AECOM

UNSW Tyree Building
Green Star Strategies Report

Tyree Building

UNSW

21 October 2009

Green Star Strategies Report

Prepared for

UNSW

Prepared by

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21 October 2009

60103216

Quality Information

Document Green Star Strategies Report

Ref 60103216

Date 21 October 2009

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Reviewed by Jason Veale

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	28/09/2009	Draft for Client Review and Discussion	Jason Veale Principal Sustainability Specialist	
01	22/10/2009	Incorporating client comments	Jason Veale Principal Sustainability Specialist	

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Executive Summary

This environmental strategies report has been commissioned by the University of New South Wales (UNSW) to identify and undertake an Ecologically Sustainable Development (ESD) assessment of the proposed Tyree Building to be constructed within the UNSW campus.

Amongst the range of environmental rating tools commonly used in Australia, the Green Building Council of Australia's *Green Star Education* rating tool v1 is most applicable to the Tyree Building. Assessing the prototypes against the Green Star *Education* rating tool v.1 is useful to understand the environmental impact of the construction and operation and identify areas where potential environmental improvements can be made.

The report is structured around the environmental categories and credits outlined in the *Green Star Education* rating tool. Where other ESD strategies beyond Green Star may be appropriate, these have been included in each category following the Green Star compliance analysis.

The following table outlines each of the identified sustainability categories for the fitout project. The key suggested sustainability measures for each of these indicators are based on a combination of measures proposed for the Tyree Building, measures designed to achieve Green Star compliance and other sustainability measures worthy of consideration.

Sustainability Category	**Key Sustainability Measures for consideration**
Management	• Monitoring of utility bills • Regular environmental bulletins during building operation • Adequate services commissioning • Appropriate building tuning • Preparation and adherence to an Operational Waste Management Plan
Indoor Environment Quality	• CO_2 sensors in each return duct in order to facilitate continuous monitoring and adjustment of outside air ventilation rates • Improved thermal comfort conditions • Building finishes selected for low toxicity
Energy Efficiency/Greenhouse	• Energy efficient lighting, use of T5 or T8 fluorescents • Building Management System that monitors energy and water usage for the building • High performance glazing, shading and building fabric • Installation of PV • High efficiency mechanical systems • Tri-generation system
Transport	• Green Travel Plan • Bicycle storage facilities to encourage alternate modes of transport • Excellent existing public transport
Water Efficiency	• Water efficient fixtures to all hydraulic fittings • Connection to a Building Management System which monitors usage • Provision of water sub-meters to monitor usage • Reduced use of potable mains water through use of rainwater and borewater

Materials	• Provision of appropriate recycling sorting and composting facilities in common accessible areas of the building • Source timber from sustainable sources, certified where possible • Specification of product manufacturers who take into consideration the life cycle of their product, including manufacture and design for disassembly at the end of the products life.
Emissions	• Thermal insulation to external walls which avoids the use of ozone-depleting substances in both its manufacture and composition

1.0 Introduction

This report provides details of the Green Building Council of Australia (GBCA) Green Star Education v1 tool and how it relates to the proposed Tyree building within the University of New South Wales (UNSW) campus.

Ecologically Sustainable Design (ESD) strategies to be implemented in the design & construction of the building to target a 6 Star Green Star Education v1 rating are discussed in detail.

The purpose of this report is to refine the number of points to be targeted in the Green Star *Education* point schedule.

2.0 Green Star Education v1 Tool

The Green Star *Education Design* and *Education As Built* v1 rating tool has been developed by the Green Building Council of Australia to evaluate the environmental design of Australian buildings based on a number of criteria including energy and water efficiency, quality of indoor environments and resource conservation. The rating system takes a holistic view in assessing the ecological footprint of a development and benchmarking it against Australian and World best practice.

Green Star *Education Design* certification identifies projects that have demonstrated a commitment to sustainability by **designing** a building which has the potential to achieve its highest environmental performance. Green Star *Education As Built* certification validates the **construction**, procurement and environmental and design initiatives that have been actioned by the builder. Both Green Star *Education Design* and *As Built* rating tools are separate and independent.

The credit categories and scores for both the Green Star *Education Design* and *Education As Built* rating tools are similar. A 6 Star Design rated building if constructed to the specified compliant Design requirements will yield a 6 Star As Built rated building. Both the official Green Star *Education Design* and *Education As Built* certification need to be independently obtained through the Green Building Council.

3.0 Proposed 6 Star Design Target Strategies

AECOM has compiled the following Green Star assessment using the Education v1 tool to illustrate how the building's design & construction process will be developed in detail so as to target a 6 Star Green Star Education v1 rating (> 75 weighted points). The rating's credits are itemised and a brief description of the implications of each is provided in section 3.1 through to section 3.9 of this report.

Not all Green Star points have equal value. A weighting system is applied to the categories that deem an emissions point at 5% weighting; only one fifth the value of an energy point which has a weighting of 25%. Table 1 and Table 2 itemises the available and achieved weighted score for each category to yield the overall target Green Star point total.

Table 1: Green Star Education v1 Weighted Credit Summary for Tyree Building.

	Weighted Score			
	Weighting	Available	Achieved	
Management	10%	10	10	0.71
Indoor Env Quality	20%	20	14	1.18
Energy	25%	25	20	1.09
Transport	10%	10	10	0.83
Water	15%	15	14	1.00
Materials	10%	10	6	0.77
Land Use & Ecology	5%	5	1	2.50
Emissions	5%	5	2	1.25
		100	**77**	

Table 2: Green Star Education v1 Target Credit Summary for Tyree Building

Green Star - Education Summary for:		UNSW - Tyree				
					6 STAR	
Category	**Title**	**Credit no.**	**Points Available**		**Points Achieved**	
Management						
	Green Star Accredited Professional	Man-1	2	1.4	2	1.4
	Commissioning - Clauses	Man-2	2	1.4	2	1.4
	Building Tuning	Man-3	1	0.7	1	0.7
	Independent Commissioning Agent	Man-4	1	0.7	1	0.7
	Building Guide	Man-5	2	1.4	2	1.4
	Environmental Management	Man-6	2	1.4	2	1.4
	Waste Management	Man-7	2	1.4	2	1.4
	Learning Resources	Man-10	1	0.7	1	0.7
	Maintainability	Man-11	1	0.7	1	0.7
				0.0		0.0
		TOTAL	14	10.0	14	10
Indoor Environment Quality						
	Ventilation Rates	IEQ-1	3	2.5	0	0.0
	Air Change Effectiveness	IEQ-2	2	1.7	0	0.0
	CO2 Monitoring & Control & VOC Monitoring	IEQ-3	1	0.8	1	0.8
	Daylight	IEQ-4	3	2.5	1	0.8
	Thermal Comfort	IEQ-5	3	2.5	2	1.7
	Hazardous Materials	IEQ-6	0	0.0	0	0.0
	Internal Noise Levels	IEQ-7	2	1.7	2	1.7
	Volatile Organic Compounds	IEQ-8	4	3.3	4	3.3
	Formaldehyde Minimisation	IEQ-9	1	0.8	1	0.8
	Mould Prevention	IEQ-10	1	0.8	0	0.0
	Daylight Glare Control	IEQ -11	1	0.8	1	0.8
	High Frequency Ballasts	IEQ-12	1	0.8	1	0.8
	Electric Lighting Levels	IEQ-13	1	0.8	1	0.8
	External Views	IEQ-14	1	0.8	1	0.8
						0.0
		TOTAL	**24.0**	**20.0**	**15.0**	**12.5**
Energy						
	Greenhouse Gas Emissions	Ene-1	20	17.2	17	14.7
	Energy Sub-metering	Ene-2	1	0.9	1	0.9
	Peak Energy Demand Reduction	Ene-3	2	1.7	2	1.7
	Lighting Zone	Ene-4	1	0.9	1	0.9
	Unoccupied Areas	Ene-7	2	1.7	2	1.7
	Stairs	Ene-8	1	0.9	1	0.9
	Efficient External Lighting	Ene-9	1	0.9	1	0.9
	Shared Energy Systems	Ene-10	1	0.9	1	0.9
		TOTAL	**29**	**25**	**26**	**22.4**
Transport						
	Provision of Car Parking	Tra-1	2	1.5	2	1.5
	Fuel Efficient Transport	Tra-2	1	0.8	1	0.8
	Cyclist Facilities	Tra-3	4	3.1	4	3.1
	Commuting Mass Transport	Tra-4	5	3.8	5	3.8
	Transport Design & Planning	Tra-6	1	0.8	1	0.8
		TOTAL	**13**	**10**	**13**	**10**
Water						
	Occupant Amenity Water	Wat-1	5	4.7	4	3.8
	Water Meters	Wat-2	1	0.9	1	0.9
	Landscape Irrigation	Wat-3	3	2.8	3	2.8
	Heat Rejection Water	Wat-4	4	3.8	4	3.8
	Fire System Water	Wat-5	1	0.9	1	0.9
	Potable Water Use in Laboratories	Wat-6	2	1.9	2	1.9
		TOTAL	**16**	**15.0**	**15.0**	**14.1**
Materials						

Materials						
	Recyling Waste Storage	Mat-1	2	1.0	2	1.0
	Building reuse	Mat-2	0	0.0	0	0.0
	Recycled Content & Reused Products & Materials	Mat-3	1	0.5	1	0
	Concrete	Mat-4	3	1.4	2	1.0
	Steel	Mat-5	2	1.0	1	0.5
	PVC Minimsation	Mat-6	2	1.0	1	0.5
	Sustainable Timber	Mat-7	2	1.0	0	0.0
	Design for Disassembly	Mat-8	1	0.5	1	0.5
	Dematerialisation	Mat-9	1	0.5	0	0.0
	Flooring	Mat-11	3	1.4	2	1.0
	Joinery	Mat-12	1	0.5	1	0.5
	Loose Furniture	Mat-13	3	1.4	2	1.0
		TOTAL	**21**	**10**	**13**	**6.2**
Land Use & Ecology						
	Topsoil	Eco-1	0	0.0	0	0.0
	Reuse of Land	Eco-2	1	0.7	1	0.7
	Reclaimed Contaminated Land	Eco-3	2	1.4	0	0.0
	Change of Ecological Value	Eco-4	4	2.9	1	0.7
		TOTAL	**7**	**5**	**2**	**1.4**
Emissions						
	Refrigerant Ozone Depleting Potential	Emi-1	1	0.4	1	0.4
	Refrigernat GWP	Emi-2	2	0.8	0	0.0
	Refrigernat Leaks	Emi-3	2	0.8	1	0.4
	Insulant ODP	Emi-4	1	0.4	1	0.4
	Watercourse Pollution	Emi-5	2	0.8	2	0.8
	Discharge to Sewer	Emi-6	2	0.8	0	0.0
	Light Pollution	Emi-7	1	0.4	1	0.4
	Legionella	Emi-8	1	0.4	**0**	0.0
		TOTAL	**12**	**5**	**6**	**2.5**
TOTAL POINTS			**136**	**100**	**104**	**79**
Innovation						
	Innovative Strategies and Technologies	Inn-1	points		0	
	Exceeding Green Star Benchmarks	Inn-2	in total		0	
	Environmental Design Initiatives	Inn-3	for Inn-		0	
TOTAL INNOVATION					**0**	
OVERALL WEIGHTED SCORE:					**79**	
TOTAL WEIGHTED POINTS					**79**	
OVERALL STAR RATING:					**6**	

3.1 Management

3.1.1 MAN-1: Green Star Accredited Professional

Points Available 2

Points Targeted 2

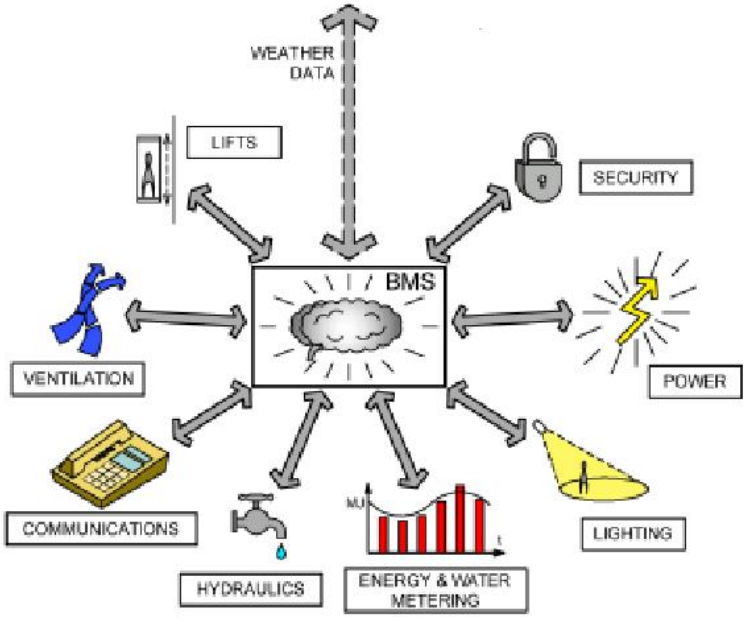
Credit Criteria	Responsibility and Application
• Green Star Accredited Professional (GSAP) engaged on the design team	• UNSW to provide copy of letter of appointment of GSAP listing scope of works.

	• Paul Osmond from UNSW is a GSAP who has been a part of the design team from schematic design. • AECOM's Jason Veale and Le Han Tan, also on the design team are both GSAP's.

3.1.2 MAN-2: Commissioning Clauses

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• Demonstrate comprehensive pre-commissioning, commissioning and quality monitoring are contractually required in accordance with ASHRAE Guideline 1, CIBSE Commissioning Codes etc).	• All services contractors will be required to carry out specific commissioning of their services according to the relevant CIBSE codes. • Necessary clauses are to be inserted into relevant design specifications requiring services sub-contractors to commission their systems in accordance with CIBSE Commissioning Codes.
• Design team and contractor required to transfer information and documentation to building owner regarding documented design intent.	• All design services to contribute to preparation of design intent report.

	
Appropriate commissioning of services ensures building services can operate to optimum design potential.	*Incorporation of a BMS or automated monitoring system for all services allows building management to effectively monitor consumption and detect any operational problems at an early stage.*

3.1.3 MAN-3: Building Tuning

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• Monthly monitoring of building tuning is required and outcomes to be reported to building owner quarterly.	• All services contractors will be required to undertake 12 months post-handover commissioning building tuning.
• Full re-commissioning is required 12 months after practical completion.	• Necessary clauses are to be inserted into relevant design specifications.
• Building tuning report is required on the outcomes of the tuning process and to be provided to building owner and made available to the design team.	• All design services to contribute to preparation of building tuning report.

3.1.4 MAN-4: Independent Commissioning Agent

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• Appointment of an independent commissioning agent to provide commissioning advice to design team and monitor and verify commissioning of all building systems.	• UNSW to engage commissioning agent for involvement at a minimum, at the beginning of each major stage in the documentation process, in order to comply with credit requirements. • AECOM have forwarded generic brief/scope of works for the engagement of an independent commissioning agent. Design team to review and contribute respectively where appropriate.

3.1.5 MAN-5: Building Guides

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• Preparation of a Building User's Guide	• All services contractors will be required to contribute to preparation of a Building User's Guide. UNSW to ensure this document is compiled with necessary input from all design services.
• Preparation of a Building Maintenance Guide	• All services contractors will be required to contribute to preparation of a Building Maintenance Guide. UNSW to ensure this document is compiled with necessary input from all design services.

3.1.6 MAN-6: Environmental Management

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• Preparation of a comprehensive Environmental Management Plan (EMP) for the works in accordance with Section 4 of the NSW Environmental Management System guidelines (1998)	• Early works and demolition works are to be undertaken in accordance with the relevant site EMP. • UNSW to ensure the engaged Head Contractor prepares compliant EMP for the works.
• Demonstrate that contractor has ISO 14001 EMS accreditation applicable to the construction of the Tyree Building.	• UNSW to provide copy of ISO14001 certification for its Environmental Management System. • Contractor engaged for early works relating to the building to have ISO14001 EMS accreditation.

3.1.7 MAN-7: Waste Management

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• Minimum of 80% of construction and demolition waste is to be reused/recycled.	• UNSW to ensure recycling receipts are collection for all construction and demolition waste in order to monitor against the minimum 80% target.
• Waste contractor is to be contractually bound to provide certification for the same recycling level.	• UNSW to ensure this is stipulated in the contract prior to engaging waste contractor.

3.1.8 MAN-10: Learning Resources

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• At least three of the building's environmental attributes are to be displayed in a manner that can be readily understood by building users.	• UNSW to confirm with the design team which attributes are to be displayed. • FJMT to ensure signage is included in floor plans for location of the chosen attributes.

3.1.9 MAN-11: Maintainability

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• Preparation of a Preliminary Design Review by a suitably appointed maintenance person.	• UNSW to ensure nominated maintenance staff or organisation prepares Preliminary Design Review report conforming with the Green Star requirements.

3.1.9.1 Other Management Strategies not covered by Green Star

Regular Environmental Achievement Bulletin
UNSW may consider applying a regular or monthly bulletin concept detailing the building management systems, including water, waste, energy and indoor environment quality. The distribution of monthly targets or goals and actual building operation can help to demonstrate how the strategies have been successful and evaluate the building's ongoing performance.

Regular surveys of building occupants, including staff and students may also determine how successful the design strategies of the building and operation have been.

Monitoring of Utility Bills
Utility bills often provide a source of how a building is operating. Electricity, gas and water bills can be used to track long term trends when key information is entered into a spread sheet. The spreadsheet can then be used to highlight exceptions to ordinary operational usage. The use of such a spreadsheet can provide key information such as total consumption, total cost, time of use of consumption etc.

3.2 Indoor Environment Quality

3.2.1 IEQ-1: Ventilation Rates

Points Available	Points Targeted
3	0

Credit Criteria	Responsibility and Application
• Points currently not being targeted as mechanical engineer has indicated that laboratories will not be able to maintain increased outside air levels.	• Mechanical engineer to provide justification as to why laboratories cannot maintain increased outside air rates. • AECOM to further discuss with GBCA as to whether laboratories can be excluded from credit criteria based on mechanical justification.

3.2.2 IEQ-2: Air Change Effectiveness

Points Available	Points Targeted
2	0

Credit Criteria	Responsibility and Application
• Points currently not being targeted as credit requirements considered difficult and ambiguous. Further discussions to be undertaken with Green Building Council Australia (GBCA) in order to clarify requirements and determine how this point is achieved.	• AECOM to further discuss with GBCA.

3.2.3 IEQ-3: Carbon Dioxide Monitoring & Control & VOC Monitoring

Points Available	Points Targeted
1	1

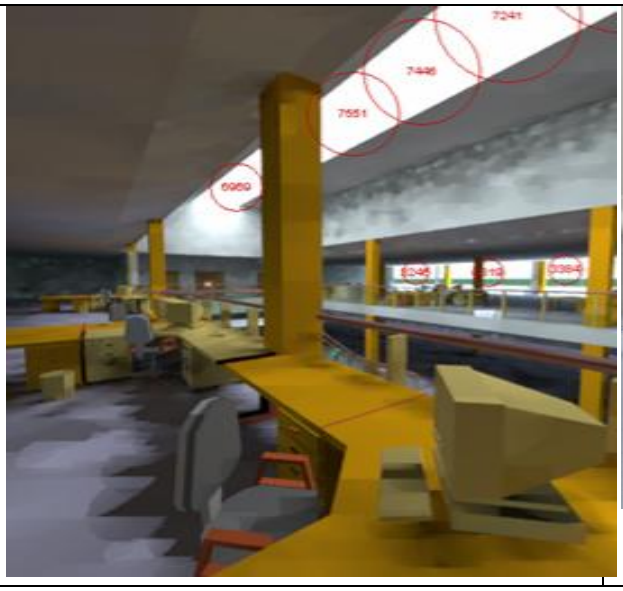
Credit Criteria	Responsibility and Application

• Carbon dioxide (CO_2) monitoring system with a minimum one CO_2 sensor per return duct is to be provided to facilitate continuous monitoring and adjustment of outside air ventilation rates to at least 95% of the UFA. • VOC monitoring system is to also be provided which is linked to the BMS and has minimum one sensor per return duct. VOC monitoring system is to provide an alarm when VOC pollutants reach 0.5mg/m^3 level.	• Mechanical engineer to ensure adequate number of CO_2 sensors and VOC monitoring system is installed as per the Green Star requirements and ensure compliance is met. • Mechanical engineer to ensure functional description is included in the tender documentation which specifies functionality of the CO_2 system and the mandatory VOC monitoring system.

3.2.4 IEQ-4: Daylight

Points Available	Points Targeted
3	1

Credit Criteria	Responsibility and Application
• A minimum 30% of the UFA is to demonstrate a Daylight Factor of not less than 2.5% as measured at the floor level under a uniform design sky.	• FJMT to collaborate with design team to ensure minimum 30% of the UFA to comply with credit requirements. • Daylight results to be validated by AECOM using computer simulation modelling.



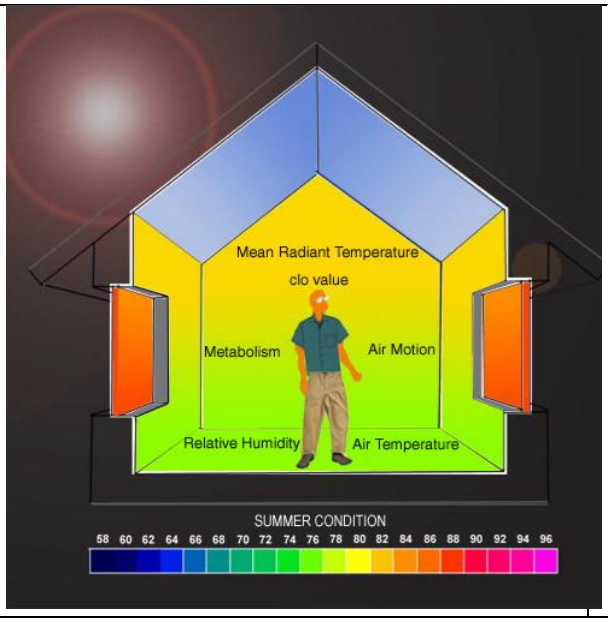
Good design allows for optimum daylight levels for building users and can assist in reducing the sole reliance on artificial lighting.

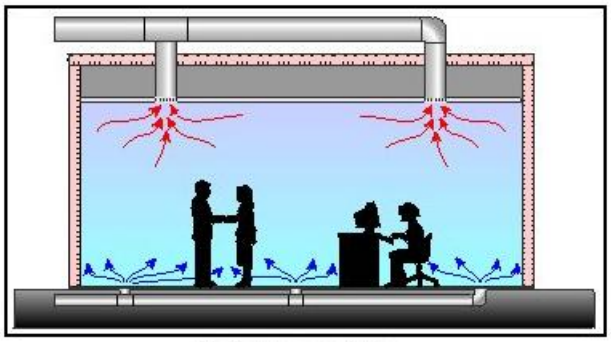
3.2.5 IEQ-5: Thermal Comfort

Points Available	Points Targeted
3	2

Credit Criteria	Responsibility and Application
• It is required that internal temperatures are within 90% of Acceptability Limit 1 during standard operating hours of occupancy for 98% of the year for naturally/mechanically assisted natural ventilation areas.	• AECOM to prepare Thermal Comfort report with relevant input from mechanical and electrical engineers.

• For mechanically ventilated areas, PMV levels are to be calculated in accordance with ISO7720 to be between -0.5 and +0.5 inclusive during standard operating hours of occupancy for 98% of the year.	





Underfloor displacement system can provide individual comfort control and improved thermal comfort conditions.

3.2.6 IEQ-6: Hazardous Materials

Points Available	Points Targeted
N/A	N/A

Credit Criteria	Responsibility and Application
• In order to prove N/A, the following is to be provided.	• FJMT to provide description of the built area on the site at the time of purchase. • FJMT to provide calculations with justification of all inputs used, and the proportion of the built area on the site.

3.2.7 IEQ-7: Internal Noise Levels

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• Building services noise is required to meet the recommended design sound levels provided in Table 1 of AS/NZS2107:2000 • The nominated design sound levels measured in LAeq and reverberation times, for each functional space are to be provided in accordance with the lower values in Table 1 of AS/NZS2107:2000. • All partitioning between adjoining academic	• Acoustic consultant to ensure compliance requirements are met for building services design and overall building sound levels. • Acoustic consultant to provide short summary report detailing how the credit criteria have been achieved.

offices or classrooms is to be constructed to achieve a weighted sound reduction index (Rw) of at least 45 between spaces.	

3.2.8 IEQ-8: Volatile Organic Compounds

Points Available **Points Targeted**
4 4

Credit Criteria	Responsibility and Application
• Minimum 95% of all internal painted surfaces are to meet the Total Volatile Organic Compound (TVOC) content limits outlined in Table IEQ-8.1. • Minimum 95% of all adhesives and sealants are to meet the TVOC Content Limits outlined in Table IEQ-8.2. • All carpets must meet the TVOC emissions limits outlined in Table IEQ-8.3. • 95% of all tenancy fitout items (workstations, walls/partitions, chairs, tables and storage units) must meet the TVOC emission limits outlined in Table IEQ-8.4.	• FJMT to ensure all relevant architectural specifications outline the TVOC limits for all paints, sealants, adhesives, carpets and tenancy fitout items. • FJMT to provide a list of all the paints, sealants, adhesives, carpets and tenancy fitout items used in the project. • UNSW to ensure that following construction works, the engineer undertakes a final audit to ensure that the correct products have been used.

3.2.9 IEQ-9: Formaldehyde Minimisation

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• All composite/engineered wood products are to have low formaldehyde emissions.	• FJMT to ensure all relevant architectural specifications outline the formaldehyde limits for all engineered wood products. • FJMT to provide list of all the engineered wood products used in the project.

3.2.10 IEQ-10: Mould Prevention

Points Available **Points Targeted**
1 0

Notes:
No points are being claimed for this credit due to the increased amount of energy required for operation of the system requirements. There would also be a capital cost premium to install additional coils, humidifiers and pumps in the mechanical plant.

3.2.11 IEQ-11 Daylight Glare Control

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• Fixed shading devices are required which shade the working plane, 1.5m from the	• AECOM to prepare short report with input from FJMT detailing how the credit criteria is

centre of the glazing, from direct sun at desk height (720mm AFFL) for 80% of standard occupancy hours; OR • If blinds or screens are fitted on all glazing and atriums, these devices must eliminate all direct sun penetration, be controlled with an automatic monitoring system with manual override function accessible by occupants, and have a VLT of <10%.	achieved. • FJMT to provide relevant façade drawings showing the shading devices installed.

3.2.12 IEQ-12 High Frequency Ballasts

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• High frequency ballasts are required in all fluorescent luminaires over a minimum of 95% of the nominated area.	• Electrical consultant is required to ensure lighting design incorporates high frequency ballasts in all fluorescent luminaires over the nominated area.

3.2.13 IEQ-13: Electric Lighting Levels

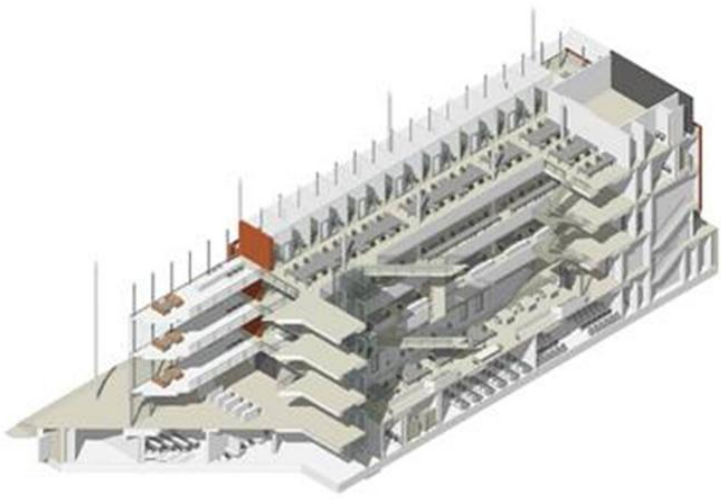
Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• Facility lighting design must provide a maintenance illuminance of not greater than 25% above the minimum maintained illuminance levels recommended in Table E1 of AS1680.2.3 for 95% of the nominated areas as measured at the working plane (720mm).	• Electrical consultant to ensure lighting design complies with the specific requirements of the credit. • Electrical consultant to provide illuminance calculations demonstrating the maximum lighting levels for each layout and compliance with the percentage of nominated area requirements.

3.2.14 IEQ-14: External Views

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• A minimum of 60% of the nominated area is to have a direct line of sight to the outdoors or into an adequately sized day-lit atrium.	• FJMT to provide marked-up layout plans which indicate the specified areas (minimum 60% of the nominated area) complying with the credit criteria. • FJMT to provide calculations demonstrating the percentage of area complying with the credit requirements.



Design of an internal atrium allows for greater floor area to have access to natural light

3.3 Energy

3.3.1 ENE-1: Greenhouse Gas Emissions

Credit Criteria	Responsibility and Application
• Conditional requirement that the projects predicted greenhouse gas emission must meet the greenhouse gas emission benchmark.	• AECOM to complete energy modelling report using input from mechanical, electrical and lighting services.

Notes:
Preliminary calculations of the energy estimation and minimum strategies required in order to achieve the possible number of points targeted (17 out of the 20 which equates to an approximate 85% reduction against the Conditional Requirement) are provided below.

In order to achieve the targeted reduction, the following design strategies are being considered:

- Mixed mode ventilation system
- Displacement A/C system for the office/teaching areas
- VAV system for laboratories
- VSDs on fans and pumps
- Economy cycle
- High efficiency chillers, boilers, fans and pumps
- High efficiency lighting
- Larger internal design temperature ranges (i.e. adaptive comfort)
- High performance glass
- Appropriate shading
- Well insulated external walls
- Tri-generation system
- Thermal labyrinth
- Geothermal heat rejection.

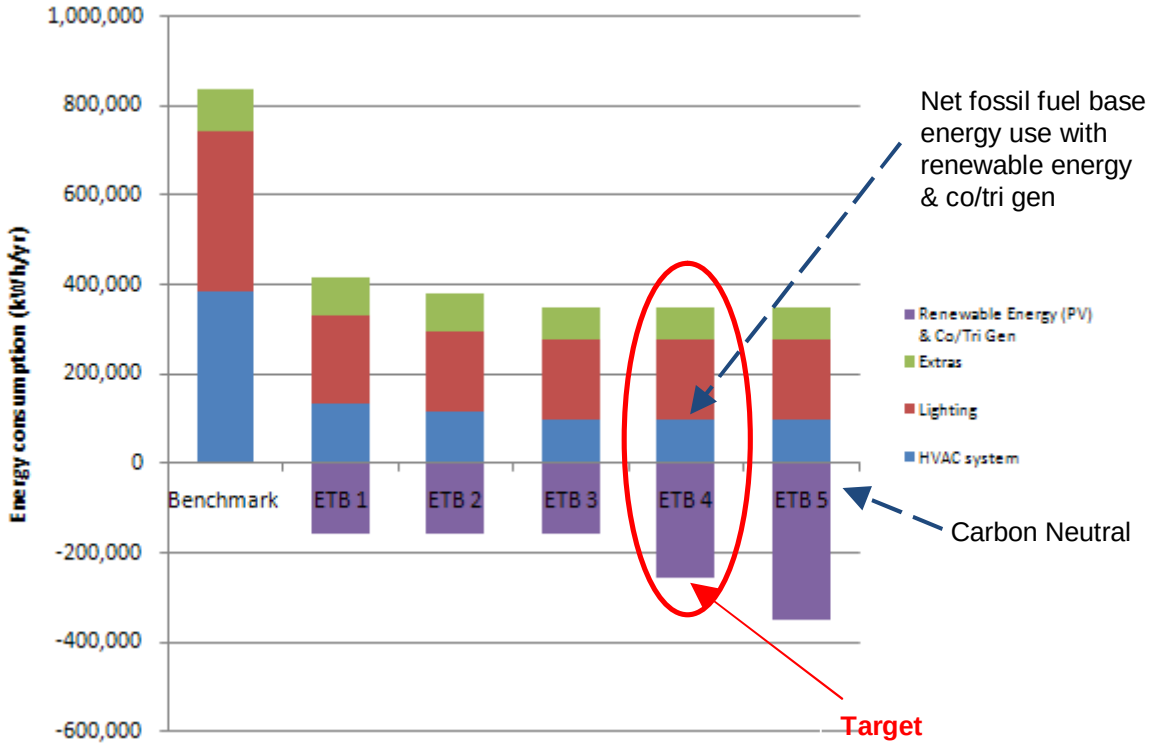
The design also incorporates a photovoltaic system which is estimated to be able to provide annual energy savings of approximately 155,617kWh/yr.

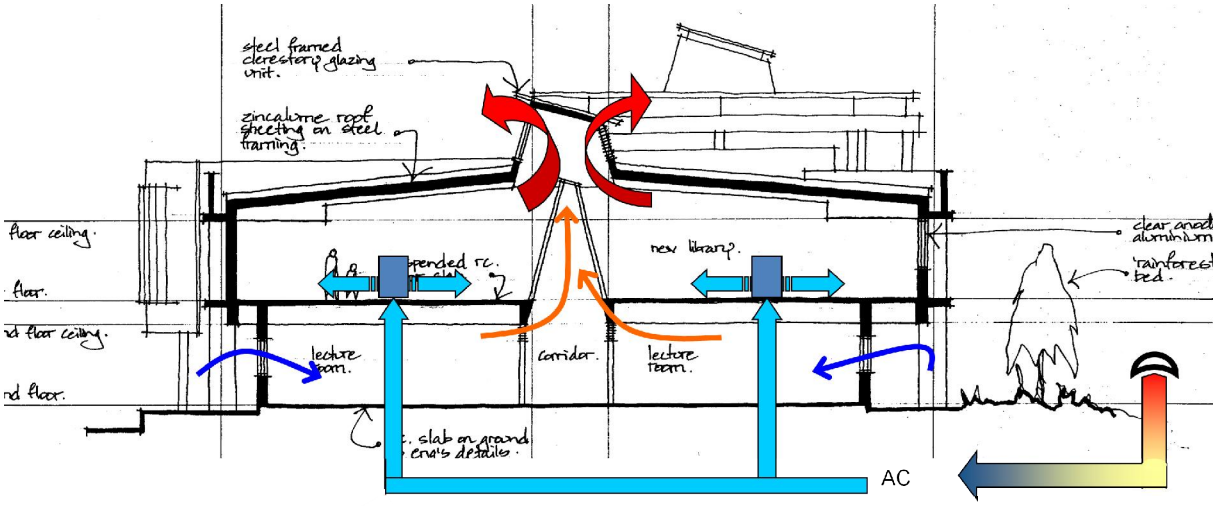
The table below shows the total estimated energy consumption compared to the Green Star benchmark building. Four scenarios were modelled, each with different proportions of alternate energy substitution.

In order to achieve 17 point in the Green Star credit, co/tri generation system or other renewable technologies, including the use of the PV system, need to be considered and adopted into the design.

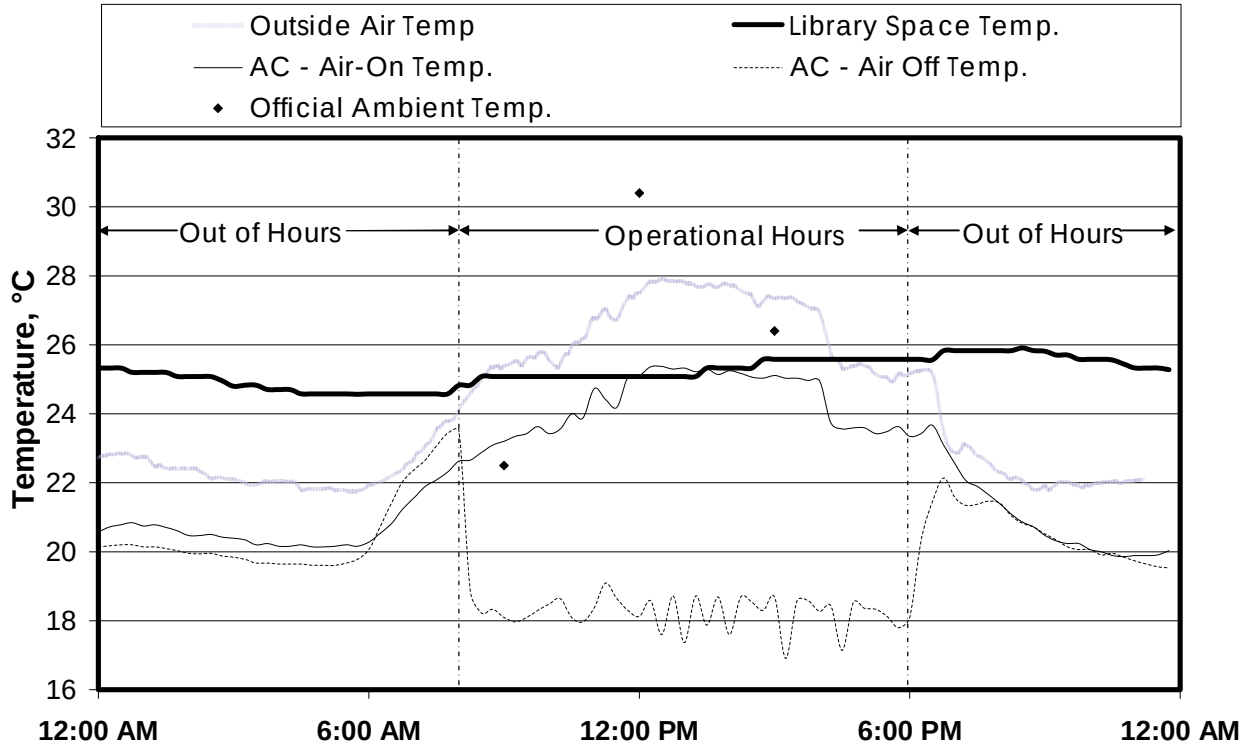
	HVAC system (kWh/yr)	Lighting (kWh/yr)	Extras (kWh/yr)	Renewable Energy (kWh/yr)	TOTAL (kWh/yr)	Points Achieved	% CO2 reduction
Benchmark	383,087	359,747	93,767	0	836,601		
Tyree Building 1	134,080	197,861	84,390	-155,617	260,715	13	68.8%
% reduction	-65%	-45%	-10%	-19%			
Tyree Building 2	114,926	179,874	84,390	-155,617	223,573	14	73.3%
% reduction	-70%	-50%	-10%	-19%			
Tyree Building 3	95,772	179,874	75,014	-155,617	195,042	15	76.7%
% reduction	-75%	-50%	-20%	-19%			
Tyree Building 4 (including additional renewables etc)	95,772	179,874	75,014	-255,617	95,042	17	88.6%
% reduction	-75%	-50%	-20%	-31%			

The following provides a graphic representation of the four scenarios against the benchmark. Note that option Tyree Building 4 is required in order to achieve the number of points targeted.





Example of a thermal labyrinth system, a method of passive pre-cooling of supply air



Graph demonstrating cooling benefit of thermal labyrinth at Illawarra TAFE Library

Thermal labyrinth at Penrith Joan Sutherland Performing Arts Centre

3.3.2 ENE-2: Energy Sub-metering

Points Available	Points Targeted
1	1

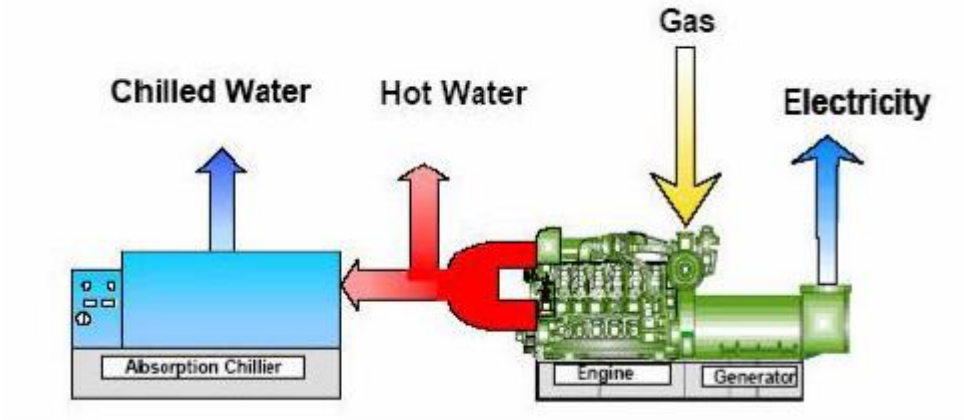
Credit Criteria	Responsibility and Application
• Sub-metering is required to separately monitor lighting and general power consumption for primary functional areas (per floor). Note that these areas include class/lecture/tutorial areas, office and administration spaces and laboratories. • The sub-meters must be connected to a Building Management System (BMS) or dedicated energy monitoring and reporting system.	• Electrical engineer to provide summary of all separately metered spaces in the building. • Electrical engineer to ensure specification details the installation requirements for electrical sub-meters that meet the credit criteria. • Electrical engineer to provide schematic electrical drawings with all uses and loads indicated.

Energy sub-metering provides the opportunity to monitor and differentiate building energy usage and allows early detection of any operation problems if they arise

3.3.3 ENE-3: Peak Energy Demand Reduction

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• The building is required to reduce the peak energy demand load on electricity infrastructure by a minimum 30%.	• Options to reduce the peak energy demand load on electricity to be confirmed and responsibility assessed accordingly. • Options include tri-generation and chilled water storage • Further calculations to be completed with input from mechanical and electrical engineer to determine whether proposed tri-gen system meets the minimum reduction criteria



Basic concept of a combined heat and power tri-generation system

3.3.4 ENE-4: Lighting Zoning

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• The lighting design is to include an automated lighting control including occupant detection and daylight adjustment. • Light switching must be wired for zones of no greater than 100m^2.	• Electrical engineer is to provide a summary listing all separately switched zones and their areas. • Electrical engineer to ensure specifications details the requirement for automated lighting control system.

3.3.5 ENE-7: Unoccupied Zones

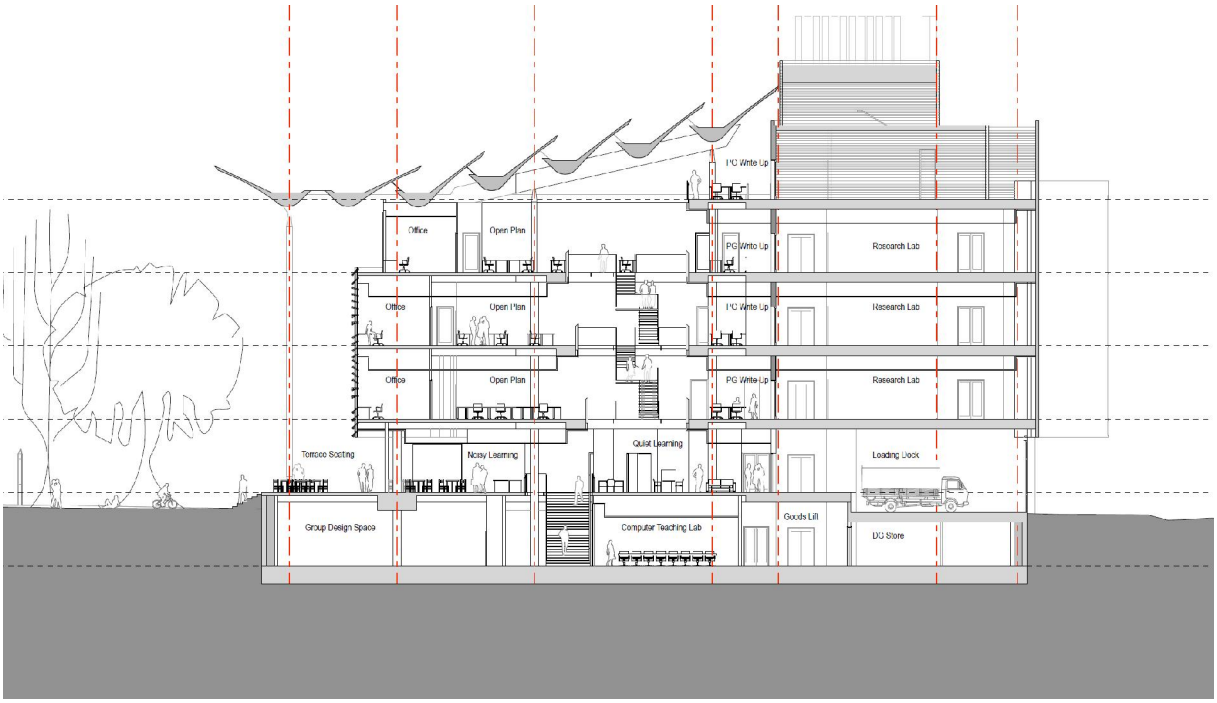
Points Available **Points Targeted**
2 2

Credit Criteria	Responsibility and Application
• A minimum 90% of the nominated Usable Floor Area is to display a HVAC system in each separate enclosed space (e.g. laboratory, classroom, office, tutorial space, lecture theatre etc), to be either designed to be automatically shut down when not in use; OR • Design to allow a wider temperature control band when not in use, a minimum of an additional 2^0 is required in each direction.	• The mechanical engineer is to ensure the requirements for the HVAC system are incorporated in the design to allow compliance with the credit criteria.

3.3.6 ENE-8: Stairs

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• The internal stairs are to be located within 20m of a main entrance and the stair is to be fully open to the interior on at least one side over the entire span of the stairwell.	• FJMT to ensure design allows for criteria as per the credit requirements for the internal stairwell.



An open and easily accessible stairwell encourages the use of alternate means of vertical transportation instead of using more energy intensive lifts

3.3.7 ENE-9: Efficient External Lighting

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• All externally lit spaces are to meet the following criteria: - All external lighting is to have a light source efficacy of at least 50 lumens/watt - 95% of outdoor spaces must meet or exceed the minimum requirements of AS1158 for luminance levels - All external lights must be connected to daylight sensors.	• Electrical engineer is to ensure lighting design complies with the requirements of the credit criteria with light source efficacy of at least 50 lumens and exceeding the minimum requirements of AS1158 for luminance levels. • Electrical engineer is to ensure these requirements are detailed in the electrical specification.

3.3.8 ENE-10: Shared Energy Systems

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• Potential for this credit to be targeted based on use of the Tyree Building tri-generation system to supplement electricity for other buildings on the UNSW campus.	• AECOM to further discuss with GBCA credit requirements and confirm whether this complies with the credit intention.

3.3.8.1 Other Energy Strategies not covered by Green Star

Carbon Neutrality

For the focus group meeting, define additional measures required in order to achieve operational carbon neutrality for the building.

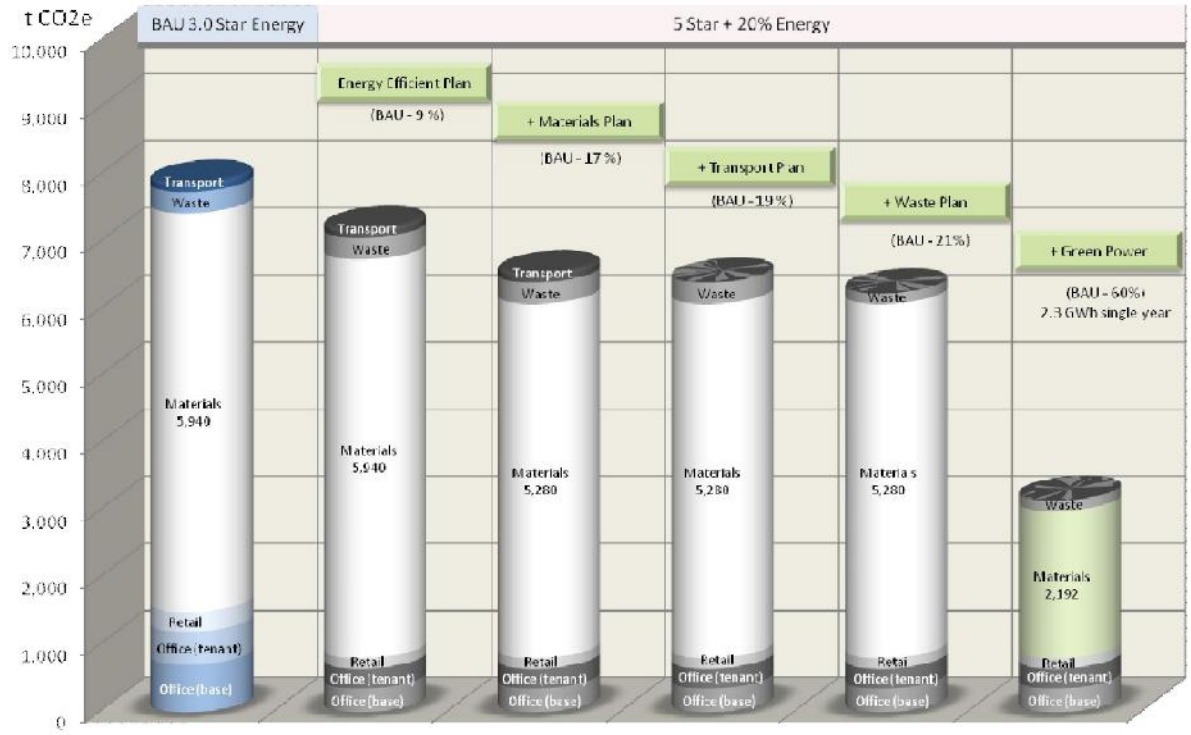


Figure 13: Total Carbon Model for BAU - 60%, analysis period one year

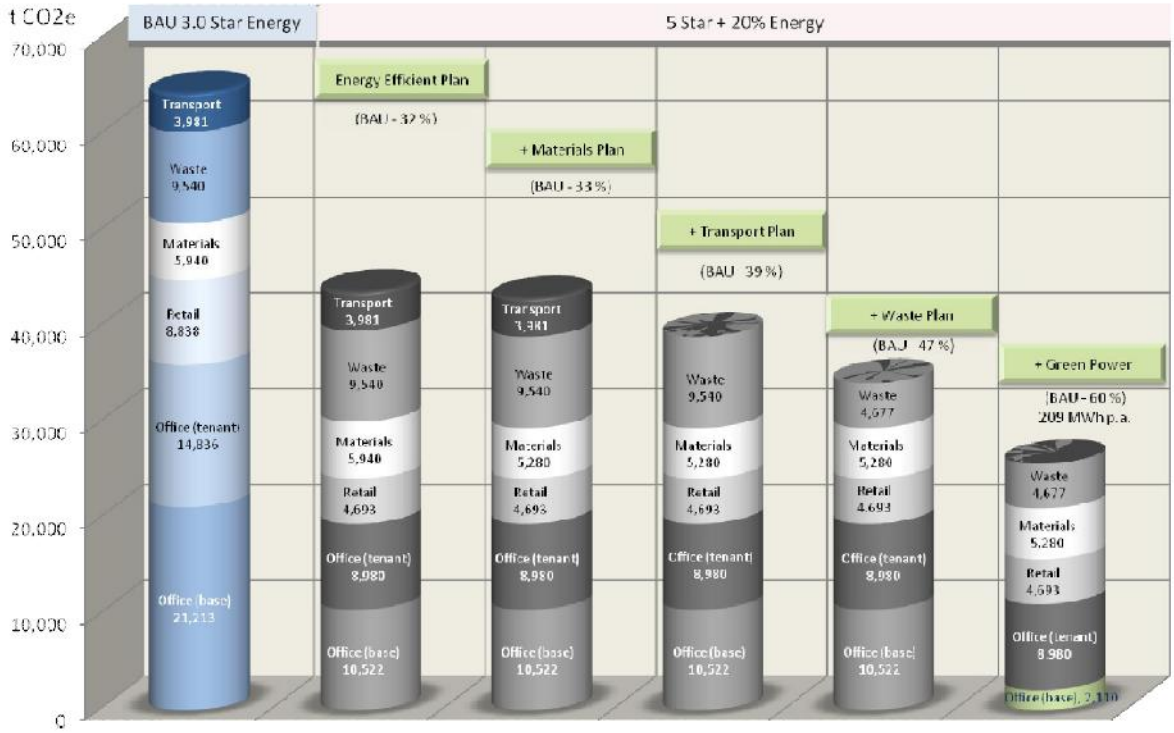


Figure 14: Total Carbon Model for BAU - 60%, analysis period thirty years

The use of alternate or renewable power options can assist in overall carbon reduction strategies

3.4 Transport

3.4.1 TRA-1: Provision of Car Parking

Points Available 2

Points Targeted 2

Credit Criteria	Responsibility and Application
• Achieving this credit is based on the assumption that no car parking is provided for the building. • If car parking spaces are provided, the total number is to be at least 50% less than the maximum local planning allowances (or no more than the minimum if minimum number is provided).	• FJMT to provide tender drawings and summary confirming that no car parking has been provided for the Tyree Building. • If car parking is provided, extracts from planning authority required and tender drawings showing number of car parking spaces.

3.4.2 TRA-2: Fuel Efficient Transport

Points Available N/A

Points Targeted N/A

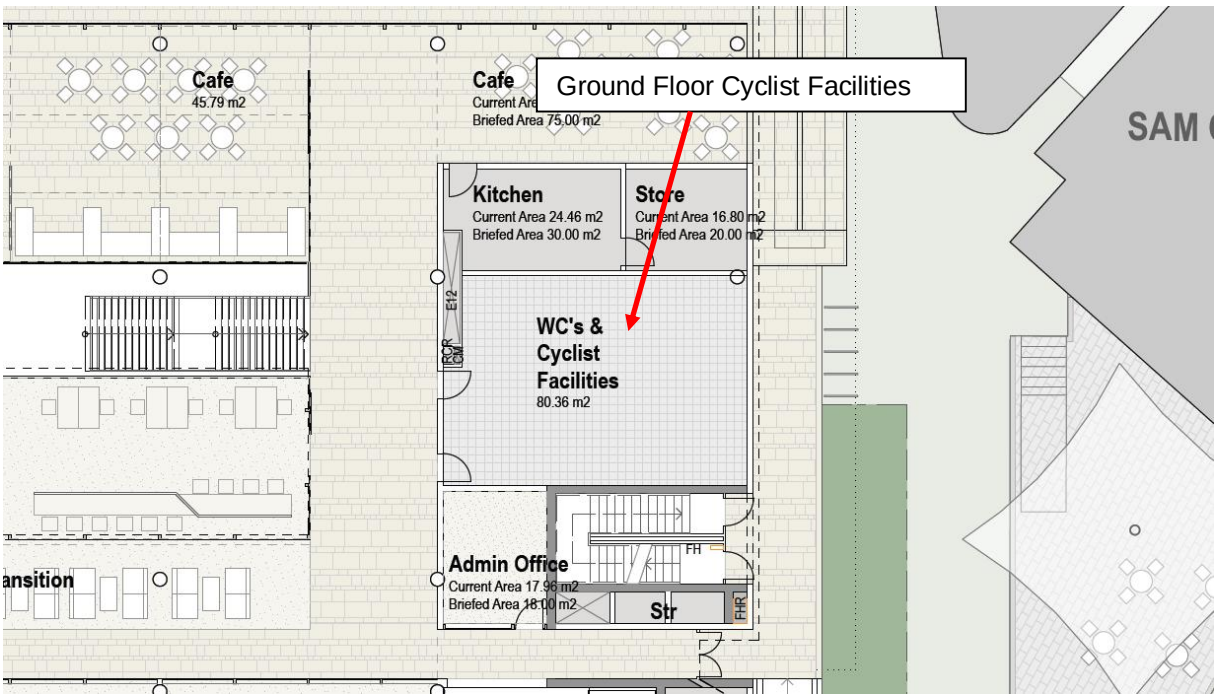
Credit Criteria	Responsibility and Application
• This is currently not applicable as no car parking spaces have been provided for the building. • If car parking is provided, a minimum 25% of all provided spaces are to be dedicated for small cars and/or motorbikes, AND minimum 10% must be dedicated solely for use by car pool participants, hybrid or electric car parking.	• FJMT to provide tender drawings confirming that no car parks are provided. • UNSW to provide letter confirming that no car parks have been provided for the Tyree Building. • If car parking is provided, tender drawings are required showing car parking spaces. • Extracts from the contract are required which shows car park spaces are designed as per AS2890.1:2004 for small car parking.

3.4.3 TRA-3: Cyclist Facilities

Points Available 4

Points Targeted 4

Credit Criteria	Responsibility and Application
• Adequate cyclist facilities to be provided for a minimum of 10% of peak number of students using the building at any one time. • Cyclist facilities are also required for a minimum 10% of building staff. • One locker is required for each bicycle space provided. • Accessible showers are required based on 1 per every 10 bicycle space provided.	• FJMT to provide tender drawings confirming the total number and location of bicycle storage facilities, associated lockers and accessible showers. • Based on initial numbers provided by FJMT, sufficient facilities are evident for claiming 4 points.



Adequate provision for bicycle storage facilities and cyclist facilities including lockers and showers provided on the lower ground floor

3.4.4 TRA-4: Commuting Public Transport

Points Available	Points Targeted
5	5

Credit Criteria	Responsibility and Application
• Due to close proximity of the site to transport options, all 5 points are considered achievable for this credit.	• AECOM to complete Green Star Transport Calculator. • UNSW to provide any site specific transport timetables applicable for this credit.

Proximity to transport options such as highly serviced bus stations encourages the use of public transport

3.4.5 TRA-6: Transport Design and Planning

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• A Travel Plan is required for the site that details a site specific transport assessment and provides information on sustainable transport initiatives. • At least one dedicated pedestrian route is required to be provided on and off the site.	• UNSW to provide site specific Travel Plan which details transport assessment for the site. • FJMT to provide site plan which details dedicated pedestrian routes on and off the site.

3.4.5.1 Other Transport Strategies

Green Travel Plan

Consideration of a Green Travel Plan for the building occupants would assist UNSW to systematically investigate transport options across the whole campus and assess where more sustainable transport alternatives may be used.

A Green Travel Plan is effectively a suite of initiatives, activities and actions to encourage travel behaviour change. Having a Green Travel Plan would be a valuable resource which can be used to promote and encourage building occupants to choose sustainable transport options such as walking, cycling, car pooling and public transport. While the location of the Tyree Building will encourage public transport, a Green Travel Plan could provide further emissions savings for staff.

A key aspect of a Green Travel Plan is that individuals need only change a few of their weekly single occupancy motor vehicle trips to sustainable forms of transport to have a marked impact on their health, traffic congestion and greenhouse gas emissions.

Implementation of such a plan would ultimately be beneficial for the social, economic and environmental aspects of the building occupants and to visitors and the wider community.

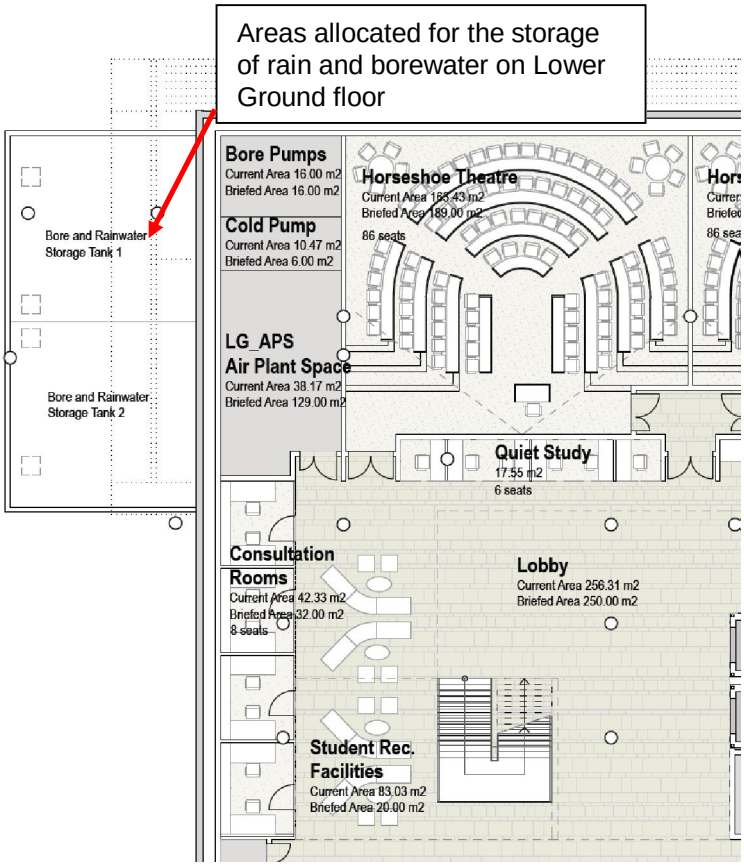
3.5 Water

3.5.1 WAT-1: Occupant Amenity Potable Water Efficiency

Points Available	Points Targeted
5	4

Credit Criteria	Responsibility and Application
• The predicted potable water consumption for sanitary use within the building is to be reduced against a 'best practice' benchmark put forward by the Green Building Council Australia. • This is based on the installation of minimum 4 star WELS rated hydraulic fixtures and fittings. • It is assumed an adequately sized rainwater tank is provided to collect roof run-off and to supply landscaping or WC flushing requirements. • It is also assumed water re-use for toilet flushing and non-potable uses (including cooling tower make-up water) is supplied	• Hydraulic engineer is to ensure adequate sized rainwater storage tank is provided in order to provide sufficient supply for WC flushing, landscaping and other needs as required. • Hydraulic engineer to ensure all fittings and fixtures meet the minimum requirements for WELS rating. • Hydraulics engineer to ensure appropriate connection with bore water, including run-off for recharge and supply etc.

through the bore water re-charge scheme and not drawn from mains supply where additional water is required.	



3.5.2 WAT-2: Water Meters

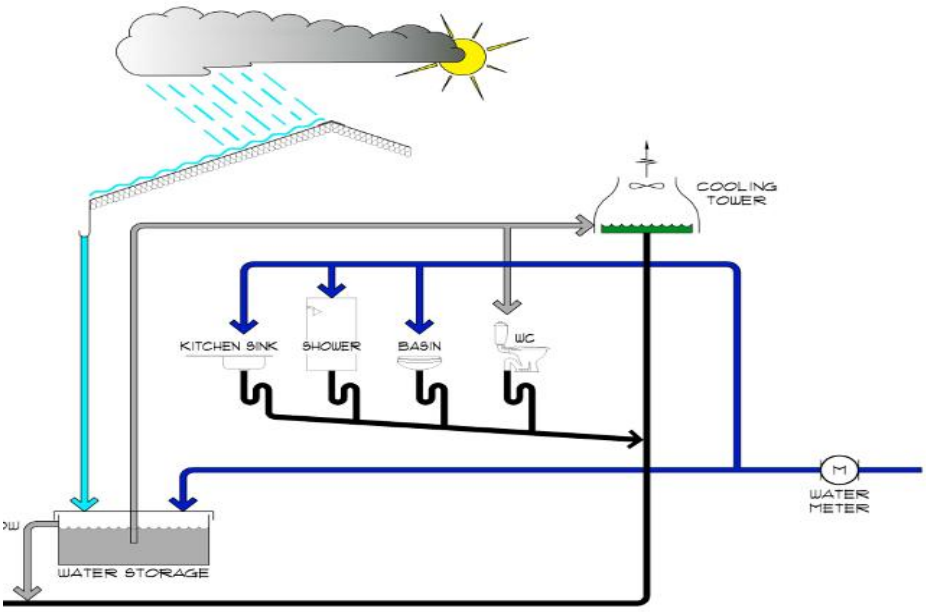
Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• Water meters are required to be provided for all major uses in the project, including bathrooms, fire systems water, irrigation systems, rainwater/recycled water supply, hot water, laboratories and evaporative heat rejection systems. • Connection to a BMS or automated monitoring system is required in order to provide water monitoring data.	• Hydraulics engineer to ensure sub-metering requirements are stipulated in the specifications, including detail on connection to the automated monitoring system. • Hydraulics engineer to provide schematics indicating location and associated uses of all water meters for the project.

3.5.3 WAT-3: Landscape Irrigation Water Efficiency

Points Available	Points Targeted
3	3

Credit Criteria	Responsibility and Application
• Potable water used for landscaping purposes is required to be reduced by a minimum 90%. This is to be either through rainwater supply or bore water make-up.	• FJMT to confirm extent of on-site landscaping. • Hydraulics engineer to ensure that specifications detail proposed landscaping irrigation system, including its water source and operation requirements. • Hydraulics engineer to provide schematic drawings indicating design, location and water supply of the irrigation system.



A generalised schematic for capturing rainwater from a roof catchment for use in landscaping, WC etc.

3.5.4 WAT-4: Heat Rejection Water

Points Available	Points Targeted
4	4

Credit Criteria	Responsibility and Application
• Potable water consumption of the heat rejection system is to be reduced by a minimum 90% through the use of alternate sources such as rainwater and bore water.	• Mechanical engineer to ensure specifications detail and identify the proposed heat rejection system, including its water source and operation requirements. • Hydraulics engineer to provide schematic drawings highlighting the location and water supply (borewater) of the heat rejection system.

3.5.5 WAT-5: Fire System Water

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application

• The design must provide for sufficient temporary storage for a minimum of 80% of the routine fire protection system test water and maintenance drain downs for re-use on site. • Each floor fitted with a sprinkler system is required to have isolation valves or shut-off points for floor by floor testing.	• Fire consultant to ensure specifications detail the fire protection system components and their properties. • Hydraulics consultant to ensure any water storage or re-use system is detailed in the specifications. • Hydraulics engineer to provide fire suppression drawings for each typical floor showing the water storage and re-use system.

3.5.6 WAT-6: Potable Water Use in Laboratories

Points Available **Points Targeted**
2 2

Credit Criteria	Responsibility and Application
• No once-through cooling for any equipment (excluding water for cooling tower makeup or other evaporative systems) is to be provided.	• Hydraulic engineer and UNSW to provide summary demonstrating that no once through cooling systems are installed.

3.6 Materials

3.6.1 MAT-1: Recycling Waste Storage

Points Available **Points Targeted**
2 2

Credit Criteria	Responsibility and Application
• A dedicated storage area for the separation and collection of recyclable waste is to be provided for the building, which is located within 20m of the exit used for recycling pick-up or 20m of the lift core serving all floors. • The recycling waste storage area must be appropriately sized for the estimated amount of recyclable waste stream for the building. • The recycling waste storage area must be separate, but adjacent to, the general waste facility. • The provided recycling waste storage area must meet the requirements of Section A (A12 – A17) of the "Policy for Waste minimisation in New Developments' (NSW, 2004).	• FJMT to ensure design incorporates dedicated waste recycling storage area which complies with the credit criteria. • UNSW to ensure appropriate waste auditor is engaged who is required to prepare summary detailing how the area complies with the credit requirements and calculations demonstrating that the area provided is adequately sized to handle the recyclable waste stream.

3.6.2 MAT-2: Building Reuse

Points Available **Points Targeted**
N/A N/A

Notes:
This credit is not applicable as the site does not contain any buildings prior to construction works.

3.6.3 MAT-3: Recycled Content & Reused Products & Materials

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• A minimum 2% of the project's total contract value is to be represented by either re-used products/materials; OR • Requires a post-consumer recycled content of at least 20%.	• FJMT to provide tender documentation where the reused products and materials in the project as well as the associated quantities of the materials are stipulated.

3.6.4 MAT-4: Concrete

Points Available	Points Targeted
3	1

Credit Criteria	Responsibility and Application
• The absolute quantity of Portland cement used in the project is required to be reduced through the substitution with industrial waste products (30% for in-situ, 20% for pre-cast and 15% for stressed concrete). • Structural engineer to investigate possibility of minimum 20% of all aggregate used for structural purposes to be recycled or slag aggregate for 1 additional point.	• A concrete technologist report is required which describes how the credit criteria is met and indicates the volume of Portland cement that is replaced by the industrial waste product. • Structural engineer to ensure the specifications stipulate the requirement for replacement of Portland cement, including percentage and volumes replaced.

Thermal Insulating, Light Weight Bricks | High Value Wall and Floor Tiles | High Quality, Water Absorbent Pavers

High Strength, Low Density Aggregate & Sand

Pavers and bricks, a significant portion of which is made from flyash waste which reduces the quantity of cement required

3.6.5 MAT-5: Steel

Points Available	Points Targeted
2	1

Credit Criteria	Responsibility and Application

• A minimum 60% of all steel (by mass), used in the project must either have a post-consumer recycled content of greater than 50%; or is reused.	• The structural engineer to provide a summary which identifies the total amount of steel used within the building structure and the amount that is provided with either recycled or reused steel. • Structural engineer to ensure the specifications stipulate the steel requirements and clearly referencing the post-consumer content or re-use.

3.6.6 MAT-6: PVC Minimisation

Points Available **Points Targeted**
2 1

Credit Criteria	Responsibility and Application
• A minimum 30% of the total cost of PVC content is required to be reduced through the replacement with alternative materials.	• Cost planner required to establish a 'reference' case by identifying the total anticipated cost of PVC if PVC is specified for the entire major standard PVC uses in the project, in order to demonstrate that a minimum 30% of the total cost of PVC has been reduced through the replacement with alternative materials. • Structural engineer to ensure the specifications stipulate the replacement of PVC products used within the project and identifies which products are to be used.

3.6.7 MAT-7: Sustainable Timber

Points Available **Points Targeted**
2 0

Credit Criteria	Responsibility and Application
• Cost planner advised this is difficult credit to achieve based on current GBCA requirements. • Further discussions with GBCA to determine how credit criteria can be achieved.	• AECOM to further discuss with GBCA.

3.6.8 MAT-8: Design for Disassembly

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• Structural engineer to look at possibility of 95% of the total façade to be designed for disassembly.	• Structural engineer to provide summary which outlines overall approach of how credit criteria is achieved. • Detailed tender drawings marked to identify elements designed for disassembly required.

3.6.9 MAT-9: Dematerialisation

Points Available	Points Targeted
1	0

Notes:
This credit is not currently being targeted, however AECOM will further investigate potential to claim this credit.

3.6.10 MAT-11: Flooring

Points Available	Points Targeted
3	2

Credit Criteria	Responsibility and Application
• The flooring used in the project must have a reduced environmental impact as determined by the Green Star Flooring Calculator. • Assessment is under the following: - Environmentally innovative - Re-use - Eco-preferred content - Durability - Environmental management systems - Product Stewardship - Modularity - Design for Disassembly.	• UNSW to ensure that all flooring sourced for the building meets the requirements under the Flooring Calculator for reduced environmental impact. • FJMT to ensure layout and design can incorporate compliant flooring types. • FJMT to ensure compliant flooring is stipulated in the specifications and summarise different flooring types in a flooring schedule.

3.6.11 MAT-12: Joinery

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• The joinery used in the project must have a reduced environmental impact as determined by the Green Star Flooring Calculator. • Assessment is under the following: - Environmentally innovative - Re-use - Eco-preferred content - Modularity - Design for Disassembly.	• UNSW to ensure that all joinery sourced for the building meets the requirements under the Joinery Calculator for reduced environmental impact. • FJMT to ensure compliant joinery is stipulated in the specifications and summarise different joinery types in a joinery schedule.

3.6.12 MAT-13: Loose Furniture

Points Available	Points Targeted
3	2

Credit Criteria	Responsibility and Application
• The loose furniture used in the project (defined as chairs, tables and storage only) must have a reduced environmental impact as determined by the Green Star Loose Furniture Calculator.	• UNSW to ensure that all loose furniture sourced for the building meets the requirements under the Loose Furniture for reduced environmental impact. • FJMT to ensure compliant loose furniture is

• Assessment is under the following: - Environmentally innovative - Re-use - Eco-preferred content - Durability - Environmental management systems - Product Stewardship - Design for Disassembly.	stipulated in the specifications and summarise different loose furniture types in a schedule.

Preference towards furniture, joinery, flooring which have a reduced environmental impact in manufacture contribute towards a more sustainable design.

3.7 Land Use and Ecology

3.7.1 ECO-1: Topsoil

Points Available **Points Targeted**
N/A N/A

Notes:
This credit is not applicable as the Tyree Building is located on a previously developed site, hence there is no topsoil which would be affected by the development.

3.7.2 ECO-2: Re-use of Land

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• A minimum 75% of the site has to have been previously built on.	• FJMT to provide calculations on the proportion of built area on the site prior to development of the Tyree Building.

3.7.3 ECO-3: Reclaimed Contaminated Land

Points Available **Points Targeted**

2 0

Notes:
This credit is not achievable as the site prior to development of the Tyree Building was no considered significantly contaminated.

3.7.4 ECO-4: Change of Ecological Value

Points Available **Points Targeted**
4 1

Credit Criteria	Responsibility and Application
• Comparison between the 'before' and 'after' ecological value of the site determines the number of points achievable for this credit.	• FJMT to provide summary describing the site's bioregion and land types and describing the 'before' and 'after' scenario of the site.

3.8 Emissions

3.8.1 EMI-1: Refrigerant Ozone Depletion Potential

Points Available **Points Targeted**
1 1

Credit Criteria	Responsibility and Application
• All refrigerants used in the project are to have an ozone depleting potential (ODP) of zero.	• Mechanical engineer to provide equipment schedule listing all refrigerants, their type and volume, and the respective ODP. • Mechanical engineer to provide summary describing the HVAC system and identifying all systems that contain refrigerants.

3.8.2 EMI-2: Refrigerant GWP

Points Available **Points Targeted**
2 0

Notes:
This credit is not being targeted if refrigerants of R134 are used for efficiency of the mechanical plant.

3.8.3 EMI-3: Refrigerant Leaks

Points Available **Points Targeted**
2 1

Credit Criteria	Responsibility and Application
• All HVAC systems containing refrigerants are to be contained in a moderately airtight enclosure with the addition of a refrigerant leak detection system installed to cover high-risk parts of the plant.	• Mechanical engineer is to ensure specifications stipulate the refrigerant leak detection system. • Mechanical engineer is to provide summary describing the HVAC system and indicate the types and volumes of refrigerants used in the system.

3.8.4 EMI-4: Insulant ODP

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• All thermal insulants in the project must avoid the use of ozone depleting substances in both its manufacture and composition.	• All relevant design services to ensure respective specifications stipulate the requirements for thermal insulation to avoid the use of ozone depleting substances.

3.8.5 EMI-5: Watercourse Pollution

Points Available	Points Targeted
2	2

Credit Criteria	Responsibility and Application
• Achieving these points are based on design that minimises stormwater runoff so as not to increase peak stormwater flows for rainfall events of up to a one-in-two year storm. • All stormwater leaving the site is to be treated or filtered in accordance with either ANZECC or CSIRO guidelines.	• Civil engineer to provide calculations of original peak stormwater flows against projected peak stormwater guidelines. • Tender site plans required showing the systems included in the project design.

3.8.6 EMI-6: Reduced Flow to Sewer

Points Available	Points Targeted
2	0

Notes:
For the Tyree Building, there is no known grey or blackwater recycling system which would reduce the flow to sewer, hence no points are being targeted for this credit.

3.8.7 EMI-7: Light Pollution

Points Available	Points Targeted
1	1

Credit Criteria	Responsibility and Application
• No direct light beam generated from within or outside the building is to be directed at any point in the sky. • The lighting design must comply with AS4282 'Control of the Obtrusive Effects of Outdoor Lighting' • 95% of outdoor spaces are not to exceed the minimum requirements of AS1158 for illuminance levels.	• Electrical sub-contractor to ensure that lighting design complies with the Green Star requirements. • Electrical sub-contractor to provide summary detailing the external and atrium lighting on the site and calculations or diagrams demonstrating that no light spill is impacting night sky. • Electrical sub-contractor to provide luminaire schedule for all external lighting.

Poor outdoor lighting can result in light being wasted as it is directed into the night sky

3.8.8 EMI-8: Legionella

Points Available	Points Targeted
1	0

Notes:
For the Tyree Building, this credit is unlikely to be achievable depending on the water based system selected for the mechanical design.

3.9 Innovation

3.9.1 INN I: Innovative Strategies & Technologies

Points Available	Points Targeted
2	**2**

- Potential for the Spree Labs to be claimed as an innovative solution to be judged by GBCA to be worthy of a credit as the project contributes to the broader market transformation towards sustainable development in Australia.
- Number of points to be determined by Green Building Council Australia.

Up to five Innovation points are awarded at the discretion of the GBCA where it is demonstrated that an innovative strategy or technology is eligible for an Aus-Industry Research and Development Tax Concession and has a significant environmental benefit. The application will be assessed by the GBCA against the following criteria:

- Does the application comply with AusIndustry Research and Development Tax Concession requirements?
- What is the environmental benefit of the innovation?

More than one innovation can be submitted, however the maximum points available for any one building assessment under Inn-1, Inn-2 and Inn-3 is five (in total).

Application
For the Tyree Building, it is not yet understood whether any of innovative solutions will be judged by the Green Building Council to be worthy of a credit. At this stage, no credits in this category have been claimed.

3.9.2 INN 2: Exceeding Green Star Benchmarks

Points Available	Points Targeted
2	0

- No credits claimed for this category at this stage.

Up to five Innovation points are awarded at the discretion of the GBCA where it is demonstrated that the design exceeds, by a measurable margin, one or more existing Green Star – Office Design credit category criteria. The application is assessed by the GBCA against the following criteria:

- How have the design initiatives exceeded the benchmarks in Green Star – Office Design?
- What is the measurable environmental benefit of the innovation?

More than one innovation can be submitted, however the maximum points available for any one building assessment under Inn-1, Inn-2 and Inn-3 is five (in total).

Application

For the Tyree Building, it is not yet understood whether any of innovative solutions will be judged by the Green Building Council to be worthy of a credit. At this stage, no credits in this category have been claimed

3.9.3 INN 3: Environmental Design Initiatives

Points Available	Points Targeted
1	1

- UNSW to consider proposal to analyse and reduce the carbon content of the building materials.

Up to five Innovation points are awarded at the discretion of the GBCA where it is demonstrated that a design feature provides a significant environmental benefit but is not awarded points under the Green Star – Office Design rating tool criteria. The application will be assessed by the GBCA against the following criteria:

- What is the measurable environmental benefit of the innovation?
- Which significant environmental benefits of the innovation have been addressed by Green Star – Office Design credits?

More than one innovation can be submitted but the maximum points available for any one building assessment under Inn-1, Inn-2 and Inn-3 is five (in total).

Application

For the Tyree Building, it is not yet understood whether any of innovative solutions will be judged by the Green Building Council to be worthy of a credit. At this stage, no credits in this category have been claimed.