Built Ecology™

WSP Lincolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Nepean Hospital

Environmental Concept Design

Environmental Concept Design

Following is a summary of the ESD strategies identified for the Nepean Hospital – Integrated Mental Health Unit. This report describes how ESD principles will be incorporated into the design of the building, implemented during construction and throughout operation.

Measures will be implemented to minimise consumption of resources, water and energy. The design will be benchmarked against the Green Star Health Care Tool V1 to demonstrate how a 4 star rating may be achieved.

Due to the nature of the building, certain limitations exist in terms of the form of the building and accessibility to building services. This has been a consideration when determining the most suitable initiatives.

As a NSW health project it is also required that the project complies with the NSW Health Engineering Services and Sustainable development guidelines (Technical Series TS-11).

The proposed initiatives for the development are intended to assist in achievement of these requirements, and of high environmental outcomes. A holistic approach to ESD has been taken. Strategies in environmental management, passive design, energy, water and transport have been considered.

ESD Strategies

Environmental Management

Environmental Management will ensure that the best outcomes are achieved.

- A green star professional has been engaged to provide sustainability advice
- Commissioning and building tuning will be performed in accordance with relevant codes to ensure that the building operates at its most efficient
- An Environmental Management Plan (EMP) and Waste Management Plan will be designed and implemented in order in order to ensure all works are conducted in accordance with state environmental guidelines, and that waste from site is minimised
- Ongoing metering and a BMS system have been included. This will allow for tracking of ongoing environmental performance.
- A building users guide will be made available to the occupants and staff with information on environmental features of the building, and how to occupy the building correctly

Passive Design

Incorporating passive design principles is an effective method of reducing energy consumption and increasing the indoor environment quality of the space. Due to the restrictions on types of mechanical systems available for the building, it is imperative the form of the building manages the impact of the external environment to reduce the requirement for artificial heating, cooling and lighting in the spaces. Through smart passive design, it will be possible to mitigate the impact of external weather conditions on the internal spaces to provide comfortable, minimum energy consuming environments.

- Maximised daylight to increase indoor environment quality and reduce reliance on artificial lighting:

The building is shallow in depth and includes ample glazing on the facade. This will assist in providing daylight to the majority of spaces. Lighting controls such as daylight sensors in perimeter zones should be incorporated to reduce lighting demand in adequately daylit spaces.

- Eaves and shading to reduce discomfort from glare, and to reduce solar loads and air conditioning energy

The shading design and window orientation has been carefully designed to balance adequate daylight to the space with visual privacy for the occupants as well as solar control to reduce heat gain in summer and promote passive solar heating in winter.

- Thermal mass to maximise effects of warming winter sun

The building is heavy in thermal mass, with floors, walls and ceilings all made from concrete. By allowing sun to warm the mass in winter and shading it in summer, more stable indoor temperatures can be achieved, reducing the demand on supplementary air conditioning and improving thermal comfort for the occupants.

- High performance materials to prevent thermal losses and gains through the building envelope:
  - Roof R Value of 3.2 minimum
  - Walls R Value of 2.7 minimum
  - Double glazed windows and high performance glazing to staffed areas.

Insulation will mitigate the impact of external weather conditions on the indoor environment. In winter, heat loss will be reduced by insulation and double glazing. In summer, heat gain will be reduced through the same mechanisms.

Built Ecology™

WSP Lincoolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Electrical Services

Efficient lighting control strategies and effective monitoring will reduce electrical demand for the building, as well as emissions from energy consumption

- Efficient lighting – T5 fittings ensure an efficient light output to electrical input.
- Lighting zoning and sensors – ensure that lighting is not on when it is not required e.g. in an empty room or space. Inclusion of motion sensors in rooms other than bedrooms will enable adequate control of lighting.
- Separate metering of lighting and power – this allows for monitoring of energy consumption and allows for any unusual usage patterns to be detected and any problems to be quickly identified and corrected

- Connection to BMS system – a building monitoring system will allow for the results of the metering to be easily accessed and interpreted.

Mechanical Services

The air conditioning system has been selected to be of the highest efficiency with the restrictions imposed by the nature of the facility. A variable air volume (VAV) system will provide tempered air to the bedrooms and common areas. VSD (variable speed drive) fans and pumps will reduce energy consumption and a high efficiency chiller will provide cooling to the air. A condensing boiler will be used for heating, a more efficient method of heating.

Throughout the detailed design stage, the option of supplementing this system with a chilled and heated floor will be investigated. Pipes running through the concrete slab floors will provide chilled water in summer and heated water in winter to help maintain a stable indoor environment. The benefits of this system include:

- Improved energy efficiency
- Improved thermal comfort for occupants

For this system to be successful at reducing energy consumption and maintaining indoor comfort, the building form must be carefully designed to ensure solar loads are controlled. Slab temperatures are slow to respond, therefore internal loads from people, equipment and solar gains must be kept stable.

Hydraulic Services

Within hydraulic services there are options for reducing water demand, provision of alternative sources of water to reduce potable consumption, and the use of energy efficient water heating strategies to reduce energy consumption.

Hot water

There is the potential to capture waste heat from the chiller for the use of heating domestic water. This effectively free heating, providing a significant energy saving. The potential for including this in this project will need to be investigated further in later stages as it will require conversations with chiller and plant manufacturers to ensure warranties for parts will not become void.

A further opportunity to reduce energy consumption for hot water is to install a gas boosted solar hot water system. In a climate such as Sydney's, the daily solar radiation has been found to be quite sufficient for providing a significant portion of hot water requirements. This will need to be modelled in the detailed design stage in order to adequately size the solar array required.

Water demand reduction

There are two strategies to reduce the use of potable water:

- Reduce water demand with water efficient practices and efficient fittings
- Harvest rainwater and install rainwater tanks to supply water for non-potable demands such as toilet flushing and irrigation.

Water Efficient Practices and Fittings

A preliminary water balance for the development has been conducted based on the following assumptions:

- 4.5/3L dual flush toilets
- Low flow hand basins and sinks
- 6 WELS Star urinals
- 3 WELS Star Showerheads
- 4 star dishwashers

Efficient fixtures will reduce water consumption by 18% compared to standard fixtures.

Built Ecology™

WSP Lincolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Rainwater Harvesting and Reuse

The water balance identified that approximately 4kL of water a day may be consumed by non-potable demands such as toilets and irrigation.

The building offers a large area for the collection of rainwater. Approximately 175kL per month of rainwater is available to be collected and reused. Because of the unpredictability of rainfall, the supply of water is dependent upon having a tank large enough to store the water for the dry periods.

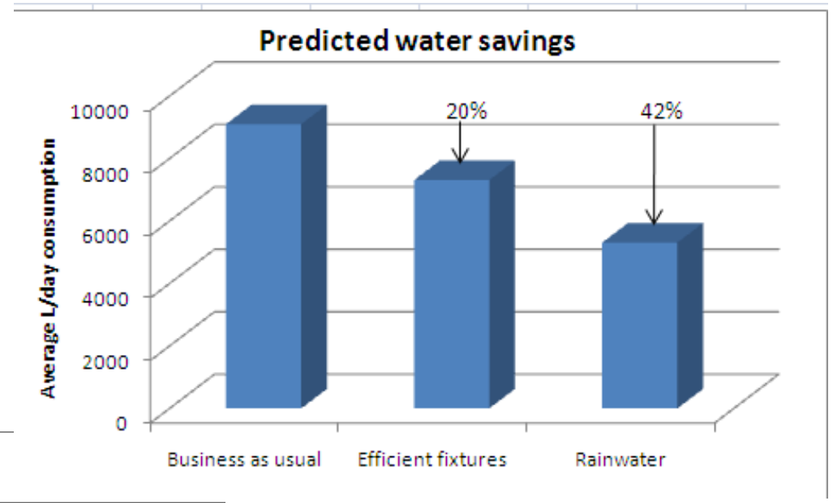
The optimum tank size for rainwater collection has an inverse relation to the amount of rainfall available. The optimum tank size is at the point where an increase in size of the tank will not have a significant effect on the rainwater amount collected. A preliminary analysis indicates that a rainwater tank of 50kL would be able to meet 57% of the non potable demand on site.

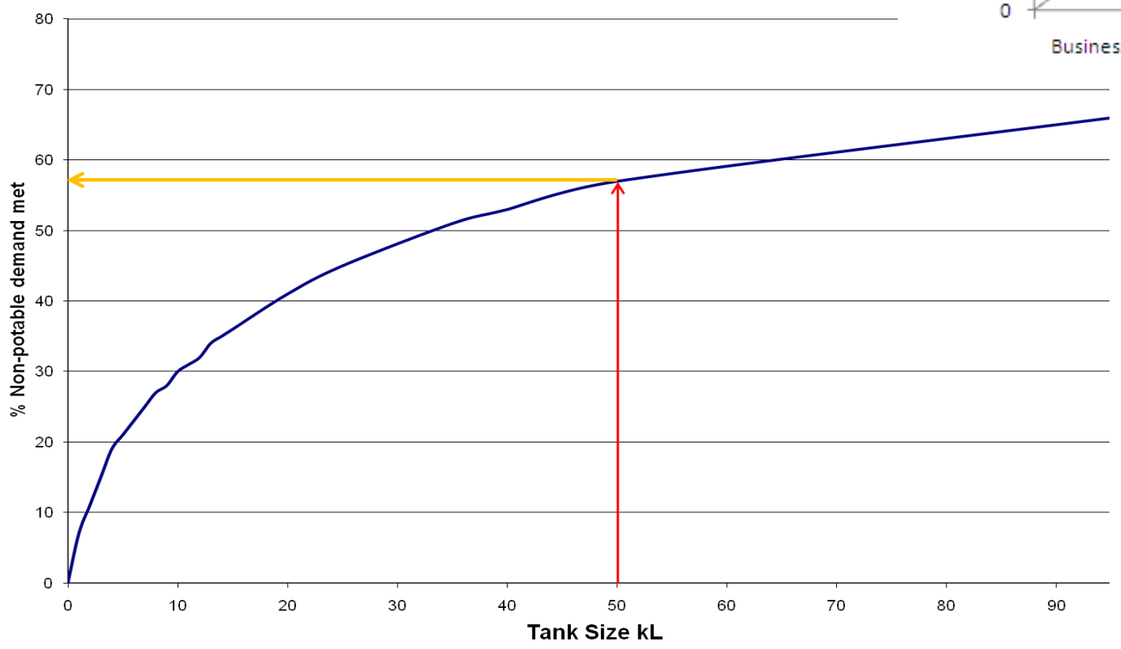
Doubling the size of this tank to 100kL will only increase the demand met to 68%. Therefore the optimum tank size for the building is 50kL.

Integrated Water Management Plan

Through Design development, a water cycle assessment for the site will be conducted to optimize the strategies listed above. This will assist in selection of water use reduction opportunities such as choosing fittings that meet the requirements of the facility and optimizing the size of the rainwater tank to ensure maximum toilet flushing and irrigation demand will be met.

This information will be used in conjunction with the civil design for Water Sensitive Urban Design and the Irrigation plan for the landscaping to create an Integrated Water Management Plan for the project.





Built Ecology™

WSP Lincolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Transport

Promoting alternative forms of transport provides a significant environmental benefit through the reduction of personal vehicle emissions. The site will incorporate provisions which support alternative transport use to improve its environmental performance as well as to assist the project in meeting planning requirements.

The site is located near a large arterial road, and is also in proximity of Kingwood train station. The site will encourage the use of public transport, pedestrian travel and bikes, to reduce the number of cars on the road and their associated emissions.

Public transport use will be encouraged by providing:

- Signage - clearly indicating paths to public transport alternatives
- Significantly less car parking to the site than the maximum planning allowances

Bicycle use will be encouraged by providing:

- facilities for staff including secure parking, showers and lockers

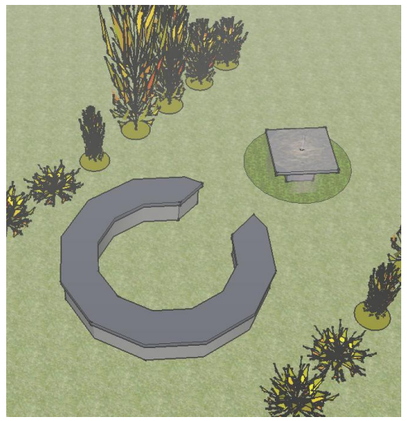
Indoor Environment Quality and Places of Respite

As part of the holistic approach to sustainability, the indoor environment will be maintained to a high quality. This enhances the comfort and well being of occupants.

In addition to increasing the daylighting in the space, the following initiatives will be implemented:

- Noise control – to ensure that noise levels from building services are not excessive, or disruptive to occupants
- High frequency ballasts – to ensure that uncomfortable flickering does not disturb occupants
- Daylight glare control – venetians will allow occupants to control daylight into spaces, and reduce discomfort
- External views – allow occupants to feel connected to the outside environment

Places of respite will also be offered in the form of outdoor courtyards. These courtyards are offered as a protected space which allows direct physical connection to the natural environment. These are believed to improve both physical and psychological health.



Materials

Material selection will aim to reduce the environmental impact of the building's construction through the use of sustainable materials, recycling and waste minimisation.

Adequate storage will be provided within the building to allow for storage of recyclable waste. This encourages good management of waste streams from the building.

Material selection can also have a significant impact on the indoor environmental quality of the building.

- Sustainable materials will be sourced such as FSC of AFS certified, reclaimed or recycled timber;
- At least 80% of construction and demolition waste from the site will be reused or recycled;
- Products will be selected which contain low levels of VOC's: paints, adhesives, sealants, flooring, wall and ceiling coverings and mattresses;
- Flooring, joinery, furniture, ceilings, walls and partitions will be selected that are environmentally sensitive in their design and production. This includes recycled content, design for disassembly, longevity, and product stewardship.

Built Ecology™

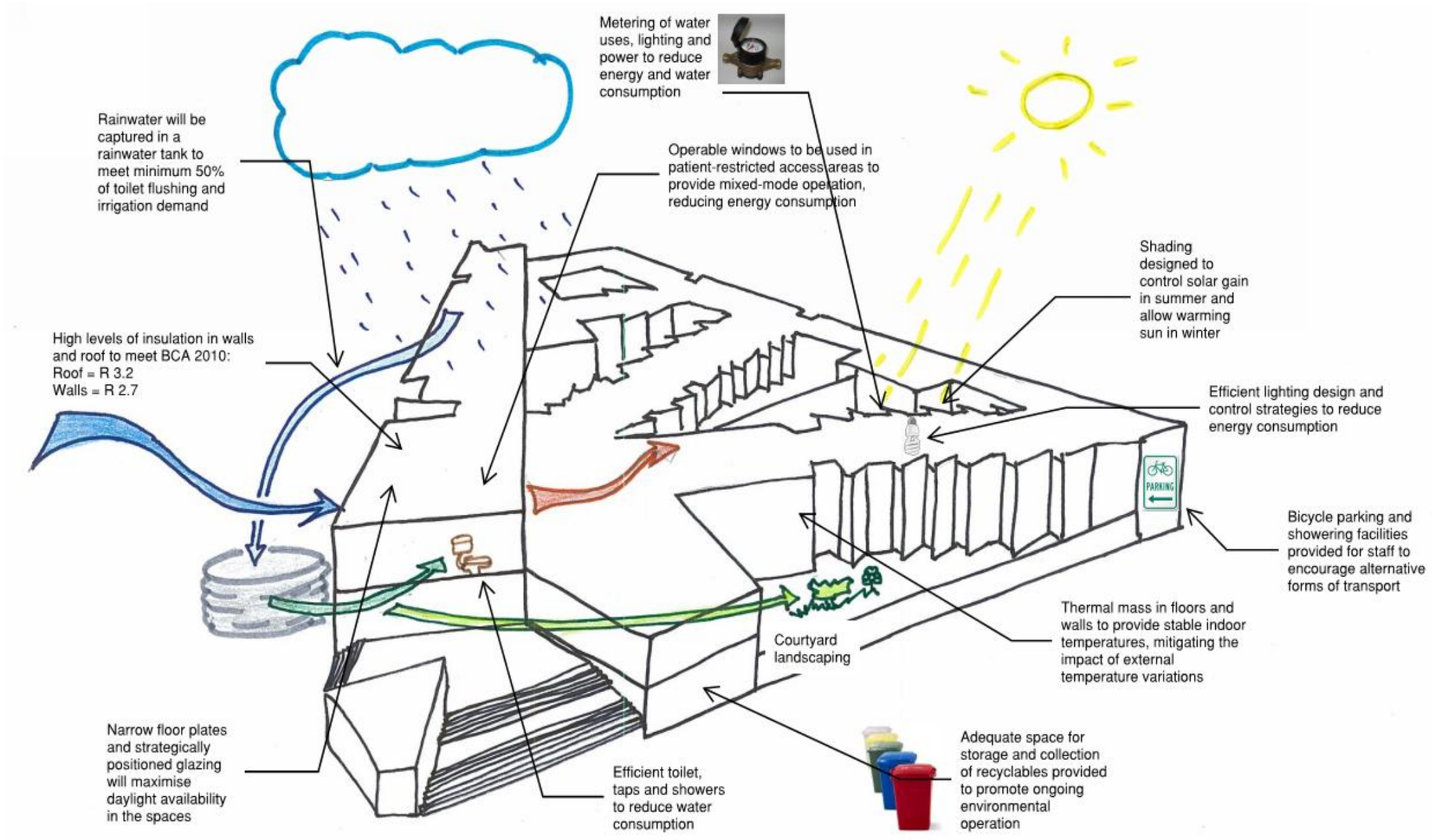
WSP Lincolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Summary of ESD initiatives



Built Ecology™

WSP Lincolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Path to 4 star Green Star

The above strategies are expected to allow the hospital to achieve a 4 star Green Star rating under the Healthcare v1 tool.

Notable inclusions within the 4 star scheme include:

Management credits targeted;

- Full commissioning clauses
- Building tuning every 12 months after quarterly reviews
- Monitoring of energy and water consumption
- Provision of building users' Guides and Sustainable Procurement Guides

Indoor Environmental Quality:

- Natural daylight to up to 90% of the NLA
- Efficient lighting system with high frequency ballasts
- Low levels of internal noise from mechanical systems and low levels of noise ingress
- Use of low VOC paints, adhesives, sealants and mattresses

Energy:

- High efficiency HVAC plant selection
- Natural Ventilation in a mixed mode operation to patient-restricted access areas
- Efficient operation of building systems
- Electrical and tenancy sub-metering
- Lighting zoning to reduce unnecessary lighting
- Lighting controls to naturally daylight or unoccupied spaces

Transport:

- Secure bicycle parking and shower and locker facilities for 10% of building staff.
- Public transport promotion by signage
- No provision of car parking specifically for this development

Water:

- Water efficient rated fixtures for showers, hand basins and urinals
- Water meters to monitor water use and identify unusual consumption
- Rainwater harvesting and reuse for toilet flushing and irrigation

Land Use & Ecology:

- Re-use of previously developed site
- No decrease in the ecological value of the site
- Stockpiling of any topsoil during construction to retain a balance of topsoil on site and ensure no reduction in topsoil quality

Emissions:

- No Ozone Depleting Potential (ODP) in refrigerants and insulants used within the building.
- Minimised light pollution though strategic design ensuring no light is directed to the sky

The full list of potential targeted points is shown in the table below. The table lists the credits of the Green Star Health Care V1 tool, how many points are available under each credit, and how many points will be targeted for this project.

45 points are required for a 4 star rating, however, to account for design contingency, a minimum 10% safety margin is recommended, Therefore the project will target a minimum of 51 points.

The points strategy has been determined based on consultation with the design team to determine which points will be achievable and which will not be targeted for this project either because of design constraints or inhibitive cost impact.

Throughout design development, the opportunity for further ESD initiatives will be investigated and assessed for their environmental benefits. If feasible they will be included in the Green Star strategy, and where appropriate substituted for other points suggested below.

Built Ecology™

WSP Lincolne Scott Pty Ltd
ABN 47 005 113 468

Level 1, 41 McLaren St
PO Box 6245, North Sydney
NSW 2060 Australia

T. +61 2 8907 0900
F. +61 2 9957 4127

E. built-ecology@wsplincolnescott.com
W. built-ecology.com

Category	Title	Points Available	Points Achieved
Management			
Green Star Accredited Professional	Man-1	2	2
Commissioning Clauses	Man-2	2	2
Building Tuning	Man-3	1	1
Independent Commissioning Agent	Man-4	1	1
Building Guides	Man-5	1	1
Environmental Management	Man-6	2	2
Waste Management	Man-7	2	2
Building Management Systems	Man-9	1	1
Maintainability	Man-11	1	1
Construction Indoor Air Quality Plan	Man-12	3	3
Sustainable Procurement Guide	Man-13	1	1
		17	17
Indoor Environment Quality			
Ventilation Rates	IEQ-1	4	0
Air Change Effectiveness	IEQ-2	2	0
CO2 Monitoring & Control and VOC Monitoring	IEQ-3	1	0
Daylight	IEQ-4	3	3
Thermal Comfort	IEQ-5	2	1
Hazardous Materials	IEQ-6	0	na
Internal Noise Levels	IEQ-7	1	1
Volatile Organic Compounds	IEQ-8	5	4
Formaldehyde Minimisation	IEQ-9	1	1
Mould Prevention	IEQ-10	1	0
Daylight Glare Control	IEQ-11	1	1
High Frequency Ballasts	IEQ-12	1	1
Electric Lighting Levels	IEQ-13	1	1
External Views	IEQ-14	2	0
Individual Thermal Comfort Control	IEQ-15	2	0
Exhaust Riser	IEQ-16	1	1
Air Distribution System	IEQ-17	1	1
Outdoor Pollutant Control	IEQ-18	1	0
Places of Respite	IEQ-19	1	1
	TOTAL	31	14
Energy			
Conditional Requirement	Ene-Con	Cond Req.	Yes
Greenhouse Gas Emissions	Ene-1	20	3
Energy Sub-metering	Ene-2	1	1
Peak Energy Demand Reduction	Ene-3	2	0
Lighting Zoning	Ene-4	2	1
Car Park Ventilation	Ene-6	0	na
Efficient External Lighting	Ene-9	1	1
	TOTAL	26	6
Transport			
Provision of Car Parking	Tra-1	2	2
Fuel-Efficient Transport	Tra-2	0	na
Cyclist Facilities	Tra-3	3	3
Commuting Mass-Transport	Tra-4	5	1
Transport Design and Planning	Tra-6	1	1
	TOTAL	11	7
Water			
Occupant Amenity Water	Wat-1	5	5
Water Meters	Wat-2	1	1
Landscape Irrigation	Wat-3	2	2
Heat Rejection Water	Wat-4	4	4
Fire System Water	Wat-5	0	na
Potable Water Use for Equipment	Wat-6	0	na
	TOTAL	12	12
Materials			
Recycling Waste Storage	Mat-1	1	1
Building Re-use	Mat-2	0	na
Recycled Content & Re-used Products & Materials	Mat-3	2	0
Concrete	Mat-4	3	1
Steel	Mat-5	2	1
PVC	Mat-6	2	0
Timber	Mat-7	1	na
Design for Disassembly	Mat-8	1	0
Dematerialisation	Mat-9	1	0
Flooring	Mat-11	3	0
Joinery	Mat-12	1	1
Loose Furniture	Mat-13	4	2
Ceilings, Walls and Partitions	Mat-14	2	2
	TOTAL	23	8
Land Use & Ecology			
Conditional Requirement	Eco-Con	Cond Req.	Yes
Topsoil	Eco-1	1	1
Re-use of Land	Eco-2	1	1
Reclaimed Contaminated Land	Eco-3	0	na
Change of Ecological Value	Eco-4	4	1
	TOTAL	6	3
Emissions			
Refrigerant ODP	Emi-1	1	1
Refrigerant GWP	Emi-2	2	0
Refrigerant Leaks	Emi-3	2	0
Insulant ODP	Emi-4	1	1
Watercourse Pollution	Emi-5	3	0
Discharge to Sewer	Emi-6	5	0
Light Pollution	Emi-7	1	1
Legionella	Emi-8	1	1
Trade Waste Pollution	Emi-9	1	1
	TOTAL	17	4

Total weighted points: 51

Once certified, this would equate to a 4 star rating