		8.0	0.27				0.00	1.00	1.00	190.80	100% of 100%
2	Strip Window	S		3.00	48.77		5.4	1.00				0.00	1.00	1.00	146.31	100% of 100%
3	Strip Window	E		3.00	43.55		8.0	0.15				0.00	1.00	1.00	130.65	100% of 100%
4	Strip Window	W		3.00	47.70		7.0	0.10				0.00	1.00	1.00	143.10	100% of 100%
5																
6																
7																
8																
9																
10																

**IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR**

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

*if inputs are valid*



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# NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description

**Wagga Wagga Rural Referral Hospital Stage 3**

Application

**other**

Climate zone

**4**

Storey

**Level 4**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	396m <sup>2</sup>		380m <sup>2</sup>		384m <sup>2</sup>		379m <sup>2</sup>		
Option B									n/a

Glazing area (A) 129m<sup>2</sup> ..... 175m<sup>2</sup> ..... 92.6m<sup>2</sup> ..... 131m<sup>2</sup>

Number of rows preferred in table below **10** (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)						
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m <sup>2</sup> )	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S <sub>H</sub> )	Cooling (S <sub>C</sub> )	Area used (m <sup>2</sup> )	Element share of % of allowance used
1	Strip Window	N		3.00	42.87		8.0	0.40				0.00	1.00	1.00	128.61	100% of 100%
2	Strip Window	S		3.00	30.87		7.6	1.00				0.00	1.00	1.00	92.61	100% of 100%
3	Strip Window	E		3.00	58.40		7.3	0.10				0.00	1.00	1.00	175.20	100% of 100%
4	Strip Window	W		3.00	43.80		8.0	0.15				0.00	1.00	1.00	131.40	100% of 100%
5																
6																
7																
8																
9																
10																

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