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January 2009

POWMRI Neuroscience Research Precinct

Prepared for

POWMRI

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Report No:	001	Revision:	E	Date:	27/01/09
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Revision	Description	Date
A	Preliminary	12/12/08
B	Updated following comments	12/12/08
C	Portrait Issue	12/12/08
D	Including consultants comments	23/01/09
E	Updated	27/01/09

The success and realisation of the proposed initiatives will be dependant upon the commitment of the design team, the development of the initiatives through the life of the design and also the implementation into the operation of the building. Without this undertaking the proposed targets may not be achieved.

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Executive Summary

Cundall have been appointed as the sustainability consultant for the proposed new development for the Prince of Wales Medical Research Institute (POWMRI). This report concerns the environmental initiatives being assessed for the development of a new Neuroscience Research Precinct on the site of the existing POWMRI facilities. Principles of environmentally sustainable design (ESD) are detailed within this report.

The new facilities will comprise both office and laboratory facilities housed within the same building. This report discusses the environmental rating tools available and highlights why there is no specific tool available for a laboratory building in Australia. The approach being taken by the design team in implementing a holistic sustainability strategy by considering the initiatives considered in various related environmental tools is discussed within this report.

Cundall have developed an alternative ESD Laboratory rating tool designed to benchmark the environmental performance of the new Neuroscience Precinct, which will be used throughout the design process to ensure that ESD principles are incorporated from design stages and carried through to construction.

1. Introduction

There are a number of environmental rating tools used in Australia for different building types such as:

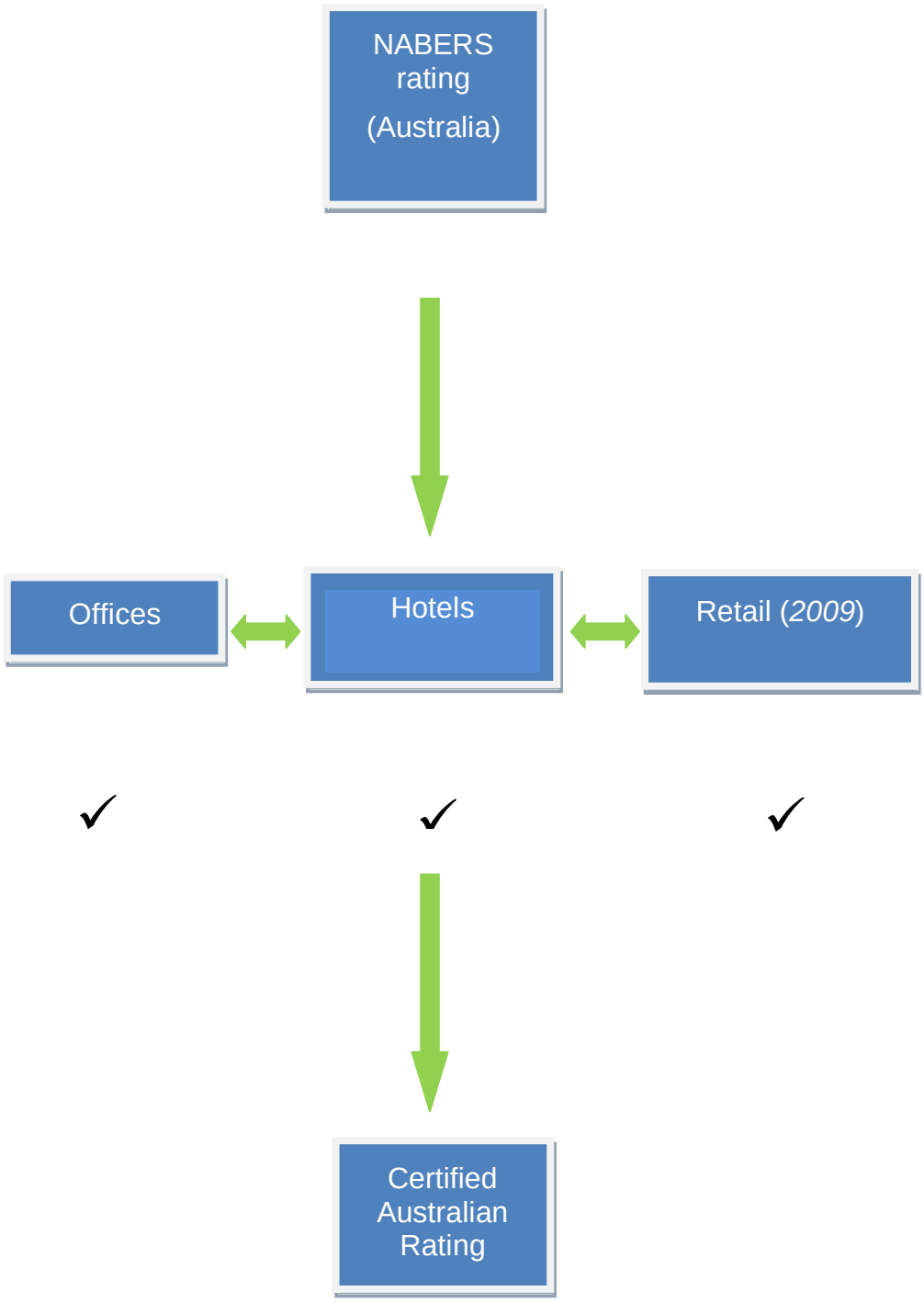
- Commercial office buildings
- Retail buildings
- Light industrial buildings
- Health care buildings
- Educational buildings
- Residential buildings

Two main methods exist in Australia for rating the environmental performance of buildings, NABERS and Green Star. NABERS is a suite of tools designed to rate the performance of existing buildings in terms of Energy, Water, Waste and Indoor Environmental Quality (IEQ). NABERS ratings currently only exist for commercial buildings or hotels. NABERS Energy (formerly ABGR) is a measure of a buildings energy consumption which enables it to be benchmarked against other similar buildings and allows buildings can be designed to achieve a certain rating. Green Star is a rating tool designed to assess the overall environmental performance in categories such as management, materials, energy, water and indoor environmental quality.

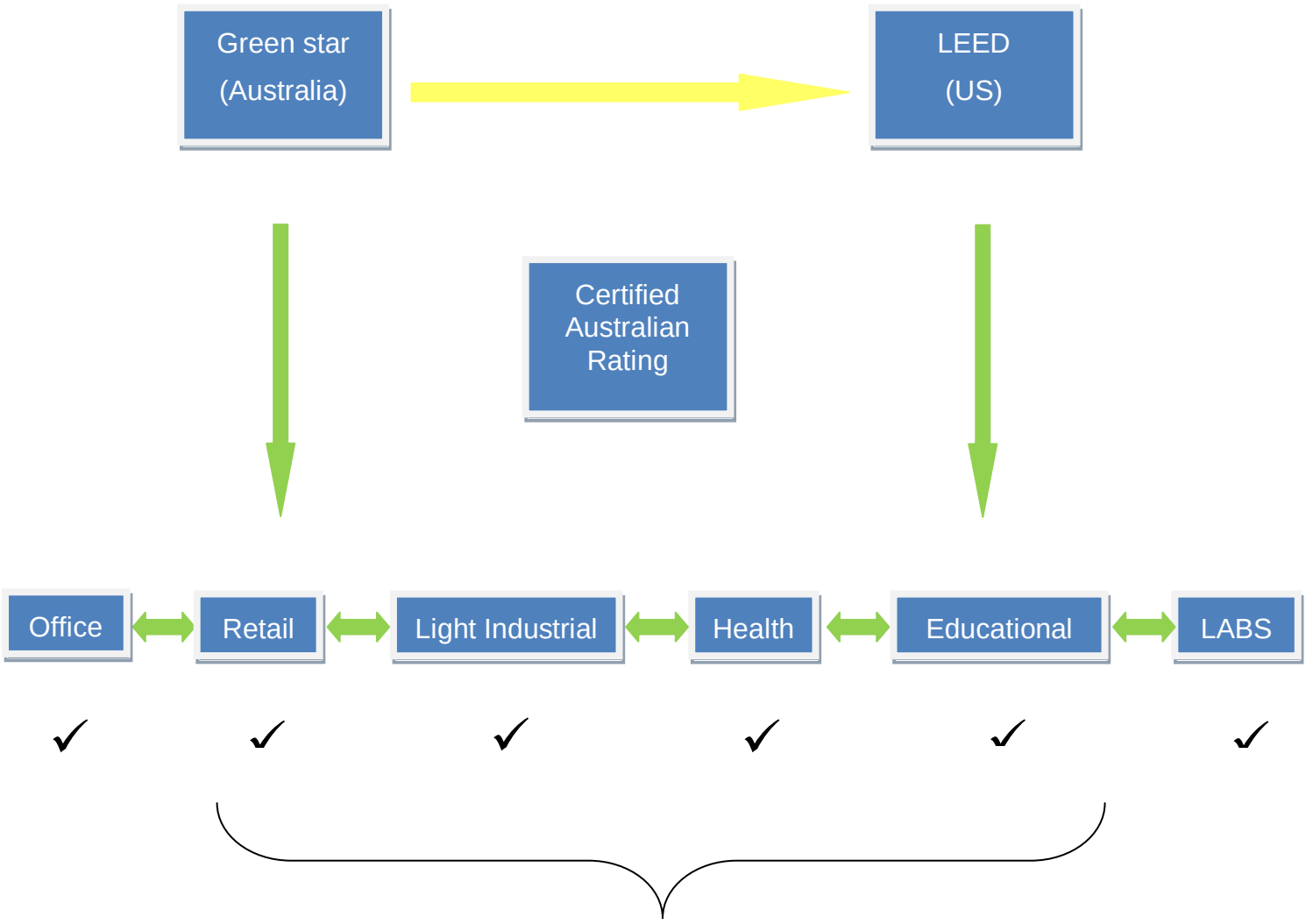
There are currently no Australian rating tools for laboratories but there is a suite of environmental rating tools from the US called LEED (Leadership in Energy and Environmental Design. One of the LEED tools is specifically designed to assess the performance of laboratory buildings – Laboratories for the 21st Century or Lab 21. Due to an agreement between the US and Australian Green Building Councils, no developments can officially be LEED rated in Australia at this point in time and many of the credits are not applicable to an Australian development (see section 1.3 for further details). Therefore in order to assess the environmental credentials of the proposed POWMRI building the design team have developed an alternative strategy.

1.1 Rating Schemes

The following flow charts indicate the methodology that has been applied when assessing the environmental credentials of POWMRI:



Not applicable to a laboratory building



The project team will take the framework from Green Star and apply it to LEED to develop a project specific lab tool for POWMRI

The POWMRI lab tool will be developed by the team for this project. This would be an internally certified tool and not able to be officially certified.

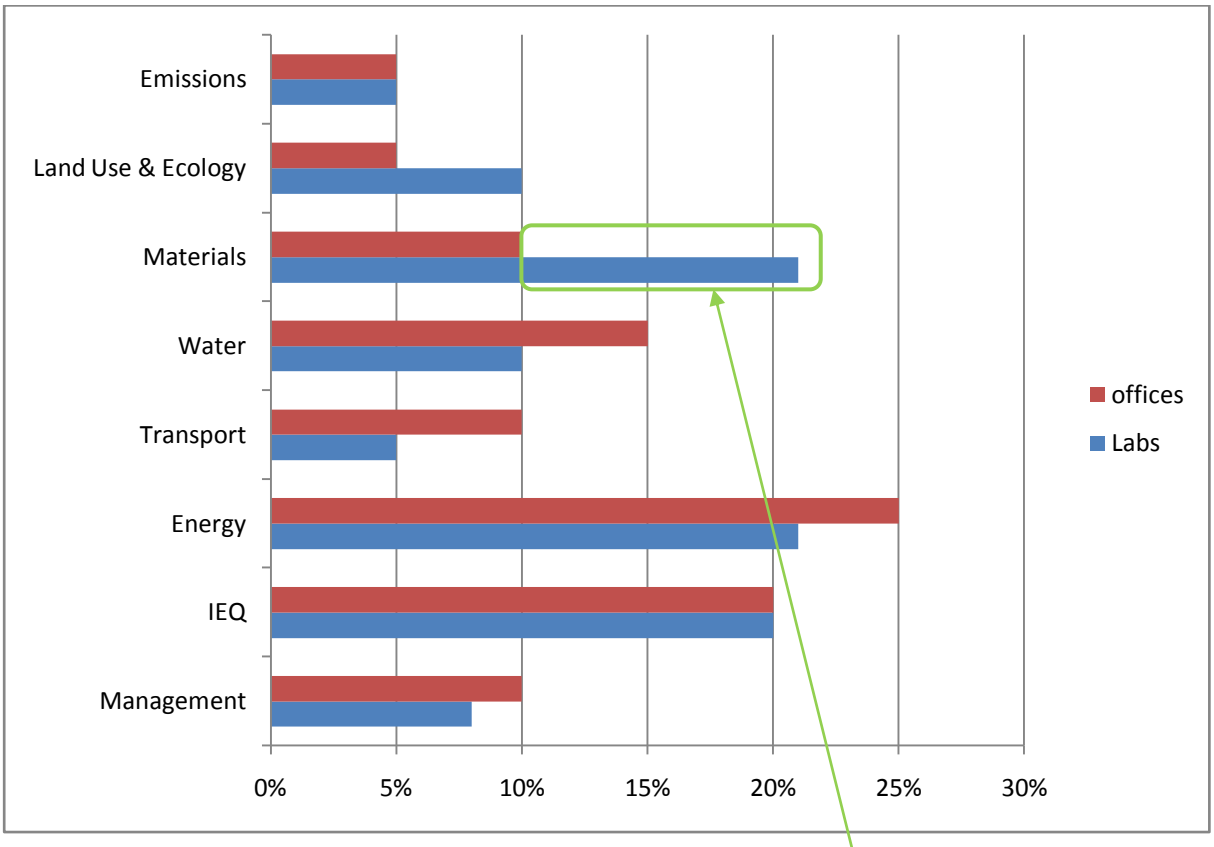
POWMRI

Lab tool suitable for Australia

1.2 Weightings

Green Star places weightings on each category dependent on their relative importance to the specific tool. The Interiors tool places a higher importance on materials and IEQ whereas the Office design tool places a higher weighting for energy and water. Similarly the US Lab 21 tool places weightings on each category. In order to develop a Lab tool suitable for Australian laboratories the weightings of the Green Star Office Design, Office Interiors and the Lab 21 tools have been considered.

The graph below summarises the weighting of importance that is placed on each green category within Green Star Office Design tool and the weighting that the project team has determined would be suitable for a laboratory building. The percentage weighting of importance is indicated on the horizontal axis.



The material weighting for labs is a lot higher than offices because it assesses liquid materials such as hazardous material handling and chemical resource management

1.3 LEED rating Labs-21

Although the US LEED based rating tool Labs-21 has been developed to assess the environmental performance of laboratory designs, it has been developed specifically for laboratories in America. Evident by the numerous unique US focused credits such as the IEQ credit Prereq 2 on Environmental Tobacco Smoke (ETS) Control, whose intent is to prevent exposure of building occupants and systems to tobacco smoke. Or the different emphasis LEED places on IEQ with no specific focus on ventilation rates, use of high frequency ballasts or electric lighting levels.

In addition to these unique US focused credits, the use of the US LEED based rating tool Labs-21 to test such things as energy performance or water efficiency for an Australian based laboratory is not appropriate. The Lab-21 rating tool also makes reference to design standards and codes which are not applicable to the design of laboratories in Australia.

However, the different areas covered by Lab-21 as compared to office designs are very important and need to be recognised by any environmental assessment of the POWMRI laboratory design. It is just that these different areas identified in Lab-21 need to reflect Australian laboratory design standards and Australia's different climatic conditions.

In recognition of this and lack of an equivalent Australian environmental rating tool for laboratories it is proposed to develop a specific Laboratory ESD Rating Tool. This tool would be based on both the Green Building Council of Australia (GBCA) Green Star rating tools as well as the US LEED based rating tool Labs-21 and would be used to evaluate the environmental performance of the POWMRI Laboratory fitout design.

The proposed strategy to develop the specific unofficial and uncertified POWMRI Laboratory ESD Rating Tool is to wherever possible adopt the credits within the Green Star – Office Interiors rating tool that are equally applicable to laboratory fitout design (e.g. waste management, commissioning, etc.). Then for those Green Star – Office Interior credits which are considered to be different for laboratories, such as energy and laboratory ventilation, reference will be made to Lab-21 or to Green Star – Office Design to determine how best to address these issues.

2. POWMRI Laboratory Environmental Rating

Cundall have developed a project specific laboratory rating tool that uses the framework of the Green Star tools and the LEED Lab-21 tool. As an indication of the tool, the materials section (one of the most important to a laboratory building) is summarised below:

Materials		21%			
Green Star - Office Interiors	Workstations	Mat-1	Y	Confirm environmental credentials of workstations (i.e. eco preferred content, warranty, manufacturers EMS, ISO 14001:2004 certification, products stewardship, modularisation & design for disassembly)	COX
Green Star - Office Interiors	Flooring	Mat-2	Y	Confirm environmental credentials of all flooring (i.e. eco preferred content, warranty, manufacturers EMS, ISO 14001:2004 certification, products stewardship, modularisation & design for disassembly)	COX
Green Star - Office Interiors	Walls and Partitions	Mat-3	Y	Confirmation of built zones, that is areas enclosed by full height walls and / or partitions	COX
Green Star - Office Interiors	Chairs	Mat-4	Y	Confirm environmental credentials of all chairs (i.e. eco preferred content, warranty, manufacturers EMS, ISO 14001:2004 certification, products stewardship, modularisation & design for disassembly)	COX
Green Star - Office Interiors	Tables	Mat-5	Y	Confirm environmental credentials of all tables (i.e. eco preferred content, warranty, manufacturers EMS, ISO 14001:2004 certification, products stewardship, modularisation & design for disassembly)	COX
Green Star - Office Interiors	Storage	Mat-6	Y	Confirm environmental credentials of all storage units (i.e. eco preferred content, warranty, manufacturers EMS, ISO 14001:2004 certification, products stewardship, modularisation & disassembly)	COX
Green Star - Office Interiors	Joinery	Mat-7	Y	Confirm environmental credentials of all joinery (i.e. eco preferred content, warranty, manufacturers EMS, ISO 14001:2004 certification, products stewardship, modularisation & design for disassembly)	COX
Green Star - Office Interiors	Ceilings	Mat-8	Y	Confirmation that tenant specific ceilings will be installed along with Base Building ceiling provisions as part of the integrated fitout and that removal of Base Building ceiling will be required	COX
Green Star - Office Interiors	Waste Management for Tenancy Operation	Mat-9	Y	Confirmation that fitout planning is based on the presence of 1m² of recycling storage space for 24 workstations	COX
Green Star - Office Interiors	PVC Minimisation	Mat-10	Y	30% - 60% of the total cost of PVC content was reduced through replacement with alternative materials.	COX
Green Star - Office Interiors	Sustainable Timber	Mat-11	Y	95% of all timber products used in the building and construction works have been sourced from any combination of; reused timber, post-consumer recycled timber; or Forest Stewardship Council (FSC) certified timber	COX
Labs 21 (Prereq 2)	Hazardous Material Handling	Mat-12	Y	Provide information on the proposed system to be adopted to manage hazardous materials stream	POWMRI
Labs 21 (Credit 8)	Chemical Resource Management	Mat-13	Y	Provide information on the proposed action plan for chemical resource management to be adopted	POWMRI
Green Star - Office Design	Recycling Waste Storage	Mat-14	Y	Confirm of dedicated storage area for the separation and collection of recyclables.	COX
Green Star - Office Design	Building Re-Use	Mat-15	Y	A portion of the existing facade is reused. Aiming to achieve 90% re-use A portion of the existing major structure, by gross building volume is re-used. Aiming to achieve 90%	COX
Green Star - Office Design	Re-Used Materials	Mat-16	Y	At least 2% of the projects total contractual is represented by reused products/materials.	COX
Green Star - Office Design	Shell and Core or Integrated Fitout	Mat-17	Y	The project is delivered as any combination of shell and core or integrated fitout.	COX
Green Star - Office Design	Concrete	Mat-18	Y	The project has reduced the absolute quantity of portland cement, as an average across all concrete mixes, by substituting it with industrial waste product or oversized aggregate as follows.	WWW
Green Star - Office Design	Steel	Mat-19	Y	Aiming for 90% of all steel, by mass, in the project either to have a post-consumer recycled content greater than 50%	WWW
Green Star - Office Design	PVC Minimisation	Mat-20	Y	Aiming to >50% of the total cost of PVC content reduced through replacement with alternative materials	COX
Green Star - Office Design	Design For Disassembly	Mat-21	Y	50% of the structural framing, roofing, and facade cladding systems are designed for disassembly OR 95% of the total facade is designed for disassembly.	COX
Green Star - Office Design	Dematerialisation	Mat-22	Y	To encourage and recognise designs that produce a net reduction in the total amount of material used in the structure, ductwork, building efficiency, finishes, cladding and piping.	COX

These credits refer to the environmental credentials of the finishes and fixtures

These credits refer to hazardous material handling and chemical resource management

The credits also consider the life of the material through to demolition in the future

2.1 ESD Initiatives

The following table summaries the ESD initiatives being included as part of the design of the proposed POWMRI redevelopment.

	ESD INITIATIVES
Management	• Commissioning and building tuning • Environmental Management Plan during construction and operation • 60-80% of demolition and construction waste to be reused / recycled • Building user guide
Indoor Environmental Quality	• Good levels of daylight through central light wells • C02 sensors • 100% fresh air with heat recovery • High frequency electronic ballasts • Avoidance of materials with volatile organic compounds (VOCs)
Energy Conservation	• Good controls strategy • Natural ventilated entrance / foyer space • Energy efficient glazing throughout • Onsite energy generation being considered 
Transport	• Workforce travel package • Shower facilities for cyclists • Small parking spaces for fuel efficient vehicles 
Water Conservation	• Dual flush toilets • High efficiency water fittings • Rainwater storage for landscape irrigation and toilet flushing  
Materials	• Avoidance of environmentally sensitive products such as timber • Materials selection focused on embodied energy and a high recycled content • Proportion of cement replaced with industrial waste product 
Emissions	• Refrigerants to have zero Ozone Depletion Potential (ODP) • Thermal insulants to have zero ODP • Minimisation of external light pollution

2.2 Management

Commissioning is an integral part of the project delivery process, ensuring optimum comfort control, building services performance and operational efficiency. The Green Star design tool recognises the importance of commissioning in delivering a successful building that performs as it was designed to, and therefore gives credit for good commissioning practice.

The following will be included within this development:

- Contractual requirement for comprehensive pre-commissioning, commissioning and quality monitoring of building services installations;
- Commitment to a 12 month commissioning / building-tuning period after handover, comprising of quarterly reviews and recommissioning at the end of the 12 months;
- Appointment of an independent commissioning agent to check commissioning practice

An Environmental Management Plan will be developed to regulate the environmental impacts of the development during construction and operation. This will include a Waste Management Plan, stipulating a minimum of 60-80% of demolition and construction waste to be recycled or reused.

In recognition of effective handover being critical to the success of a building in achieving its environmental aspirations, a simple and concise building users' guide will be developed to inform and educate staff and facility management staff on how to capture and promote strong on-going environmental performance.

2.3 Indoor Environmental Quality

Achieving a high standard of Indoor Environment Quality is a key sustainability strategy for a laboratory and the following strategies are being included to promote this strategy:

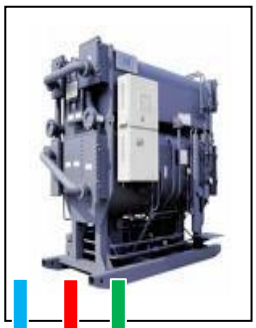
- Central light well voids are introduced to daylight deep into the laboratory spaces with external shading devices that eliminate direct sun whilst allowing diffuse light into the space. Direct sun can cause glare problems and is undesirable in both laboratory and office applications.
- Daylighting is also being designed into the auditorium space
- 100% fresh outside air supplied with mechanical heat recovery.
- Carbon dioxide sensors to monitor carbon dioxide levels, and increase fresh air supply rates if carbon dioxide levels become undesirably high.
- Contamination of air by common indoor pollutants will be reduced by careful material selection, for example:
    - Avoidance of Volatile Organic Compounds (VOC) emissions by selecting carpets and paints with a low VOC content
    - The building is being designed to maximise the natural light potential through selecting a façade with high light transmission properties.
    - High frequency electronic ballasts will improve office amenity by avoiding the strain caused by low frequency flicker.

2.4 Energy

Energy is another of the key performance indicators for laboratory buildings. As there is no specific benchmark tool available for laboratory buildings, energy reductions compared to existing facilities will be targeted where possible and a number of energy efficiency strategies are being included:

- Careful selection of building form and orientation to control heat gain
- Controls are a key area that has been assessed to improve the operational efficiency of the building. This will include lighting controls based on occupancy levels and available daylight, individual AC controls and manual over ride that can be simply operated and energy reporting and monitoring.
- A hybrid air conditioning system has been developed that includes a VRV system to condition the smaller cellular and open plan office areas and a chilled water system to condition the larger volume spaces.
- The large volume entrance/foyer spaces are naturally ventilated.
- Selection of energy efficient glazing throughout to limit solar heat gains
- Additionally, energy generation options such as cogeneration and PV panels are being assessed and are summarised in the table on the following page.

All equipment will be selected and systems designed with a view to energy efficiency. This will particularly relate to the plan for sequential fitout and occupancy of floors.

Solar cooling	Tri-generation	PV panels
High efficiency solar panels  Solar energy in Hot water out Absorption chiller  Heating and cooling out	 Gas in Hot water out Absorption chiller  Heating, cooling and electricity out	Solar energy in  Electricity out
This energy strategy uses high efficiency roof mounted solar panels to generate hot water which is pumped to an absorption chiller to generate chilled water.	Tri- generation uses gas to generate power whilst recycling the waste heat to generate chilled water via an absorption chiller.	The PV panels (photovoltaic) generate electricity from the suns energy.

2.5 Water

Potable water use will be reduced by installing highly efficient fittings and fixtures and supplementing mains water use with alternative water sources where ever appropriate for laboratory spaces.

The following water conservation initiatives are being included:

- Dual-flush toilets
- Hand Wash Basins – 6 litre per minute
- Smart flush urinals – 0.8l per flush
- Rainwater storage will be provided to supply water for landscape irrigation and toilet and urinal flushing, reducing the quantity of high quality drinking water that is flushed down the toilet. Fire sprinkler and hydrant test water may also be recovered for reuse in toilet-flushing, rather than discharged to drain.
- Quality of stormwater will be improved by filtering for storm events up to 1 in 20 years. Rainwater captured from the roof will be reused directly, before it can be contaminated by ground surface pollutants.
- Sub-metering on major water uses will reduce the considerable water losses that occur in many commercial buildings through leakage. Meters will be connected to the BMS for leak detection purposes.

2.6 Materials

Material usage and handling before and after construction is a key sustainability performance indicator and the following initiatives are being included within the design:

- Avoidance of environmentally sensitive products - For example, timber used in the design will be sourced from sustainable sources where possible, such as sustainable plantations or post-consumer recyclers.
- Preference given to materials with a low embodied energy & high recycled content. A proportion of cement will be replaced with an industrial waste product, reducing the huge embodied energy impacts of Portland cement production. In addition, where feasible, steel used in the design will have a post-consumer recycled content of greater than 50%.
- Low impact on the indoor environment –The project will minimise the use of volatile organic compounds (VOC's) and formaldehydes in internal materials and finishes (e.g. floor coverings, furniture, paint, etc.).

2.7 Transport

The site is in an accessible location, and is well-serviced by the public transport network. It is recognised however that some of the functions of the laboratory may require out of hours operation, incompatible with public transport. Therefore staff will be encouraged where possible to use the most fuel efficient methods of transport.

To encourage staff to cycle to work, secure and accessible bicycle storage facilities are being provided for building staff, including accessible showers, lockers and changing facilities

Twenty-five percent of car spaces provided will be sized and labelled for small vehicles, encouraging the use of smaller, less emissions-intensive private vehicles.

A workforce travel package will be developed, to inform building occupants of their sustainable transport alternatives, including:

- Shortest and safest pedestrian routes to public transport stops;
- Information on established and proposed bicycle routes serving the area, as well as connections to this site;
- Information on on-site bicycle storage options and available shower, change and locker facilities;
- Information on public transport service frequency and stop locations.

2.8 Emissions

Emissions to air, land and water will be managed where possible using the following strategies:

- 100% of refrigerants by volume will have an Ozone Depletion Potential of zero; and integrated refrigerant leak detection will ensure early identification of leaks;
- All thermal insulants used in the design will have a low Ozone Depletion Potential in their manufacture and composition;
- Stormwater runoff will be filtered in accordance with best practice guidelines, reducing contamination of waterways by rubbish and gross pollutants;
- Estimated wastewater discharge to sewer is significantly reduced relative to a standard building through the implementation of water efficiency measures.
- External light pollution will be controlled by careful lighting design

3. Implementation of ESD Strategies:

ESD strategies will be key throughout all phases of this development, from initial concept design phases through to construction and ongoing as part of building management. The following sections outline how ESD principles have and will be incorporated through the various phases of design:

3.1 Design Development

ESD principles have been incorporated from the earliest stage of design as part of an integrated design approach. Following the development of the laboratory specific ESD tool as described in previous sections, strategies are being included as part of the overall design development.

An integrated design process is crucial to delivering sustainable buildings. It is the process by which all of the design variables affecting one another are considered together and resolved in an optimal fashion. Often referred to as holistic design, it looks at the entire building as a whole, with the emphasis on integrating the different aspects of the building design.

Daylighting, ventilation and water conservation, for example, cut across multiple disciplines. Daylighting in particular affects virtually every design discipline, including architecture (building envelope and orientation), mechanical (reduced internal heat loads and modified fabric loads), electrical (lighting design and lighting controls), structural (floor-to-floor heights and external shading) and interiors (interior colours and reflectivity). It is therefore essential that an integrated design approach is taken with ESD from the earliest stages.

Cundall have developed and implemented a “Green Plan” successfully on many developments which is used to track the progress of the agreed ESD principles and ensure that they are considered throughout the design. Such strategies are already in place with regards to this development to ensure that all initiatives are tracked throughout the design phases.

3.2 Construction Phases

It is important throughout the construction phase that all of the proposed ESD strategies are successfully realised. As such the following strategies are to be applied during and after construction:

- Contractors to have, where possible, an Environmental Management Plan (EMP) and be ISO 140001 Accredited to ensure that all environmental principles are upheld and adhered to throughout.
- ESD principles communicated effectively to all contractors and subcontractors on site
- Monitoring of all materials used on site, to ensure all are compliant with the relevant ESD principles
- Monitoring of waste management and recycling targets

3.3 Ongoing operation

The ongoing management of building operations is essential to ensure that the aspirations for the development are implemented in practice. Additionally environmentally sound management practices will help to reduce energy and water consumption and waste generation and reduce operational running costs.

The following strategies will be incorporated following occupation of the building:

- Production of a tenant users guide will help to communicate effectively to the users of the building how to operate the building in the most efficient manner. Additionally this will also contain information on transport routes to encourage staff to seek alternative means of transport.
- Monitoring of ongoing energy and water consumption and waste generation. Monthly monitoring of building resources will help to identify any problems and can ultimately help in reducing emissions associated with the building use.
- Review of ESD strategies – those strategies incorporated into the design will be reviewed and lessons learned can be identified. This is important as it can help to inform future decision making, particularly for the later stages of the proposed Neuroscience Research Precinct development.