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Westmead Millenium Institute Research Hub

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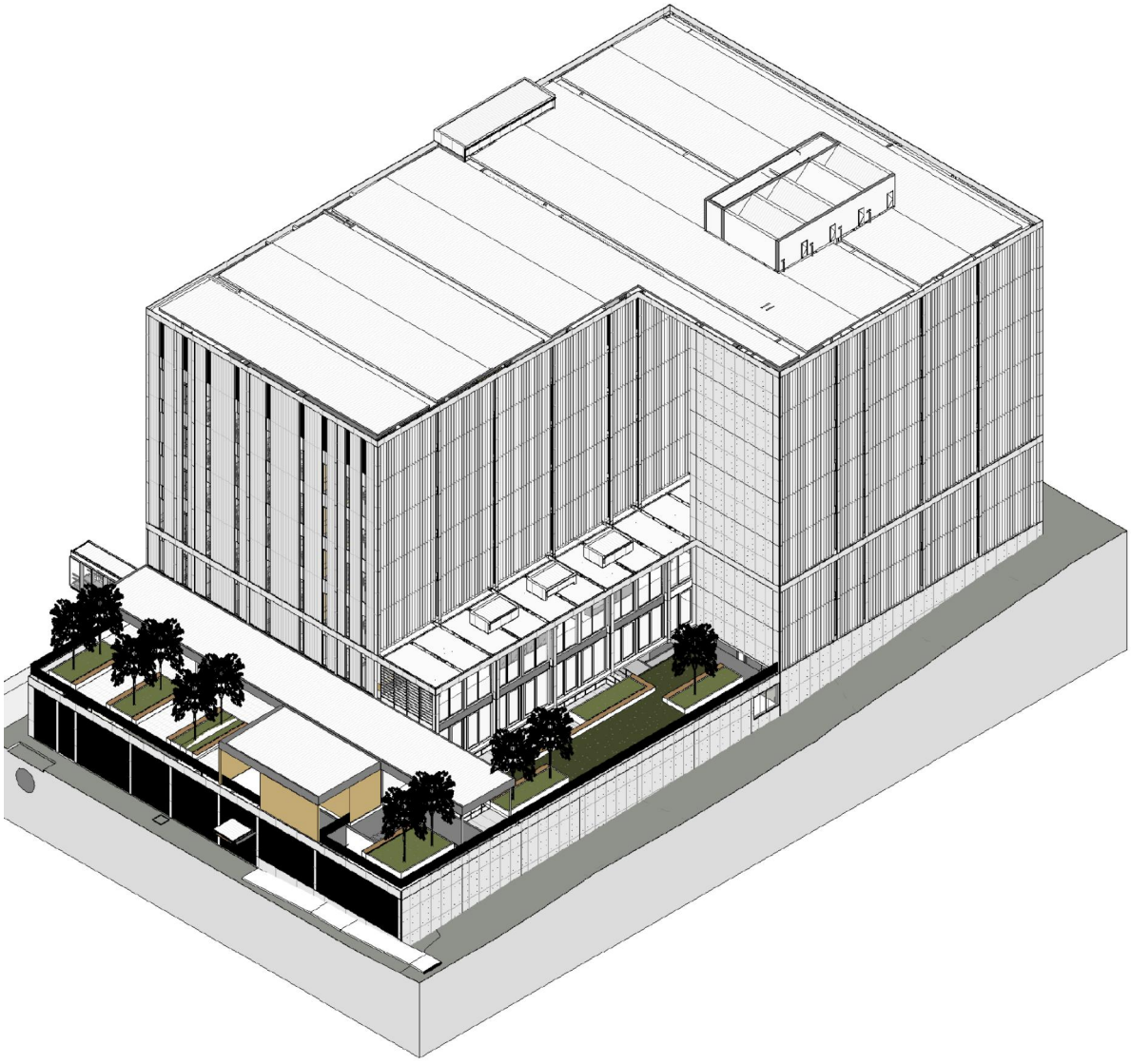
Westmead Millennium Institute Research Hub: ESD Initiatives Report



Westmead Millennium Institute Research Hub: ESD Initiatives Report

Prepared for

Abigroup Cockram Joint Venture (ACJV)

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01	14-Nov-2012	For Client Review	Lehan Tan Principal Engineer	
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Executive Summary

This report identifies the various ESD initiatives that will be incorporated into the design & construction of the Westmead Millennium Institute & Research Hub by the ACJV project team. The principles of Green Star and requirements of BCA Section J have been used as a basis for developing the ESD targets.

The sustainability initiatives fall within the broad Green Star categories of:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use & Ecology
- Emissions

1.0 Introduction

The Westmead Millennium Institute and Research Hub (WMIRH) is a new building development located on the Westmead Hospital campus dedicated towards leading medical research.

The WMIRH building comprises approximately 17,000m^2 of floor area over 9 storeys, and contains Building Code of Australia (BCA) Class 8, Class 9b, Class 5 and Class 6 areas. BCA Class 8 and Class 5 form the vast majority of the floor area.

The Abigroup Cockram Joint Venture (ACJV) project team is delivering the WMIRH building through a design & construct (D&C) arrangement.

The design and construction of the Westmead Millennium Institute & Research Hub is intended to be consistent with “best practice” Ecological Sustainable Design (ESD) initiatives.

The objective of this report is to identify the ESD initiatives that will be adopted by the ACJV project team into the design and construction of the WMIRH building.

1.1 ESD Initiatives and Green Star Education

The ESD initiatives proposed to be implemented are based broadly on sustainability credits within the Green Star Education v1 rating system administered by the Green Building Council of Australia.

The Westmead Millennium Institute & Research Hub is not eligible for a formal Green Star Education v1 Design or As Built rating because it does not fulfil the minimum 50% BCA Class 9b requirement for certification. In addition, the Green Star Education v1 ESD initiatives are typically not suitable for application within buildings containing highly specialised Class 8 laboratory areas (such as the WMIRH building).

Nonetheless, suitable initiatives from the Green Star Education v1 tool can be adapted and modified for application on this project.

The sustainability initiatives fall within the broad Green Star categories of:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use & Ecology
- Emissions

The following sections identify individual initiatives that will be targeted in the WMIRH building design & construction.

2.0 Management Initiatives

The following initiatives encourage the implementation of environmental principles including commissioning, tuning and operation of the building and its systems. Design and construction management initiatives concerning environmental, waste and building maintainability will ensure systems within the WMIRH development operate to their intended design potential during its life cycle.

The ACJV project team will target the following management related ESD initiatives:

2.1 Commissioning

Figure 1 Commission all building services for optimal building operation

Commissioning is essential to ensure that all building services can operate to its optimal design potential. The project team will develop a rigorous commissioning plan and implement pre-commissioning, commissioning and quality monitoring for mechanical, electrical, hydraulics, fire protection, laboratory gases and automatic controls (Building Management) systems.

In addition, the project team will provide the building owner with all As-Built drawings, commissioning reports, Operations & Maintenance (O&M) manuals, BIM Models and provide sufficient training for building management to operate the development effectively.

2.2 Building Services Tuning

Building tuning is an integral part of ensuring optimum occupant comfort and energy efficient services performance throughout the year. The project team will conduct building services tuning (particularly for mechanical and BMS services) for 12 months after building handover, as part of the Defects Liability Period. This will include quarterly building services tuning, and tuning reports will be generated for the building owner.

2.3 Building Users Guides

Figure 2 User-friendly Building User Guides for staff

Building guides will assist and enable building users to optimise the building's environmental performance. The project team will develop an easy-to-use Building User's Guide (BUG) for building users and occupants. The Building Users Guide will provide building services information, transport facilities, operational waste management policies, and expansion & refit considerations.

2.4 Environmental Management

The ACJV has ISO14001 certification, and will develop and implement a project specific Construction Environmental Management Plan (CEMP) in accordance with Section 4 of the NSW Environmental Management System Guidelines (1998) requirements. All sub-contractors will be required to adhere to the requirements of the CEMP.

2.5 Construction Waste Management

Figure 3 Implement construction waste management practices on-site

The ACJV project team will implement on-site construction waste management practices that will minimise the amount of demolition and construction waste going to disposal. A construction waste management plan will be developed and a minimum 80% of demolition and construction waste by weight will be re-used or recycled.

2.6 Maintainability

WMIRH facilities management will review design documentation and provide feedback to the project team on the adequacy of access for on-going maintenance, cleaning of the building services and cleaning of external building features. This will allow for on-going future maintenance to be conducted easily as required.

3.0 Indoor Environment Quality (IEQ) Initiatives

The following initiatives promote enhanced building occupant internal comfort and well-being. The IEQ initiatives will address how the HVAC system, indoor air pollutant monitoring systems, acoustics, and natural daylight can contribute to a more comfortable environment. Initiatives related to health such as finishes containing formaldehyde and volatile organic compounds minimisation are also addressed.

The ACJV project team will aim to target the following IEQ related ESD initiatives:

3.1 Outdoor Air Ventilation Rates

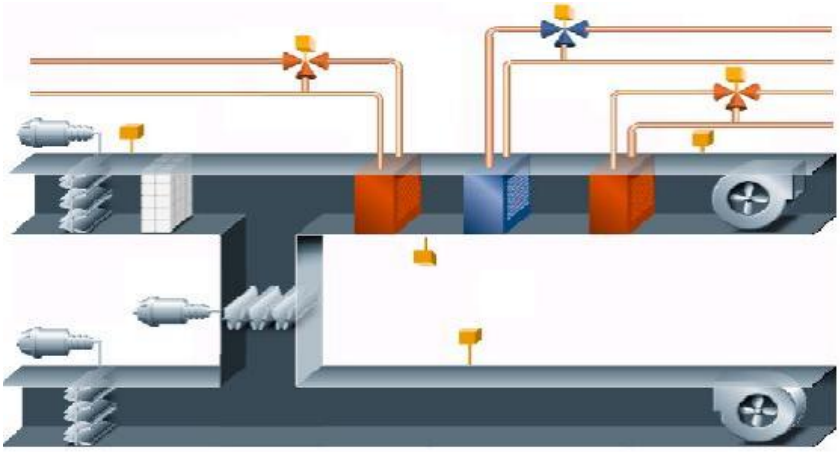

Figure 4 Provide adequate outdoor air ventilation rates to the building

The build-up of indoor pollutants in the building will be minimised by providing ample amounts of outside air. The mechanical design for the WMIRH development generally aims to provide outside air ventilation at rates up to 50% greater than the minimum requirements of AS1668.2-1991. A CO_2 monitoring system will automatically reduce the outside air ventilation rates during periods of low occupancy to save operational energy.

3.2 Mixed Mode Ventilation & Thermal Comfort

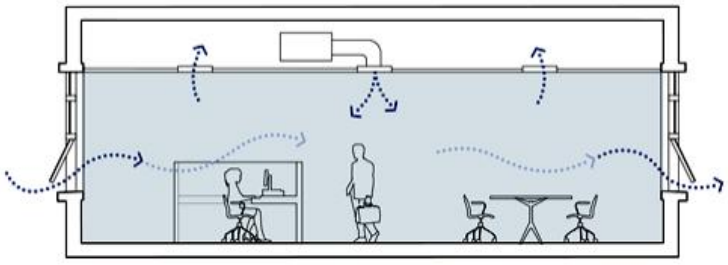

Figure 5 Mixed mode ventilation will reduce energy use and provide thermal comfort in the WMIRH Café Space

Natural ventilation has the potential to provide for a healthier environment for building occupants and also provide energy savings to the building's HVAC system. The Café located within Level 2 of the WMIRH development is designed to function as a mixed mode space and is deemed to be a transitional zone with a wider temperature band (e.g. refer to ASHRAE 55-2004 for adaptive thermal comfort ranges).

The BMS will monitor external temperature, humidity, wind speed and precipitation to determine when the Café space can be naturally ventilated. When outdoor ambient conditions are suitable to naturally ventilate the café space, the BMS will open the cafe door and louver control systems, and switch off the local cafe air-conditioning system. The opposite will occur when outside conditions are unsuitable. The cafe operator shall have the facility to override the operation of the natural ventilation system.

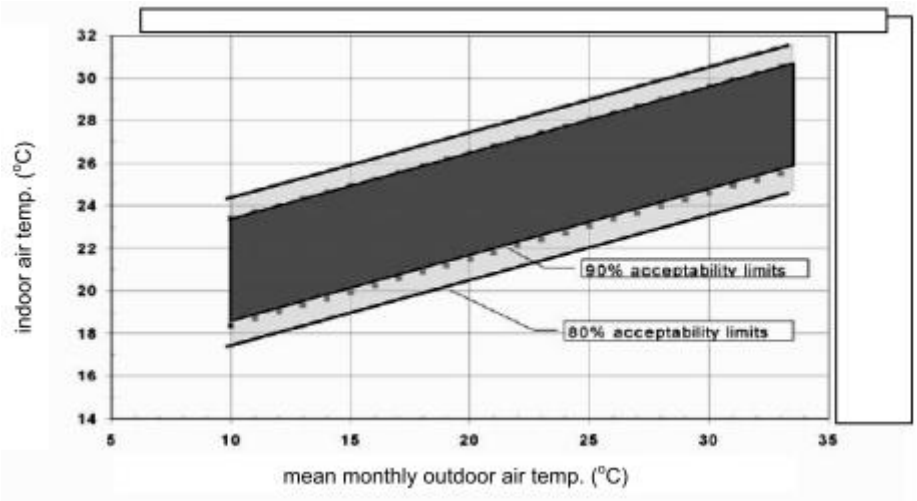

Figure 6 ASHRAE 55-2004 chart for adaptive comfort indicating thermal comfort conditions for building occupants based on the outdoor air temperature[1]

3.3 Aircuity System: Carbon Dioxide Monitoring & VOC Monitoring

Response monitoring of carbon dioxide and Volatile Organic Compounds (VOC) levels will be implemented as part of the Aircuity system proposed to ensure optimum quantities of outside air and monitoring of VOC pollutants.

Aircuity[2] will supply demand control ventilation with High Level Interface (HLI) connection to WMIRH's building management system. Aircuity performs this via its patented OptiNet system that collects samples of air using room sensors and duct probes from various spaces throughout the building and routes them to a centralised suite of sensors. These sensors measure the critical indoor environmental parameters and allow the OptiNet system to communicate intelligent input to WMIRH's ventilation systems to provide high quality indoor environmental quality. Aircuity will provide demand control ventilation (DCV) to control the WMIRH's HVAC system to reduce energy use during periods of low occupancy.

Figure 7 Aircuity's OptiNet System Components including sensors and air data routers[3]

3.4 Daylight & Glare Control

The WMIRH building design aims to allow for sufficient levels of natural daylight, whilst simultaneously minimising glare and thermal comfort issues. External shading and internal blinds/curtains are part of the building features to minimise direct glare and sun penetration to building occupants.

[1] ANSI/ASHRAE Standard 55-2004 Thermal Environmental Conditions for Human Occupancy
[2] http://www.aircuity.com/
[3] http://www.aircuity.com/technology/optinet-components/

3.5 Internal Noise Levels

The WMIRH building will be designed to maintain internal noise levels at an appropriate level to ensure building user comfort. Building services noise levels are to meet the recommended design sound levels stipulated within AS/NZS2107:2000.

3.6 Finishes Volatile Organic Compounds (VOC) Minimisation

Low VOC content interior finishes for paints and carpets will be selected for the WMIRH building.

Figure 8 Minimisation of VOCs in paint and carpet finishes

3.7 Composite Timber Formaldehyde Minimisation

Low formaldehyde emission level composite wood products for doors, partitions, joinery, or flooring will be selected for the WMIRH building.

3.8 High Frequency Ballasts

High frequency electronic ballasts will be used for all fluorescent lighting to reduce occupant discomfort due to low frequency flickers.

4.0 Energy Efficiency Initiatives

The following initiatives aim to reduce the overall energy consumption within the WMIRH development. Energy efficient building design, demand control ventilation and energy monitoring systems will help reduce energy use within the building.

The ACJV project team will target the following energy related ESD initiatives:

4.1 Compliance with NCC BCA Section J

The WMIRH building must comply mandatorily with the design & construction requirements of the BCA Section J, either through the Deemed-to-Satisfy requirements or through an alternate solution (Verification Method). Access for maintenance and facilities for monitoring will also be provided.

4.2 Energy Sub-Metering

Electricity and gas sub-metering will help facilitate on-going management of energy consumption for the WMIRH building. The energy sub-metering will be provided to comply with the requirements of the BCA Section J Part J8.3. This includes separate energy metering for air-conditioning, lighting, power, central hot water supply, internal transport devices and other ancillary plant.

If possible, primary functional areas including laboratories, teaching classroom spaces and office administrative areas will also be metered.

Energy sub-meters will be connected to the BMS to provide for an energy monitoring system

Figure 9 Energy sub-meters to provide energy monitoring of general lighting and power use[4]

4.3 Lighting Zoning

The WMIRH internal lighting system will be designed to be energy efficient and will comply with the BCA Section J Part J6 minimum energy efficiency requirements. The lighting switching & zoning will also allow building occupants to only light occupied areas. All individual or enclosed spaces will have individual light switches which are clearly labelled and easily accessible to building occupants.

4.4 Unoccupied Areas

Aircuity will provide demand control ventilation (DCV) to control the WMIRH's HVAC system to reduce and eliminate energy use in unoccupied zones. Conventional DCV solutions risk inaccuracy by deploying multiple sensors within a facility and another one placed outdoor as a reference. Instead, Aircuity uses a single sensor approach to test both indoor CO2 and outdoor air to provide a truer and accurate CO2 differential measurement.

4.5 Stairs

The WMIRH building will provide accessible and highly visible internal stairs for building users as an alternative to using vertical transportation by lifts.

4.6 Efficient External Lighting

The external lighting system will be designed to be energy efficient and be controllable by time-switch as a minimum. Where possible, daylight sensors will be used to switch external lighting also.

5.0 Transport Initiatives

The following initiatives encourage building users to utilise more environmentally friendly modes of transportation.

The ACJV project team will target the following transport related ESD initiatives:

5.1 Fuel Efficient Transport

The WMIRH development will provide adequate numbers of small car spaces and motorcycle parking spaces to encourage users to utilise smaller fuel efficient vehicles as part of their commuting.

[4] http://www.phoenixcontact.com.au/signal-level-matching/242_63908.htm

5.2 Cyclist Facilities

The WMIRH development will provide adequate cyclist facilities for building users. Cyclist facilities including secure bicycle storage space, accessible showers and changing facilities will be provided to WMIRH staff and students.

Figure 10 Cyclist storage facilities will be available to WMIRH staff and students[5]

5.3 Commuting Mass-Transport

The WMIRH building location site provides accessible public transport facilities. Mass transport services including bus stops and a train station (Westmead Station) are available within 1000m of the site.

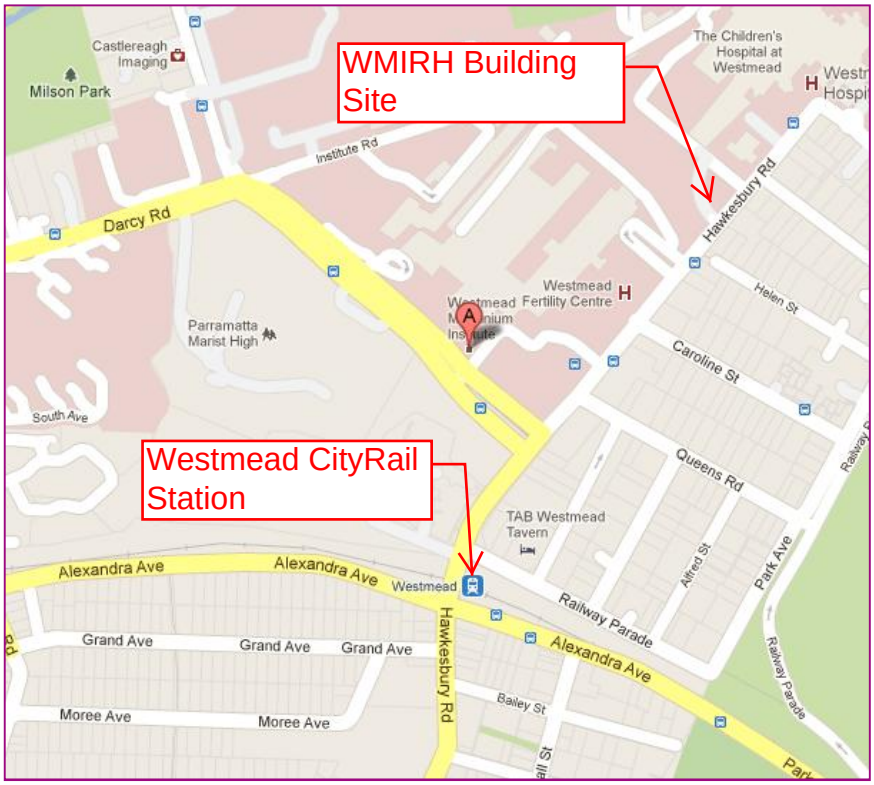

Figure 11 The WMIRH development is located near public transport facilities

[5] http://bicyclecanberra.blogspot.com.au/2010/10/intergrated-transport.html

6.0 Water Efficiency Initiatives

The following initiatives aim to reduce overall water consumption within the WMIRH development. The implementation of water efficient features such as using recycled rainwater for toilet flushing, landscape irrigation, installation of efficient hydraulic fixtures and fittings will help reduce water consumption. Water monitoring systems will keep building users informed of the building's water usage.

The ACJV project team will aim to target the following water related ESD initiatives:

6.1 Potable Water Use Reduction

The WMIRH development will reduce overall potable water use by installing water efficient WELS rated hydraulic fixtures and fittings. In addition, the WCs and urinals will be flushed using recycled rainwater.

Figure 12 WELS rated hydraulic fixtures and recycled rainwater will be used for toilet/urinal flushing

6.2 Water Meters

Water metering will help facilitate on-going management of water consumption for the WMIRH building. Pulse water meters connected to the BMS will be fitted to all major water uses, such as bathroom water consumption, irrigation and cooling towers. The BMS will raise an alarm if excessive water consumption is detected when compared to a daily averaged value.

Figure 13 Pulse water meters to monitor the building's water usage[6]

6.3 Landscape Irrigation

Recycled rainwater will be used to service the landscape irrigation. In addition, the landscape irrigation system will be designed to be water efficient with drip systems, timers and rainwater sensor override.

[6] http://www.instrumart.com/products/24873/seametrics-mj-series-pulse-water-meter

6.4 Fire Water System

Fire system test water will be recycled back into the sprinkler tank and waste water reticulated into the rainwater tank located on site.

7.0 Sustainable Materials Initiatives

The following initiatives aim to reduce overall consumption of resources within the WMIRH development. Material related initiatives include implementing a recycling waste storage area to reduce waste going to landfill and using certified recycled products within the building.

The ACJV project team will target the following materials related ESD initiatives:

7.1 Recycling Waste Storage

Adequate dedicated space will be provided for storage and collection of recyclable waste generated during operation of the building. This will assist in reducing the amount of operational waste being directed into landfills. Waste storage facilities will be based on the projected building waste streams and will be designed to meet the access requirements of 'Policy for Waste Minimisation in New Developments' (NSW, 2004).

Figure 14 Recycling Waste Storage facilities will be provided based on projected building waste streams[7]

7.2 Recycled Products in Construction

Where feasible and cost effective, the ACJV project team will endeavour to use certified recycled products in construction of the building, in order to prolong the useful life of existing products and materials.

[7] http://video.planetgreen.discovery.com/go-green/recycling/recycling-numbers-stats.html

8.0 Land-Use & Ecology

The following initiatives aim to reduce negative impacts on ecological systems and biodiversity during the development of the WMIRH building. The building is built on re-used land with minimal ecological impacts.

The ACJV project team will target the following land-use & ecology related ESD initiatives:

8.1 Re-Use of Land & Minimise Change of Ecological Value

The WMIRH building will be built on existing re-used land and will not further disrupt areas with high ecological value.

The building site ecological condition prior to and post development will not be significantly affected.

Figure 15 Aerial satellite view of WMIRH site prior to development

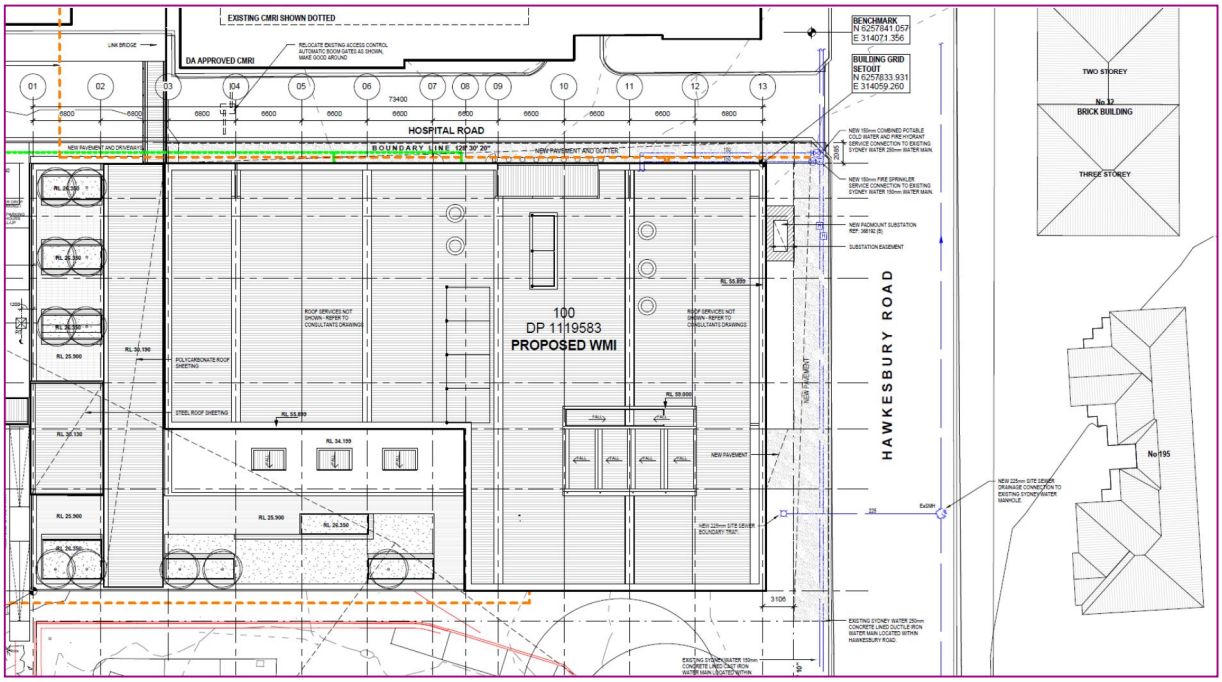

Figure 16 Proposed site plan of the WMIRH development

9.0 Emissions

The following initiatives aim to address the environmental impacts of the WMIRH building's physical emissions. Refrigerants and insulation that have zero ozone depleting potential will be used. In addition, refrigerant leak detection will be installed for the chiller plantroom.

The ACJV project team will target the following emissions related ESD initiatives:

9.1 Refrigerant Ozone Depleting Potential (ODP) Minimisation

Chillers and other HVAC equipment will only utilise zero ODP refrigerants such as R134A and R410A.

Figure 17 Zero ODP refrigerants R134A and R410A will be used

9.2 Refrigerant Leak Detection

Figure 18 Refrigerant leak detection systems will be implemented in the WMIRH chiller plantroom

Refrigerant leak detection systems will be installed in the WMIRH chiller plantroom. Alarms will be raised by the system for facilities management indication when a leak is detected.

9.3 Insulation with zero ODP

Thermal and acoustic insulation used for building services (pipework, ductwork, water tanks etc.) and building fabric (roof, wall, floor, facade spandrel insulation) will have zero ozone depletion potential in both manufacture and composition.

10.0 Conclusion

This report has identified the various ESD initiatives that will be incorporated into the design & construction of the Westmead Millennium Institute & Research Hub by the ACJV project team. The principles of Green Star and requirements of BCA Section J have been used as a basis for developing the ESD targets.

11.0 References

[1] Google www.google.com.au

[2] Green Star Education v1 (2008), Green Building Council of Australia

[3] Building Code of Australia 2011