ESD Report

Faculty of Arts and Social Sciences (FASS) University of Sydney, Camperdown Campus

University of Sydney

Prepared for

Lend Lease

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1. Introduction

1.1 Purpose of Report

The report outlines the sustainable design initiatives to be incorporated into the Faculty of Arts and Social Sciences (FASS) building and RD Watt redevelopment to University of Sydney Camperdown Campus. The report has been prepared in reference to the provisions defined in the Secretary Environmental Assessment Requirements document for the project and is to be submitted as part of Development Application documents.

1.2 Project Description

The FASS development will involve the construction of a new 6 level facility comprising:

- Plant rooms;
- Computer laboratories and general teaching spaces;
- Lecture theatre at the western end of the building;
- Offices and meeting rooms;
- Tutorial rooms and consultation rooms;
- Various breakout spaces, informal lounges/seating, and facilities on each level; and
- Trafficable roof top terrace space.

The following works are also proposed as part of the SSD application:

- Tree retention and removal within and surrounding the building footprint;
- Hard and soft landscaping works including tree planting;
- Civil works including excavation works to accommodate the building foundation and structures;
- Utilities and infrastructure connections to the building;
- Alterations and additions to the R.D Watt Building to facilitate uses that are complementary to the FASS development; and
- Building identification signage zones.

The FASS building will be connected to the R.D Watt Building by an awning across a linear courtyard that will function as an entry space to the new building.

1.3 Secretary's Environmental Assessment Requirements (SEARs)

The Secretary's Environmental Assessment Requirements (SEARs) for the project dated 18 June 2015 state that the following ESD items must be addressed in the application:

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

Section 2.1 of this report addresses SEARs point 1, **Section 2.2** addresses point 2 and **Section 3** addresses point 3.

Clause 7(4) of the Environmental Planning Assessment Regulation 2000 Schedule 2 for Environmental impact statements relating to the content of these documents states:

4) The principles of ecologically sustainable development are as follows:

(a) the "precautionary principle" , namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

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

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

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

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

This report has been prepared in reference to the above provisions and Development Application tender drawings produced by other consultants listed below.

1.4 Reference Documents

The following documents have been referenced in preparation of this report:

Document Reference	Title	Revision	Author
DA-0001	Context and Locality Plan	D	Architectus
DA-0003	Proposed Site Plan	D	
DA-1010	Level 1 Plan	E	
DA-1020	Level 2 Plan	E	
DA-1030	Level 3 Plan	E	
DA-1040	Level 4 Plan	E	
DA-1050	Level 5 Plan	E	
DA-1060	Level 6 Plan	E	
DA-1070	Roof Plan		
SSD 7081	Secretary's Environmental Assessment Requirements (SEARs)	18 June 2015	Department of Planning
	Building Services Return Brief	12 April 2016	NDY

1.5 Terminology

The following terms have been used in the preparation of this report:

AUMS Advanced Utilities Monitoring System

BMCS Building Management Control System

EMP Environmental Management Plan

ESD Ecological Sustainable Design

FASS Faculty of Arts and Social Science Building to the University of Sydney

Framework refers to the University of Sydney Sustainability Framework document

Green Star is an internationally recognised rating system that delivers independent verification of sustainable outcomes throughout the life cycle of the built environment

SEARs Secretary's Environmental Assessment Requirements

2. Project Response to SEARs

2.1 SEARs Requirement 1

The project acknowledges the requirements set out in the SEARs document and reference to the Environmental Planning Regulation 2000. The project proposes to meet the ESD Principles as defined in Clause 7(4) of the Environmental Planning Assessment Regulation 2000 Schedule 2 by:

1. Assessing the project design against the University of Sydney Sustainability framework which sets operational energy and water efficiency targets, lifecycle costing requirements for major plant and equipment and materials conservation goals
2. Undertaking building science studies for the FASS building to demonstrate compliance with the targeted operational goals of the building
3. Identifying appropriate sustainable design initiatives for the project given the nature of the building

2.2 SEARs Requirement 2

The University has stated that the approach to sustainable design for the FASS building is through the incorporation of the University of Sydney's Sustainability Framework. This is to ensure that the proposed FASS building aligns with the core sustainability aspirations of the University.

The project will not be certified against or complete any formal rating to a recognised environmental scheme, rather assessed against the University's Sustainability Framework. The University of Sydney Sustainability Framework is a holistic rating scheme that draws from the best national (Green Star) and international building (BREEAM & LEED) rating systems and best design practice. A comparison to the Green Star rating system has been completed and this comparison is provided below.

The University's Sustainability Framework provides an equivalent rating scheme to demonstrate industry best practice for sustainable design. The Sustainability Framework considers the following themes:

1. Leadership and Communication
2. Resource Efficiency
3. Healthy Environment
4. Materials
5. Climate Change, Landscape & Infrastructure
6. Sustainable Transport

The Sustainability Framework benchmarks sustainability across the different building types by using common sustainability ambition levels. The FASS building is targeting a Bronze rating under the Sustainability Framework. This equates to a minimum environmental rating score of 91 points out of a possible 140 points and is considered to be an appropriate target for a project of this nature. Similar to other rating systems, the University of Sydney's Sustainability Framework requires a formal submission of design and as-built documentation to the University for review and to demonstrate the project has achieved the requirements of the framework.

2.2.1 Green Star Comparison

A comparison has been made of the initiatives being targeted for the project derived from the Sustainability Framework to the Green Star Design & As-built v1.1 tool. The table below provides summary where each Green Star initiative aligns with the University of Sydney framework

Green Star Design & As-built Credit		Does the University of Sydney Sustainability Framework Standard align with Green Star tool?	Is the Initiative Proposed to be Targeted?
1.0	Accredited Professional	Yes	Yes
2.0	Environmental Performance Targets	Yes	Yes
2.1	Services and Maintainability Review	Yes, aligns with University Delivery Standards	Yes
2.2	Building Commissioning	Yes	Yes
2.3	Building Systems Tuning	Yes	Yes
2.4	Independent Commissioning Agent	Yes	Yes
3.1	Implementation of a Climate Adaptation Plan	No	No
4.1	Building Operations and Maintenance Information	Yes, aligns with University Delivery Standards	Yes
4.2	Building User Information	Yes	Yes
5.1	Environmental Building Performance	Yes	Yes
5.2	End of Life Waste Performance	No	No
6.0	Metering	Yes	Yes
6.1	Monitoring Systems	Yes	Yes
7.0	Environmental Management Plan	Yes	Yes
7.1	Formalised Environmental Management System	Yes	Yes
8.0	Operational Waste	Yes	Yes
9.1	Ventilation System Attributes	No	No
9.2	Provision of Outdoor Air	No	No
9.3	Exhaust or Elimination of Pollutants	No	No
10.1	Internal Noise Levels	Yes	Yes
10.2	Reverberation	No	No
10.3	Acoustic Separation	No	No
11.0	Minimum Lighting Comfort	Yes	Yes
11.1	General Illuminance and Glare Reduction	Yes	Yes
11.2	Surface Illuminance	No	No
11.3	Localised Lighting Control	No	No
12.0	Glare Reduction	Yes	Yes
12.1	Daylight	Yes	Yes
12.2	Views	Yes	Yes
13.1	Paints, Adhesives, Sealants and Carpets	Yes	Yes
13.2	Engineered Wood Products	Yes	Yes
14.1	Thermal Comfort	Yes	Yes
14.2	Advanced Thermal Comfort	Yes	Yes
15.0	Greenhouse Gas Emissions	Yes	Yes

17B.1	Access by Public Transport	Yes	Yes
17B.2	Reduced Car Parking Provision	Yes	Yes
17B.4	Active Transport Facilities	Yes	Yes
17B.5	Walkable Neighbourhoods	Yes	Yes
18B.1	Sanitary Fixture Efficiency	Yes	Yes
18B.2	Rainwater Reuse	Yes	Yes
18B.3	Heat Rejection	Yes	Yes
18B.4	Landscape Irrigation	Yes	Yes
18B.5	Fire System Test Water	Yes	Yes
19B.1	Concrete	Yes	Yes
19B.2	Steel	Yes	Yes
19B.3	Building Reuse	Yes	Yes
20.1	Structural and Reinforcing Steel	Yes	Yes
20.2	Timber Products	Yes	Yes
20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	Yes	Yes
21.1	Product Transparency and Sustainability	Yes	Yes
22B	Percentage Benchmark	Yes	Yes
23.0	Endangered, Threatened or Vulnerable Species	Yes	Yes
23.1	Ecological Value	Yes	Yes
24.0	Conditional Requirement	Yes	Yes
24.1	Reuse of Land	Yes	Yes
25.0	Heat Island Effect Reduction	Yes	Under Review
26.1	Reduced Peak Discharge	Yes	Yes
26.2	Reduced Pollution Targets	No	No
27.0	Light Pollution to Neighbouring Bodies	No	No
27.1	Light Pollution to Night Sky	No	No
28.0	Legionella Impacts from Cooling Systems	No	No
29.0	Refrigerants Impacts	No	No

The above table demonstrates that the University of Sydney Sustainability Framework aligns with greater than **75%** of the Green Star initiatives of the Design & As-built v1.1 tool and as such the Framework can be considered an appropriate environmental tool to apply for the FASS project. Further it is noted that the University of Sydney Framework exceeds the initiatives set-out in Green Star through thirteen (13) other environmental initiatives and targets that are specific to the needs of the University.

2.3 SEARs Requirement 3

There are a number of environmental initiatives and measures that will be implemented for the FASS development that will minimise consumption of resources, water (including water sensitive urban design) and energy in operation. This is described in Section 3 of this report.

3. Sustainable Design Initiatives

A number of sustainable design initiatives are proposed for the FASS Building to reduce resource consumption, reduce operational water consumption, cater for flood and urban sensitive water management, manage and reduce operational energy consumption. These initiatives specifically address SEARs Requirement 3.

3.1 Materials and Resource Use

A number of initiatives are proposed to be met through design standards, material specifications and construction practices to be employed on the site. These have all been identified to reduce resource consumption and improve the indoor quality of the building in operation.

3.1.1 Construction Management

A comprehensive Construction Environmental Management Plan is to be implemented prior to any early works, demolition or construction stages are commenced on the project. The EMP is to be prepared in accordance with NSW Environmental Guidelines and is to be formalised by a third party. All contractors are to be inducted into this plan. The plan should include measures that relate to materials management, noise impacts, air quality, water and energy management for any works conducted on the site and the plan is to be certified to one of the following standards:

- AS/NZS ISO 14001 ;
- BS 7750; or
- European Community's Eco-Management and Audit Scheme (EMAS).

The Head Contractor is to hold the accreditation to demonstrate compliance with this requirement. In this case, the Head Contractor for the project must have a valid certificate before and throughout construction. All subcontractors must be required to adhere to the EMP conditions, and monitored for compliance.

3.1.2 Waste Management

A Demolition and Construction Waste Management Plan is to be documented and implemented on site by the Head Contractor and relevant Early Works Contractors which will outlines all measures for reducing wastes, recycling and management of wastes. During the construction stage of the project monthly waste reporting to the client is to be completed by the Head Contractor. This is to form part of the materials tracking and management of the development.

The goal is to divert greater than 90% of all construction and demolition wastes for the project from landfill.

3.1.3 Material Specifications

There are a number of material specifications required to be met for the project to reduce environmental impacts.

Low Volatile Organic Compound (VOC) materials for paints, adhesives, sealants, coatings and carpets are to be specified and installed to improve the indoor air quality of the building post construction.

Composite Timber

At least 95% of the permanent composite Timber products used in the building are to have a low formaldehyde emission of E1 or less. Engineered wood products include particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels. Timber veneers are excluded.

This will reduce the release of formaldehyde into the indoor air in occupation of the building.

Certified Timbers

Greater than 50% of all timber used in the building construction works is to be either:

A. Certified by a forest certification scheme that meets the GBCA's 'Essential' criteria for forest certification; or

B. from a Reused source.

This target is for all timber applications within the building and construction works for applications such as:

- Formwork and other temporary installations of timber (e.g. hoardings);
- Structural and non-structural timber, including internal walls, floors and roof structures;
- External and internal cladding;
- Flooring, wall, and ceiling finishes;
- Internal and external joinery (windows, doors); and
- Other specialist uses of timber, such as installed furnishings or balustrades.

Materials Tracking

Materials tracking and reporting shall be undertaken by the Head Contractor in the delivery of the project. The contractor shall identify all materials to be used on the project prior to commencement and track the usage of specific items through construction to completion for timbers, paints, adhesives, sealants, flooring, pipework, cabling, formwork. Regular reporting on the materials used shall be undertaken with the consultant team and the University of Sydney.

Concrete

At least 25% of all fine aggregate (sand) and coarse aggregate inputs in the concrete are to be from manufactured sand or other alternative materials (measured by mass across all concrete mixes in the project) and the average content of portland cement used in the concrete mix are to be reduced by at least 30% compared to a reference case. This is to reduce the environmental impacts of concrete used within the project.

3.2 End of Trip Facilities

The development will include end of trip facilities to the FASS building on Level 1 of showers, change and lockers. Centralised bicycle parking is to be provided in the RD Watt building on Level 2 with access from the public domain area. The spaces located within this building will be undercover with additional bicycle parking provided to the east and west public domain areas in highly visible public domain areas. A total of 36 off bicycle parking spaces is proposed to the development for staff and students with more than half of the spaces to be located undercover.

3.3 Water Efficiency

The project is targeting water efficiency performance which includes reducing overall potable water consumption by around 10% against comparable benchmark projects.

This is to be achieved through:

- Rainwater harvesting and reuse within the FASS building for toilet flushing and on site landscaping
- Appropriate selection of water fixtures
- Recovery of fire test water for reuse within the building
- Appropriate storage and management of site stormwater and flood management

The following strategies have been adopted to reduce water consumption throughout the development:

3.3.1 Efficient Fixtures

Water efficient WCs, taps and shower heads are to be installed to minimise potable water consumption. The following minimum WELS ratings and maximum flow rates are proposed:

- Water Closets – minimum 4 WELS rated with average flush of 3.5 L
- Urinals – minimum 6 WELS rated with maximum flow rate of 0.8L/flush
- Tapware – minimum 5 WELS rated with flow rate between 5.0 – 6.0 L/min
- Showerheads – minimum 3 WELS rated with flow rate between 6 – 7.5 L/min

3.3.2 Water Harvesting

Rainwater is to be collected from the FASS building roof and collect in 110kL tank on the site. The collected rainwater will be used for site irrigation for landscaping, cooling tower water makeup and possibly toilet and urinal flushing. This initiative is subject to further design development. A minimum of 80% of the fire test water discharged during routine fire maintenance testing will also collect into the tank for reuse within the building.

3.3.3 Stormwater Management

Site stormwater is to be managed through a rainwater harvesting system designed in accordance with the University's Stormwater Masterplan and will incorporate water sensitive urban design elements.

3.4 Energy Efficiency

The building is targeting up to a 10% energy improvement to the National Construction Code Part J provisions. This requirement is to be met through mechanical systems design and zoning, interior lighting efficiency, building fabric treatments and reduced hot water demands.

3.4.1 Mechanical Systems

A water cooled mechanical system is proposed to improve the operational energy performance of the building. Carbon dioxide sensors are proposed within return air ducts to turn down fans when the occupancy levels are low within the building to reduce energy consumption of the building in operation. Space management systems will be provided throughout the building to control mechanical system operations and link AV, lighting and mechanical systems so that they can be shut down both manually and automatically when unoccupied.

3.4.2 Metering and Reporting

Sub-metering shall be provided in the building which meets the University Design standards and accounts for all substantive energy uses including light and power sources. Meters are to be linked to Building Management Control System and Advanced Utilities Monitoring System (AUMS) that will identify faults, and raise alarms on plant operation as required. It is intended that the AUMS system will be used for energy reporting and audit requirements.

The Building Management Control Systems (BMCS) to be provided to the building which will raise alarms and provide monitoring system to optimise the Mechanical and Lighting System operations. This will be achieved through programming system operations, space use controls and demand management.

3.4.3 Daylighting of Interior Spaces

Natural daylighting has been incorporated into the indoor spaces to reduce the reliance on artificial lighting and improve line of sight to outdoor areas. The building incorporates a rooflight above the atrium which provide a significant amount of natural daylighting to the interior spaces of the building and reduce the reliance on artificial lighting during the day. The façade glazing system will adopt coatings to optimise natural daylighting into the spaces whilst controlling the extent of direct solar gains.

3.4.4 Lighting Design

Energy efficient lighting with electronic ballasts shall be installed for all fluorescent fittings with LED lighting fittings to specific areas where feasible to reduce maintenance and operational energy costs. All lighting shall be installed to be easily accessible for maintenance and shall incorporate appropriate zoning and occupancy sensors to reduce operation of lights when not required. Daylight sensors are to be installed to areas around the façade to turn down light fittings when natural daylighting of space is adequate. Generally the lighting design to the FASS building is to meet the University of Sydney Lighting Design Standards.

Lighting control systems are to be integrated into the BMCS with the following functionalities:

- Provide link to the building lighting control system

- Provide Interface to pick-up status of the space PIR, each space with HVAC that has a PIR located in it is to display the status of the PIR on the associated rooms HVAC units graphic display.

3.4.5 Commissioning

Comprehensive pre-commissioning and commissioning activities are proposed to be undertaken based on the approved standards and guidelines such as the CIBSE Commissioning ancillary Codes. This is to optimise the operation of the building and confirm that the building is operating as intended. An independent commissioning agent not involved with the design or construction of the project is to be made available to test, verify and certify the building services meet the required performance criteria of this standard which will be appointed by the University.

3.4.6 Photovoltaics

An array of photovoltaics is proposed to the roof of the building to generate alternative source of energy for the building. The array will utilise the area of the rooftop not used for plant and areas that fall below the planning height restrictions which is approximately 85m^2. The final details of this system are subject to further design development.

3.4.7 Operational Guide

A Building Users' Guide is to be developed and distributed to the operators of the FASS Building to improve the occupant's understanding of the building's intended mode of operation and the potential energy savings behind the design intent.

3.5 Indoor Quality

3.5.1 External Views

Greater than 40% of the nominated area is proposed to a high quality internal or external view. All floor areas within 8m from a compliant window, atrium, or view can be considered to meet this credit criterion. The building and floor layouts have been designed to deliver external views wherever possible. External views are provided to the building to the north, east, west and south which provides views across general landscaping, movement of people around the campus and well-lit external spaces.

3.5.2 Glare

Glare is managed in the building through the use of façade glazing treatments that mitigate direct solar glare into the interior spaces. It is also proposed that for some specific areas with the building internal blinds such as brownout/blockout blinds will be provided to ensure the spaces are fit for lecturing purposes.

3.5.3 Avoiding Over-lighting of Spaces

The building lighting design for Fully Enclosed Covered Areas (FECA) will provide illuminance of no more than 25% above the minimum maintained illuminance levels in accordance to the University of Sydney Lighting Design Standard. This is to be assessed at the working plane and will improve the lighting levels provided within the interior spaces to reduce glare and provide good lighting comfort design for all occupants in different spaces.