Randwick Campus Redevelopment Integrated ASB (IASB) Addition

Sustainability Report

Revision M
100% Detailed Design Issue

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1. Revision Information

Project	Appendix 21 Prince of Wales – Integrated ASB (IASB) Addition
Title	Sustainability Report (ESD)
Client	Lendlease Building (LLB)
Revision	M
Revision Date	12 August 2019
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2. Revision Schedule

Revision	Date	Issue Name	Author	Authorised
A	20/04/2018	Draft Issue	CK	LP
B	22/06/2018	50% Design Issue	CK	LP
C	20/08/2018	100% Detailed Design Issue	CK	LP
D	01/09/2018	100% Detailed Design Issue	CK	LP
E	04/09/2018	100% Detailed Design Issue	CK	LP
F	06/09/2018	100% Detailed Design Issue	CK	LP
G	15/05/2019	100% Detailed Design Issue	CK	LP
H	01/07/2019	100% Detailed Design Issue	CK	LP
I	09/07/2019	100% Detailed Design Issue	CK	LP
J	13/07/2019	100% Detailed Design Issue	CK	LP
K	16/07/2019	100% Detailed Design Issue	CK	LP
L	05/08/2019	100% Detailed Design Issue	CK	LP
M	12/08/2019	100% Detailed Design Issue	CK	LP

Contents

3. Executive Summary

The intent of this report is to identify Ecologically Sustainable Development (ESD) strategies for the Integrated Acute Services Building (IASB) Addition. The IASB Addition is composed of the following core elements, which will be assessed as part of the cumulative Green Star rating for IASB (approved ASB including IASB addition):

- UNSW Eastern Extension (Base Building only)
- Associated modifications within the ASB
- Lowering of Hospital Road
- Landscaping

This report will only look at the building components of the proposed development (UNSW Eastern Extension). The ESD strategies proposed are designed to assist the proposed development to achieve a high level of sustainability performance, whilst also meeting the minimum performance standards of National Construction Code (NCC): Building Code of Australia (BCA) Section J and the Randwick Development Control Plan 2013. The ESD strategies proposed for the development includes details of how various initiatives are proposed to be adopted to reduce resources, water and energy consumption and improve indoor environment quality for occupants. As the proposed development is yet to progress through detailed design, the ESD Strategies outlined in this report will be subject to further investigation during the coming stages of the design development.

Key drivers for adopting sustainable practices include:

- Lower energy costs
- Reduced peak electrical demand
- Building an effective learning space and a productive research environment
- Improved staff amenity
- Responsible corporate citizenship towards the environment.

Through design development stages, the IASB Addition will aim to deliver a 10% improvement on NCC section J energy use during construction. This will be consistent with what has been achieved by the 100% detailed design of the approved ASB. All new facilities will target a Green Star Health Care 4-star equivalency rating, this has been and will continue to be considered as aspirational within the context of project location, scope and budgetary allowances, no documentation or certification is required. Based on the ASB 100% Detailed Design documents, the approved ASB will achieve a theoretical 4-star green star building. The ESD initiatives proposed for the IASB Addition will adopt the existing ASB strategies where possible to also target a 4-star equivalency rating. The IASB Addition shall comply with the Deemed-to-Satisfy (DTS) requirements of BCA Section J for insulation, building sealing and glazing.

- Building envelope shall comply with the minimum DTS requirements specified in Part J1 as shown below.

Envelope Item	Section J Performance Requirements
Roof/Ceiling	Total R-value (m^2K/W) – **R4.2 downwards**
External Walls	Total R-value (m^2K/W) – **R2.8**
Internal Walls	Total R-value (m^2K/W) – **R1.8**
Floors	Total R-value (m^2K/W) – **R2.0 downwards**

Table 3.1 – Building Insulation Summary

- Glazing on the building shall comply with the requirements outlined in the separate JV3 assessment report.

4. UNSW Integration

The IASB Addition has increased the net lettable area of the ASB by approximately 5,000 m^2, which equates to an approximate increase of 10% to the approved ASB. This additional area is to be constructed as an eastern extension above the existing Hospital Road. The extension will comprise of:

- Level 00: Clinical Innovation and Research Space.
- Level 01: Clinical Translational Lab Space.
- Level 02: Clinical Translational Lab Space.
- Level 03: Biomedical Engineering Innovation Space.
- Level 04: Biomedical Engineering Innovation Space.
- Level 05: Education and Research Space.
- Level 06: Education and Research Space.
- Level 07: Education and Research Space.
- Level 08: Education and Research Space.
- Level 09: Plant

The cold shell will include:

- Compliant fire protection systems.
- Compliant emergency light and exit lighting systems.
- Compliant ventilation systems, including smoke control systems.

As part of the fit-out, UNSW will install specialised mechanical, electrical, hydraulic and fire protection services to suit their requirements.

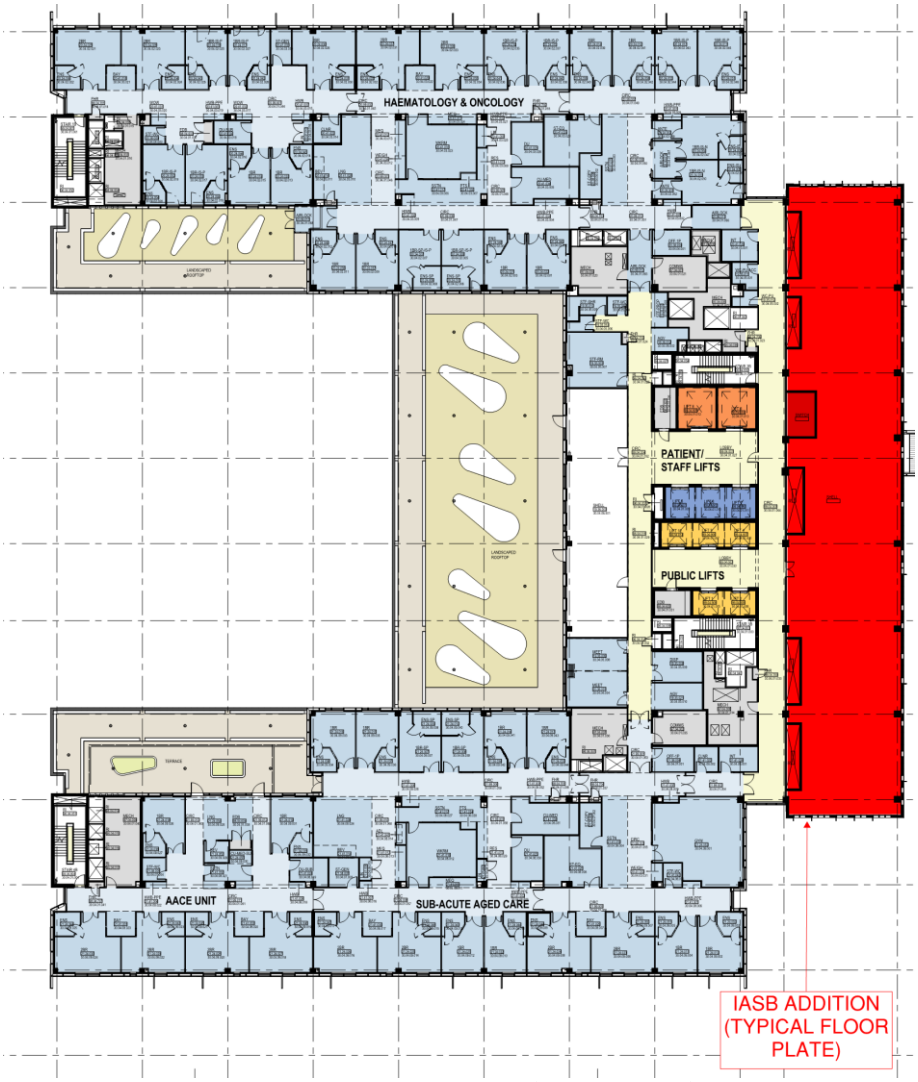

Table 5.1 – IASB Addition (Typical Floor)

5. Terms of Reference

5.1. Purpose of this report

This report describes the sustainability initiatives and key design principles associated with the cold shell elements within the ASB that are to be followed through the design development, construction and operational stages.

5.2. Project Stakeholders

Consultation throughout the detailed design stage has been undertaken with the following key project stakeholders:

- Lendlease Building (LLB).
- Health Infrastructure (HI).
- University of New South Wales (UNSW).
- IASB Addition design team.

5.3. Reference Documents

This report has been prepared with reference to the following documents:

- Architectural Drawings and Documents (BVN June 2019).
- Schematic Façade Drawings and Documents (BVN June 2018).
- NSW Health Infrastructure Engineering Services Guidelines (August 2016)

The assessment contained within the report has been based on the documents nominated above (e.g. scale measurements). Any changes to the documents listed above, may affect the accuracy of the assessment presented in this report.

5.4. Standards

The NCC BCA Section J works shall be designed and installed to comply with the National Construction Code (NCC).

All works shall be carried out in accordance with this specification and the current Australian Standards and standards detailed within.

5.5. Design Principles & Criteria

Key Design Criteria

This sustainability report addresses the requirements of the NSW Health engineering services guidelines.

- Sustainable Energy Hierarchy
    - Sustainable initiatives and systems will be analysed using the NSW Health Engineering Services Guideline's energy hierarchy as shown below.

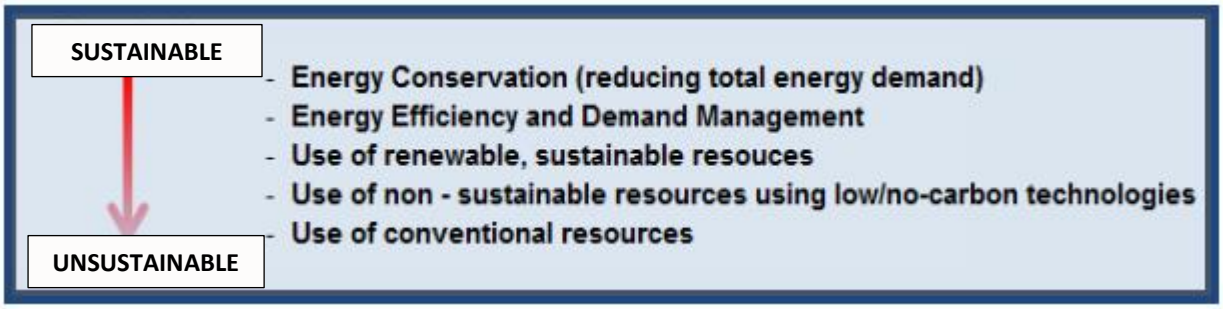

Figure 6.1 - NSW Health Energy Hierarchy

UNSW have their own sustainability guidelines; however, as the IASB Addition is a small part of the overall ASB the NSW Heath sustainable initiatives will be adopted.

- Sustainability, Lifecycle and Waste Management
    - Proposed designs will include passive sustainable design strategies such as day lighting, demand management, gravity systems, energy and water efficiency and conservation techniques, use of non-toxic and environmentally sound material and finishes, and consider lifecycle sustainability and maintenance implications.
- Materials
    - Consideration to be given to materials of low embodied energy content, high recycled content and / or highly recyclable.

Sustainability and Energy Targets

The NSW Health engineering services guidelines state the following with respect to sustainability and energy targets.

- Green Star
    - All new facilities will target a Green Star Health Care 4-star equivalency rating.
- Energy Targets
    - All new standalone buildings will have a mandatory requirement of delivering a 10% improvement on national construction code (NCC) section J energy use.

Building Importance Level

The ASB is classified as an Importance level four (IL4) (Buildings or structures that are essential to post-disaster recovery or associated with hazardous facilities) under BCA and AS 1170 (structural design actions).

5.6. Statement Regarding Climate Adaptation and Resilience

The project requires design features that will future proof the IASB Addition from the impacts of climate change. This is addressed through the Climate Adaptation and Resilience credit within the Green Star Design & As-Built v1.2 rating tool. NSW and ACT Government Regional Climate Modelling (NARCLIM) has identified the following climate change projections:

1. More hot days and fewer cold nights.
2. Increased number of heatwave events.
3. More hot days above 35^{O}C, particularly in Spring and Summer.
4. Increased rainfall in Summer and Autumn and decreased rainfall in Winter and Spring.
5. Change in rainfall patterns that will affect drought and flooding events.

These projections will have an impact on operational costs and occupant comfort and safety. Hotter days and more heatwave events will particularly affect patients and the operation of the building services equipment. To overcome the temperature increases the building services plant will have to work harder, this will increase

energy use, maintenance cycles and operating costs. Increased drought events will require measures to reduce potable water consumption on site. This is likely to be achieved through efficient selection of equipment and suitable landscaping treatments. Facades and roofs will need to be suitably reinforced and fitted with adequate drainage to deal with more extreme rainfall events and gustier wind conditions.

The design initiatives in the following table aim to mitigate the effect of future climate change while maximising efficiency in energy, water and material use. These measures will allow the IASB Addition to meet the challenges predicated by the CSIRO's climate change projections, while maintaining occupant comfort and operational efficiency.

Climate Change Projections	Climate Change Design Initiatives
Hotter days and more frequent heatwave events	• Improved thermal performance of the building envelope (IASB Addition will aim to deliver a 10% improvement on NCC section J energy use). • Efficient glazing to reduce solar heat gain. • Improved efficiency of mechanical services (IASB Addition will aim to deliver a 10% improvement on NCC section J energy use). • Optimised shading devices across the façade to reduce summer heat gain from direct sunlight.
Extended drought periods	• Provision of stormwater capture and storage for reuse (landscaping) or short-term detention to manage flows into the suburban storm water network. • Potential grey water capture, treatment and reuse (landscaping). • Landscaping with plants that require minimal water and will generate 'cooler' green spaces, which in turn assist in transforming the urban heat island effect. • Selection of water efficient building services plant.
More extreme rainfall events	• Provision of storm water capture and storage for reuse (landscaping) or short-term detention to manage flows into the suburban storm water network. • Management of overland flow paths on the site. • The use soft landscaping to break-up hard pavement areas were possible. • Minimise tree removal on the site to reduce soil erosion effects. • Reinforced façades, roofs and adequate drainage.
Gustier wind conditions	• Reinforced façades and roofs. • Respite and shelter areas. The large lobby space provides a shelter area, while still allowing building users to visually connect with the external environment. • Efficient filtration on the mechanical air handling plant.

Table 5.1 – Climate Change Adaptation and Resilience Summary

5.7. Limitations of this report

This report reflects the design for sustainability only.

6. Green Star Equivalency

The IASB Addition uses a 4 Star equivalent Green Star rating as a design guide only. This is not a formal rating and no documentation or certification is required. The UNSW eastern extension base building space will use the same equivalent Green Star rating. The following general sustainability principals have been used to guide the design process:

Management & Operations:

- Recognised building commissioning and tuning process
- Provision of building information to facilitate understanding of the building's systems, operation and maintenance requirements
- Use of best practice environmental management procedures during demolition and construction
- Provision of recycling facilities for operational waste

Energy:

- Optimised building orientation
- Good quality building envelope
- Efficient heating, ventilation and air conditioning (HVAC) components
- Use of efficient lighting fixtures

Indoor Environment Quality:

- Use of materials with low or no volatile organic content (VOC) and formaldehyde
- Mitigation of outdoor and indoor pollutants
- Provision of appropriate and comfortable acoustic conditions for staff and patients
- Use of refrigerants with low environmental impact

Water:

- Use of water efficient fixtures and fittings with Water Efficiency Labelling and Standards (WELS) rating
- Closed loop fire system test water system

6.1. Sustainability Principals

The following table summarises the sustainability principals to be adopted in the project (ASB and IASB Addition).

Sustainability Initiative	Comments / Status	Design Response
Comprehensive services and maintainability review of the project led by the head contractor or owner's representative (e.g. Independent Commissioning Agent ICA) during the design stage and prior to construction.	Head Contractor or ICA to lead review at design stage and produce report. Recommendations to be addressed in building design.	An initial maintainability review has been carried out as part of the safety in design process. Follow-up reviews will be conducted by the design team during the preparation of construction documentation.
Comprehensive pre-commissioning and commissioning activities are performed for all building services according to AIRAH/CIBSE codes for all services or ASHRAE for mechanical services only.	Requirement to be specified to all services trades. ICA to prepare a Commissioning Plan and produce a Commissioning Report.	A commissioning plan will be developed by the ICA in consultation with the design team during the preparation of construction documentation.
Tuning process in place requiring as a minimum, quarterly adjustments and measurements for the first 12 months after occupancy and review of building system manufacturer warranties. Tuning process requires analysis of monitoring system data and assessment of occupant feedback on building conditions.	Tuning team must include facilities manager, owner's rep and ICA with the Head Contractor and services designers/installers to address tuning issues. Requirement to be specified to all services trades.	A tuning plan will be developed by the ICA in consultation with the design team during the preparation of construction documentation.
Engagement of an ICA to advise, monitor, and verify the commissioning and tuning of all building systems.	Head contractor to engage ICA.	An ICA will be engaged as the project progresses into the construction stage.
Produce comprehensive Building Operation and Maintenance information made available to Facilities Management team.	Contractor team to produce O&M information including a Building Log Book that provides a summary of key O&M information.	Detailed operations and maintenance manuals will be prepared by the trade contractors. These manuals will be submitted for review during the project construction stage.
Produce Building User information and make available to all relevant stakeholders.	Building User Guide required and building user information to be provided in digital format and made available through combination of digital signage / interactive information kiosks in high traffic areas (e.g. lobby areas).	Building user guides will be prepared by the head contractor. These user guides will be submitted for review during the project construction stage. The user guides will be in a digital format; which will allow the hospital to make them available through their ICT

Sustainability Initiative	Comments / Status	Design Response
		network.
Provide accessible metering to all energy and water consumption covering common and major uses and sources for distinct uses or floors (whichever is smaller). Energy items >100kVA must be individually metered.	Thermal/Energy/Water metering to be incorporated within developed elec / mech / hyd services designs. Meters to follow NABERS meter validation protocol.	Fredon have documented the required metering in the mechanical and electrical packages. The metering will be accessible through the BMCS.
Implementation of a monitoring strategy in accordance with a recognised standard (e.g. CIBSE TM39 Building Energy Metering), capable of capturing and processing data from all energy and water meters, and accurately and clearly presenting data consumption trends.	Requires development of monitoring strategy and automatic monitoring system that reports on metered data against targets. ICA/HC to collate meter/monitoring system commissioning reporting.	Fredon have documented the required metering, through the BMCS. The automatic monitoring strategy will be documented in the commissioning plan and the tuning plan.
Engaged Contractor must implement a project specific EMP meeting requirements of the NSW Environmental Management System Guidelines.	Appointed contractor to developed and implemented a project specific EMP for all demolition and construction phases of the project. Sub-contractors must adhere to the requirements of the EMP.	LLB will develop a project specific environmental management plan as the project progresses into the construction stage.
Engaged Contractor to have a Formalised Environmental Management System with evidence of independent auditing & system compliance to ISO 14001.	Contractor to have ISO14001 accreditation and an independently audited EMS that is in place for the duration of the construction works.	LLB have an accredited ISO 14001 environmental management system that is independently audited.
Provide occupant waste storage containers for separation of all applicable waste streams, have a dedicated waste storage area for collection of all waste sized to handle all waste streams that is provided to meet best practice access requirements.	Requires waste facilities to be sized and have access requirements in accordance with prescriptive criteria (e.g. City of Sydney Policy for Waste Minimisation in New Developments). Architect to assess Policy requirements and incorporate sufficient spatial allowance for recyclable waste storage in additional to general waste near loading dock meeting the access requirements.	BVN have document the required waste / recycle storage and handling spaces in architectural package.

Sustainability Initiative	Comments / Status	Design Response
Mechanical ventilation systems are to be: - designed in accordance with ASHRAE Standard 62.1:2013 regarding separation of outdoor air intakes & pollution sources to minimise entry of pollutants; - designed with provision of access for maintenance and cleaning to both sides of all moisture and debris-catching components; and - cleaned prior to occupation and use, covering all new and existing ductwork.	Requires mitigation of outdoor pollutants through minimum separation distances between pollution sources and air intakes, designing system for ease of maintenance (access panels either side of moisture and debris catching components) and cleaning prior to occupation.	Fredon have documented the mechanical ventilation system to mitigate outdoor pollutants through minimum separation distances between pollution sources and air intakes. They have also designed the system so that filters can be accessed and maintained.
Provide exhaust systems in accordance with AS1668.2-2012 to remove pollutants from printing and photocopy equipment, cooking processes and equipment, and vehicle exhaust &/OR remove the source of these pollutants. (For photocopiers, elimination of pollutants through using photocopiers meeting emission standards can be used in place of dedicated exhaust ventilation).	Design to incorporate either: 1. dedicated kitchen exhaust riser 2. dedicated exhaust system for the car park.	Fredon have documented the mechanical ventilation systems for kitchens and car parks in the mechanical package. These systems comply with AS 1668.2-20012.
Internal noise levels in the nominated area considering all internal & external noise sources are to be no more than 5dB(A) above the "satisfactory" sound levels listed in AS/NZS 2107:2000.	Requires façade to control external noise. Features to control HVAC noise to be incorporated. Readily achievable.	The façade has been designed to control external noise. Additional features to control HVAC noise have also been incorporated. The Acoustic Studio design report summarises these requirements.
The reverberation time in the nominated area must be below the maximum stated in AS/NZS 2107:2000.	Requires internal noise control.	Measures have been incorporated to control reverberation times. The Acoustic Studio design report summarises these requirements.
All lights in the nominated area are installed with ballasts (flicker free) and have a minimum Colour Rendering Index (CRI) of 80.	Requires good quality lighting to meet CRI requirements.	Fredon have documented flicker free ballast lighting with appropriate CRI in the electrical package.
Maintained illuminance meets the recommended levels of AS1680.2.5 for Healthcare Facilities.	Requires good quality lighting.	Fredon have documented AS1680.2.5 lighting in the electrical package.

Sustainability Initiative	Comments / Status	Design Response
Glare from sunlight through the viewing facades in the nominated area is reduced through a combination of blinds, screens, fixed devices, or other means. Where the functional requirements of an area require the exclusion of daylight and views, these areas may be excluded.	Use of blinds, screens and fixed devices to comply with Glare Reduction.	BVN have documented blinds for glare control in the architectural package. In addition to this, external screens have been documented in the façade package.
At least 95% of all internally applied paints, adhesives, sealants and carpets meet the stipulated 'T-VOC' limits.	Standard practice.	BVN have documented paints, adhesives, sealants and carpets to meet the stipulated 'T-VOC' limits in the architectural package.
Engineered Wood Products: At least 95% of all engineered wood products meet the stipulated formaldehyde limits.	Standard practice.	BVN have documented all engineered wood products to meet the stipulated formaldehyde limits in the architectural package.
The proposed building GHG emissions are less than those of the equivalent benchmark building (a 10% improvement on minimal compliance with the NCC section J DTS provisions).	Will comply.	Fredon and LCI will carry out energy modelling to demonstrate this compliance. The modelling will be carried out once equipment is selected and documented in the construction documentation.
Use of water efficient fixtures and fittings with Water Efficiency Labelling and Standards (WELS) rating.	Standard practice.	Central Plumbing have documented standard WELS rating fixtures and fittings in the hydraulics package.
At least 60% of all reinforcing bar and mesh is produced using energy-reducing processes.	Suppliers such as NatSteel & OneSteel use energy reducing processes for the manufacture of bar and mesh.	Enstruct have documented that 60% of all reinforcing bar and mesh is produced using energy-reducing processes in the structural package.
At least 95% (by cost) of all timber used is certified by a forest certification scheme.	All timber permanently installed or used for construction of the development must be sustainably sourced meeting either FSC or PEFC certification with appropriate	Enstruct have documented that 95% of all timber used in the formwork is re-used or supplied through a forest certification scheme in the structural

Sustainability Initiative	Comments / Status	Design Response
	Chain of Custody (COC) records or be re-used.	package.
At least 90% (by cost) of all permanent formwork, cables, pipes, flooring and blinds meet Best Practice Guidelines for PVC	Compliant products being PVC free or Best Practice certified are readily available and standard practice.	This is standard practice for all PVC products.
Any significant site contamination is identified with remedial steps undertaken to decontaminate site prior to construction.	Anticipated that there will be contamination issues to be addressed in the existing dwellings. Advice to be provided from site contamination consultant/contractor.	LLB will coordinate any contamination identified during the demolition process to be treated in accordance with the statutory requirements for the type of contamination found.
Demonstrate a reduction in peak sewer discharge comparing pre-development to post-development discharge.	The new site condition stormwater discharge would be reduced over existing site condition with on-site detention tank.	Acor have documented stormwater discharge to be reduced over existing site conditions with the use of an on-site detention tank in the civil package.
Stormwater discharged from the site must meet the following Pollution Reduction Targets: - Total Suspended Solids (TSS) - 80% - Gross Pollutants - 85% - Total Nitrogen (TN) - 30% - Total Phosphorus (TP) - 30% - Total Petroleum Hydrocarbons - 60% - Free Oils - 90%	Storm water will meet these requirements.	Acor have documented the stormwater discharge meet these requirements in the civil package
All outdoor lighting must comply with AS4282:1997.	External lighting design to be compliant with AS4282.	Fredon have documented AS4282:1997 external lighting in the electrical package.

Table 6.1 – Sustainability Principles

6.2. Building Material Selections

Where possible materials with low embodied carbon or ability to be recycled will be given preference over materials with high embodied carbon contents or single use materials.

Common building materials with high embodied carbon content include:

- Aluminium products
- Copper products.
- Steel products.
- Glass products.
- Compressed fibre cement products.
- Polycarbonate products

For the case of aluminium, copper, steel and glass; these materials are readily recycled and are very common materials in hospital buildings. The use of these materials cannot be avoided.

Common building materials with low embodied carbon content include:

- Plantation timber products
- Natural stone products
- Light weight concrete products.
- Rockwool insulation products.
- Plasterboard products,

Timber and stone products are used throughout the landscaping. Concrete, rockwool insulation and plasterboard are used extensively throughout the building.

7. BCA Section J

The IASB Addition will be assessed for section J compliance as part of the ASB. The section J requirements for the ASB are described in the ASB detailed design sustainability report submitted as part of State Significant Development SSD 9113 - Prince of Wales Hospital Extension Stage 1.

8. Sustainability Initiatives

The following sustainability initiatives have been adopted as part of the IASB Addition design.

8.1. Electrical Services

Initiative	Proposed ESD Strategy
External lighting	External lighting will be provided around the perimeter of the IASB Addition and external areas in accordance with AS/NZS1158 and Crime Prevention Through Environmental Design (CPTED). External lighting will be controlled via light sensors. Light Emitting Diode (LED) lighting options will be assessed bases on life cycle analysis to develop the most appropriate external lighting solution.
Efficient internal lighting systems	Generally LED luminaries are proposed throughout. Lighting levels will be provided according to AS/NZS 1680.
Switching systems	It is proposed to provide a centralised DALI or equivalent lighting control system or equivalent with graphical user interface to enable remote control. Implementation of area dimming, time clocks, scene lighting and daylight sensing will be discussed with the user groups.
Emergency exits	Emergency and exit lighting will be in accordance with AS/NZS 2293.1, and will be designed to minimise ongoing maintenance and cost. This is proposed to be achieved through the following: - Centrally monitored system with automated self-testing; - Long life LED luminaries; - Individual long-life batteries; and - Wide area coverage luminaries.
Photovoltaics	Roof mounted photovoltaic systems are not part of the design as the payback period is beyond five years. However, roof space is available for a future installation if the payback period reduces.
High quality materials	Minimising the amount of PVC cabling where possible.
Energy monitoring	All sub meters will be linked to the Building Management System (BMS) to monitor energy consumption. There will be a continual monitoring of monthly energy consumption and building turning to optimise energy performance.
NCC section J performance	The project will target a 10% improvement on NCC Part J minimum

Initiative	Proposed ESD Strategy
	performance requirements for the lighting power density.

8.2. Mechanical Services

Initiative	Proposed ESD Strategy
Central Systems	The building air conditioning chilled water requirements shall be met by way of a combination of high efficiency variable speed chillers piped in series counter-flow to match the building demand profile in a stable and economical manner. Water cooled chillers will be selected to maximise efficiency.
Secondary systems	Energy efficient FCU's with EC/DC motors to provide air-conditioning. Modular variable speed pumps to minimise and reduce energy output for peak and non-peak demands Preference to be given to energy efficient equipment, with consideration of cost, suitability and maintenance.
Type of Refrigerants	Zero Ozone Depleting Potential (ODP) and Low Greenhouse Warming Potential (GWP) refrigerants shall be specified in the design.
Passive heating and cooling techniques	Passive conditioning techniques where applicable, to reduce the overall air-conditioning loads. Shading of windows to prevent solar penetration in summer but allow passive heating in winter. Efficient insulation of hot and warm water distribution pipe-work to minimise heat losses Use of high performance glazing and high levels of insulation. Building thermal mass and insulation combinations, avoiding thermal bridging.
BMCS system	Building Management System (BMS) to schedule and optimise plant efficiency. The air-conditioning system to be designed to either shut down or to be set to a wider temperature control band, when a space is unoccupied.
Heating and cooling	Air side systems selected to match thermal zones and individual

Initiative	Proposed ESD Strategy
systems	departments, served from zoned secondary heating and cooling circuits to apportion energy use.
Air handling systems	Units shall be selected with economy cycle where appropriate even when below the BCA threshold.
Heat rejection	Chillers and cooling towers shall be selected to accept low entering condenser water to maximise efficiency, based on favourable wet bulb conditions.
Heating hot water	Heating coils to be selected with a high temperature difference and low return water temperature to maximise condensing water efficiency.
Heat recovery	Heat shall be recovered from ventilation systems either through direct return air or indirect heat exchange where there is a benefit in doing so.
NCC section J performance	The project will target a 10% improvement on NCC Part J minimum performance requirements.

8.3. Hydraulic Services

Initiative	Proposed ESD Strategy
Efficient water fixtures and fittings	Low flow taps will be used throughout. Flow rates for water outlets shall be controlled by flow restrictors and will deliver water at the flows listed below: - Shower 7.7L/m - Basin 7.7L/m - Sink 7.7L/m - Scrub trough 7.7L/m
Hot water system	The building's heating water requirements shall be met by way of a series high efficient gas fired boilers.
Hot water Pipework	Additional insulation is provided for the domestic hot water pipework insulation in excess of section J 7.2 minimum requirements. The thicker insulation (38mm) will achieve a 26% reduction in energy losses when compared with the industry standard 25mm thickness.

Initiative	Proposed ESD Strategy
Water metering	All water sub-meters are connected to the BMS.
Other initiatives	Domestic hot water preheat by a high-grade heat source where feasible. Use of gravity systems where feasible. Fire test water re-use in non-potable water systems. Water sensitive urban design.

8.4. Architectural

Initiative	Proposed ESD Strategy
Daylight	Courtyards and light wells are used to improve daylight on to the floor plates at lower levels. Floor to ceiling glazing where possible to allow daylight deep into floor plate.
Daylight glare	High performance building envelope- glass will be selected with a high visual light transmission whilst still providing a 10% improvement in section J compliance. Public areas at lower level shaded by concourse. Deep reveals to windows at podium level.
Façade performance to meet section J	The project will target a good quality façade to meet the NCC Part J minimum performance requirements via the JV3 method.
Waste	Materials selected for the façade will be part of a modular system based on panel efficiencies thus minimising waste, construction time and costs. Modular systems are largely factory assembled and tested.

8.5. Structural

Initiative	Proposed ESD Strategy
Description of sustainable concrete and construction techniques-concrete	PT construction technique will reduce the amount of construction materials – concrete and reinforcement. Provision for future core holes can be made without the need for strengthening. Recycled material can be used in the form of fly ash or ground-granulated blast furnace slag as a replacement for part of the Portland cement concrete mix. Use of recycled aggregates.
Description of sustainable concrete and construction techniques-Steel	Use Bondek as permanent slab formwork.
Other initiatives	Design for adaptability – adopting a higher loading allowance to avoid the need to having to strengthen or demolish later; adopting a sacrificial topping zone for provision of future set-downs for wet zones; adopt non-loadbearing walls as partitions which allows them to be removed around in future. Minimise materials by maximising efficiency. Source materials responsibly and locally if possible. Minimise off-site transportation of contaminants by the use of on-site borrow pit for storage of excavated materials.