Finley Hospital Redevelopment

Concept Design Report

NSW HI

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→ The Power of Commitment

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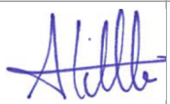
Final	1	T Little	A Upadhyay		T Little		
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Executive Summary

The NSW Government has committed $25 million to the Finley Health Service redevelopment, which will provide a high-quality contemporary health facility and ensure health care services are carefully planned to meet community needs now and into the future. The project is currently in the planning stage, with concept design report completed.

GHD has been engaged by NSW Health Infrastructure to complete Parts 1 to 9 (Electrical, Comms, Hydraulics, Mechanical, ESD, Acoustics and Traffic) for the Finley Hospital Redevelopment. This report is the Concept Design report outlining the key design criteria for the site. The report recognises the planning undertaken by the project Architect HDR, for option 1C issued to GHD on 26 September 2023.

Inspections of the existing Finley Hospital buildings engineering services infrastructure were undertaken on 30 March and 13 July 2023. This report is an extension of the previously issued Master Plan report.

Sustainability

A strategy and range of initiatives to support the sustainability outcomes sought by the various requirements are proposed. These initiatives will be assessed against whole of life principles and operational and environmental benefits prior to adoption.

The relevant regulations (incl. state planning requirements) and other drivers which collectively influence the sustainability response for the proposed development at Finley hospital are as follows:

- National Construction Code 2022 – Section J
- DGN 058 / ESD Evaluation Tool
- Environmental Sustainability Strategy 2022-2024 from Health Murrumbidgee Local Health District
- Secretary Environment Assessment Requirements (SEARS) (yet to be issued)
- Other drivers e.g., decarbonisation of the built environment

Electrical

Site electricity supply grading issues were identified during the latest site inspections. Therefore, the existing electricity supply infrastructure requires an assessment to be undertaken to confirm its suitability for continued use for the redevelopment. The assessment currently sits with the MLHD.

It is anticipated that the existing site supply infrastructure can be utilised for the redevelopment. However, an upgrade to the site main switchboard will be required to accommodate the PV installation connection, battery and future connections to a energy storage system (BESS), KWA and EV charging stations.

Generally new and reconfigured infrastructure will be provided for the new and refurbished areas of the redevelopment.

ICT

The existing communications room will be expanded in its current location. New racks will be provided with existing equipment transferred to the new racks. Rack-mounted UPSs will be provided.

Existing carrier lead-in cabling will be retained.

New horizontal Cat 6A FUTP cabling will be provided to all new communications outlets.

Hydraulics

Based on MLHD discussion hospital fixtures old and new will be served by a pressurised (booster) system. This will include a 5,000L (1900W x 1860H) break tank to comply with current standards.

The existing gas hot water unit will be replaced with an electric hot water unit (1930mm L x 1680mm H).

New downpipes will be provided to the new roof area.

Existing cold and hot water reticulation will be retained with new extensions connected for the new wet areas.

Existing sewer connection will be retained with new extensions connected for the new wet areas.

Mechanical

There is an existing VRF system serving the ED ward of the hospital that was installed as part of the 2018 works. It is proposed to retain this system and reconfigure the indoor units to suit any room changes in the area. Where additional indoor units are required to supplement the refurbishment and expansion, investigations will be undertaken to ascertain if the existing system has capacity for additional indoor unit connections.

The new IPU expansion will require a new VRF system to provide heating and cooling to the new patient rooms. External heat pump units are proposed to be located adjacent to the existing units serving the ED ward. Fresh air shall be provided by roof cowls and ducted to the various indoor units to provide fresh air to the spaces in accordance with the relevant standards and codes.

The medical imaging department shall have its own standalone heat pump air conditioning system, due to the differing operational hours of this department compared to ED and IPU. It is proposed to utilize ducted concealed indoor units connected to reverse cycle outdoor units, located in the area where the existing ED outdoor units are installed.

All new mechanical services and equipment are proposed to be supplied by a dedicated mechanical services switchboard. The switchboard shall have a connection to the existing FIP and shall be configured to trip non-essential mechanical services in the event of a fire signal.

Medical gases for the new and refurbished areas shall be provided by extending from the existing bottled oxygen supply, with necessary augmentations being provided to pipe sizes and manifolds to suit the new demand.
A new vacuum pump is proposed to supply medical suction to the various ward areas, due to the age of the existing system. Again, suction pipe augmentations shall be provided to meet the new demands from the refurbishment and expansion.

Fire

Wet Fire

In accordance with the BCA, a wet fire sprinklers system is not required for the extension and refurbishment works and will not be provided.

Dry Fire

The existing detection and emergency warning systems are in good condition and suited to be reused for the redevelopment. They will be reconfigured throughout the refurbished areas of the redevelopment and extended into new areas as required.

Traffic

There is sufficient parking on site to satisfy the existing demand. As the redevelopment scope is a refurbishment, there will be no impact on the traffic and parking demand on the site. Traffic and parking arrangements will remain unchanged. Some resurfacing and formalised parking line marking may be implemented subject to available budget.

Contents

Table index

Figure index

1. Introduction

1.1 Purpose of this report

The NSW Government has committed $25 million to the Finley Health Service redevelopment, which will provide a high-quality contemporary health facility and ensure health care services are carefully planned to meet community needs now and into the future. The project is currently in the planning stage, with concept design report completed.

GHD has been engaged by NSW Health Infrastructure to complete Parts 1 to 9 (Electrical, Comms, Hydraulics, Mechanical, ESD, Acoustics and Traffic) for the Finley Hospital Redevelopment. This report is the Concept Design report outlining the key design considerations and criteria for the site. The report recognises the planning undertaken by the project Architect HDR, and option 1C issued to GHD on 26 September 2023.

This report is an extension of the previously issued Masterplan Report.

1.2 Site Inspections, Stakeholder Consultation and Collaboration

Initial high-level consultation was undertaken with the site maintenance staff during non-invasive site inspections undertaken by GHD on Friday, 30 March 2023 and Thursday 13 July 2023. Engineering and ICT workshops were also undertaken with stakeholders on 13 and 14 September 2023, and regular Design Team Meetings.

Further detail consultation will be required throughout the delivery of the project.

During the Feasibility Development, Schematic Design and Design Development stages, GHD will consult with NSW HI, the MLHD users and maintenance personnel, industry and the wider project team to ensure the facility is developed to expectations addressing stakeholder, operational and ESD requirements.

1.3 Safety in Design

A Safety in Design workshop and risk assessment will be undertaken during the projects Schematic Development.

1.4 Scope and Limitations

This report has been prepared by GHD for NSW HI and may only be used and relied on by NSW HI for the purpose agreed between GHD and NSW HI as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than NSW HI arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and

information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

1.4.1 Scope

Part 2, Feasibility Development, presents an enhancement on the Master Planning to further refine the scope and to develop the cost plan to successfully steer the redevelopment through the Gate 1 at the completion of Feasibility Development. It identifies limitations in the existing infrastructure via site inspections, stakeholder consultation, and where available, review of existing “as built” documentation, and provides planning advice to project stakeholders and wider project team to inform design concepts for further development through Part 3, Schematic Development.

1.4.2 Limitations

This report is based on non-invasive site inspection undertaken by GHD on Friday, 30 March 2023 and Wednesday 13 July 2023, Engineering and ICT workshops undertaken with stakeholders on 13 and 14 September 2023, and regular Design Team Meetings.

2. Sustainability

The following chapter summarise the main sustainability requirements applicable to the small refurbishment spaces and extension. A strategy and range of initiatives to support the sustainability outcomes sought by the various requirements are proposed and summarised. These initiatives will be assessed against whole of life principles and operational and environmental benefits prior to adoption.

2.1 Sustainability requirements

The relevant regulations (incl. state planning requirements) and other drivers which collectively influence the sustainability response for the proposed development at Finley hospital are as follows:

- National Construction Code 2022 – Section J
- DGN 058 / ESD Evaluation Tool
- Environmental Sustainability Strategy 2022-2024 from Health Murrumbidgee Local Health District
- Review of Environmental Factors (REF) (yet to be issued)
- Other drivers e.g., decarbonisation of the built environment

2.1.1 Building Code of Australia - Section J

Section J in The National Construction Code (NCC) 2022 Volume 1 Building Code of Australia (BCA) sets the mandatory minimum energy performance requirements. The objective is to reduce building greenhouse gas emissions by efficiently using operational energy whilst maintaining comfort levels.

The building must as a minimum meet the requirements as set out in the NCC BCA Section J building fabric, glazing, building sealing, HVAC and light and power provisions.

Note that the project is targeting improved energy performance over the minimum code requirements. This is to support better operational performance outcomes and to address DGN58 performance requirements.

2.1.2 Design Guidance Note 058 (DGN 58)

Health infrastructure has introduced its own sustainability evaluation tool. The HI tool defines a range of principles and performance targets covering the design and major refurbishment of HI projects. DGN58 provides instructions on how to how to use the tool to evaluate the projects performance and describes the assessment procedure required by HI on all of its projects.

Health infrastructure has defined minimum targets, in alignment with the NSW Government Resource Efficiency Policy v2 section E4, for individual point categories.

Based on the location of our project the following requirements apply:

- A minimum of 45 points is to be achieved by the design in accordance with the Hi ESD evaluation tool. A preliminary strategy is proposed in appendix A.
- A minimum 10% improvement in energy efficiency compared to a baseline NCC section J compliance is applicable.

2.1.3 Local Health District Environmental Sustainability strategy

The Murrumbidgee Local Health District has produced a sustainability strategy for 2022-20224. The document follows the NSW government strategic commitments to achieve net zero by 2050 and the NSW health commitments around energy consumptions reductions to achieve a 10% reduction in electricity and gas use.

The plan identifies key sustainability actions:

- Energy use reduction
- Water consumption reduction

– Whole Of Life approach
– Waste reduction

2.1.4 NSW Government Resource Efficiency Policy

The NSW Government Resource Efficiency Policy (GREP) objective is to reduce the NSW Government's operating costs and lead by example in increasing the efficiency of its resource use. The policy includes measures and targets to reduce and report on energy, water, waste and air emissions from NSW government operations, including facilities. The policy includes a 10% energy improvement target. Relevant Policy requirements will be adopted as part of the design.

2.1.5 NSW Climate Change Policy

NSW Government have committed to reaching Net Zero by 2050. Whilst no formal target has yet been set by NSW HI, this project, in anticipation of a future target will opt to design and construct the project to be "Net Zero Enabled" to allow for future net zero operation with the use of 100% green power and offsetting residual emissions from waste and water.

2.2 Sustainability Initiatives

The requirements set in Chapter 2.1 have been used to inform the design response. The strategies summarised in the following section are to be considered, developed and documented as the design progresses. Verification of the measures will need to be made through the formal building certification and ESD validation process using the HI ESD validation tool to verify measures are implemented and sustainability performance goals achieved.

As the project is currently in concept design phase, a number of the proposed sustainability initiatives have been identified and are being considered for value management. This is the case for the stormwater retention. However the chosen design will need to meet statutory requirements as a minimum. As the design progresses a Whole of Life Approach to decision making will be followed. Removal of relatively inexpensive sustainable solutions will impact the overall building ESD targets. Discussion and coordination with the project team will be undertaken during all stages of the design to reconfirm the implementation of the selected strategies.

The current concept design scheme has been evaluated against the HI ESD evaluation tool in consultation with the disciplines and the architect. Comments and status of the targeted strategies have been included in the ESD schedule and provided at Appendix A of this report. Below is a summary of the current design ESD strategy:

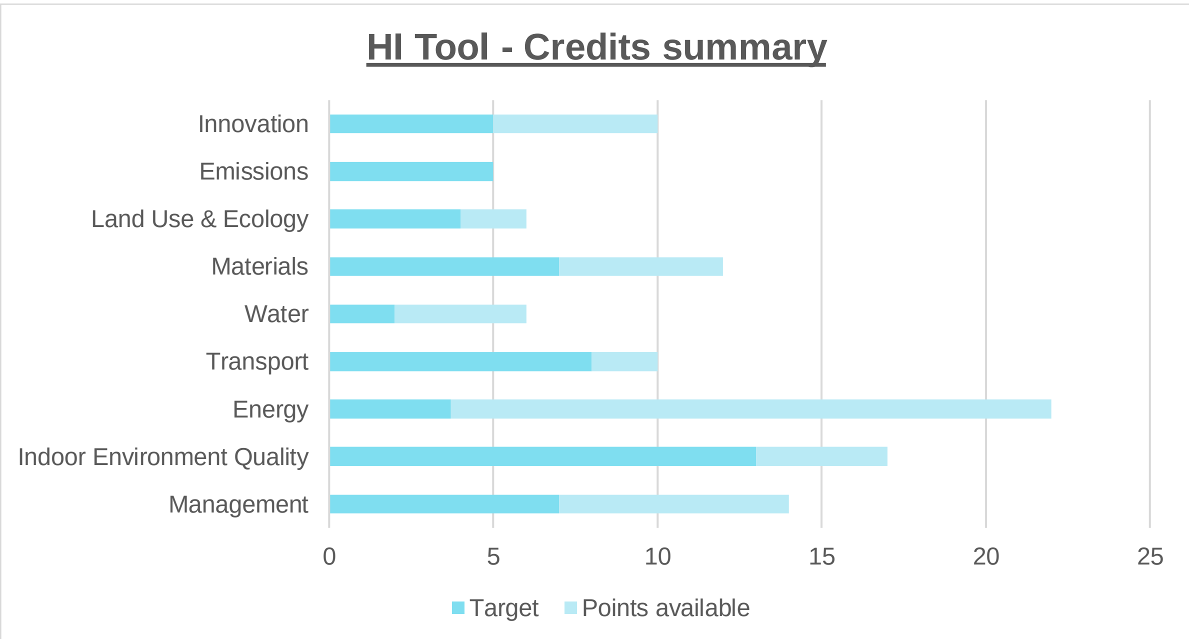


Figure 1 HI ESD tool – Current ESD strategy

Sustainability requirements include the continuous improvement of the HI portfolio through the application of ecologically sustainable development (ESD) and whole of life (WOL) principles with particular consideration to the following themes.

2.2.1 Management

The following initiatives are being targeted to demonstrate leadership by embedding commitments to targets over and above business as usual and using the HI ESD tool environmental rating system as means to verify that sustainability outcomes are implemented.

- Development is targeting 45 points using HI ESD framework.
- Adopting a “net zero carbon ready” design approach: HI Net Zero Road Map follows the NSW Government’s net zero plan to reduce emissions and achieve Net zero by 2050.

2.2.2 Indoor Environmental Quality.

Health and wellbeing of personnel and visitors shall be maximized through incorporation of outdoor space, facilities to support active living and implementation of measures to provide best practice indoor environmental quality. These may include the following strategies that will be investigated during design:

- Outdoor shaded landscaped communal areas where feasible.
- Bike racks to encourage active modes of transport.
- Nominating use of the low formaldehyde engineered timber and low volatile organic compounds (VOCs) materials to improve internal air quality.
- Use of natural daylight consistent with best practice thresholds for primary spaces where feasible.
- Designing internal spaces to have views to the outside.
- Control of external noise, building services noise, reverberation management and limiting sound transmission between internal spaces for acoustic comfort.
- Use of natural ventilation as part of a mixed mode system for ventilation and thermal comfort where feasible.
- Lighting designed to meet best practice illuminance levels and control glare.
- High performance building envelope to minimise heat losses and gains to provide thermal comfort.
- Air conditioning for primary and secondary spaces to provide year-round thermal comfort.

2.2.3 Energy

The project will target a minimum 10% reduction in electricity and gas use (for the spaces upgraded and the extension only – No changes will be applied to the building fabrics and services serving the existing spaces). The following strategies will be investigated further during the design to reduce energy consumption and generate power though renewable sources to contribute to operational carbon emissions reduction and reduce ongoing operating costs:

- The design will follow the energy reduction hierarchy in design of the buildings: energy conservation, energy efficiency, renewable energy and use of low or zero emission energy.
- The design will investigate the use of highly efficient thermal envelopes and glazing systems around the extension in combination with considered shading devices to effectively manage heating and cooling loads & energy consumption. The thermal envelope around the existing spaces part of the refurbishment will be insulated to section J.
- Building envelope considerations will include the following features to balance heat loads, glare and daylighting:
  - Walls, roofs and floors to be insulated to higher performance requirements than section J to reduce heat gains and support occupant thermal comfort.
  - Thermal mass to be made available to the internal spaces of the building by using a reverse wall construction with concrete, brick or blockwork available on the inside of the building to reduce peak

heating and cooling loads, peak electricity demand, reduce mechanical equipment size and reduce energy use where budget allows.

  - Shading to glazing using proprietary shades, overhangs which minimise solar heat gains.
  - Exposed areas of roof be light coloured roof with high solar reflectance and low emissivity.
- Building Services design targets improvement over minimum NCC Section J requirements as far as practicable to optimise energy efficiency. Design considerations will include:
  - All electric air conditioning using reverse cycle or heat recovery heat pump systems (for heating and cooling) with improved efficiency specified over NCC minimum requirements.
  - LED lighting with controls and lighting power densities improved over NCC minimums.
  - Electrification of domestic hot water using heat pump technology. Heat pumps offer one of the most efficient forms of hot water generation.
- Roof mounted onsite renewables with overall capacity up to 99kWp will be considered in design.
- Energy modelling will be completed during the design stage for the new building and confirm the new building initiatives are expected to result in energy reduction of more than 10% improvement over existing (for the upgraded spaces and extension spaces only). The project is targeting a 20% reduction in overall energy use for the HI ESD Tool assessment.

2.2.4 Transport

The following transportation related initiatives are to be developed:

- Electric vehicle charging provision and enabling infrastructure as per NCC J9 requirements.

2.2.5 Water

The project will target 15% reduction in water use. The following initiatives may be introduced in the design to reduce potable water usage through demand reduction measures and using rainwater capture and reuse for non-potable purpose:

- Waterless heat rejection
- Water efficient taps, toilets, showers and appliances
- Rainwater harvesting for irrigation and washdowns

2.2.6 Materials and resources

The design is to look into incorporating initiatives specifically targeted to reduce material waste, use and life cycle impact and manage waste during construction and operation. Initiatives for investigation include:

- At least 90% of waste generated from construction and demolition will be reused or recycled and the appointed contractor will develop waste management plans prior to demolition and construction activities.
- For demolition waste the following process can be applied:
  - Create a salvage list: Some of the construction elements that may be salvaged such as bricks, doors, windows, fixtures and architectural elements of interest. That may be carefully removed and store for future reuse.
  - Put forward a reuse program for salvaged materials; This may include reuse on site, establishing partnerships with local builders, contractors or organizations that specialise in reused materials.
  - Repurpose material from demolished building: For example, bricks can be cleaned and reused in new construction projects or reused for landscaping purposes.
- Use standardised approaches to manufacture and assembly leading to reduced material waste and construction time compared to onsite construction methods.
- Reducing Portland cement content through maximising use of supplementary cementitious materials where feasible.
- Maximising use of steel and timber sourced from certified environmentally responsible suppliers.

- Use of permanent formwork, pipes, flooring, blinds and cables to be free of PVC or PVC that meets the Best Practice Guidelines.
- Sustainable timber procurement with third party environmental certification schemes.
- Adequate waste storage facilities to enable effective separation of waste streams (and transfer stations for general waste, hospital waste and organics recycling) and ease of collection.
- Retaining elements of the building will make it harder to provide good daylight and make it difficult to decrease the existing hospital operational carbon but this aligns with promoting resource conservation and waste reduction. Where practically feasible and where budget allows, elements will be retained and upgraded for thermal performance and water/air tightness.

2.2.7 Ecology

The site should include a number of measures to support ecology and biodiversity:

- Retention of existing large mature native species trees where possible.
- Use of native vegetation in new landscaped area.

2.2.8 Emissions and discharges

Emissions and discharges from site shall be limited by the following initiatives where possible:

- Water sensitive urban design principles to be adopted to reduce stormwater flow and meet water quality targets.
- Design to minimise the use of refrigerants with high global warming potential and use only zero ozone depleting potential products.
- Light spill to neighbouring properties to be controlled.
- Light pollution to night sky to be prevented.

3. Mechanical Services

3.1 Introduction and Mechanical Scope

3.1.1 Referenced Documents

The following documents and standards will be referenced for the mechanical services design:

- National Construction Code (NCC) 2022.
- Australasian Health Facility Guidelines.
- NSW Health Engineering Services Guide – December 2022 version.
- Medical Gas Systems – Installation and testing of non-flammable medical gas pipeline systems: AS 2896.
- Mechanical ventilation and air conditioning: AS/NZS 1668.1-2015 and AS 1668.2-2012, as required by the Building Code of Australia.
- Microbial control in air handling and water systems: AS/NZS 3666.1-2011, AS/NZS 3666.2-2011.
- Ductwork Systems: AS 4254.1-2012 and AS 4254.2-2012.
- Refrigerants – Designation and safety classification: AS/NZS ISO 817-2015.
- Refrigerating systems and heat pumps - Safety and environmental requirements: AS/NZS 5149-2016:
  - Part 1: Definitions, classifications, and selection criteria.
  - Part 2: Design, construction, testing, marking and documentation.
  - Part 3: Installation site.
  - Part 4: Operation, maintenance, repair and recovery.
- Plumbing, drainage and water supply: To AS/NZS 3500 series (2021).
- Electrical installations: To AS/NZS 3000-2018.
- Electromagnetic compatibility of electrical and electronic apparatus: To AS/NZS 4251.1-1999 and AS/NZS 61000.6.1-2006.
- Degree of electrical protection (IP Code): To AS 60529-2004.
- Seismic restraints: AS 1170.4-2007
- Labelling and Identification: AS 1345-1995.
- Commissioning Codes: CIBSE commissioning codes, AIRAH DA27 Building Commissioning.

It is understood that there is a lack of existing as-built documentation, however as much of the existing systems are not anticipated to be retained in the expansion and refurbishment works, this is not envisaged to be a major concern.

3.1.2 Stakeholder Consultation

Initial high-level consultation was undertaken with the site maintenance staff to understand the existing types of mechanical systems at the hospital campus, however, further detailed consultation will be required to understand the existing systems performance and how they serve the various parts of the building and any limitations (if any). No detailed stakeholder consultation has been carried out to date relating to mechanical engineering services.

During the Feasibility Development, Schematic Design and Design Development stages, GHD will consult with NSW HI, the MLHD users and maintenance personnel, industry and the wider project team to ensure the refurbished area is developed to expectations addressing stakeholder, operational and ESD requirements.

3.1.3 Design Conditions and Criteria, Assumptions and Departures

The mechanical services design for the expansion and refurbished areas of the building will be based on the following design criteria and assumptions.

3.1.3.1 Design Conditions

The table below summarises design ambient and indoor conditions for the proposed mechanical building services installation.

Table 1 Design Conditions

Parameter	Design Criteria	
Ambient Design Conditions (for air conditioning plant full load performance)	Critical care areas, etc: – Summer: 43.7°C dry-bulb, 24.1°C wet-bulb – Winter: -0.3°C dry-bulb Remaining areas: – Summer: 39.6°C dry-bulb, 22.6°C wet-bulb – Winter: -0.3°C dry bulb minimum Based on AIRAH DA09 "*Comfort and Critical Outdoor Design Conditions – Air Conditioning Load Estimation*", 2000-2021 data set for **Deniliquin Airport**.	
Ambient Extreme Conditions (limits that air conditioning plant will continue to operate albeit at reduced capacity)	Summer: 48°C dry bulb. Winter: -10°C dry bulb.	
Internal Conditions (for air conditioning plant full load performance)	As outlined in AusHFG or Engineering Services Guidelines. Otherwise generally 22.5ºC dry-bulb, no active humidity control (anticipated range 30-70%).	
Air Conditioning System Controls Tolerance	As outlined in AusHFG or Engineering Services Guidelines. Otherwise ±1.5°C dry-bulb at point of control.	
Ventilation	Outside Air:	Based on most stringent of Engineering Services Guidelines and AS 1668.2.
	Exhaust Air:	Based on most stringent of Engineering Services Guidelines and AS 1668.2.
Supply Air	Air Diffusion Performance Index (A.D.P.I.) of not less than 0.80 at full or part load operation.	

3.1.3.2 NCC Requirements and Classification

GHD understand the building will be classified as the following, to be confirmed by the Building Certifier:

- Class 5 – Office/Administrative
- Class 9a – Acute Services, Hospital.

The mechanical services design will be carried out in accordance with NCC 2022 requirements.

3.1.3.3 HVAC System Life Expectancy

The design life expectancy of new HVAC services will be as follows, based on AIRAH DA19 and CIBSE Guide M as summarised in Table 2 below.

Table 2 HVAC Equipment – Life Expectancy

Equipment	Economic life (years)
Fans (ducted)	15 – 20
Ductwork	30 – 40
Air filters (dry media)	6 – 18 months (subject to environmental conditions)
Split system air conditioners	10 – 15
Variable Refrigerant Flow (VRF) systems	10 – 15

3.1.3.4 Infection Prevention and Control

The following infection control measures shall be considered for the expansion and refurbishment works:

– Outdoor air rates selected in accordance with ESGs, which generally are beyond the minimum requirements of AS1668.2 for increased dilution in improved air quality.

– Room differential pressures designed in accordance with ESGs, to control air movement and either contain contaminated air (i.e. negative pressure rooms) or prevent ingress of contaminated air (i.e. positive pressure rooms).

– Air filtration will be provided to the facility to comply with the minimum requirements outlined in AusHFG, ESG and AS1668.2. In general, there is a requirement for high-efficiency particulate filtration to the clinical areas to maintain clean air quality. This requires G4 pre-filters and F8 main filters generally to all clinical spaces.

– Maintenance cleaning provision designed in accordance with AS/NZS 3666 series of standards. This includes provision of fan coil units with access to coils, access to vermin mesh on cowls/louvres, and access to duct segments where moisture may collect.

– Provision of impervious linings on internal ductwork insulation, to prevent fibres dislodging and entering airstream, or prevent condensation within the insulation that could allow bacteria growth.

3.1.3.5 Ease of Maintenance

The following measures will be considered to facilitate ease of maintenance:

– Selection of mechanical system types that are serviceable in these regional areas.

– Minimise installing HVAC equipment that requires regular maintenance in the following areas:

  - In-ceiling spaces above high-traffic clinical areas which require maintenance personnel to be climbing ladders in these areas.
  - Rooftops or other locations where fall hazards are present.

– Provide sufficient clearances around equipment in plant rooms to allow safe egress and provide the required space for regular routine maintenance tasks and future plant replacement.

– Select equipment from reputable manufacturer's that are serviceable by local technicians. Select filter module dimensions that are commonly available.

3.1.3.6 Resilience

It is understood that there are no specific HVAC redundancy requirements for the general building HVAC services. Multiple units will be provided for any item of central plant to maintain partial capacity in the event of equipment failure.

Medical gases will be provided with N+1 redundancy provisions.

3.1.3.7 Environmental Considerations

The following environmental considerations will be factored into the design:

– Electrification – HVAC services to not use natural gas or LPG combustion for heating and domestic hot water purposes and rely solely on electricity for these services. In terms of heating plant, this removes consideration of gas-fired hot water boilers and focuses consideration on heat pumps.

– Refrigerant selection will be based on the equipment available on the market for the types of systems being considered. All refrigerants will be zero Ozone Depletion Potential (ODP), and where practical refrigerants with low Global Warming Potential (GWP) will be used. For split systems this is achievable with R32 which has a GWP of 675, however larger VRF systems typically continue to operate on R410A which has a higher GWP of 2090.

– Energy saving measures to be considered include the following:

  - Economy cycle used for some ducted air conditioning units, to use outdoor air to provide "free-cooling" when conditions suit. This is typically quite effective during shoulder seasons in regional Australian climates.

- Wide dead-band (or tolerances) for temperature control in areas that can accommodate this.
- Heat recovery systems can be used to transfer heat that would otherwise be rejected from the building to other areas of the building that require heating, as follows:
  – Heating/cooling systems, whereby areas that are in cooling reject their heat to areas of the building that require heating (e.g. VRF heat-recovery type systems).
- Maximising the benefits provided by the controls systems to incorporate:
  – Control strategies for the implementation of the above measures, and additional features which may include optimum start/stop, night purge, lockouts, etc.
  – Monitoring of HVAC plant for unusual and inefficient operation and providing alarms for maintenance personnel to attend to.

3.1.3.8 Proposed Mechanical Air Conditioning System

It is proposed to install VRF system for the IPU extension and refurbishment works, to provide heating and cooling to the various areas. These systems will consist of outdoor condensers located adjacent to the existing ED condenser units on the western aspect of the ED and shall reject/extract heat to/from the ambient air. Indoor units are proposed to be ducted type, with air filtration, ventilation rates and air change rates targeting the ESG requirements. Heat recovery type VRF is proposed to allow for simultaneous heating and cooling to be provided to suit the requirements of each indoor zone.

The imaging area shall be provided with a separate air conditioning system to the IPU, due to the different operational hours for this department and different envisaged heat loads for the space. The outdoor units for the system are proposed to be with the IPU outdoor units, on the western perimeter of the ED.

VRF systems have been implemented successfully in other regional NSW healthcare facilities and such systems have key benefits including:

– Lower capital cost and less complexity.

– Lower plant room space requirements.

3.1.3.9 Ventilation Systems

Ventilation covers the requirements of Engineering Services Guidelines (ESG) and AS 1668.2 for the supply of outdoor air to occupied areas and exhaust requirements from areas such as toilets, utility areas and certain clinical areas. Supply air and exhaust air systems shall be interlinked to prevent one system over or under pressurising in the event of a failure on the other system.

Outdoor air mechanical ventilation will be provided via passive roof cowls, which shall reticulate via ductwork to the indoor units serving the various areas of the expansion. Air filtration will consist of G4 pre-filters and F8 main filters, as required in the ESGs.

Exhaust systems will be provided for the following areas:

– WC's and ensuites – contain odours.

– Cleaners store – reduce spread of odours of chemicals.

– Dirty utilities / disposal rooms – reduce spread of odours.

– Isolation rooms (negative pressure) – reduce spread of infection.

– Triage and waiting rooms – reduce spread of infection.

Note: Where extraction fans are installed, the preferred option for makeup air is through door under cuts and or door transfer air grilles. Where fire doors are installed, intumescent type door grilles will be installed. Where room acoustic performance is considered important, make-up air may be via acoustic transfer ducts within roof space.

3.1.3.10 Smoke Management Systems

It is not anticipated that the new extension will be of a nature that a smoke management system will be required, but this will need to be confirmed as architectural design is developed.

3.1.3.11 Mechanical/Electrical

Mechanical systems for the new IPU and imaging wards shall be connected to a dedicated mechanical services switchboard, which shall be located local to the ward. It is proposed to wire the existing ED mechanical systems (VRF outdoor units, indoor units, and branch boxes) to the new mechanical switchboard, as they are currently connected to a non-essential electrical services switchboard in ED.

The new VRF system for the IPU expansion and refurbishment works shall be controlled via its own proprietary controller, with a central control panel proposed to be located in the staff bay area. The central controller will allow staff to alter setpoints, operational schedules and alert users of any units in a fault condition. The central controller will also have the functionality to control dampers and fans connected to the system.

3.1.3.12 Medical Gases

The new extension will have piped medical gases and suction to each area, as required by the AusHFG standard.

The required plant to supply the hospital extension will include:

– Central packaged medical vacuum unit that incorporates twin vacuum pumps under variable speed drive (VSD) control, receiver and filtration. This vacuum plant serves suction and scavenge reticulation.
– Zone isolation valve boxes to isolate supply to the extension area.
– Medical gases master alarm panel will be modified to include for the new IPU extension.

3.1.3.13 Acoustic design services

All mechanical systems specified for the new extension will be designed to meet any acoustic treatments required of relevant standards, through the inclusion of attenuators in ducted systems, acoustic louvres for plantrooms, etc.

3.1.3.14 Spatial Requirements

Mechanical

Required plant spaces for the mechanical services are as follows:

– Ceiling void height: There is a requirement for a minimum clearance of 600mm for services reticulation through ceiling spaces within the new IPU extension. Where there are beams, it is requested to have a minimum clearance of 400mm between underside of beam and ceiling.

4. Electrical

4.1 Introduction and Electrical and Communications Scope

4.1.1 Referenced Documents

The following documents and standards will be referenced for the electrical and communications services design:

- National Construction Code (NCC) 2022 including its referenced standards
- Australasian Health Facility Guidelines.
- NSW Health Engineering Services Guide – December 2022 version
- NSW Health Cabling and Equipment Room Standard – Version 2.1
- AS/NZS 3000 – Wiring Rules
- AS/NZS 3003 – Electrical Installations – Patient Areas
- AS/NZS 3009 – Standby Power Systems
- AS/NZS 2293 – Emergency Lighting and Exit Signs for Buildings
- AS/NZS 1768 – Lightning Risk Assessments
- AS/NZS 1680.2.5 – Interior Workplace Lighting: Hospital and Medical Tasks
- AS/NZS 11801 Series –Information Technology

4.2 Design Assumptions

The site maximum demand is calculated on the assumption that the existing staff accommodation building will be demolished on completion of the future key worker accommodation (KWA).

4.3 Electrical Supply Infrastructure

4.3.1 Incoming power supply

The electricity supply authority for Finley is Essential Energy (EE). There is a single span of overhead high voltage (HV) supply from Scoullar Street, along an apparent easement for a future road, to a pole mounted substation that supplies the site. The substation consists of a 22kV/400/230V 315 kVA pole mounted transformer that also supplies a large number of private consumers in the area in addition to the hospital site. The maximum LV fuse size for a 315kVA two circuit substation is 250A/phase. There are maximum demand indicators on the substation, however the maximum demand values are not legible from the level ground.

From the pole mounted substation, a low voltage (LV) underground service supplies a private electricity pillar within the site boundary.

Figure 2 22kV/400/230V Pole mounted substation

Figure 3 Underground service to private pillar

As the immediate increase in load will be modest, it is anticipated that augmentation to the existing EE supply infrastructure may be limited to a substation upgrade only. However, this is subject to confirmation of final loads including proposed imaging equipment and MLHD EV charging preferences.

If an upgrade is required, the existing arrangement will be augmented in accordance with EE requirements to accommodate the revised maximum demand. GHD will undertake the Level 3 EE design scope associated with the upgrade.

4.4 Electrical Reticulation Infrastructure

There is an existing site main switchboard (MSB) and generator located to the eastern end of the facility adjacent the maintenance workshop. The site MSB supplies the main distribution switchboard (MDSB) located in the old reception area, in the vacated portion of the main hospital building. The MDSB then supplies the distribution boards throughout the site.

4.4.1 Existing Grading Issues

The Finley redevelopment project is hopeful of retaining the existing electricity supply arrangements, however there are existing grading issues between the incoming supply to the site MSB, the supply from the MSB to the MDSB and submains from the MDSB that need to be resolved. The site MSB will be modified/upgraded to accommodate additional connections.

The existing supply is limited to 160A/phase at the MSB. There are submains to the Consult DB supplied from the MDSB that are protected by circuit breaker set to 300A/phase. Therefore, if there is a fault on the supply to the consult area, the main supply breaker will trip before the submain breaker. In this event, the generator will detect a loss of supply and start up. When supply transfers to the generator, the automatic transfer switch (ATS) will close in on the fault, dropping the generator out as well.

An assessment of the grading issues needs to be undertaken by confirming the Essential Energy supply fuse size, current carrying capacity of the consumer mains from the substation fuses to the site main switchboard, current carrying capacity of the submains from the site main switchboard to the adjacent ATS, and the capacity of the supply cabling from the ATS to the MDSB.

In addition, the size of the supply from the MDSB to the consult DB should also be confirmed for capacity as they are nominated as 50mm² which has a current carrying capacity of 146A but according to the 'as installed' drawings, are protected by 300A setting on the 400A circuit breaker. The existing supply arrangement poses operational and safety risks should a fault occur, and a full grading study of the existing supply arrangements should be undertaken.

4.4.2 Anticipated Maximum Demand and Load Profile

The previous 12 months metering interval data indicates a maximum demand of 106 kVA or 150 amps per phase. As a part of extension and refurb works, there will be a small increase to the maximum demand in the vicinity of 55 amps per phase due to the electrification of the domestic hot water plant and a modest increase in floor area. However, additional demand may be created subject to verification of MLHD EV charging preferences. There is also the inclusion of the KWA building that will need to connect to the site MSB. The maximum demand assessment assumes that the existing staff accommodation will be decommissioned when the future KWA facility is provided.

4.4.3 Reticulation of incoming and consumer mains

From the pillar, underground consumers mains supply a site main switchboard (MSB) located at the eastern end of the building adjacent to the maintenance workshop. This arrangement is likely to be retained, however modifications to the site MSB will be required to accommodate a new circuit breaker to supply the PV, future battery, future KWA and potentially for EV charging facilities.

4.4.4 Main switchboard, power factor correction and metering arrangements

As a part of redevelopment works, the existing site MSB will need to be upgraded in its existing location outside the eastern end of the building adjacent the generator. Connections in this location is so the services are not supplied from the generator. The upgrade will consist of:

– New connection for the KWA
– New connection for the Roof-top PV installation
– Provision for a future battery energy storage system (BESS) connection

– Potential new connection for EV charging facilities

The MSB contains the retail metering which will also be retained. The multiple earth neutral (M.E.N.) point resides in the site MSB and will be retained.

The existing consumer mains will need to be assessed for suitability for the anticipated increase in load. The supply breaker and cabling infrastructure between the MSB and the MDSB will also need to be assessed for capacity.

The MDSB, located in the disused original main entry, is not accommodated in 2-hour fire rated enclosure, and is concealed behind a roller door, which is not in accordance with NSW HI ESG requirements. There is no safety services section in the board, however there will be no requirement for the inclusion of a safety services section due to the absence of AS/NZS 3000 safety services proposed within the building.

There are two existing spare circuit breakers in the MDSB. Consultation with the switchboard manufacture informs that there are two additional spare pole spaces that can accommodate new circuit breakers, facilitating a maximum of 4 additional connections to the MDSB.

It is anticipated that the project will only require one additional supply from the MDSB for a new connection to the new mechanical services switchboard to be located in the IPU extension.

The supply to the existing X-Ray will be transferred from the existing X-Ray machine to its new location.

It is anticipated that the existing mechanical services supplied from the BD ED Non-essential switchboard will be transferred to a new mechanical services switchboard, freeing up 16 pole spaces in the DB non-essential switchboard. The DB ED boards will then be relabelled DB Essential 1 and DB Essential 2 to align with the NSW HI ESG.

It is assumed that the supply to the existing Staff Accommodation will be removed from the MDSB on completion of the future KWA. Ideally, EV charging will also be connected to the site MSB so it is not supplied from the generator.

Power factor correction will be retained in its existing location subject to the communications room expansion requirements.

Figure 4 ***Existing main distribution switchboard (MDSB)Standby Power System***

The existing generator is rated for 150kVA (standby) and is sized for the anticipated maximum demand. It is located adjacent the maintenance workshop at the eastern end of the building and provided with a canopy to protect it from the elements. The site is currently fully backed up by generator. Therefore, there are no separate essential/non-essential distribution systems on the site which aligns with the MLHD preferences. The existing generator and site MSB will be retained subject to final confirmation of loads.

It is likely that a central UPS would not be justified, and that rack-mounted UPSs will be provided in the communications room to support ICT services continuity. A packaged UPS will also be provided for the BMS head-end if a laptop computer is not considered appropriate.

UPS for X-Ray will be confirmed subject to confirmation of X-ray requirements which are still to be advised.

4.4.5 Distribution boards

DB Non-essential and DB Essential, located in the ED, will be reconfigured to remove supplies to mechanical equipment from the board to separate mechanical services loads from clinical services loads. DB Essential and DB Non-essential will be renamed DB Essential 1 and 2 respectively.

General power protection will be in accordance with AS/NZS 3000. All remaining DB's in areas where no new works will be undertaken will remain unchanged.

4.4.6 General Power

The redevelopment consists of an expansion of IPU to west and new/refurbished FOH and Imaging. Within these areas, all new electrical infrastructure will be provided. The migration of mechanical services from the existing boards to dedicated mechanical services board will free up sufficient pole spaces to accommodate all general power and lighting to be supplied from DB Essential 1 and 2.

Body protected power will be provided in accordance with the AusHFGs and AS/NZS 3003.

4.4.7 Lighting and Lighting Control

All new internal and external LED lighting will be provided to the new extension and refurbished areas. The central corridor will also be upgraded with new LED lighting to match the new areas. Automated lighting controls will be proposed in accordance with AS 1680 series of standards and in accordance with the NCC section J, project ESD initiatives and in consultation with stakeholders.

4.4.8 Emergency and Exit Lighting

As a part of redevelopment works, all new emergency lighting and exit signs will be provided to the new and refurb area in accordance with the NCC and AS/NZS 2293. Emergency lighting will be non-monitored to match the existing installation.

Existing emergency lighting within the ED area will be reconfigured to comply with AS/NZS 3000 as it is currently non-compliant.

4.4.9 PV installation

It is proposed that a 99kW roof-mounted PV installation is provided to align with the project ESD initiatives. Final sizing will be subject to further analysis and the availability of suitably oriented roof space.

The PV array will connect into the existing MSB. Appropriately ventilated spatial provisions will need to be provided in the adjacent plant room for the inverters. External inverters may also be considered.

4.4.10 Lightning protection

Secondary surge protection will be provided to new distribution boards.

4.5 Communications

4.5.1 Carrier Connections

There is Telstra and NBN lead-in cabling servicing the site from separate pits on the southern side of Dawe Avenue which, as advised by MLHD is adequate for the current function of the facility. The MLHD also advises that the relocation of imaging will not place any additional demand on the existing bandwidth.

There is a pole mounted Vertel microwave link that will remain.

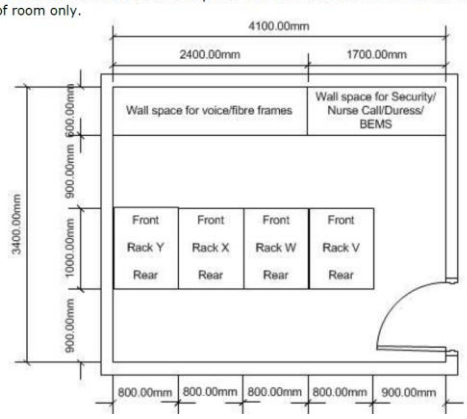
4.5.2 Communication Room and Distributors

The existing main equipment room (MER), located in the unused portion of the main hospital building, appears to be at capacity. It is proposed to expand the comms room in its existing location by utilising adjacent rooms and cupboards as expansion areas.

The expanded comms room will accommodate new racks in accordance with NSW HI Cabling and Equipment Room Standard version 2.1. providing a telecommunications room for servicing up to 3000m² of usable floor area.

Figure 5. TR servicing up to 3000sqm of usable floor space

Notes:
1. Typical load would be a 9-12Kva for power and 9-12Kva for HVAC for NSW Health data side of room only.



Telstra lead-in, NBN lead-in terminations will relocate within the new equipment room as required. The existing phone system is at end of life and requires replacement. As this is active equipment, the replacement will be by the MLHD.

4.5.3 Redundant power to racks including UPS

Two electrical supplies will be provided to each rack. One supply in each rack will be routed via a rack mounted UPS. Additional UPS requirements will be determined in consultation with stakeholders.

4.5.4 ICT Cabling

Stakeholder consultation informs that the available bandwidth within the existing lead-in cabling is sufficient for the current operations.

The new extension and refurbished areas will incorporate Cat6A ICT cabling complying with NSW HI Guidelines. From the comms room, horizontal cabling will extend to telecommunications outlets to the new extended and refurbished areas. Services will include (but not limited to) the following:

- Telecommunications outlets
- WiFi outlets
- Medical equipment
- Mechanical equipment
- Monitoring equipment
- Patient Entertainment systems (IPTV)
- A/V systems
- Hearing augmentation
- Security system
- Nurse call system

Additional conduit infrastructure will be provided from the building, terminated and marked outside the perimeter of the building to distribute future communications cabling to the wider campus should it be developed. However, future campus buildings should incorporate their own processing capacity to maintain LHD ICT security requirements.

4.5.5 Message Integration Engine

There is an existing message integration engine (MIE) that will remain in place. Reconfiguration of the MIE will be undertaken by the MLHD.

4.5.6 Nurse call systems

The existing Rauland Responder nurse call system will be reconfigured and extended as required to align with AusHFG requirements. Annunciator panels and corridor indicator lights will be located throughout the new and refurbished areas to the user's requirements.

The existing head-end equipment will need to be relocated within the refurbishment area.

4.5.7 Security systems

There is an existing Inner Range Integriti system installed in the refurbished ED reception which will be reconfigured and extended as required subject to stakeholder consultation. There is also an Ekahau duress alarm system.

Systems will include access control and monitoring systems as follows:

– Security alarm system
– Electronic access control system
– Fixed duress
– Wireless duress
– Closed circuit television (CCTV)
– Video intercom – generally for entrances, deliveries, pharmacy etc.
– Key safe

The existing head-end equipment will need to be relocated within the refurbishment area. The security alarm systems are provided with battery back-up and interface with the BMS. A security credentials terminal will be provided at a location agreed by the MLHD.

4.5.8 Clocks

The building is not proposed to include networked clock system.

4.5.9 Public Address System

The building is not proposed to include a public address system.

4.5.10 Spatial Requirements

ICT

– Communications Room (MER): 4.1m x 3.4m - 2 hour fire rated .

5. Hydraulic and Wet/Dry Fire Systems Services

5.1 Introduction and Hydraulic and Fire Scope

5.1.1 Reference Documents

The following standard and documents will form the basis of the Finley Hospital Redevelopment design:

- NSW Health Infrastructure Engineering Services Guidelines 2022
- Australasian Health Facility Guidelines (AusHFGs)
- National Construction Code (NCC) 2022
- NCC Volume 3 Plumbing Code of Australia (NSW) 2022
- Australian Standards (AS) 3500:2021 - Plumbing and drainage
  - Part 1: Water services
  - Part 2: Sanitary plumbing and drainage
  - Part 3: Stormwater drainage
  - Part 4: Heated water services
- AS 1670.1:2018 – Fire detection, warning, control and intercom systems – System design, installation and commissioning
- AS 1851:2012 – Maintenance of Fire Protection of System and Equipment
- AS 2419.1:2021 – Fire Hydrant Installations – System Design, Installation and Commissioning
- AS 2419.2:2009 – Fire Hydrant Installations – Fire Hydrant Valves
- AS 2419.3:2012 – Fire Brigade Booster Connections
- AS 2441:2005 – Installation of Fire Hose Reel
- AS 2444:2001 – Portable Fire Extinguishers and fire blankets selections and locations
- Site Survey Drawings
- Architectural Masterplan

5.1.2 Stakeholder Consultation

As a result of a consultation with Murrumbidgee LHD (MLHD) on 13th September 2023, the following was determined.

- Water is pumped to an overhead water tank tower which serves only older flush valve toilets (approximately 6 units). Other fixtures are served by a pressurised (booster) system.
- The tower and timber platform have reached their end of life and need replacement. MLHD proposed demolishing the tower and platform and replacing them with a pressurised (booster) system for the hospital. Including the replacement of flush valve toilets. This work is not directly linked to redevelopment so will be budget dependent.
- GHD proposed to demolish all legacy/redundant pipes in the ceiling space.
- Gas hot water unit at back of house (BOH) to be replaced with electric unit.
- Existing sewer connection will be retained with new extensions connected to it for the new wet areas.
- Gas supply from Dawe Avenue to the boiler room and kitchen will be retained. The gas supply going to the boiler room will be capped for future use.
- No sprinkler system on site. Sprinklers will not be added to the extension.

- Three (3) existing single pillar hydrants on site will be replaced with twin hydrants. Additional hydrants will be provided if hydrant coverage is not sufficient. As advised last DTM meeting 28th September, BMG advised that one existing fire hydrant is within the 10m distance to the new IPU extension and will need to be relocated.
- New FHR will be provided to IPU extension. FHR should be within 4 meters of an exit. Provided system coverage can be achieved.
- Confirmation received that Local fire station is not permanently staffed.
- MLHD advise concerns regarding fire safety certification noting that annual certification is becoming more challenging. MLHD advise that HI Facilities Compliance will be able to provide additional advice.
- GHD advise that design certification will be provided to all new works only. Existing services will continue to be considered compliant for the time installed.
- FIP compliance will need to be considered with redesigned fire compartments.
- New fire wall and fire compartmentation will need to be assessed by the building certifier (BMG).

5.1.3 Design Criteria and Assumptions

The hydraulic services design will be based on the following design criteria and assumptions.

Domestic water supply

The domestic hot and cold-water flow rates for sizing of building internal water supply systems shall be determined by the water fixture demand method provided in AS/NZS 3500.1.

Domestic hot and cold water will be reticulated to all sanitary fixtures, fittings and tapware via a local service valve to facilitate minimum disruption during maintenance and allow for subsystem isolation.

To ensure the water supply remains uncontaminated, any fixtures within potential hazard areas shall have backflow prevention valves installed in accordance with AS/NZS 3500.1. Backflow preventions valves like thermostatic mixing valves (TMV's) and tempering valve (TVs) will be provided and fully monitored.

The water reticulation system will be sized to a maximum velocity of 1.5 m/s for mains and 1.3 m/s for branches.

The system will be designed to insure that all fixtures will have a pressure of no less than 250 kPa.

The maximum pressure anywhere in the system shall not exceed 500 kPa.

Table 3 Minimum WELS Ratings for Sanitary Fixtures and Fittings

Fixture	WELS Rating
Basins	4 Star
Showers	3 Star
Toilet Pan	4 Star
Sinks	4 Star

Sanitary drainage

The sanitary drainage system will be designed to meet the requirements of AS/NZS 3500.2.

Sanitary plumbing and drainage for all drains, vents, fixtures, and fittings will be designed as a conventional gravity system. This will then be connected to the existing sewer connection located outside the hospital. An inspection opening will be provided to the surface for the ease of maintenance.

All sanitary drainage shall be designed to comply with AS/NZS 3500.2 and local authority requirements.

Roof rainwater

The roof rainwater collection and reticulation design are based on the roof catchment area and climate information data from the Bureau of Metrology with the nearest weather station being Finley ambulance station NSW Station number 073037.

Roof rainwater will be captured via a system of eaves gutter and strategically placed downpipes. The system shall be designed to cater for the 1:20 year ARI storm event for eaves gutter.

The roof rainwater and downpipe system shall be provided throughout the building and in accordance with the requirements of AS 3500.3.

BCA Requirements

New fire wall and separation will be provided to separate the new and old areas of the hospital.

There will be no sprinkler requirements for the hospital. This will be confirmed by the certifier on the next stage.

5.2 Proposition

5.2.1 Incoming water supply

The Hospital has three incoming mains water supplies: filtered water (Ø100), raw water (Ø80), and fire water (Ø100) supply. All water supplies come from Dawe Avenue. These incoming mains will be retained, and upgrade of pipework is not required. The pressure and flow within the mains water is unknown.

The filtered water supplies the hospital fixtures - using a pressurized (boosted) system and the overhead water tank - using a gravity feed system.

As per Council requirement, water cannot be pumped directly from the property service connection without Council approval. Direct boosting has the potential to generate nuisance or damage in the Council network or surrounding property services.

As advised by the Council, the pressure is low on site and tanks and pumps are required. A 5,000L break tank will be provided to comply with the Council requirements and the existing booster pump will remain. This is to be confirmed upon receipt of the updated pressure and flow from the Council.

During the stakeholder’s presentation it was noted that the overhead water tank is supplying the 6 units of flush valves toilets. Because this work is not directly related to redevelopment, this will be confirmed in the next stage.

5.2.2 Sewer connection

All sanitary plumbing and drainage from the expansion of IPU and new FOH, will run by conventional gravity drain to the existing sewer infrastructure. As per the survey plan provided, there are several sewage inspection chambers installed on the site to which the new building will be connected.

The integrity of the existing inground sewer pipes have been determined using CCTV drainage inspections. Refer to Figure 5. This shows that most of the sewer joints have intrusions of tree roots and the existing sewer pipes have reached the end of life and need replacement.

It is proposed to install new sewer inground piping to ensure the pipe’s integrity. The proposed drainage will be extended to serve the proposed wet areas as required.

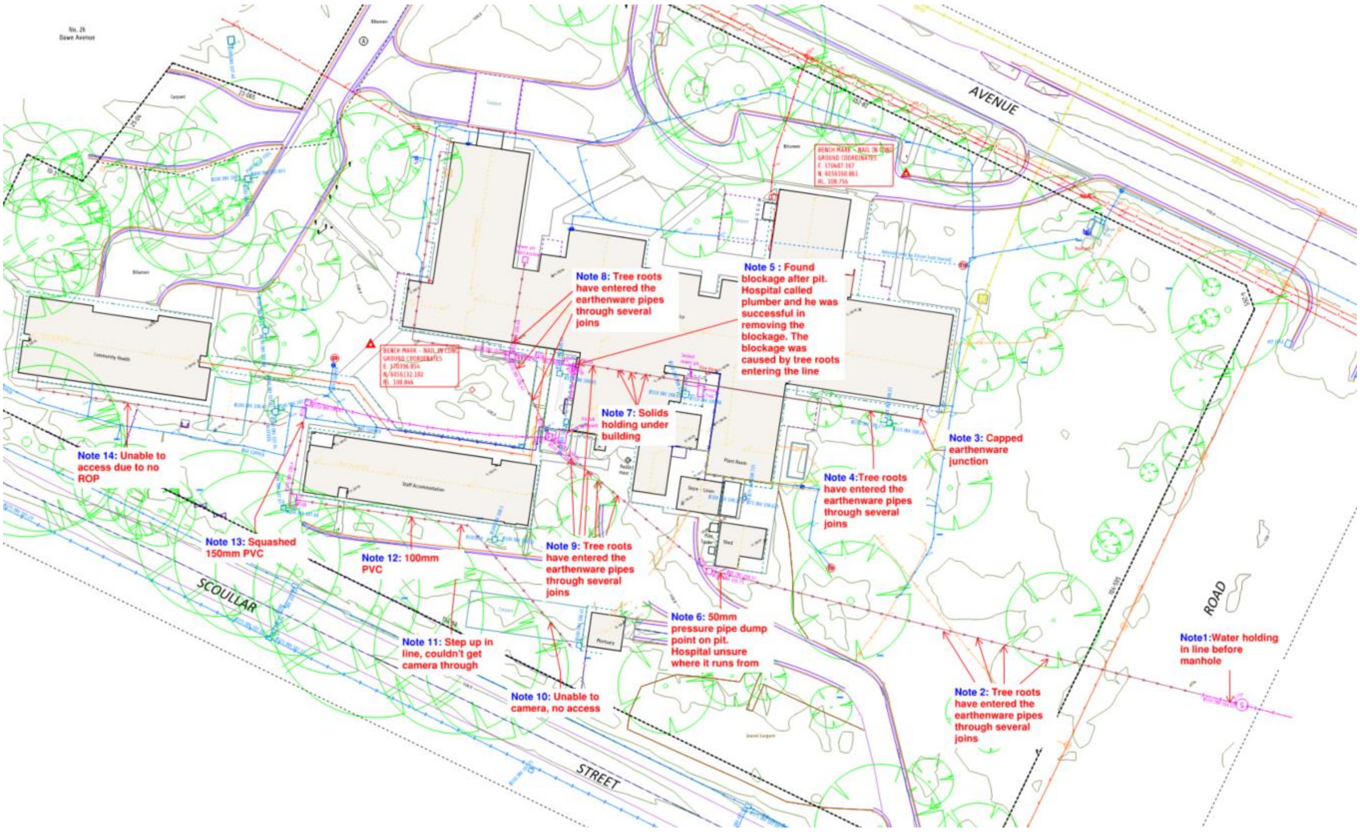


Figure 5 CCTV drainage investigation results

5.2.3 Stormwater connections

(note: stormwater drainage to be completed by the civil engineer)

The collection of roof water will be reticulated throughout the site within in-ground drainage pipes (material proposed to be PVC-U) connecting to the civil infrastructure drainage system which discharges into the council stormwater system. In suitable locations clear outs will be incorporated for maintenance and clearing of the system in the event of blockages.

5.2.4 Fire mains

There is an existing fire brigade booster main that will remain in place. There will be no reconfiguration required for this item.

5.2.5 Hydrant and hose reel system

There are currently fire hydrant and fire hose reel installed throughout the hospital. The location of existing fixtures will be assessed to determine whether adequate coverage can be achieved based on the new layout. If there are any shortages identified, they shall be addressed through additional fire hose reel or a possible alternate solution.

One existing fire hydrant is within the 10m distance to the new IPU extension and will need to be relocated. The single pillar hydrant will be upgrade to twin-pillar hydrants to comply to current standard. The fire hose reel should be within 4 metres of an exit.

Figure 6 ***Existing single pillar fire hydrant the differs from the dual pillar fire hydrant specified in the fire hydrant block plan***

5.2.6 Fire sprinkler system

There is currently no fire sprinkler protection system for the hospital. As a part of redevelopment works, a sprinkler system will not be provided same as the existing.

5.2.7 Fire detection and alarm system

There are smoke and heat detectors throughout the site. Most of the existing fixtures looked new as some of the areas were recently refurbished. All the detectors and speakers need to be replaced and relocated to the new hospital.

5.2.8 Fire panels

The Fire Indicating Panel and EWIS panels are located in the foyer next to the Main Switch Board in the main building. The panel is from Notifier and is nearly end of life. It is proposed that the FIP panel will be replaced and will be relocated to the entrance of the new building.

5.2.9 Hot water systems

It is proposed the type of hot water generation system would be a twin element electric water heater. This will be sized similar to the existing unit. This will replace the existing gas water heater.

5.2.10 Trade waste

The building is not proposed to include upgrading the existing grease trap.

5.2.11 Sanitary plumbing system including sanitary fixtures and fittings

New fixtures units will be provided for the IPU and FOH wet areas and will have applied water saving principles. The design intent is to connect to the closest base building drainage pipework. Proposed drainage will be extended to serve the IPU and FOH wet areas. Additional venting requirements will be provided as required.

5.2.12 Authority main gas supply including site reticulation

No works are required on the authority main gas supply. The gas supply within the hospital will still remain in order to keep the kitchen burners operating. Gas supply to the boiler room supplying the existing gas hot water will be capped for future use.

5.2.13 Domestic hot and cold water reticulation systems, including fixtures to bathrooms

Reticulation of domestic hot and cold-water pipework within the building will be located within the ceiling space, with pipework dropping in walls or specific services ducts to serve wet areas. For safety and ease of maintenance, stop valves will be provided in wall boxes at a height accessible by maintenance personnel standing on the ground floor.

In areas such as dirty utilities that require zone protection, backflow prevention valves will be provided, suitably drained and located for ease and safety during servicing. Hot water will be provided where required.

A branch connection will be provided off the base building hot and cold-water supply. This will then be connected to the new fixtures for IPU and FOH.

Type B copper pipework is proposed for cold and hot water. Hot water will be insulated against heat loss. TMV's will be provided for all ablution fixtures to suit HI requirements. TMV's will be monitored in accordance to AusHFG.

5.2.14 Rainwater gutters and downpipes to main stormwater lines (note: stormwater drainage to be completed by the civil engineer)

The basis of design for calculation of roof water flows, gutter and downpipe sizes will be in accordance with AS/NZS 3500.3. Box gutters are not recommended and also not supported by HI.

Eaves gutter water flow calculation will be based on 1:20 year flows and will incorporate free edge overflow so that overtopping of gutters will not result in water entry into the building.

5.2.15 Fire water reticulation

Water supply pipes for the fire systems will be sourced from the council water main. As a duty of care, fire water main pressure and flow from the Council will be assessed to ensure that it is still compliant within the standard.

5.2.16 On-site water storage

Upon evaluation of the current condition of the site water system and consultation with MLHD, it is proposed to remove the on-site water storage tanks and assess the hospital water main to determine if it is needed to be upgraded with the redevelopment. This will be confirmed on the next stage.

5.2.17 Water treatment

The building is not proposed to include any water treatment.

5.2.18 Manual and automatic fire suppression systems including:

5.2.18.1 Fire extinguishers

Portable fire extinguishers and fire blankets will be provided to comply with the NCC, AS2444.2001. These are provided with the intent of being able to used by suitably trained staff as an initial emergency response. Fire extinguishers are best located along the path of travel to exits that would be used in a fire and also adjacent plant or equipment by their nature regarded as a potential fire source.

5.2.18.2 Fire hose reel systems

The fire hose reel shall be connected to the potable water supply. The fire hose reels will be provided to fully protect the new building and fire hose reels will be located within 4 metres of required exits, in accordance with AS 2441.2005 and AS 1221.1997. Fire hose reel coverage through fire compartment walls is not permitted. These maybe removed as an alternative solution, depending on the advice of BMG.

5.2.19 Spatial Requirements

Hydraulics

- New domestic 5,000L break tank will be provided to comply with council standard. The spatial requirement for the tank is 1900W x 1860H and will need to be located beside the existing booster pump with space for circulation.
- The existing gas hot water unit will be replaced with electric hot water unit (1930mm L x 1680mm H)

Dry Fire

– FDCIE – Appropriate cupboard or wall space in the building entrance to accommodate FDCIE and EWCIE. Finley will require 1-2 panels 600mm wide with a minimum clearance of 1m in front and 0.5m to each side.

6. Acoustic Services

6.1 Introduction

All aspects of the Finley Hospital redevelopment acoustic design will be completed in accordance with the NSW Health Engineering Services Guide (NSW Health 2022) which includes:

– Environmental noise.
  - Environmental noise emission.
  - Environmental noise intrusion.

– Building services noise and vibration.

– Architectural acoustics.
  - Internal design noise and vibration levels.
  - Internal acoustic isolation.
  - Room acoustics.
  - Vibration and structure borne noise.

6.2 Acoustic design criteria

6.2.1 Noise emission from use

All new or redeveloped facilities will be designed so that operational noise emissions and impacts on neighbouring noise sensitive receivers comply with project specific criteria established in accordance with the requirements of the NSW planning and development assessment process.

Noise generating sources and activities that are anticipated to be present at the hospital include (but are not limited to):

– All external mechanical plant (including emergency/ standby plant).

– Workshop areas.

- Loading dock areas.
- Car park noise.
- Noise from road traffic generated by the facility.
- Noise from emergency helicopter flights associated with the facility.
- Medical imaging (and associated) equipment.

6.2.1.1 Noise Policy for Industry

Noise emission must comply with the requirements of the New South Wales Noise Policy for Industry (NPI) (EPA 2017). The NPI sets out the procedure to determine the project noise trigger levels relevant to a particular development. The project noise trigger level is the lower of the project intrusiveness noise level (determined by background noise logging) and the amenity noise level (determined by the planning zoning of the nearby sensitive receivers).

Background noise logging will be undertaken to set project specific noise criteria and satisfy the requirements of the NPI.

The objectives of project noise trigger levels (PNTL) for industry are to balance the need for industrial activity with the community's desire to minimise intrusive noise.

It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location. To ensure these objectives are met, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The intrusiveness noise levels apply over 15 minutes in any period (day, evening or night) and aim to control the relative audibility of operational noise compared to the background level at residential receivers.

The amenity noise level limits the total level of extraneous noise for all receiver types and is assessed over the entire assessment period (day, evening or night). Both the intrusiveness and amenity noise levels are calculated and the lower of the two in each time period is set as the PNTL. For the purposes of assessment to standardise the approach the NPI recommends that the $L_{Aeq(15min)} = L_{Aeq(period)} + 3$ dBA unless an alternative approach can be justified.

6.2.1.2 Intrusiveness noise level

The intrusiveness noise level is determined by a 5 dB addition to the RBL with a minimum intrusiveness noise level of 35 dBA for the evening and night period and 40 dBA for the day period. The NPI recommends that the intrusiveness noise level for the evening and day period should not exceed the daytime period. The intrusiveness noise levels are only applicable to residential receivers.

6.2.1.3 Project amenity noise level

The recommended amenity noise level applies to all industrial noise in the area which when combined should remain below the recommended amenity noise level. The recommended amenity noise level represents the total industrial noise at a receiver location and a Project Amenity Noise Level is set at 5 dBA below the recommended amenity noise level.

Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses and the existing level of noise from industry and road traffic. With consideration to the NPI 'noise amenity area' classification, the residential receivers identified are classified as 'Suburban Residential' as per the NPI.

6.2.2 Noise emission from construction

Noise and vibration associated with the construction works will be assessed in accordance with the methods outlined in the following documents:

- Interim Construction Noise Guideline (EPA 2009).
- Construction Noise and Vibration Guideline (TfNSW 2022).
- Road Noise Policy (DECCW 2011).
- Assessing Vibration: A Technical Guideline (EPA 2006).

These documents provide methods to determine noise management levels for construction works to reduce impacts onto nearby sensitive receivers. The methods recommend background noise monitoring to determine site specific noise management levels.

Background noise logging will be undertaken to set project specific noise management levels.

6.2.3 Environmental noise intrusion

All elements of the building façade will be considered to control external noise entering the hospital. Sound insulation performance requirements for each element will be nominated based on the external noise sources that surround the building and any known future noise sources. The assessment will consider the following external noise sources:

– Steady state / continuous noise sources such as free flowing traffic or mechanical services.
– Intermittent noise sources such as aircraft, trains, driveways or loading docks. Intermittent noise sources have the potential to disturb sleep.
– Emergency helicopter noise.
– Rain noise.
– Emergency plant.

Internal noise requirements are provided below in Table 4 Acoustic requirements for areas affecting patient care hospitals and outpatient .

6.2.4 Building services noise and vibration

6.2.4.1 Mechanical and hydraulic services

Internal noise levels due to mechanical plant and hydraulics will be assessed to ensure they do not exceed the maximum allowable internal noise levels (recommended in the NSW Health Engineering Services Guide) considered in aggregate with noise from steady state / continuous external noise sources.

Internal noise levels in occupied spaces will be designed so that no tonality or annoying characteristics are present.

The following mechanical and hydraulic items will be considered (but not limited to):

– Plant noise levels.
– Down duct noise transmission.
– Aerodynamic noise and air velocities (regenerated noise).
– Duct breakout noise.
– Duct break-in noise.
– Reverberation minimisation inside plant rooms.
– Cross talk.
– Mechanical penetrations.
– Strategic location of plant and ductwork (such as fan coil units to be installed in corridors not inside rooms, and main ductwork to be installed in corridors and not between rooms).
– Ducts, pipes, or hydraulic services that pass through sensitive spaces should be sufficiently separated from the space by a construction with a sound insulation rating that will achieve the internal noise levels nominated for that room.
– Adequate space should be allowed in plantroom for attenuators and other control measures.

Acoustic requirements for specific areas are provided in Table 4 Acoustic requirements for areas affecting patient care hospitals and outpatient .

Table 4 Acoustic requirements for areas affecting patient care hospitals and outpatient

Acoustic requirements for areas affecting patient care hospitals and outpatient facilities							
Area designation	Continuous internal noise levels $L_{Aeq,}$ dB		Intermittent internal noise level $L_{Amax,}$ dB (9)	Internal noise level helicopter $l_{Amax\ (slow)}$ dB (7)	Floor impact sound isolation $L_{n,w}$ dB	Reverberation time (s) (fully furnished)[4]	Emergency generator internal noise level $L_{Amax,}$ dB (11)
	Satisfactory	Maximum					
Clinical							
Operating theatre	40	45	55	65	50	Note 12	+ 5
Birthing room	45	50	65	75	60	Note 12	+ 5
Intensive care	40	45	60	65	55	Note 12	+ 5
Single patient bed room	35	40	55 (10)	68	50	0.4 - 0.7(13)	+ 5
Multi bed room	35	40	55 (10)	68	55	0.4 - 0.7(13)	+ 5
Toilet / ensuite	50	55	–	75	60	-	+10
Patient corridor	40	50	–	80	60	Note 8	+ 10
Counselling / interview room	40	45	60	65	55	0.4 - 0.6	+ 5
Consultation room	40	45	60	65	55	0.4 - 0.6	+ 5
Speech therapy	35	40	60 (6)	65	55	0.4 - 0.6	+ 5
Treatment / medication / examination room	40	45	60	65	60	0.4 - 0.6	+ 5
Public areas							
Corridors and lobby spaces	40	50	–	80	60	Note 8	+ 10
Cafeterias / dining	45	50	–	80	60	Note 8	+ 10
Toilets	45	55	–	70 -	–	–	+ 10
Waiting rooms, reception areas	40	50	–	80	60	0.4 - 0.6	+ 10
Multi faith / chapel	30	35	35	65	50	0.4 - 0.6	+ 5
Staff / back-of-house areas							
Meeting room	35	40	–	70	55	0.6 - 0.8	+ 5
Board / conference room (large)	30	35	–	70	55	0.6 - 0.8	+ 5

Acoustic requirements for areas affecting patient care hospitals and outpatient facilities							
Area designation	Continuous internal noise levels $L_{Aeq,}$ dB		Intermittent internal noise level $L_{Amax,}$ dB (9)	Internal noise level helicopter $l_{Amax\ (slow)}$ dB (7)	Floor impact sound isolation $L_{n,w}$ dB	Reverberation time (s) (fully furnished)[4]	Emergency generator internal noise level $L_{Amax,}$ dB (11)
	Satisfactory	Maximum					
Open plan office space	40	45	–	75	60	0.4 - 0.6	+ 5
Single person offices	35	40	–	70	55	0.6 - 0.8	+ 5
Multiple person offices	40	45	–	75	55	0.4 - 0.6	+ 5
Change/ locker room	50	55	–	-	-	-	+ 10
Staff room	40	45	–	75		Note 8	+ 5
Classrooms, training rooms	35	4	–	75	55	0.5 - 0.6	+ 5
Lecture theatre	30	35	–	75	55	Curve 1 of AS 2107	+ 5
Library	40	45	–	80	55	0.4 - 0.6	+ 5
Workshops	45	50	–	–	–	Note 8	+ 10
Plant rooms	N/A	<85	–	–	–		–
Laboratories	45	50	–	75	60	0.4 – 0.7(12)	+ 10

Notes:

1. *All sound pressure levels referenced to 20 micro-Pascals (dB re 20 µPa).*
2. *For Column A, Leq noise levels should be measured over a repeatable, worst-case one hour period. A one hour averaging period has been selected to best represent impacts from continuous noise sources, and any frequently occurring intermittent noise sources.*
3. *The repeatable maximum noise level generated by lift operations should not exceed the maximum Leq noise level specified for that space (excluding lift lobbies).*
4. *Reverberation times are the arithmetic average of the middle frequencies in the octave bands of 500 Hz and 1 kHz.*
5. *Where rooms have a "confidential" or "private" speech privacy requirement (Refer to Table 5 for speech privacy requirements), the ambient noise levels in adjoining rooms are to be in the range between "satisfactory" and "maximum" in Column A . In other words, the "satisfactory" criterion should be interpreted as a "minimum" value for rooms adjoining those that require a degree of acoustic privacy, unless partition ratings have been otherwise determined using lower background noise levels. In this case the design basis should be nominated.*
6. *Speech and language therapy excludes audiometric rooms and specialist test and measurement rooms that require more controlled ambient noise conditions.*
7. *Noise levels apply to Westmead and Royal North Shore hospitals. For new buildings with a rooftop helipad, specific consideration should be given to controlling helicopter noise levels, in agreement with NSW HI on a case-by-case basis. Direction should be sought from NSW HI on a project-by-project basis as to whether consideration should be given to 'future-proofing' the building against future increases to helicopter movements on the rooftop helipad.*
8. *Reverberation time should be minimized as much as practicable for noise control. Acoustic treatment should have a minimum acoustic performance equivalent to NRC 0.7 covering at least 80% of the area of the ceiling. If acoustic materials with a higher NRC performance are proposed, the coverage area can be reduced proportionally.*
9. *The acceptability of any intrusive noise depends on the frequency of occurrence, the intrusive noise level and character, plus the sensitivity of the space. The intermittent internal noise levels shown are intended to apply to any frequently occurring intermittent noise sources including rail, internal and external driveways, loading docks, nearby*

industry, etc. and where the frequency of occurrence of the noise source is sufficiently high or low that adequate control of the intrusive noise level is not achieved via the Column A, Leq noise levels. The project acoustic engineer is required to apply professional judgement in assessing the frequency of occurrence of the intrusive noise, the intrusive noise level and character, plus the sensitivity of the space to apply the intrusive noise limits in Column B. Justification of the basis of the design needs to be reported for HI review. The intrusive noise limits in Column B do not apply to noise from commercial aircraft (which is to be assessed in accordance with AS2021).

10. *Where a significant, intermittent and intrusive noise source is prevalent, a sleep disturbance assessment is required. The outcome of this assessment shall be included with the acoustic design.*
11. *Noise levels are set relative to the 'maximum' continuous internal noise levels from Column A.*
12. *For spaces where sound absorptive finishes may have critical implications for infection control, hygiene or sterility requirements, the design team should investigate suitable acoustic treatment options from manufacturers that can satisfy the functional requirements.*
13. *For mental health units, while good room acoustic design is desired, achieving the reverberation time targets will be challenging given conflicting requirements (e.g. anti-ligature, security, tamper proof, etc.). The design team should justify any instances where sound absorptive finishes may not be possible.*

6.2.5 Acoustic isolation

6.2.5.1 Walls and floors – airborne noise

Layout plans will be reviewed and the design sound isolation rating, expressed as R_w of all partitions will be documented and verified as part of the design process.

Design of the sound isolation rating for each partition will consider:

– Adjacency of any noise generating spaces.
  - Walls and floors – airborne noise.
  - Walls – impact noise.
  - Floors – impact noise.

– Speech privacy requirements.

– The reduction in achieved performance from laboratory to the field.

– The composite sound isolation performance of the partition.
  - Doors and internal glazing.

– The background noise level within the receiver room.

The adjacency of different room types will influence the sound isolation rating required for a construction. The final sound isolation rating should consider the adjacency of the different room types with consideration of the following:

– The speech privacy requirements of a noise source room

– The noise sensitivity of the receiving room

– The background noise level in the receiving room, and

– Whether there is a door to a corridor (or the like) in the partition that would otherwise limit the potential performance of the partition as a whole.

Table 5 Levels of privacy and the subjective outcome for the end users describes the levels of privacy and the subjective outcome for the end users. Table 5 below indicates speech privacy required for various room types and adjacencies.

Table 5 ***Levels of privacy and the subjective outcome for the end users***

Level of speech privacy	Description	Required outcome (sound insulation, Dw plus background noise, dBA)
Confidential	Raised speech would be audible but not intelligible. Normal speech would be audible.	80 to 85

Level of speech privacy	Description	Required outcome (sound insulation, Dw plus background noise, dBA)
Private	Raised speech would be audible and could be intelligible. Normal speech would be audible.	75 to 80
Moderate	Normal speech would be audible and intelligible but not intrusive.	70 to 75
Not private	Normal speech would be clearly audible and intelligible.	Less than 70

Figure 7 below illustrates the important dependence of speech privacy on both sound insulation and background noise levels.

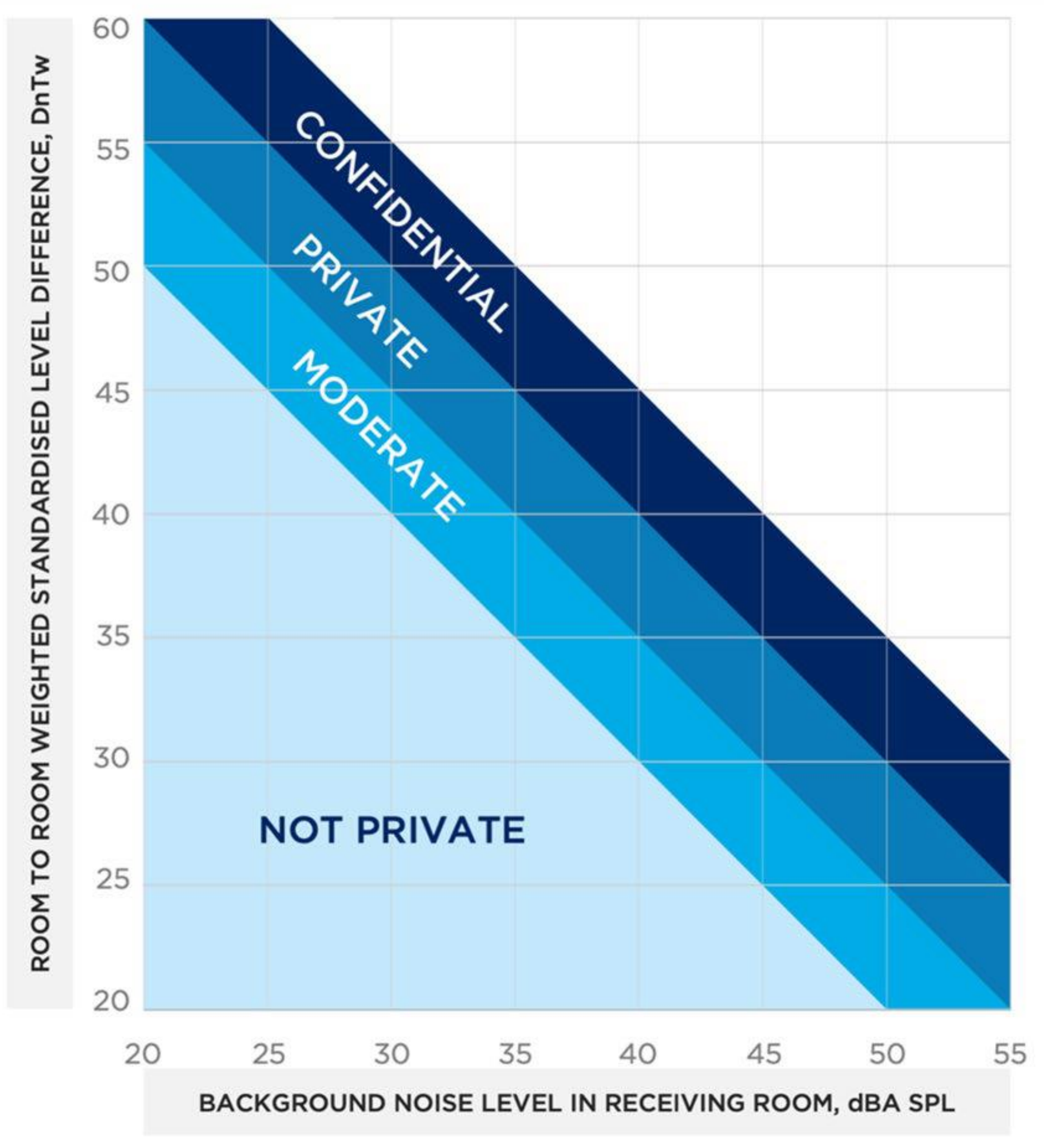


Figure 7 *Dependencies of speech privacy*

6.2.5.2 Doors and internal glazing

Partitions with doors will always achieve a lower performance than a partition of the same construction without a door. Doors will limit the overall performance as they are generally of a much lighter construction and they are difficult to seal. Therefore, locating of doors is important where the following should be considered:

– Maximising the distance between doors of neighbouring spaces, rather than directly side by side.
– Doors along corridors should be offset where possible, rather than opposite one another.
– Sliding doors and/ or pivot doors should be avoided where any degree of acoustic separation is required.
– Doors should be avoided between noise generating/ sensitive rooms and rather installed in partitions facing corridors.
– There are generally two standard door types that are used in healthcare building including:
  - General doors with no specific acoustic performance
  - Acoustic doors to provide a higher level of sound isolation typically achieved with a thick solid core door with full perimeter and threshold seals.

Additionally, there may also be in some instances critical spaces/ adjacencies where proprietary acoustic door sets should be provided.

Table 6 Acoustic speech privacy indicates door types required for various room types and adjacencies.

While higher performance doors can be provided, they are likely to be heavy, more difficult to operate with functionality that may conflict with healthcare environments, require greater maintenance and be relatively expensive.

Where glazing is included within a partition, it should be appropriately specified to ensure that the overall performance of the partition is not degraded significantly.

6.2.5.3 Walls – impact noise

Where partitions are expected to receive a significant number of impacts e.g. from moving trolleys / equipment or from services / machinery and the partition is adjacent to a noise sensitive space, then the partition must be a double leaf wall without connection between the leaves except at the periphery e.g. ‘staggered stud’ partitions.

Examples of partitions that should be considered for double leaf construction when adjacent to a noise sensitive space are:

– Bathrooms
– Kitchens
– Laundries
– Workshops.

It also important for the design team to consider structure borne noise that can be generated via direct mounting of equipment such as TVs and other audio vibration generating devices which may require some form of additional separation between two sides of a partition.

Table 6 Acoustic speech privacy requirements

Speech privacy requirements for areas affecting patient care hospitals and outpatient facilities				
Area designation	Speech privacy requirement (for walls with no doors)	Door type (1) / adjacency		
		Room to room	Room to reception / waiting	Room to corridor
Clinical				
Operating theatre	Private	Type 1	-	–
Birthing room	Confidential (2)	Type 2	Type 1	–
Intensive care	Moderate	–	–	–

Speech privacy requirements for areas affecting patient care hospitals and outpatient facilities				
Area designation	Speech privacy requirement (for walls with no doors)	Door type (1) / adjacency		
		Room to room	Room to reception / waiting	Room to corridor
Patient room / single bedroom	Minimum Rw 42 partition	–	–	–
Clinical				
Multi bedroom	Moderate	–	–	–
Toilet / ensuite	Moderate	–	Type 1	–
Patient corridor	–	–	–	–
Counselling / interview room	Confidential (2)	Type 2	Type 1	Type 1
Consultation room	Confidential (2)	Type 2	Type 1	–
Speech and language therapy (4)	Moderate	Type 1	Type 1	–
Treatment / medication room	Private	Type 2	Type 1	Type 1
Public areas				
Corridors and lobby spaces	–	–	–	–
Cafeterias / dining	–	–	–	–
Toilets	–	–	Type 1	–
Waiting rooms, reception areas	–	–	–	–
Multi faith / chapel	Confidential (2)	Type 2	Type 1	–
Staff / back of house areas				
Meeting room	Private	Type 2	Type 1	–
Board / conference room (large)	Private	Type 2	Type 1	Type 1
Open plan offices	Moderate	–	–	–
Private offices	Private	Type 1	Type 1	–
Multi person offices	Moderate	–	–	–
Locker room	Moderate	–	–	–
Rest room	–	–	–	–
Classrooms, training rooms	Private	Type 2	Type 1	–
Lecture theatre	Private	–	Type 1	Type 1
Library	–	–	–	–
Workshops	–	–	– (3)	– (3)
Plant rooms	–	–	– (3)	– (3)
Laboratories	Moderate	–	–	–

Notes:

1. *Door Types*
    - *Type 1 – Solid core door with perimeter and threshold acoustic seals*
    - *Type 2 – Specialist acoustic door set (the use of Type 2 doors should be minimised by appropriate planning)*
2. *Confidential privacy requirements can be difficult to achieve in practice with cost-effective solutions. These spaces should be reviewed and agreed on a case-by-case basis.*
3. *As required to control noise break-out from plant, equipment or machinery to adjacent areas.*
4. *Excluding audiometric rooms and specialist test and measurement rooms that require specific sound insulation*

and intrusive noise requirements.

5. *For lecture theatres, meeting rooms, etc where use of AV, assisted speech or teleconferencing is used extensively, ratings for separating constructions should be increased by five points.*

6.2.6 Room acoustics

Each room and area will be designed to have room acoustic design that supports the function of the space as per Table 15 of the NSW Health Engineering Services Guideline.

Acoustic absorptive treatment will be recommended in all areas (including corridors) to achieve a Reverberation Time (RT) criterion as per Table 15 of the NSW Health Engineering Services Guideline. These requirements are provided in Table 6 above.

6.3 Acoustic design strategy

6.3.1 Internal building elements

The construction of internal building elements will be designed to control noise transfer between internal spaces to the recommended sound insulation performance for the project. Each element will be designed such that the overall sound insulation integrity of the separation partition is maintained.

It is envisaged that lightweight partitions will be utilised for the internal separating partitions within the Project. Table 7 Internal building element provides a summary of each internal building element, the corresponding standard/guideline that will determine the recommended construction and general comments on the anticipated construction build up.

Table 7 Internal building element construction

Internal building element	Comments
Partitions	– Anticipated to consist of lightweight constructions which will likely include double stud and/or staggered stud constructions as well as inclusion of fire rated and/or sound rated plasterboard for higher rated partitions or partitions that require impact noise isolation.
Glazing	– Any internal glazing and/or glazed partitions will be selected such that the overall acoustic performance of the partition is not compromised. – Should internal glazing be proposed for partitions that require a high acoustic performance, double glazed units are likely to be required.
Doors	– Doors in separating partitions will result in a reduction of the performance of the overall partition rating. – Doors requirements for specific areas are recommended in Table 6 Acoustic speech privacy , with the different types of doors being: • General doors with no acoustic requirements • Type 1 – Solid core door with perimeter and threshold acoustic seals • Type 2 – Specialist acoustic door set. The use of Type 2 doors should be minimised by appropriate planning – Maximising the distance between doors of neighbouring spaces, rather than directly side by side – Doors along corridors should be offset where possible, rather than opposite one another – Sliding doors and/ or pivot doors should be avoided where any degree of acoustic separation is required – Doors should be avoided between noise generating/ sensitive rooms and rather installed in partitions facing corridors. – Seals will remain an important aspect of the door acoustic performance. Acoustically rated doors will require quality rubber seals to create an airtight seal around the perimeter, door bottom and for double doors at meeting stiles. – Door grilles and undercuts will not be allowed for acoustically rated doors.
Ceilings	– Ceiling system throughout is an important acoustic consideration. Based on preliminary review, acoustically absorptive ceiling is typically expected in majority of spaces.

Internal building element	Comments
	– Ceiling system will need to be selected to ensure sound insulation performance between areas are not compromised. – For reverberation control purposes, acoustically absorptive ceiling will likely be required in majority of spaces. For clinical spaces, consideration may be given suitable acoustic products for health and clean room applications. – Ceiling with minimum Ceiling Attenuation Class (CAC) of 35 should be provided throughout the facility for acoustically critical spaces. – Exposed ceiling areas may require additional acoustic consideration such as suspended baffles any control of services noise (use of unit boxing, duct lagging etc).
Above partition detailing	– Walls should extend full height in acoustically critical spaces with high sound insulation requirement. For lower rated acoustic walls consideration will be given to ceiling acoustic barriers as relevant. – Services related penetrations, air transfer ductwork, electrical cabling tray etc. will be designed to ensure acoustic integrity of the partition is not compromised. – Acoustically treated transfer air ducts or cross talk attenuators are expected for high acoustic rated walls. – Any pressure relief in acoustic critical spaces will need to be via acoustically treated air transfer as noted above.

6.3.2 External building elements

The construction of external building elements will be designed to control noise intrusion from external sources such as traffic, carpark, aircraft noise, rain noise, external mechanical plant and emergency generator as appropriate. The following is noted with respect to likely acoustic design strategy:

– External glazing is expected to require acoustic rating for control of noise. However, based on a review of surrounding area, generally a thermal double glazed unit which satisfy ESD requirement may be sufficient acoustically subject to further assessment at later stage when building elevations are further developed.

– Roof construction will need to consider rain noise control as well as control of external noise such as traffic. Details of design strategy is not yet known, however generally lightweight roof is expected for which consideration of appropriate building blanket to the underside of purlins and flush ceiling is typically sufficient. However, for areas with exposed/perforated ceiling or more sensitive spaces (such as function) additional build-ups may be required which will be established upon further review at later stages.

– Consideration of appropriate external door with acoustic seals may also be required for noise sensitive areas such as consult rooms where relevant.

6.3.3 Reverberation control

Acoustically absorptive finishes will be considered to control reverberation time within relevant spaces. This will be further investigated upon review of finalised concept design layout of the facility.

The following general design strategies is expected:

– Consideration of carpet flooring with backing (minimum NRC of 0.25) as far as reasonably practical throughout development.

– Acoustically absorptive ceiling tiles with minimum Noise Reduction Coefficient of 0.7. Higher NRC rating may be considered for more sensitive spaces or where lower reverberation is required or where hard flooring (such as vinyl or tiles) is proposed.

– Acoustic finishes in clinical areas will have regard to healthcare setting as well as clean applications.

– Incorporation of acoustically absorptive wall panels (minimum NRC 0.4) on two adjoining walls within enclosed spaces to minimise horizontal wall reflections.

– Incorporation of acoustically absorptive workstations where practical.

– Acoustic panelling and finishes within public spaces and common areas such as fabric furniture, acoustic panels and ceiling to be considered.

6.3.4 Building services

Mechanical

Noise emitted to the outside from any plant or equipment including chillers, air inlets and discharges, exhaust outlets, etc will be designed to comply with the relevant environmental emissions requirement at any nearby noise sensitive receivers.

Generally external mechanical plant area is expected with natural ventilation. Careful acoustic design of plant enclosure(s) is expected to achieve relevant noise emission targets. The following general considerations are recommended to be implemented in development of concept building and site layout:

- External plant to be located as far as practicable from nearby noise sensitive receivers.
- External plant and emergency generator should be located as far as practical from noise sensitive spaces within the building with no direct line of sight where practical (avoid locating condensing unit and the like immediately outside or in close proximity to consulting and sensitive spaces).
- External plant areas may require solid boundary fencing or acoustical louvre for ventilation.
- At this stage, only minimal upgrades to the mechanical system is proposed. It is likely that one additional external unit will be required, and will be located adjacent to the existing units. The approximate location is shown in red in Figure 8 below.

Figure 8 Approximate location of external mechanical plant

Necessary attenuation measures will be included in the building and services design at detailed design stage. Consideration will be given to the design of the internal mechanical ventilation system to address internal noise related issues including:

- Transfer of noise where ductwork penetrates acoustically rated partitions;
- Transfer of noise between acoustically rated rooms via air conditioning grilles/openings; and
- Noise generated through air movement, moving parts (e.g. fans) and vibration associated with the mechanical services system.

Noise generated from services should be sufficiently controlled such that the total noise from all services combined does not exceed the recommended design internal sound level levels. Plant rooms are to be designed to minimise noise breakout through the building structure to adjacent spaces.

Electrical Services

Noise from electrical services plant and equipment will be designed to meet the recommended internal design sound levels. Electrical equipment prone to the generation of tonal noise will need to be appropriately controlled.

Electrical services components such as cabling trays, lighting, electrical box and GPOs will need to be carefully considered and treated to ensure acoustic integrity of building elements are maintained.

Hydraulic Noise

Consideration will be given to the design of the hydraulic services system to address noise related issues, including:

– Structure-borne noise through the connection of the pipe work to the building structure;
– Noise from water movement in pipes; and
– Transfer of noise where pipe work penetrates acoustically rated partitions/baffles.

6.3.5 Vibration

Vibrational energy generated by mechanical plant can be transmitted through the building structure and radiated as regenerated noise from the walls, floors and ceilings and other building elements.

Vibrating plant and equipment will need to acoustically treated with the following typical considerations:

– All vibrating plant and equipment to have vibration isolation mounts/hangers installed at the structural support with sufficient static deflection;
– All pipework/ductwork subject to vibration due to connection with vibrating plant and equipment shall be vibration isolated using isolation hangers or mounts, or alternatively provide flexible connections between the pipework and vibrating equipment.
– Vibration isolator selection be determined as per Table 48 of ASHRAE Handbook's Chapter 48 Sound and Vibration Control.
– Note that all rotating mechanical plant and equipment shall be qualitatively balanced and certified in accordance with AS3709:1989.
– Generator is expected to require appropriate vibration isolators.
– Vibration isolation should be selected to suit the excitation frequency of the equipment and in particular generator including during nominal operating, start-ups and cool down/shutdown (i.e. natural frequency of the isolator should be sufficiently shifted from the excitation frequency).

Additional control may be required for particularly sensitive equipment. However, it is assumed that project don't have any highly sensitive vibration equipment such as electron microscopes.

7. Traffic Services

7.1 Introduction and Traffic Scope

7.1.1 Reference Documents

Finley Hospital Concept Design Option 1C (September 2023).

7.1.2 Design Conditions and Criteria, Assumptions and Departures

- Finley Hospital will continue to provide access/egress for delivery vehicles, ambulances and cars.
- Based upon information provided by Finley Hospital staff, there is currently sufficient parking supply to accommodate existing demand.
- There are limited paths within Finley Hospital to support the internal movements of pedestrians.
- There are no public transport services currently operating at the hospital and this is not expected to change.
- The hospital upgrade is not expected to generate increases in vehicle/parking demand.

7.2 Site Analysis

7.2.1 Site traffic analysis

Finley Hospital has frontage to Dawe Avenue and Scoullar Street within the township of Finley (refer to figure 9). Under the current arrangement:

- The main entrance to the hospital and entrance to the emergency centre are provided on Dawe Avenue.
- An access driveway is provided on Dawe Avenue, which vehicles move through in an east to west direction.
- Delivery vehicles (and some light vehicles) access/egress the hospital site via Scoullar Street.
- A western access driveway provides access/egress to the allied health and neighbouring aged care facilities. The driveway has a width of approximately six metres, which supports bi-directional traffic flows.
- Ambulances enter the hospital via the western driveway, travel eastbound via the designated ambulance facility and exit via the port cochere onto Dawe Avenue.
- An alternative ambulance parking bay is located within the access driveway.

Figure 9 Finley Hospital access arrangement

7.2.2 Site transportation analysis

There are currently no public transport services operating in proximity to the hospital site.

A pedestrian footpath is provided on the northern side of Dawe Avenue. Typically, footpaths and grassed verges are provided on key roads in proximity to the subject site.

A series of covered walkways and footpaths are provided within the hospital, to support the internal movement of staff and visitors.

7.2.3 Traffic impacts

Berrigan Shire Council have provided traffic count data for some key roads in proximity to the hospital, as follows:

– Scoullar Street (2021) – approximately 150 (bi-directional) vehicles per day
– Tocumwal Street (2021) – approximately 520 (bi-directional) vehicles per day
– Hamilton Street (2014) – approximately 340 (bi-directional) vehicles per day

Peak hour flows are typically in the order of 15 percent – 20 percent of daily flows. Therefore it is expected that roads in proximity to Finley Hospital accommodate approximately 30 - 105 vehicles during peak periods of road network activity. Further:

– Information from the Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis, indicates that kerbside lanes adjacent to parking lanes have one-way mid-block capacities of approximately 900 vehicles per hour.
– The available data indicates that the roads in proximity to Finley Hospital are operating well within its mid-block capacity.

- The available information indicates that the Finley redevelopment is not expected to generate additional traffic volumes associated with the movement of staff, patients, visitors, ambulances and delivery vehicles.
- Accordingly, the upgrade to Finley Hospital is expected to have a negligible impact on the operation of the adjoining road network, which is expected to continue to operate with a good level of service.

7.2.4 Car parking analysis

Car parking is provided throughout the Finley Hospital grounds, as follows:

- Ninety-degree parking is provided on both sides of the access driveway. The outside layer (closest to Dawe Avenue) provides 17 parking, and the inside layer provides seven parking spaces, including a space marked for ambulance bays (refer to Figure 10 Parking at access driveway).
- A separate parking area for the mobility impaired, with three spaces, is provided adjacent to the main entrance of the hospital.
- A separate car park (accessed via the western driveway) is located adjacent to the allied health facility.
- A covered structure (which is accessed from Scoullar Road) is located adjacent to the staff accommodation and provides six parking spaces that are designated for hospital fleet cars.
- Informal parking occurs on grassed/unseal areas adjacent to the staff accommodation (refer to Figure 11 Informal staff parking).

Figure 10 Parking at access driveway

Figure 11 Informal staff parking

In terms of parking impacts:

- Information provided by a hospital representative indicates that there is a sufficient supply of parking to accommodate the current demand by staff and visitors.
- The proposed redevelopment is not expected to generate additional parking demand and no upgrade/increase to the existing parking demand is proposed.

- As part of the redevelopment, there may be an opportunity to formalise the unsealed parking area in proximity to the staff accommodation, which would result in a slight increase in the number of parking bays that can be accessed/egressed via Scouller Street.

Further, there is potential to provide electric vehicle charging stations within the Finley Hospital Car Park to support improved environmental outcomes.

Appendices

Appendix A

ESD Framework

		C	TBC	No
Subtotal		1	49.7	1
Innovation		0	5	0
Total 25.09.23		1	54.7	1
Target		45	49.5	

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	Poinrts confirmed	Points TBC	Points not targetted	DISCIPLINES	Comments from ESD team 15.03.23	Comments from disciplines	Overlaps HI ESG AusHFG NCC 2019 SSDA Req	Standard Practice (1) Minimum requirement (C)	Healtcare relevant initiatives (1) Primarily for IPU type spaces.	Low focus initiatives
Management				14										
Accredited Professional	To recognise the appointment and active involvement of an Accredited Professional (under an Environmental Rating System) in order to ensure that the rating tool is applied effectively and as intended.	1.0	Accredited Professional	1	1			ESD	GHD appointed to review the design under the HI ESD framework tool			1		
Commissioning and Tuning	HI ESD framework	2.0	Environmental Performance Targets	-	-			HI	Design team to set Environmental performance targets on each nominated system early on in the design			C		
		2.1	Services and Maintainability Review	1		1		ICA	Consider an embedded approach to commissionability, controllability and mantainability. Involve HI commissionig team during SD to facilitate.			1		
		2.2	Building Commissioning	1		1		ICA	Will require the development of a detailed commsioning plan early on in the design and delivery of commissioning activities. Consider air tightness testing			1		
		2.3	Building Systems Tuning	1		1		ICA	Will require a tuning plan early on in the design			1		
		2.4	Independent Commissioning Agent	1		1		ICA	Engage a comissionign agent early on in the design					Requires an additional consultant. HI undertake a similar role to ICA.
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	2				ENV	Considering the location of the 2 hospital, implementing a Climate Adaptation Plan would encourage inclusion of resilience in the design. Is a CCRA available for the site? If not, consider engaging a qualified professional to preapre a site specific CCRA to inform project on climate risks to be addressed in the design High risk may include: - Water resilience (consider rainwater collection) - Exttreme temperature (consider designing to increased max temperature) - Flooding (consider flodd levels when deciding buildings FFlevels)		SEARS condition: Credit canbe used to demonstrate CSIRO project climate Impacts			
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.	4.1	Building Information	1				ARCH				1		
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				HI	Environmental performance targets for two items to be nominated and monitored. Is there a current monitoring system that would allow this.			1		
		5.2	End of Life Waste Performance	1				ARCH	Reuse of existing furniture and selection of new furniture and equipment with at least 10 years life span					
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	-	-			MECH	Consider sub- metering electrical and water major end uses			C		
		6.1	Monitoring Systems	1				MECH				1		
Responsible Building Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-		1		CONTR	Requirement to be included in spec and contracts documents			1		
		7.1	Formalised Environmental Management System	1		1		CONTR	Requirement to be included in spec and contracts documents			1		
		7.2	High Quality Staff Support	1				CONTR						Construction related credit for contractor to consider.
Operational Waste	Performance Pathway	8A	Performance Pathway - Specialist Plan	1		1		WASTE	Provide a waste management plan to inform design for waste collection, storage amd disposal			1		
		~~8B~~	~~Prescriptive Pathway – Facilities~~	-				~~WASTE~~						
Total				14	1	7	0					10	0	
Indoor Environment Quality				17										
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes	1		1		MECH	Design HVAC systems for ease of maintenance, minimise outdoor air polutants with filtration and/or choice of air intake location				1	
		9.2	Provision of Outdoor Air	2				MECH	Consider increase of OA air flow rates compare to AS1668. Note this will impact negatively the energy use but improve occupants comfort and has been proven to reduce the spread of airborne diseases		EFG requirements request 2.0 ACH to IPU spaces.		1	

		9.3	Exhaust or Elimination of Pollutants	1		**1**		MECH	**Generally best practise to provide separate exhaust to kitchens and store rooms**				1
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels	1		**1**		ACOUS	**Consider designing envelope to limit nois eintrusion. Acoustic input required**				1
		10.2	Reverberation	1		**1**		ACOUS	**Consider use of absorptive finishes to control reverb. Acoustic input required**				1
		10.3	Acoustic Separation	1		**1**		ACOUS	**Acoustic input required.**				1
Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort	-	-			ELEC	**Consider use of flicker free lights and CRI of 80**				C
		11.1	General Illuminance and Glare Reduction	1		**1**		ELEC	**Consider designing lighting to reduce glare**				1
		11.2	Surface Illuminance	1		**1**		ARCH	**Consider designing lighting to provide uniformity by using inderect lighting and well designed surface colours**				1
		11.3	Localised Lighting Control	1		**1**		ELEC	**Consider providing localise lighting control to occupants immediate envronment**				1
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	-	-			ARCH	**Consider providing blinds or design external shading to block drect sunlight**				C
		12.1	Daylight	2		**1**		ARCH	**Consider provision of daylight in all primary spaces and chose glazing with VLT > 40%**				1
		12.2	Views	1		**1**		ARCH	**Consider providing clear line of sight to high quality view in the primary spaces**				1
Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1	Paints, Adhesives, Sealants and Carpets	1		**1**		ARCH	**Consider the use of low VOC products**				1
		13.2	Engineered Wood Products	1		**1**		STRUC	**Consider the use of low formaldehyde emissions products**				1
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1		**1**		MECH ARCH	**PMV within +/-1 should be achievable. Comfort modelling required**		NCC 2019 JV3 requires a PMV assessment mto be undertaken		1
		14.2	Advanced Thermal Comfort	1				MECH ARCH	**PMV within +/-0.5 would require good façade treatment (double glazing and good solar control) . Comfort modelling required**				1
Total				17	0	13	0					0	15
Energy				22									
~~**Greenhouse Gas Emissions**~~	~~A. Prescriptive Pathway~~	~~15A.0~~	~~Conditional Requirement: Prescriptive Pathway~~	~~-~~									-
		~~15A.1~~	~~Building Envelope~~	~~1~~									
		~~15A.2~~	~~Glazing~~	~~1~~									
		~~15A.3~~	~~Lighting~~	~~1~~									
		~~15A.4~~	~~Ventilation and Air-conditioning~~	~~1~~									
		~~15A.5~~	~~Domestic Hot Water Systems~~	~~1~~									
		~~15A.6~~	~~Accredited GreenPower~~	~~5~~									
		~~15B.0~~	~~Conditional Requirement: NatHERS Pathway~~	~~-~~									
		~~15B.1~~	~~NatHERS Pathway~~	~~-~~									
		~~15C.0~~	~~Conditional Requirement: BASIX Pathway~~	~~-~~									
		~~15C.1~~	~~BASIX Pathway~~	~~-~~									
		~~15D.0~~	~~Conditional Requirement: NABERS Pathway~~	~~-~~									
		~~15D.1~~	~~NABERS Energy Commitment Agreement Pathway~~	~~-~~									
Greenhouse Gas Emissions		15E.0	Conditional Requirement: Reference Building Pathway	-	-	**1.6**		MECH ELEC HYDR ARCH	**Proposed building must achieve 10% improvement on NCC Section J reference building as part of HI ESG guidelines. Energy saving/GHG emissions reduction strategy to include: - High performance envelope (10% better than DTS) - Choice of HVAC system with COPs and EERS (10-15% better than DTS or MEPs) - Choice of lighting and controls to achieve 20% better than DTS. - Fuel switching for:DHWS (Gas to heat pump for generation) consider switching in for kitchens so gas connection/reticulation is not required on site**		Aligns with HI ESG 10% Improvement and NSW GREP. The NCC JV3 Energy Modelling approach should be used.	C	
		15E.1	Comparison to a Reference Building Pathway	20		**1.6**		MECH ELEC HYDR ARCH	**Consider aiming for a 15-20% improvement. Energy saving/GHG emissions reduction strategy to include: - Very high performance envelope (Double glazing, external shading and use of thermal mass to flatten the load curve) - Choice of HVAC system with COPs and EERS (10-15% better than DTS or MEPs). Use of thermal mass to reduce demand. Consider evaporative cooling. - Choice of lighting and improved control strategy to achieve 30% better than DTS. - Fuel switching for:DHWS (Gas to heat pump for generation) consider switching in for kitchens so gas connection/reticulation is not required on site - Use of on site renewables with PV panels on the roof**		Aligns with HI ESG 10% Improvement and NSW GREP. The NCC JV3 Energy Modelling approach should be used. 10% additional for PV panel generation (1.6points)	1	1
Peak Electricity Demand Reduction	Prescriptive Pathway	~~16A~~	~~Prescriptive Pathway - On-site Energy Generation~~	~~-~~									

		16B	Performance Pathway - Reference Building	2		0.5		ELEC	Above mentioned energy reduction strategies will reduce peak demand as will the use of hermak mass.				1	
Total				22	0	3.7	0					1	2	
Transport				10										
Sustainable Transport	Performance Pathway	17A.1	Performance Pathway	10		8		TRANS	Consider providing transport plan and additional car parking spaces. Consider end of trop facilities, cycle paths and bicyle storage in masterplanning					Hospitals are usually well connected to public transport nodes. Large percentage of patients require access to hopsitals via vehicles. Expansion of exisitng hospital also require additional carparking.
		~~17B.1~~	~~Access by Public Transport~~	~~0~~										
		~~17B.2~~	~~Reduced Car Parking Provision~~	~~0~~										
		~~17B.3~~	~~Low Emission Vehicle Infrastructure~~	~~0~~										
		~~17B.4~~	~~Active Transport Facilities~~	~~0~~										
		~~17B.5~~	~~Walkable Neighbourhoods~~	~~0~~										
Total				10	0	8	0					0	0	
Water				12										
Potable Water	Prescriptive Pathway	18A.1	Potable Water - Performance Pathway	0		2		HYDR	Consider specifying High WELS rating fixtures: - Showers 3 star WELS rated at 7.5 l/min - Indoor taps 6 star WELS rated - Toilet and uiinals to be 4 star WELS rated - Washing machines and dishwashers to be 4 star WELS rated Consider rainwater harvesting for irrigation. Consider targetting a 10-15% reduction in potable water		AusHFG Requirements limit use of RW systems (maintenance / Payback / health risks)			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.
		~~18B.1~~	~~Sanitary Fixture Efficiency~~	~~1~~				~~HYDR~~				~~1~~		
		~~18B.2~~	~~Rainwater Reuse~~	~~1~~				~~HYDR~~			~~AusHFG Requirements limit use of RW systems~~	-		
		~~18B.3~~	~~Heat Rejection~~	~~2~~				~~MECH~~						
		~~18B.4~~	~~Landscape Irrigation~~	~~1~~				~~LAND~~				~~1~~		
		~~18B.5~~	~~Fire System Test Water~~	~~1~~				~~FIRE~~				~~1~~		
Total				6	0	2	0					3	0	
Materials				14										
Life Cycle Impacts	Prescriptive Pathway - Life Cycle Impacts	~~19A.1~~	~~Comparative Life Cycle Assessment~~	~~0~~										~~Life Cycle Assessor (additional consultant) required~~
		~~19A.2~~	~~Additional Life Cycle Impact Reporting~~	~~4~~										~~Life Cycle Assessor (additional consultant) required~~
		19B.1	Concrete	3		2		STRUC	Consider: 1. Reducing Portland cement content by 40%. Cement replacement using either fly ash or GGBS 2. Water used in concrete contains at least 50% reclaimed water 3. Use 40% slag or recycled aggregates OR 25% of fine aggregate (sand) is manufactured sand or other alternative			1		
		19B.2	Steel	1		1		STUC	Consider: - procuring steel from certified environmentally responsible suppliers who use low energy processes. - Procuring steel with high recycled content.			1		
		19B.3	Building Reuse	4					retaining part of the buidling façade not considered					
		19B.4	Structural Timber	4				STRUC				1		
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		STRUC	Consider procuring steel from reponsible suppliers			1		
		20.2	Timber Products	1		1		ARCH	Consider procuring timber from reponsible suppliers			1		
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1		1		HYDR MECH ELEC ARCH STRUC	Consider procuring sustainably sourced materials			1		
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3		1		HYDR MECH ELEC ARCH STRUC	This credit can typically be targeted as there are wide selection of standard products in market now that have credentials meeting the credit. Recommend this is included in strategy and reviewed at DD stage					
Construction and Demolition Waste	Fixed Benchmark	~~22A~~	~~Fixed Benchmark~~	~~1~~										

		22B	Percentage Benchmark	-				CONTR	Consider to include as contractual obligation for appointed contractor.			1		
Total				12	0	7	0					7	0	
Land Use & Ecology				6										
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-				ARCH	Confirmation required that site does not contain critically endangered species if targetting 23.1			C		Hospitals usually built on brown field sites
		23.1	Ecological Value	3		1		ARCH	Consider increasing significantly the area of native vegetation on site. May prove difficult					Hospital sites are usually mainly buildings with minimal landscape area.
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement	-				ARCH	Confirmation requried if targetting 24.1 and 24.2			C		
		24.1	Reuse of Land	1		1		ARCH	Confirmation to be supplied that 75% of site was previously developed.					Most hospital and healthcare projects are located within exisitng hospital sites. For most projects, this credit would be considered achieved.
		24.2	Contamination and Hazardous Materials	1		1		CONTR	Details of any existing contamination or hazardous materials are present an being removed or remediated.		1			
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		ARCH	This should be targetted as part of seciton J compliance with SA>0.43			1		
Total				6	0	4	0					1	0	
Emissions		FALSE		5										
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge	1		1		CIVIL	Consider how the post development peak discharge can be kept in line with pre developmeny peak discharge. note that because increased rainfall and flood is likely to be a climate risk, consider achieving post development discharge not exceeding pre development based on a 5 Year ARI.			1		
		26.2	Stormwater Pollution Targets	1		1		CIVIL	Confirm local authority requireemnts. Consider adding additional treatment to reduce pollution.					
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies	-		1		ELEC	This should be met if design is to standard AS4282					Neighbouring buildings are usually the hospital buildings. Consider impacts to surrounding residential if any.
		27.1	Light Pollution to Night Sky	1		1		ELEC	Requires that external luminaires do not emit light pollution to the night sky above a given benchmark to be considered in design					
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		MECH	Consider waterless heat rejection Include Legionalle control and risk management indesign of water based heat rejection systems				1	
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.0	Refrigerants Impacts	1			1	MECH	Not targetted. - Would requrie CO2 HP or lek detection					
Total				5	0	5	1					1	1	
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	10										
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											
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											
	Supplementary or tenancy fitout systems review	30C	Commissioning and Tuning					ICA						
	Daylight See credit	30C	Visual Comfort					ARCH						
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the above Credits.	30D	Innovation Challenge			5		ESD HI	Community benefits (health promoting project) RAP endorsed by Reconcilation Australia Universal design (accessibility plan) Ultra low VOC Green Cleaning					
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this rating tools.	30E	Global Sustainability											
Total				10	0	5	0					0	0	
TOTAL												23	18	

Discipline	Element of design	Masterplanning recommendations
Architecture		
	Walls	For the extension Walls/partitions part of the air conditioned envelope: - Maintain the glazing to Wall-glazing ratio above 20% and below 60% and walls R values at 1.4 or insulate walls to R4. For the upgraded spaces: part of the air conditioned envelope: - walls R values at 1.4 or insulate external walls to R2.4.
	Floors	Floors to meet R2.
	Roof	New roofs to be light coloured with solar absorptance to meet SA<0.43. Current roof colour is compliant based on review of satellite photos. New roofs to meet R4.1 Roof of upgraded spaces to be insulated to meet R3.7
	PV	Consider including PV panels to generate electricity to be reuse on site. No battery 600m2 99kWp. 15degrees roof.
	Skylights	None at present. Consider the use of clerestory windows rather than skylight: if facing south they provide daylight without solar gains and if openable they can be part of a p design strategy Consider the use of sky tubes in the existing spaces to improve daylight.
	External shading	External shading is the best solution to improve energy use For glare control to occupied spaces, consider providing blinds or design external shading designed to block dire sunlight at all times.
	Internal blinds	May be required depending on External shading device
	Glazing/windows	For the extension and the upgraded windows, glazing performance will need to be reviewed base on preliminary section J assessment but will generally need to be improve compared to DTS requirements to achieve the 10% reduction. Likely requirement for double glazing with U -value <3 W/m2K and SHGC < 0.5 , VLT>40% When designing windows, consider provision of daylight and clear line of sight to high quality views in all primary spaces and chose glazing with VLT > 40% For spaces with 2 orientation, maximise glazing facing South, or North with large overhang. It is a lot more difficult to shade East and West elevations.
	Internal / linings partitions	- Consider the use of building materials which are able to be disassembled for re-use, in conjunction with considerations for the addition and removal of spaces over time. -internal parturitions and surface finishes to be documented in accordance acousticians recommendations for sound isolation and reverb control
	Furnitures/fixtures	Consider: - reuse and /or recycling of existing furniture - selection of new furniture and equipment with at least 10 years life span
	Joinery	Consider specifying joinery as follows - At least 95% of all engineered wood products to meet formaldehyde emission limits - At least 95 % (by cost) of all timber used to be certified or reused - With sustainable product certifications (such as EPD, Third party certs etc)
	Paints	Consider specifying paints as follows: - 95% of all internal paints, low or ultra low VOC limits - 50% of paints to have max TVOC content of <5g/L
	Sealants	Consider specifying sealants as follows: - 95% of all adhesives and sealants to meet low or ultra low VOC limits

	Operational wastes	Develop an operational waste management plan with targets Outcome of plan is to inform location and size of waste storage areas required. Storage required: - general landfill, - recycling (containers, paper cardboard - soft plastics - organics. Consider vehicle access and bin cleaning /washdown areas. Recycling of demolition waste Consider to include as contractual obligation for appointed contractor.
	Acoustic	Consider designing envelope to limit noise intrusion, control reverb and noise between rooms. Acoustic input required
	Lighting	Consider designing lighting to provide uniformity by using indirect lighting and well designed surface colours
	Accessibility/Universal design	- Provide circulation areas/facilities designed be accessible - Provide hearing augmentation system for areas that have amplification, generally within communal areas, provide a system to assist the aurally challenged to hear music speech within the main communal spaces
	Kitchen	Consider specifying all electric kitchen appliances
	Landscaping	Consider: - increasing significantly the area of native vegetation on site. - use of rainwater for irrigation - preference for native drought resistant plants - Use light coloured hardscaping - use of permeable pavement as often as possible
Structural		
	Concrete	1. Reduce Portland cement content through maximising use of supplementary cementitious materials. Target 20-40% Cement replacement using either fly ash or GGBS 2. Use recycled aggregates.
	Steel	Where steel is used, - procure from certified environmentally responsible suppliers who use low energy processes. - Needs to have a high recycled content.
	Timber	Specify they use of timber that meet the following criteria: - No rainforest timbers, or timbers from high conservation forests, are to be used unless plantation grown. Use only recycled timber, engineered and glued timber composit products, or timber from plantations or from sustainably managed regrowth forests that is FSC or PEFC certified. - At least 95% of all engineered wood products meet formaldehyde emission limits - At least 95 % (by cost) of all timber used is certified or reused - All timber used is to be termite (white ant) resistant or treated to be termite resistant to the appropriate hazard level
Civil		
	Stormwater	Consider how the post development peak discharge can be kept in line with pre development peak discharge. note that because increased rainfall and flood is likely to be a climate risk, consider achieving post development discharge not exceeding pre development based on a 5 Yea
		Confirm local authority requirements. Consider adding additional treatment to reduce pollution.
	Rainwater	Consider providing a 20kL (size tbc)water tank to be reused in toilets for irrigation
Electrical		
	Internal Lighting/Controls	Install luminaires / controls capable of reducing by 20-30% the DTS Lighting power density (J6)
		Specify lights in primary spaces to be Flicker-free lights and min Colour Rendering Index (CRI) of 80
	External lighting	Specify external luminaires to meet Australian Standard to avoid light pollution to neighbouring development and control of obtrusive effects as per Australian standards
	PV	Consider installing a PV array on the roof.

	Metering	Provide easily accessible data logging meter on incoming electricity for recording and monitoring
	Commissioning	services engineer to specify detailed commissioning requirements
	Acoustics	Penetrations for cabling etc to be addressed as per acoustic consultant recommendations to maintain acoustic performance of wall and floor systems
Mechanical		
	HVAC systems	Consider the following in design: - Choice of HVAC system with COPs and EERS (10-15% better than DTS or MEPs). - energy storage where feasible - Design features to achieve lower fan power (Low pressure drop distribution with oversizing ducts to lower pressure drop/meter, use of turning vanes in large ductworks, improved fan efficiencies, improved motor efficiencies) -including DCV and Heat recovery on all primary systems
	Water	Consider waterless heat rejection
		Include Legionionelose control and risk management in design of water based heat rejection systems
	IAQ	Consider improvement to IAQ by increasing the Outside air flow rates from minimum AS1668 requirements
	Metering	Provide easily accessible data logging meter on incoming electricity recording and monitoring
	Maintenance	Design ventilation and HVAC systems for ease of maintenance. (Dual access) Allow for cleaning of components coils, fans and other systems components that can trap dust and debris. minimise outdoor air pollutants with filtration and/or choice of air intake location
	Commissioning	specify detailed commissioning requirements as per Green star commissioning credit
	Acoustics	requires control of HVAC noise to achieved a total ambient noise of no more than 5db(A) above lower figure in table 1 of AS/NZA 2107:2016 Penetrations for duct work and duct noise transfer to be addressed as per acoustic consultant recommendations to maintain acoustic performance of wall and floor system
Hydraulics		
	DHW production	Consider: - Fuel switching for:DHWS (Gas to heat pump for generation)
	Fixtures	Consider specifying High WELS rating fixtures: - Showers 3 star WELS rated at 7.5 l/min - Indoor taps 6 star WELS rated - Toilet and urinals to be 4 star WELS rated - Washing machines and dishwashers to be 4 star WELS rated
	Irrigation	Consider rainwater harvesting for irrigation of planters around the buidling and for wahsdown areas near bin local.
	Metering	Provide easily accessible data logging meter on incoming water and gas for monitoring and inclusion of data into principled dashboard. Provide metering on all main water end uses
	Arrestors	Arrestors for acid, grease, plaster and clay of adequate capacity must be installed to treat wastewater from critical areas such as kitchens.
	Commissioning	Services engineer to specify detailed commissioning requirements as per Green star commissioning credit
	Acoustics	requires control of Building Services noise to achieved a total ambient noise of no more than 5db(A) above lower figure in table 1 of AS/NZA 2107:2016 Penetrations for pipe work to be addressed as per acoustic consultant recommendations to maintain acoustic performance of wall and floor systems
Contractor GENERAL / HI	**TBC**	
	Consultancy team	Consider engaging CCRA consultant to prepare CCRA and review and coordinate adaptive measures into the design
	Commissioning	Involve commissioning team early in design
	Commissioning	Confirm 2 x building performance metrics with a commitment to performance
	Contamination	Provide contam and hazmat report detailing materials found on site and proposal for remediation
	Operatonal Waste	Engage waste management planner
	Cleaning	Develop and implement a green cleaning policy

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