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Griffith University

Health and Technology Research Innovation Centre (HATRIC)

ESD Report

Design Development Stage

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Our Vision is to think beyond the square.

Our Mission is to create spaces, places, and communities that are positive for both the environment and for people. We will do this by providing our clients with sustainable and bespoke solutions that are innovative, challenge perceived ideas, and push the boundaries of achievement and excellence.

We confirm that all work has been undertaken in accordance with our ISO 9001 accredited quality management system.

Acknowledgement of country

The dsquared team wish to acknowledge the Traditional Custodians of all country throughout Australia, and their cultural, spiritual, physical, and emotional connection with their land, waters, and community. We pay our respects to all Elders past, present, and emerging.

Contents

1 Introduction

1.1 Overview

This report presents the ESD and sustainable design responses for Griffith University's proposed new Health and Technology Research Innovation Centre (HATRIC) Project.

1.2 Griffith Design Guidelines

Griffith University's Design Guidelines include a strong focus on sustainable design.

The key intended outcomes are to reduce the building's environmental impact, reduce ongoing operating costs, and create a healthy and positive environment for the building users.

Griffith University also has a Net Zero 2029 strategy which the project is required to align with, including being all-electric for its central building services, reducing and eliminating the use of fossil fuels where possible, and being energy efficient.

The Guidelines require an energy performance target to be established and energy simulation modelling to be undertaken early in the design phase to inform the design development and ensure the design is capable of meeting the energy target. This is discussed further in section 2.1.

A Sustainability Matrix is required to be completed by project teams to demonstrate compliance against the various sustainable design criteria of the Design Guidelines, and to justify any proposed deviations. A copy of the completed Sustainability Matrix is provided in Appendix A.

1.3 Sustainability Certifications

The project is not targeting any third-party sustainability certifications.

The University considered pursuing EnvioDevelopment certification at Schematic Design phase but subsequently elected not to pursue the certification.

The project is therefore being measured against the GU Design Guidelines and a series of best practice Key Performance Indicators as follows.

1.4 Key Performance Indicators

The following sustainability performance indicators have been applied throughout the design phase. These indicators have acted as a mechanism to guide the design and ensure a suitable sustainability standard is achieved.

Item	Proposed Performance Target
Energy	20% less energy than a code compliant reference building (as per GU Design Guidelines)
Daylight	High levels of daylight provided to a minimum of 40% of the regularly occupied floor area. *High levels of daylight* are defined as per the Green Star criteria i.e. minimum 160 lux of daylight achieved during at least 80% of daytime hours.
Solar glare control	No direct sunlight exposure on working surfaces or benchtops during at least 90% of daytime hours throughout the year.
Thermal comfort	Thermal comfort performance in line with Green Star and Section J standards – i.e. Predicted Mean Vote +/- 1.0 for >98% of occupied hours in all occupied zones.
Water	Minimum 10% less potable water use than a standard practice reference building
Embodied Carbon	Minimum 20% less embodied carbon than a standard practice reference building.
Waste	Minimum 90% of construction and demolition waste diverted from landfill Minimum 75% of operational waste diverted from landfill

Refer to Section 2 for a summary of performance outcomes achieved.

2 Performance

2.1 Energy

dsquared have undertaken energy modelling to estimate the building's energy performance in comparison to its targeted 20% improvement over a code compliant reference building (per GU Design Guidelines) to ensure a high energy performance standard is achieved.

Various benchmarking methods were discussed with the University in order to establish the preferred benchmarking approach to measure the 20% improvement target against, and the University's advised direction was to use the JV3 performance verification method which is widely used in industry to demonstrate compliance with the Section J energy efficiency requirements. In this method the project is benchmarked against a minimum code compliant 'reference building' of the same size, form and function as the proposed HATRIC building but comprising only the minimum code Section J standards for energy efficiency. The scope of the assessment includes only the building services which are covered by the NCC Section J energy efficiency provisions, i.e. HVAC, lighting, hot and cold water systems, and vertical transportation. Laboratory equipment and general plug-in appliances are excluded.

Energy modelling results are presented as follows:

End Use	Energy Source	Reference Building	Proposed Building
Space Cooling	Electricity (kWh)	390,992	168,103
Space Heating (incl. Reheat)	Electricity (kWh)	0	47,986
	Gas (MJ)	1,089,144	0
Cooling Towers	Electricity (kWh)	56,243	49,238
HVAC Pumps	Electricity (kWh)	280,572	237,898
AHU Fans	Electricity (kWh)	91,140	84,494
General Exhaust	Electricity (kWh)	77,645	73,948
Internal Lighting	Electricity (kWh)	189,284	148,700
External Lighting	Electricity (kWh)	1,945	1,945
DHW/NPHW Supply	Electricity (kWh)	0	32,728
	Gas (MJ)	138,713	0
DHW/NPHW Pumps	Electricity (kWh)	2,236	2,013
DCW Pumps	Electricity (kWh)	2,841	2,556
Lifts	Electricity (kWh)	34,398	30,796
Parasitic Loads	Electricity (kWh)	8,444	8,444
Solar PV	Electricity (kWh)	0	-56,414
Sub-Total	Electricity (kWh)	1,135,739	832,433
	Gas (MJ)	1,227,856	0
Total Energy	**kWh p.a.**	**1,476,811**	**832,433**
Energy Improvement	**%**	**44%**	
Total GHG emissions	**kg CO_2e p.a.**	**997,304**	**674,271**
GHG Emissions Improvement	**%**	**32%**	

The energy modelling results demonstrate a **44% reduction in energy** compared to the code compliant reference building, and a **32% reduction in greenhouse gas emissions**.

Key inputs which have resulted in this significant energy reduction versus the reference building are as follows:

- The reference case uses gas boilers for space heating, re-heat, and domestic hot water. This approach is as per the building code Section J / JV3 modelling method, whereby gas heating is a standard assumption for reference buildings. Gas boilers are significantly less energy efficient than the electric heat pumps in the proposed building, and therefore simply by using electric heating in lieu of gas, the project achieves a very significant energy improvement over the reference building.
  - If the reference building were all-electric (no gas boilers), the project would achieve a **29% reduction** in energy compared to the reference building, which remains in excess of the University's 20% target.
- The use of temperature and ventilation set-backs overnight in the laboratory spaces (26°C and ventilation turndown to 30% of design condition), whereas the reference building maintains constant temperature and ventilation rates at all times.
- High-efficiency chilled water plant which exceeds code minimum energy efficiency requirements by ~30%.
- External sunshading to all façades which minimises solar thermal loads in the proposed building.
- An engineered approach to laboratory ventilation supplies whereby the ventilation rates are right-sized to meet the required ventilation for the laboratories but without introducing excessive outdoor air.
- Closely controlled fume cupboard exhaust systems including low-velocity type fume cupboards with automated sash closers when not in use, and variable speed exhaust fans.
- The use of demand-controlled ventilation in office spaces which enables the ventilation systems to ramp down saving energy when the space is not at full occupancy.
- A lighting design which is 20% more energy efficient than the code Section J lighting power density requirements, when adjusting for illuminance requirements (lux levels) and room aspect ratios.

Refer to the Section J / JV3 Energy Modelling Report for further details of the modelling inputs and results.

2.2 Façade

The façade has been designed to achieve an appropriate balance between thermal performance, air-tightness, daylight provision, and glare control requirements.

The façade has also been designed to exclude all direct sunlight penetration into laboratories that exceeds an intensity of 100 W/m^2 per AS 2982. Refer to façade consultant's documentation for further details.

The façade has been carefully designed and coordinated with the architect (Hassell) and façade engineer (TTW) to eliminate the need for thermally-broken framing systems, which has achieved a considerable cost saving for the project. This has been achieved through a comprehensive sunshading approach and a carefully engineered ratio of vision glass to wall area such that the façade achieves the requisite thermal performance without the need for thermally-broken framing systems.

Thermal break strips are required in the steel framing wall systems for Section J compliance reasons however.

Thermal performance values for the typical façade glazing are as follows.

Type	U-value (whole of system)	Solar Heat Gain Coefficient	Visible Light Transmittance
Punch windows	3.9 W/m^2.K (or less)	0.30 (or less)	50% (or greater)
Punch windows w/ sunshade	4.9 W/m^2.K (or less)	0.30 (or less)	50% (or greater)
Window wall	3.4 W/m^2.K (or less)	0.30 (or less)	50% (or greater)

Façade performance targets – typical façade types

The façade has been designed for air-tightness and is proposed to be site-tested to verify a suitable air-tightness performance is achieved. The proposed façade air-tightness performance target is 5.0 $m^3/m^2/hr$ (or less) when tested under a pressure of 50 Pascals. Site verification testing is proposed to be undertaken (blower door testing) to verify this target is achieved in practice.

2.3 Daylight

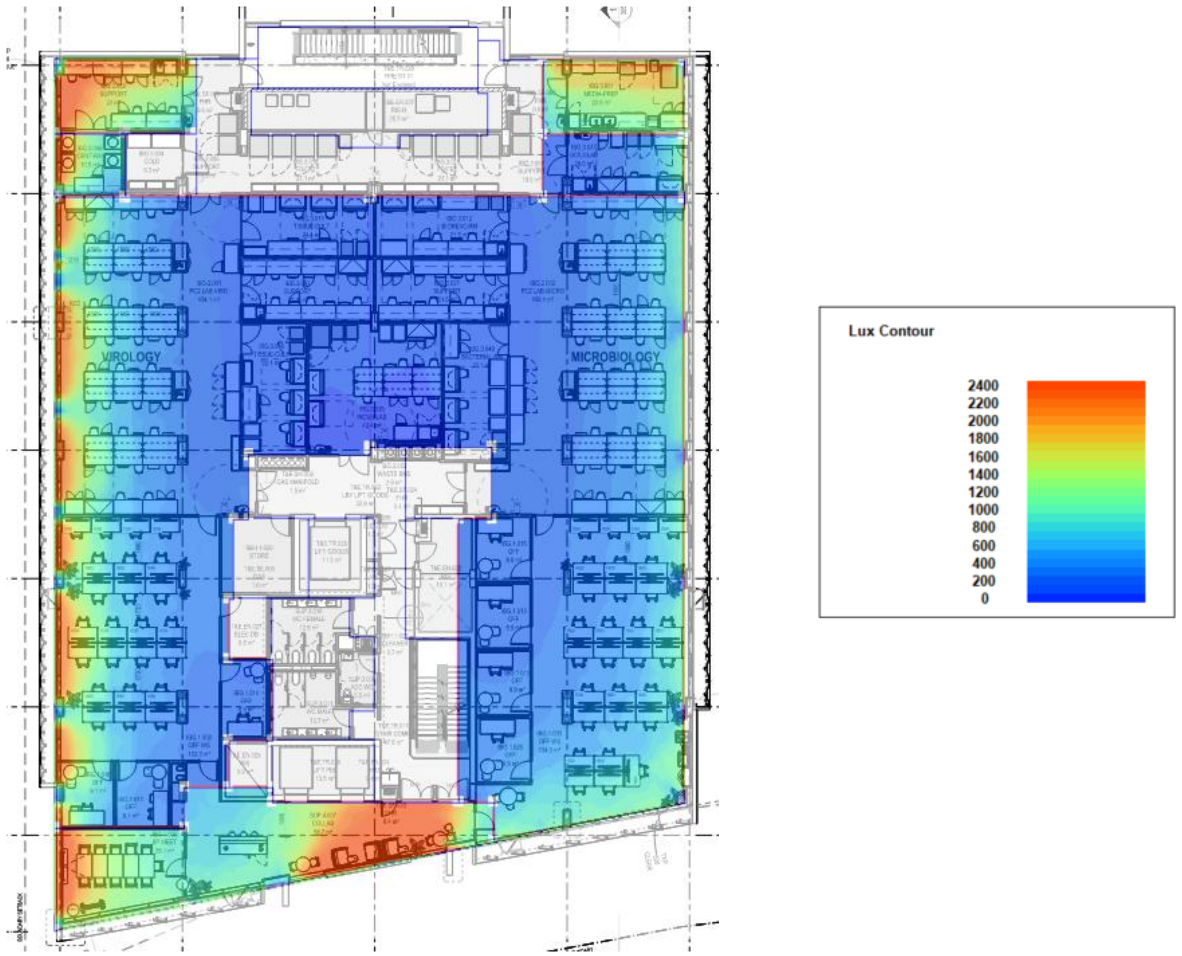
Daylight modelling analysis demonstrates the building achieves good access to natural light across the majority of the occupied spaces. The performance achieved exceeds Green Star criteria for best practice daylighting, whereby greater than 40% of the occupied floor area achieves a minimum of 160 lux of daylight for at least 80% of daytime hours. The project is not targeting Green Star certification and so the Green Star daylight criteria are only used as a benchmark indicator for the design's daylight performance.

The daylight modelling results across the whole-of-building are as follows:

% of occupied floor area with access to best practice daylight levels	56%
Green Star benchmark (for benchmarking purposes only)	40%
Outcome	Best practice daylight performance is achieved, exceeding benchmarks in the Green Star rating tool.

Daylight modelling results summary

A daylight modelling plot for a typical floor (Level 2) is presented as follows:



Daylight modelling plot for a typical floor (Level 2)

2.4 Embodied Carbon

The University is targeting a 20% reduction in embodied carbon for the building as a whole, in comparison to a standard reference building.

The project team's approach to achieving the embodied carbon target is as follows:

1. Design a materially efficient building by interrogating all elements of the design and reducing the amount of materials required in the building wherever possible. Detailed reviews have been completed between the design team and contractors through the Early Contractor Involvement process to interrogate all design packages and identify opportunities for efficiency improvements and material savings, which achieve not only embodied carbon savings but also cost savings.
2. Consider and give preference to lower-embodied carbon materials through design and procurement wherever practicable.

dsquared has undertaken embodied carbon modelling to establish the project's embodied carbon performance and the initiatives required to achieve the 20% reduction target.

A summary of the proposed initiatives to meet the 20% reduction target are as possible:

Scenario	Embodied carbon (tonnes CO_2)	Improvement over reference case
Reference case • Equivalent building of the same size and form as HATRIC • Using standard practice construction materials	7,703	-
Proposed HATRIC building including the following initiatives to reduce embodied carbon: • Efficient structural design as per TTW documentation • Lower carbon interior finishes as per architectural finishes and FF&E schedules • 30% cement replacement in all substructure concrete (piles, footings, rafts etc) • 20% cement replacement in all superstructure in-site concrete (suspended slabs, columns, core walls etc) • All reinforcing steel is Infrabuild standard EAF steel (or equivalent product with equal or lower embodied carbon kg CO_2/tonne)	6,116	20.6%

Embodied carbon analysis summary

3 Initiatives

3.1 Introduction

The following ESD initiatives are included in the design.

3.2 Climatic Responsive Design

- External sunshading has been carefully engineered to reduce heat loads and glare through the façade glazing.
- Double-glazed façades with solar performance coatings (SHGC 0.30) to reduce solar loads.
- Solar-reflective finishes on the roof to reflect heat. Roof finish to achieve a Solar Reflective Index >82.
- Water-cooled chilled water system provides high-efficiency cooling year-round.
- Daylight is provided on all elevations, and primary working areas are located around the perimeters near daylight access to reduce artificial lighting demands, while balancing this provision with glare control.
- The use of planting, landscaping and greenery around the building to provide a passive cooling effect.
- A rainwater collection and reuse system provides an on-site water source for landscape irrigation.

3.3 Energy Efficiency and Conservation

- High-efficiency central thermal HVAC plant including water-cooled chilled water systems for optimum energy performance.
- Heat recovery from laboratory exhaust air streams (not including fume cupboard exhaust).
- The use of recirculating air handling units in a selection of the laboratories, which are more energy efficient than conventional single-pass 100% outdoor air units.
- Manifolded fume cupboard exhaust in the teaching laboratories (but not the research laboratories, to improve future flexibility and alleviate safety/cross-contamination concerns).
- Demand-control ventilation (CO_2 sensors and controls) enable the outdoor air supply to modulate according to the number of people present (in office/admin areas) and the volume of exhaust required (in laboratory areas) at any point in time, saving energy by avoiding over-ventilating the space.
- The use of occupancy controls which ramp down and/or switch off the air-conditioning automatically when a room or space is unoccupied where appropriate to do so (e.g. in offices and meeting rooms).
- Motion sensor lighting controls in circulation areas, common areas, store rooms and other back of house areas which automatically switch off lighting when these spaces are unoccupied.
- Daylight harvesting lighting controls which automatically dim the lighting when sufficient daylight is available, in select spaces where appropriate (e.g. office perimeter zones, circulation areas, breakout areas, entry lobby).
- Carefully designed lighting control zones including a maximum control zone size of 100sqm per zone, to provide flexibility and avoid unnecessary over-lighting in laboratories and open plan office areas when partially occupied.
- Energy-efficient lighting design targeting a lighting power density at least 20% lower than code maximum power density allowances.
- Façade air-leakage pressure testing is proposed to be undertaken on site to verify a high air-tightness standard is achieved in practice.
- A comprehensive energy metering and management approach including separate metering for distinct services (e.g. HVAC, lighting, specialist laboratory equipment, general power, lifts, hot water) and for distinct user groups. Metering will be connected to a central Energy Management System allowing data interrogation and trend reports to be generated.

3.4 Net Zero ready

- All-electric building for the main building services including HVAC, hot water, and cooking. Gas and/or fossil fuels are only used for small end uses where no feasible alternatives exist, for example in Bunsen burners and backup power generation.
- 40 kW rooftop solar PV system, using all available roof space for solar PV panels.
- A minimum of 50% of the building's electricity use will be from off-site renewable energy in line with the University's renewable energy procurement contract. This will increase to 100% if the University elects to increase their off-site renewable energy purchase agreement to 100% when the existing contract renews in 2028, in line with GU's Net Zero 2029 target.
- Low GWP refrigerants in the HVAC thermal plant.

3.5 Indoor Environment Quality

- Ventilation rates exceed minimum code requirements by at least 20% in office and breakout spaces, and use a CO_2 setpoint of 800ppm to maintain a high indoor air quality at all times. Laboratory ventilation systems achieve a minimum 20% improvement on minimum code requirements or are 100% outdoor air systems ensuring best practice indoor air quality is maintained.
- Daylight access provided to all office workzone areas, breakout areas, and patient bedrooms, balancing this with external shading and blinds for glare control.
- Indirect daylight access provided to laboratories, using a careful design approach ensuring no direct unobscured daylight occurs on laboratory benches at any time during the day. The façade and external shading have been carefully designed to achieve sufficient glare control without the need for internal blinds in laboratory spaces. Blinds will be provided in non-laboratory spaces.
- Workzones and breakout areas are located around the perimeter of the building to maximise the number of people who have access to daylight and views to the outside.
- Artificial lighting in line with WELL Building standards including high colour perception (CRI 90), low-glare (UGR < 19), flicker-free lighting.
- High thermal comfort achieved as verified by building performance modelling, demonstrating a Predicted Mean Vote +/- 1.0 achieved in all occupied spaces throughout >98% of occupied hours.
- Acoustically comfortable environment with internal noise levels and reverberation levels to meet or exceed Australian Standard recommendations, and noise transfer through partitions and between floors reduced through careful partition and floor design.
- Internal communication stair promotes movement and interaction as people move through the building.
- Collaboration and breakout spaces promote interaction and collaboration.
- Natural materials, biophilic design principles and planting in strategic locations around the building provide a connection to nature.
- Healthy materials that do not off-gas into the air will be used throughout, including low VOC and low formaldehyde finishes and FF&E.

3.6 Resource Minimisation

The following initiatives improve circular economy outcomes and reduce materials and waste:

- No less than 40% of internal building finishes (by cost) will achieve a Responsible Products Value of at least 7.
- No less than 30% of the building envelope components (by cost) will achieve a Responsible Products Value of at least 10.
- Design for Disassembly principles have been incorporated where practicable. This enables partitions, joinery, flooring, wall coverings, services and equipment to be dismantled and reused, rather than demolished, when undertaking major refurbishments or fitout works in future.
- Avoidance of composite materials which are unable to be recycled at end of life, wherever viable.
- Multi-bin system to facilitate waste separation and recycling in line with GU sustainability targets, including separate bins for commingled recycling, paper/cardboard, organic waste, and general waste (as a minimum) in office and breakout areas, and further specialist waste bins in laboratory areas.
- Modular and prefabricated building elements have been incorporated where viable, for example the facade sunshading, in order to reduce the amount of waste generated during construction.
- Construction and demolition waste will be carefully managed with a requirement that the contractor diverts a minimum of 90% of waste from landfill.

3.7 Embodied Carbon

Initiatives to achieve the project's targeted 20% reduction in embodied carbon include:

- Structural design initiatives have reduced the quantity of concrete and steel required in the building compared to the original concept design and to a standard practice design, leading to direct embodied carbon savings. These include:
  - A significant reduction in pile sizes due to further detailed geotechnical investigations initiated by TTW.
  - The use of post-tensioning and other efficient design techniques have reduced the quantity of steel reinforcement required.
  - Structural steel roof framing developed to allow removal of Plant level floor beams (i.e. reduction in concrete / reinforcement volumes)
  - Alignment of foundation strategy with column sizes to allow omission of pile caps.
  - Coordinated placement of shear / core walls to improve reinforcement rate efficiencies.
- Concrete mixes to comprise supplementary cementitious materials, targeting a 30% cement replacement in the substructure and 20% cement replacement in the superstructure for in-situ mixes.
- Reinforcing steel to be sourced from suppliers who use Electric Arc Furnace technology e.g. Infrabuild or alternative product of equivalent embodied carbon content.
- Lower-carbon interior materials have been specified where practicable, with preference for products that have their carbon footprint verified by an Environmental Product Declaration.
- Locally made products and materials to be given preference wherever viable, to reduce carbon emissions from transporting goods to site.
- Specialist gas systems for laboratory and research purposes to be pressure tested for integrity to minimise risk of gas leaks which would otherwise create a significant source of embodied carbon emissions.

3.8 Water

- Rainwater is captured for reuse in landscape irrigation.
- The building has recycled water infrastructure in place, which is initially proposed for the rainwater reticulation but can be changed over to a permanent recycled water service in future, in the event that the municipal network is extended into the precinct in future and therefore becomes feasible for the HATRIC building to connect to.
- Water-efficient WELS rated fixtures and fittings as follows:

Item	WELS Water Efficiency Star Rating
Taps – Bathrooms	6 Star
WCs	4 Star
Urinals	Waterless (as per GU Design Guidelines)
Showers	4 Star (max 7.5 L/min)
Dishwashers	5 Star

- A comprehensive system of metering of all water uses shall be installed and connected to a central Energy Management System allowing data interrogation and trend reports to be generated.
- Landscaping comprises native drought-tolerant vegetation which requires minimal irrigation after its initial establishment phase.
- Irrigation system is provided from the rainwater tank (in-ground) and uses high-efficiency sub-surface dripper irrigation systems.
- Water Sensitive Urban Design Principles incorporated into the landscaping and plaza areas around the building, to improve stormwater quality and reduce runoff flow rates.
- All fire water is recirculated back to the fire tank during routine testing of the fire pumps.

3.9 Transport

- The project's approach to transport has been designed with consideration of the existing transport approach at the University's Gold Coast campus, including End of Trip facilities, public transport services, shuttle bus services, and ride-share programs (e.g. Liftango and RIIDE). It is anticipated that many of the staff and students who use the HATRIC building will continue to use the existing facilities at the main campus and then walk or transfer to the HATRIC building, and so the new End of Trip facilities in the HATRIC building have taken this into consideration in order to avoid an over-allocation of new facilities.
- The site has excellent public transport access including light rail and bus services.
- Secure bike parking is provided inside the building for staff and tenants, and out the front of the building for students and visitors. End of Trip facilities including showers and lockers are provided to support active and sustainable transport.
- Minimal new car parking is provided for the building, which encourages the staff, students and tenants to use the variety of other transport options available including public transport, cycling, and ride-sharing.

3.10 Social Sustainability

- A minimum 3% of the construction work (by hours worked) is to be delivered by First Nations' contractors or subcontractor personnel, in line with the University's Sustainability Strategy target for 2026 onwards.
- Opportunities to partner with suppliers and groups who deliver tangible social, economic and environmental sustainability in delivering and/or operating the building will be considered through the procurement phase, in accordance with the University's Sustainability Strategy target for 2027 onwards.
- The building provides equal access to people of all abilities.
- An intuitive wayfinding and signage design assists people of all abilities to navigate through the building.

3.11 Climate Change Resilience

- The project has been designed with capacity to respond to the following climate change risks:
  - Rising temperatures: The HVAC system has spare capacity to accommodate the anticipated increase in ambient temperatures projected to occur over the life of the HVAC thermal plant to 2050.
  - Increased rainfall intensity: Stormwater catchment systems have increased capacity to assist in responding to future increases in rainfall intensity, with the eaves gutters being designed for a 1 in 100 year rain event in lieu of a 1 in 20 year event.
  - Bushfire smoke inundation: High-grade air filtration is proposed for all air intakes on the HVAC systems (F7 / MERV 13 grade), and in the event of a major bushfire in a nearby bushfire-prone region that results in smoke inundation of the site, this will assist in reducing the concentration of bushfire smoke particles from the incoming air supply.

4 Discussion

4.1 Future works

The following items have been explored during design development but will not be resolved until future works:

- Recycled water connection – subject to discussions with the precinct developer (Economic Development Queensland) regarding the possibility of extending the existing nearby municipal recycled water network into the precinct as a joint initiative which will benefit multiple buildings in the precinct and therefore bear the cost at a precinct level instead of the cost being borne by a single building (which would be unaffordable). We understand the University is currently in discussions with the precinct developer about this topic, and if successful this would be a very significant ESD and operational cost saving opportunity if the HATRIC building is supplied with a continuous supply of recycled water.

4.2 Deviations from Griffith Design Guidelines

Anticipated deviations from the GU Design Guidelines are described as follows.

Refer also to the Griffith Sustainability Matrix provided in Appendix A.

GU Sustainability Matrix Item	Project Team Comment
Position building to minimise solar load	Optimal solar orientation is not possible due to site constraints (site is oriented northwest, not true north). Comprehensive sunshading is provided to the east and west facing glazing to manage the early morning and late afternoon solar loads.
Mixed-mode air conditioning	Mixed mode ventilation is not proposed due to the associated humidity control risks.
Recycling grey water	Not financially feasible for a standalone non-campus building.

Appendix A Griffith Sustainability Matrix

A copy of the completed Sustainability Matrix is appended on the following pages.

This matrix demonstrates the project's compliance with the sustainability requirements of the University's Design Guidelines.

28 Sustainability Matrix

Sustainability Category	Sustainability Issue	Impact / Benefit	Design Consideration (Objective / Target)	Included / Not Included in proposed Design Solution	Comments	
Note: If a sustainability issue is not included in the proposed design solution, reasons for its exclusion are to be provided in 'Comments' column.						
Site use (including land use and ecology						
Land Clearing	Clearing of flora	Weed infestation, loss of flora habitat, loss of cultural heritage	Weed management plan – Weed eradication programme	Included		Hassell (landscape)
	Pest management	Displacement of existing pests. Removal of natural predators	Identify and quantify	Included		
	Native species conservation	Identify native species	Re-establish native species – flora and fauna	Included		
	Revegetation plan	Pest habitat created	Re-establish native species, Eliminate possible pest habitats	Included		
Construction / Earthworks	Earthworks, modification of landforms	Soil erosion, surface water pollution, hydrology/stormwater paths, flooding. Contaminated soil exposure – health impact	Eliminate soil erosion Minimise impact on water table Decontaminate site as required	Included		
	Landscaping, irrigation, fertilisation, pesticides, herbicides, plant selection (re climate)	Soil salinity, water table height and quality	Reinstate native species Low water reliant plants CPTED design of landscaping Drip feed irrigation or other appropriate irrigation method specific to site and plant species	Included		
	Fencing	Fauna disturbance	Minimise disturbance, protect fauna	Included		
Birds	Bird nuisance control	Eliminate roosting or nesting of birds	Keep known problematic birds off the building face and roof, design accordingly.	Included		Hassell (architecture)
Stormwater	Stormwater management	Pollution and erosion	Use biologically based stormwater management features such as swales, sediment control ponds, pools and wetlands along drainage courses, and infiltration basins to retain and treat stormwater onsite.	Included		TTW (Civil)

Sustainability Category	Sustainability Issue	Impact / Benefit	Design Consideration (Objective / Target)	Included / Not Included in proposed Design Solution	Comments
Note: If a sustainability issue is not included in the proposed design solution, reasons for its exclusion are to be provided in 'Comments' column.					
	Stormwater management	Erosion	Design pavements and locate them in such a manner as to reduce stormwater velocity.	Included	
	Stormwater management	Runoff	• Minimise landscapes and use permeable paving and surface materials to maximise site water absorption. • Develop and design strategies that minimise disturbances to watershed. • Ensure run off is directed away from buildings.	Included	
	Stormwater management	Contamination of stormwater	• Stormwater filters and debris separators. • Use of silt control barriers to prevent contamination of stormwater drains and streams.	Included	
Energy					
Thermal control	Orientation	Energy minimisation	Position building to minimise solar load.	Refer comment →	Optimal solar orientation is not possible due to site constraints. Sunshading provided to east and west facing glazing in lieu.
	Thermal losses and gains	Energy minimisation	Optimise through use of materials with thermal mass and specification of suitable. Roof insulation and wall insulation.	Included	
	Solar penetration/shading	UV, heat	Reduce capital costs and energy consumption by selection of solar efficient glazing and by introduction of sun blades/ shading.	Included	
	Thermal efficiency of envelope	Energy minimisation, mechanical plant capacity	Carry out review of glazing options (in conjunction with shading options) to establish an optimum shading/glazing/mechanical plant combination. Aim to achieve a lower energy consumption than the requirements of Section J of the NCC	Included	Proposed building achieves a 46% reduction in energy usage compared to NCC Section J minimum requirements, The facade contributes a 2.6% reduction in itself.

Hassell (landscape)

TTW (Civil)

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Sustainability Category	Sustainability Issue	Impact / Benefit	Design Consideration (Objective / Target)	Included / Not Included in proposed Design Solution	Comments
Note: If a sustainability issue is not included in the proposed design solution, reasons for its exclusion are to be provided in 'Comments' column.					
Air Supply	Air handling and pumping	Energy, capital and operating cost minimisation	Consideration of HVAC systems shall include the following: • Minimising plant capacity and plant area	Included	
			• Efficiency when operating at peak capacity	Included	
			• Efficiency when operating at part load including operating part of the building out of hours	Included	
			• Minimise losses associated with fume exhausts in air conditioned space	Included	Fume cupboards to be variable speed, low-face-velocity type with automated sash closers when not in use.
			• Provision of economy cycle/heat recovery and/or demand control ventilation where of benefit	Included	Heat recovery included in the 100% outdoor air laboratory air handling units. Demand-control ventilation included throughout.
			• Back draft dampers to be fitted to all exhaust systems to minimise air infiltration when not running	Included	
			• Capacity to vary set points of heating and chilled water on a seasonal basis	Included	
			• Selection of temperature set point for different space usages and set back when space is unoccupied	Included	Overnight temperature set-backs in laboratories
			• Occupancy sensors l/push button operation to be considered where appropriate	Included	
	A/C zoning	Energy minimisation/worker productivity	Consideration will be given to zoning for the following circumstances: • Delivery of conditioned air to occupied spaces	Included	
			• Low occupancy areas	Included	
			• Variable occupancy areas	Included	
			• Out of hours use	Included	
			• Minimising reheat	Included	

Wood (mechanical)

Sustainability Category	Sustainability Issue	Impact / Benefit	Design Consideration (Objective / Target)	Included / Not Included in proposed Design Solution	Comments	
Note: If a sustainability issue is not included in the proposed design solution, reasons for its exclusion are to be provided in 'Comments' column.						
			• Areas exposed to high solar radiation when compared to the remainder of the building	Included		Wood (mechanical)
			• Use of individual units to serve each solar zone	Included		
			• Allow mixed mode air conditioning in staff offices wherever possible	Not Included	Mixed mode ventilation is not proposed due to the associated humidity control risks.	
	Refrigerant selection	'Minimise damage to the ozone layer	Use of refrigerants with zero ozone depleting potential and low global warming potential.	Included	Low-GWP refrigerants are proposed for the chillers and heat pumps, per Wood's refrigerant technical memo.	
Water heating/cooling	Water Heating system selection	Energy minimisation	Hot water generation by solar panels, heat pumps or electric water heating	Included	Electric calorifier water heating.	Wood (hydraulic)
	Control circulating pumps if fitted to operate only when required	Energy minimisation	Minimise pipe losses	Included		
	Low energy boiling water units with time control	Energy minimisation	Review central or distributed water heating system	Included	Central system is proposed, due to electrical maximum demand constraints and the increased demand associated with multiple distributed local heating systems.	
Lighting	Low energy lighting	Energy minimisation	Consideration to be given to: • Efficiency of luminaires	Included		NDY (electrical)
			• Reduction of glare	Included		
			• Maximisation of surface reflectances	Included		
			• Lighting control groupings to minimise energy consumption	Included		
			• Use of motion sensors where practical"	Included		
Power	Alternative energy sources	Energy conservation	Generate wind power/solar power	Included	Rooftop solar PV system	
	Transformer oil reduction in HV supply	Minimise or eliminate	Recycling of oil or oil free systems	Included		
	Utilise otherwise wasted energy	Energy conservation	Consideration of the use of heat/recovery/exchange/storage/pre-cooling	Included	Heat recovery for laboratory exhaust air in 100% outdoor air systems.	Wood (mechanical)
	Power factor correction	Energy conservation	• Equipment selection • Design to minimise loss	Included		NDY (electrical)

Sustainability Category	Sustainability Issue	Impact / Benefit	Design Consideration (Objective / Target)	Included / Not Included in proposed Design Solution	Comments	
Note: If a sustainability issue is not included in the proposed design solution, reasons for its exclusion are to be provided in 'Comments' column.						
Building layout	Maximise use of stairs	Energy minimisation	The design and placement of stairs maximises their use and minimises the use of lifts	Included		Hassell (architecture)
Water						
Toilets	Electronic flushing to toilets	Resource conservation	Controlled flushing	Included	Toilets to be minimum 4 Star WELS rated	Hassell (architecture)
	Flushers in lieu of cisterns	Resource conservation Reduced maintenance, lower lifecycle costs	Appliance selection Controlled flushing Lower life cycle costs	Included		
	Waterless urinals	Resource conservation	Appliance selection	Included		
Appliances	Flow restrictors	Resource conservation	Consider the use of flow restrictors to fixtures where appropriate	Included	Amenities taps to be 6 Star WELS rated Sanitary showers to be 4 Star WELS rated	
	Water pressure	Resource conservation	Use minimum water pressure required to satisfy requirements	Included		Wood (hydraulic)
	Low water use appliances	Resource conservation	Appliance selection	Included		Hassell (architecture)
Reuse and monitoring applications	Grey water usage	Resource conservation	Recycling grey water in lieu of dispensing to sewer	Not Included	Not financially feasible for a standalone building.	Wood (hydraulic)
	Rainwater usage for irrigation	Resource conservation	Utilise rainwater for on-site benefit	Included		
	Rainwater usage for flushing	Resource conservation	Utilise rainwater for on-site benefit	Included		
	Water conservation/monitoring	Resource monitoring	Installation of water meters	Included		
Indoor Environment Quality						
Lighting	Light levels, auto dimming, daylighting	Energy conservation/occupant comfort	Use of lighting controls, maximising daylighting, reduction of glare where appropriate	Included		NDY (electrical)
Ergonomics	Equipment	Pollution, health, energy minimisation	Purchase of energy efficient equipment	Included		
	Prefabricated materials	Resource conservation	Consider use of appropriate materials wherever possible	Included		All consultants

Sustainability Category	Sustainability Issue	Impact / Benefit	Design Consideration (Objective / Target)	Included / Not Included in proposed Design Solution	Comments	
Note: If a sustainability issue is not included in the proposed design solution, reasons for its exclusion are to be provided in 'Comments' column.						
Waste	Construction waste	Minimise generation of waste as much as possible	Reduce and recycle construction waste	Included	>90% construction and demolition waste recycling target is proposed (head contractor responsibility)	
	Packaging waste	Minimise generation of packaging waste	Reduce and recycle packaging waste, use suppliers with take back schemes	Included	A number of the specified furniture and finishes products have take-back schemes from the supplier	Hassell (architecture)
	Waste from refurbishments, additions to buildings	Waste minimisation	Design buildings to accommodate modifications and upgrades. Interior or exterior design options that should be considered include: • Design of cladding to accommodate future shading devices, more efficient glazing and lighting controls • Design cladding systems that are fixed by snap release connectors, friction or other joint connections that facilitate adaptability including bolts, screws and clips	Included		All consultants
	Recycling opportunities	Waste minimisation and resource conservation	Provision of recycling/waste collection areas within the building (and external to the building) that are easily accessible by the occupants, and accommodate collection needs specific to the project area.	Included	Multi-bin system to maximise recycling opportunities, including separate bins for organic waste, commingled recycling, paper/card recycling, Containers for Change bottle/can recycling, and general waste. Organic waste sent for composting at the GC campus, and returned as fertiliser for the landscaping. Drinking water taps provided throughout the building to eliminate single-use bottles.	Hassell (architecture)