

NEPEAN HOSPITAL

ENVIRONMENTAL PERFORMANCE REPORT

**EAST BLOCK
SCHEMATIC DESIGN STAGE**

 **STEENSEN VARMING**

SYDNEY

CANBERRA

BRISBANE

MELBOURNE

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1 EXECUTIVE SUMMARY

This report presents the ESD initiatives which have been considered at the schematic design stage for integration with the new East Block, as part of Stage-3 redevelopment of the Nepean hospital. The existing Learning and Development building would be demolished to enable the development of the new East Block.

This report presents a concise summary of the design decisions which have been made so far, during the schematic design stage. Any variations from the project definition plan (PDP) have been identified and reasons for such departures have been noted.

Hospitals by their nature are complex building types, as they consist of a wide range of functional and services requirements that place a high demand on energy and water. To reduce these demands, sustainable design initiatives have been considered and incorporated in all health care facilities in order to achieve an environmentally sensitive, energy efficient and low impact building.

Sustainable design features like day lighting, energy and water conservation techniques, use of nontoxic and environmentally sound materials and finishes would be incorporated.

At a minimum, the proposed Nepean health care facility's energy and water conservation standards would meet the NSW Health requirements (TS-11 – Version 2: Engineering services & sustainable development guidelines).

2 INTRODUCTION

The proposed East Block development is located within the Nepean Hospital campus in Penrith. The East Block is a three storeyed hospital building with the following functional spaces:

Level 1 –Vehicle Parking

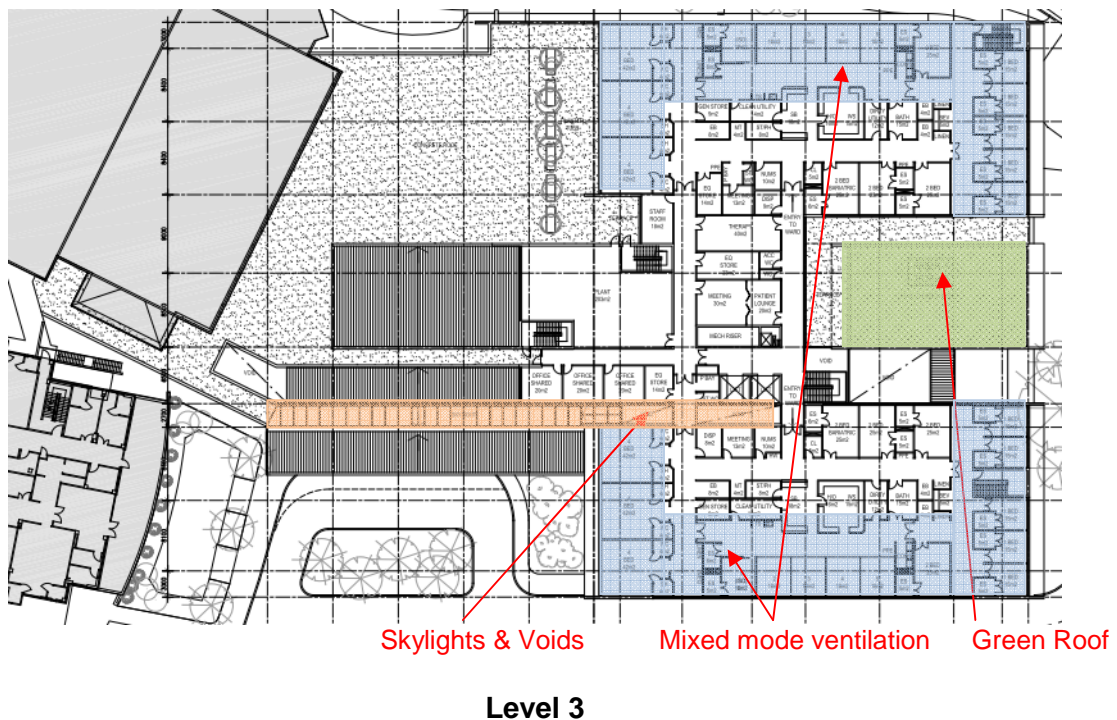
Level 2 – Pre and post-Op facilities, Operation theatres and Out-patient consultant rooms

Level 3 – Inpatient Accommodation

A number of workshops and meetings have been held with the architects to identify the ESD opportunities for the proposed development. The ESD initiatives set out in the PDP and Green Star have been considered. ESD initiatives set out in international rating tools like BREEAM (UK) and Green Guide for Health Care (US) have been referred. Few of the ESD initiatives are currently being investigated and might be incorporated during the design development phase.

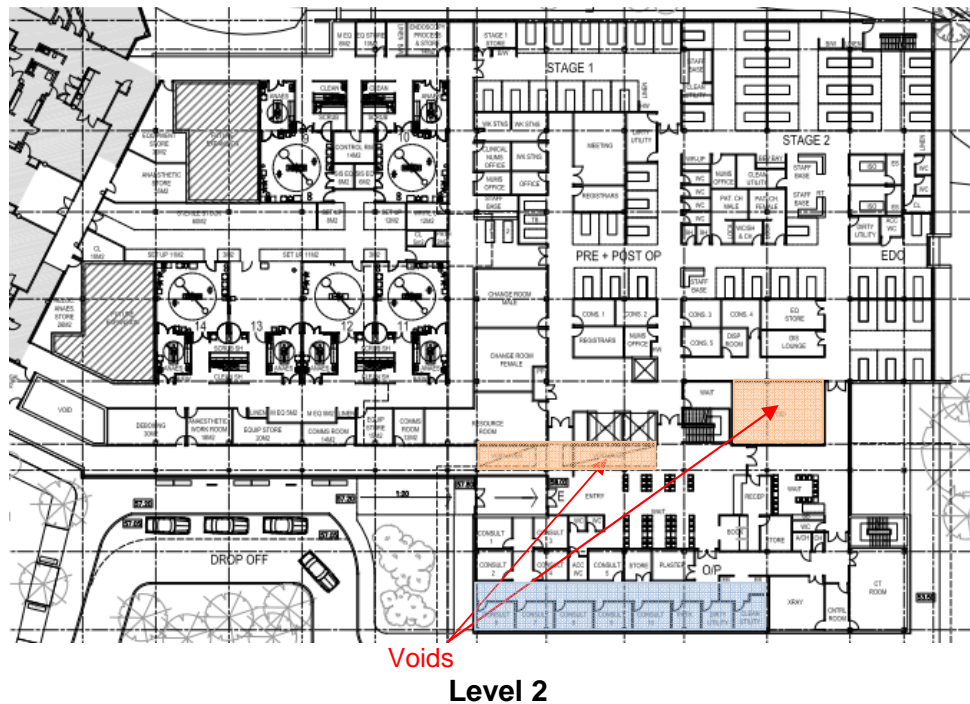
The following opportunities have been suggested for Level 3:

- Day light access
- Mixed-mode Ventilation to wards
- External Shading / glare control
- Green Roofs
- Voids to lower levels



Due to the nature of the spaces on Level 2 and the associated functional requirements, incorporating passive strategies is limited. The following opportunities have been suggested for Level 2 in areas where it is feasible:

- Day light access
- External shading
- Voids to lower levels
- Mixed mode ventilation to consultants rooms



The above ESD initiatives have been discussed in detail, in later sections of this report.

3 BRIEF REQUIREMENTS

The NSW Government is committed to sustainable development and to advancing sustainable practices in the design, construction and operation of buildings across the commercial, residential and industrial development sectors.

NSW Health requires the incorporation of sustainable development principles and strategies to all health facilities. The main idea is to reduce the environmental impact of healthcare facilities, by reducing their dependency on non-renewable sources such as energy and water, and reducing pollutants and green house gas emissions.

The key sustainable development objectives of TS-11 are:

- Comfortable and healthy indoor environment (in terms of thermal comfort, visual comfort and indoor air quality)
- Minimised non-renewable resource consumption (energy, water etc.) and environmental impacts (e.g. Greenhouse, other air and water emissions, solid waste)
- Cost effectiveness over its whole life cycle.

The following issues and requirements have been identified in TS-11 which we have considered as part of the scheme design:

- In conjunction with the functional requirements, the building form will incorporate passive design considerations to minimise the capacities and operation of engineering services, and to minimise energy use;
- The building's passive design and engineering services will complement each other, through an integrated design process involving all disciplines right from the beginning, to achieve the sustainable design outcomes for the whole building;
- The required sustainable design outcomes include thermal comfort, visual comfort and acoustic comfort for the building's users, as well as ensuring good indoor air quality;

4 SERVICES DESIGN PROPOSALS

4.1.1 Overview

Energy efficiency has been an integral part of all services design. In addition to the credits identified as part of the Green Star pre-assessment the following additional initiatives are proposed as described in the PDP.

4.1.2 Mechanical Services Design Proposals

The following key elements are currently being considered in the mechanical services design by Steensen Varming

- Outside air economy cycles will be included in all air-conditioning systems, this will reduce energy consumption at periods of favourable weather when the outside air will provide free cooling to the building.
- Heat recovery between exhaust/relief and outside air will be included whenever these duct routes permit to recapture heat from the exhaust air for pre-treatment of the outside air.
- Advice to improve thermal performance of building envelope through effective sun shading, high performance glass and innovative construction details to minimise the inherent thermal cooling and heating loads.
- The use of high efficiency equipment such as variable speed low friction loss centrifugal chillers with environmentally friendly refrigerants such as R134a and R407c and high coefficients of performance at both full load and part load conditions.
- Economy cycles for all major air conditioning systems.
- Variable speed drives on fans to ensure that the correct amount of air is delivered to the spaces.
- Zoning of systems for heat gain and occupancy times to ensure economic plant scheduling and operation.
- Consider to utilise heat recovery from the existing cogeneration energy plant
- Consideration will be given to using condensing boilers with the waste heat being used for pre-heating the cold feed make up to the domestic hot water.

Following initiatives noted in the PDP are currently being investigated, and might be incorporated during the next design stage:

- Geo-thermal bores to provide cold water for pre-cooling the outside air to the operation theatres.
- Mini wind turbines to supplement the normal electricity supply.

4.1.3 Electrical Services Design Proposals

The electrical services designed by Steensen Varming would potentially adopt the following initiatives.

- Efficient external lighting to meet or exceed the minimum requirements of AS 1158 for illuminance levels.
- The use of luminaries with high efficiency lamps and electronic control gear and high frequency ballasts
- The use of daylight sensors to maximise energy reductions by utilising daylight.
- The use of switching systems and arrangement of switching to minimise energy usage due to sufficient.
- The design team will need to work together to address the latest BCA Section J requirements. These include the building envelope thermal performance, building leakage, mechanical systems and electrical lighting design.
- The lighting design would comply with AS 4282 'Control of the Obtrusive Effects of Outdoor Lighting', to minimise light pollution into the night sky.
- Green Star environmental issues would also be included in the design.

4.1.4 Hydraulic Services Design Proposals

The hydraulic services designed by GDK would potentially adopt the following sustainable initiatives:

- Rainwater harvesting - Rainwater collected from the roof will be passed to the harvesting tank via gutters and downpipes. Current proposal includes providing a rainwater tank of capacity 100m³. Increasing the storage capacity would be considered if required.
- Blackwater or grey water systems would be considered if an additional budget is allocated.
- Efficient water fixtures and fittings would be installed in the East block. Generally, 3 star tap ware, 4 star urinals and dual flush WC's (i.e. 6/3l per flush) would be provided.
- A central hot water system would be provided with solar make up for heat loss recovery to hot water system. Heat exchange from mechanical system would be used as pre heat for hot water.
- Generally water meters would be provided for each service including hot water. Meters would also be provided to cooling tower discharge.

4.2 PASSIVE INITIATIVES

This section provides information on the ESD principles that have been considered for the Nepean East block project. The key recommendations to enhance the passive performance of this building relate to the following issues;

- Day lighting
- Adequate solar shading / glare control
- Green Roofs
- Mixed-mode Ventilation

4.2.1 Day lighting

The introduction of natural light in the East Block provides illumination without the need for artificial lighting. It has been considered that natural light would improve space ambience within the hospital, and would provide views to outside.

In general, hospitals often have large floor plates. So the possibility of introducing natural light via perimeter glazing is limited. To overcome this constraint, current design of the Nepean East Block has introduced skylights and voids to serve Level 2.

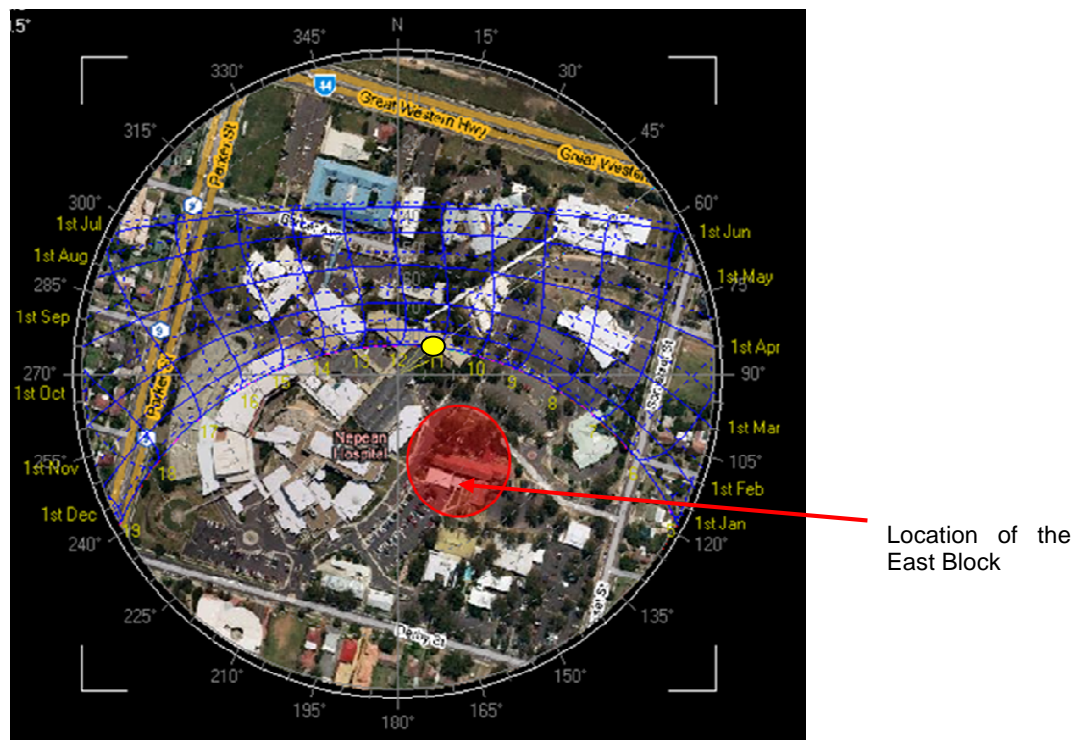
On Level 3, full height glazing has been provided for the in-patient wards. This ensures adequate day light provision. Provision of external shading devices has been advised to prevent unwanted heat gains.

4.2.2 Shading

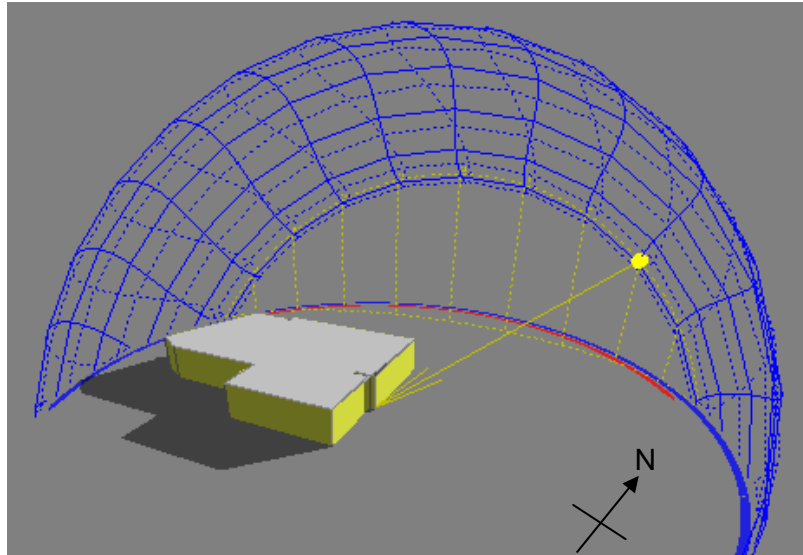
The sun contributes to significant heat load for a building. Whilst this heat gain may be pleasant in winter and lower the buildings heating energy requirements, it may cause significant discomfort within the occupied space in summer if left uncontrolled. In order to remove this solar heat gain in summer, considerable amounts of energy may be expended as cooling load. To preserve comfort and reduce cooling loads, it is important to apply natural cooling strategies and sun shading.

Key considerations for the design of external shading devices have been:

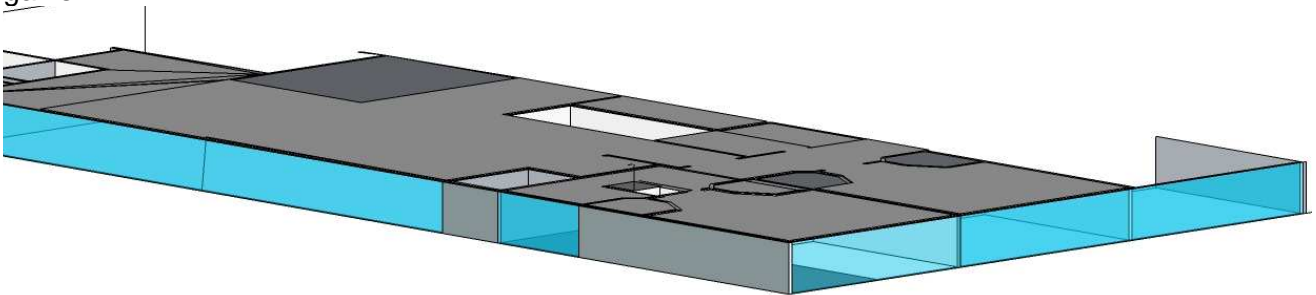
- To preserve daylight access and views to the outside
- Complement building aesthetics and are considerate to maintenance requirements.



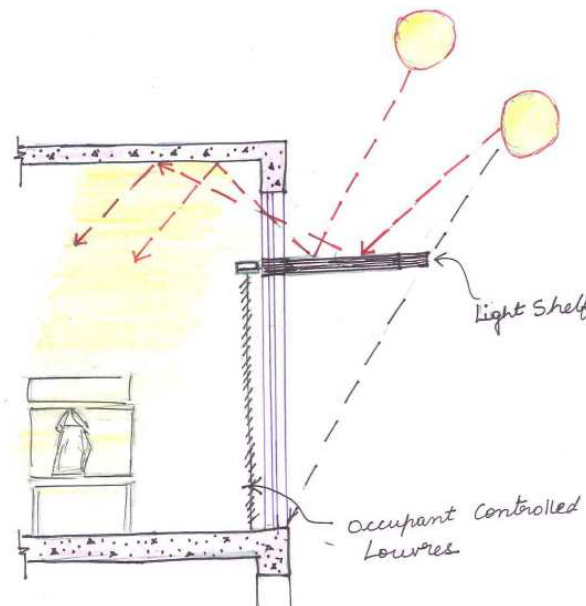
The above diagram illustrates the sun-path over the proposed building.



The above diagrams present the sun-path for the proposed East block. It has been identified that the wards and the rooms towards the northern side of the building are exposed to daylight during most of the day. Adequate shading must be provided for these areas in order to avoid unwanted solar heat gains.



Schematic illustration of the North and West facade Glazing on Level 3



Proposed shading system

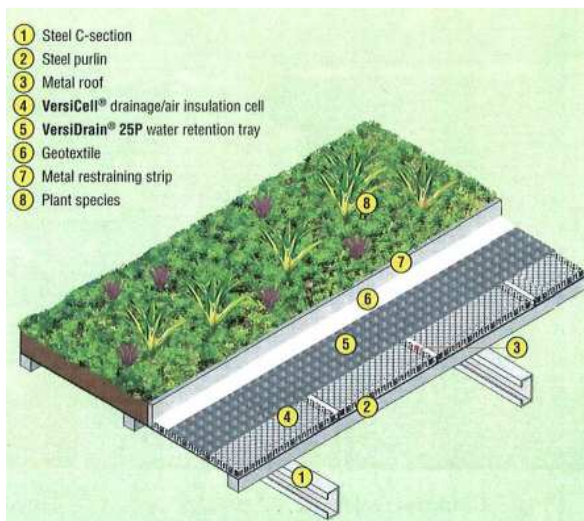
Incorporating horizontal light shelves is suggested as it would provide shade but allow diffused light transmission. Internal blinds are also incorporated to improve glare control. Design of appropriate external shading devices shall be developed further during the next design stage.

4.2.3 Green Roofs

Incorporating green roofs has been advised to the architects during the schematic design phase. Information on innovative methods of light weight green roofs has been provided. These can be integrated with metal roofs, unlike conventional green roof systems which require a deep soil bed. A green roof has been incorporated on Level 3 of the East block.

Green roofs, also known as 'vegetated roof covers' or 'eco-roofs', are thin layers of living vegetation installed on top of conventional flat or sloping roofs. They offer the following benefits:

- Provide external views
- Serve as places of respite
- Reducing air borne pollutants
- Provide thermal and acoustic insulation; and reduce heating and cooling loads
- Reduce ambient air temperature and mitigate the heat island effect
- Rainwater treatment through filtration and bio-remediation.



Green Roof over Metal sheet roofing



4.2.4 Mixed mode ventilation

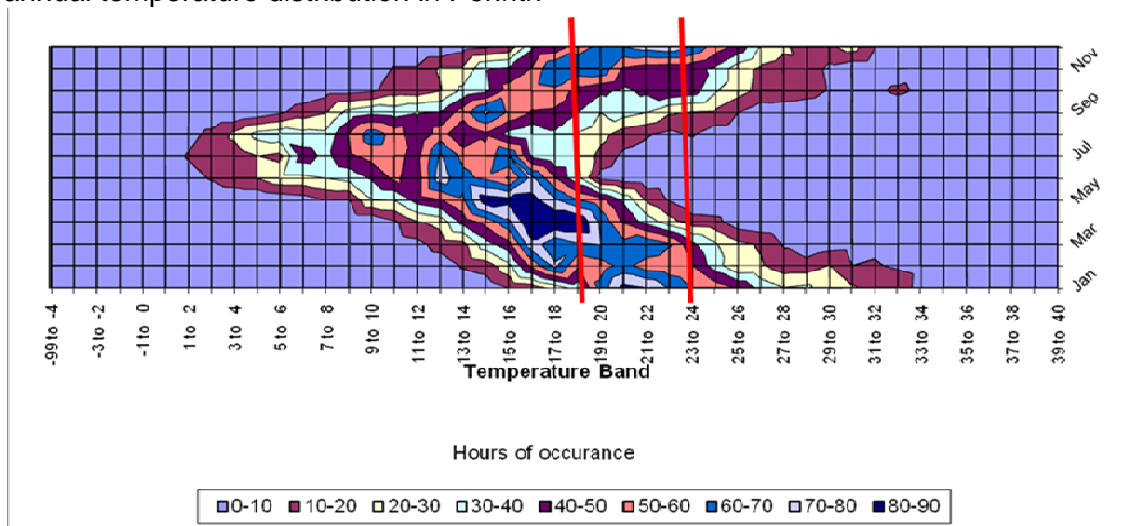
The wind data shows that natural ventilation would be feasible. But given the nature of the occupied spaces and the fact that all the spaces would contain patients and medical equipment, allowing untreated outside air into the building would create problems of dust and allergen control.

- Clinical nature - Therefore natural ventilation unsuitable.
- Suitable in some area's – wards on Level 3 and Consultant rooms on Level 2.

A mixed-mode ventilation approach has been considered viable for the inpatient wards on Level 3 and the consultants' rooms on Level 2.

Mixed-mode ventilation combines both natural and mechanical ventilation systems. The basic philosophy of this system is to open the windows and switch off the air conditioning to avoid the energy consumption and consequential environmental effects of year round air conditioning. The in-patient wards on Level 3 could benefit from incorporating a mixed mode system. Utilising mixed mode with natural ventilation system instead of continuous air conditioning can provide significant savings on energy costs.

In Penrith the outdoor air temperature is expected to be between 18 °C and 24°C for majority of the year during standard occupancy hours. This means that during these periods of the year the air conditioning may be switched off depending on the loads in the space and the occupant's choice. This would significantly reduce the buildings energy consumption. The graph below illustrates the annual temperature distribution in Penrith

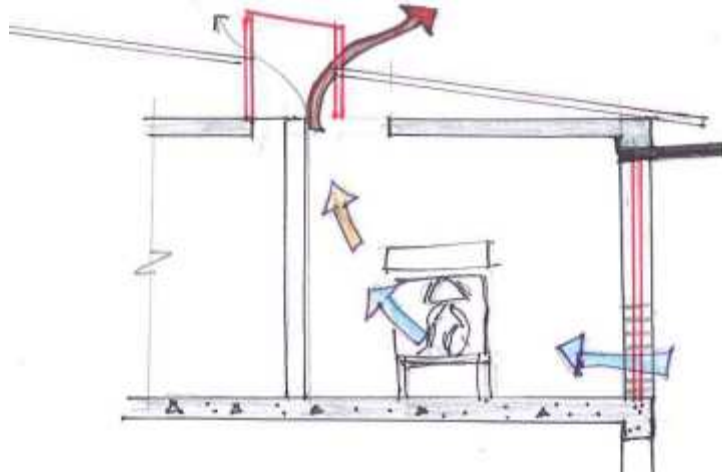


Few points need to be considered for establishing the feasibility of the mixed mode system:

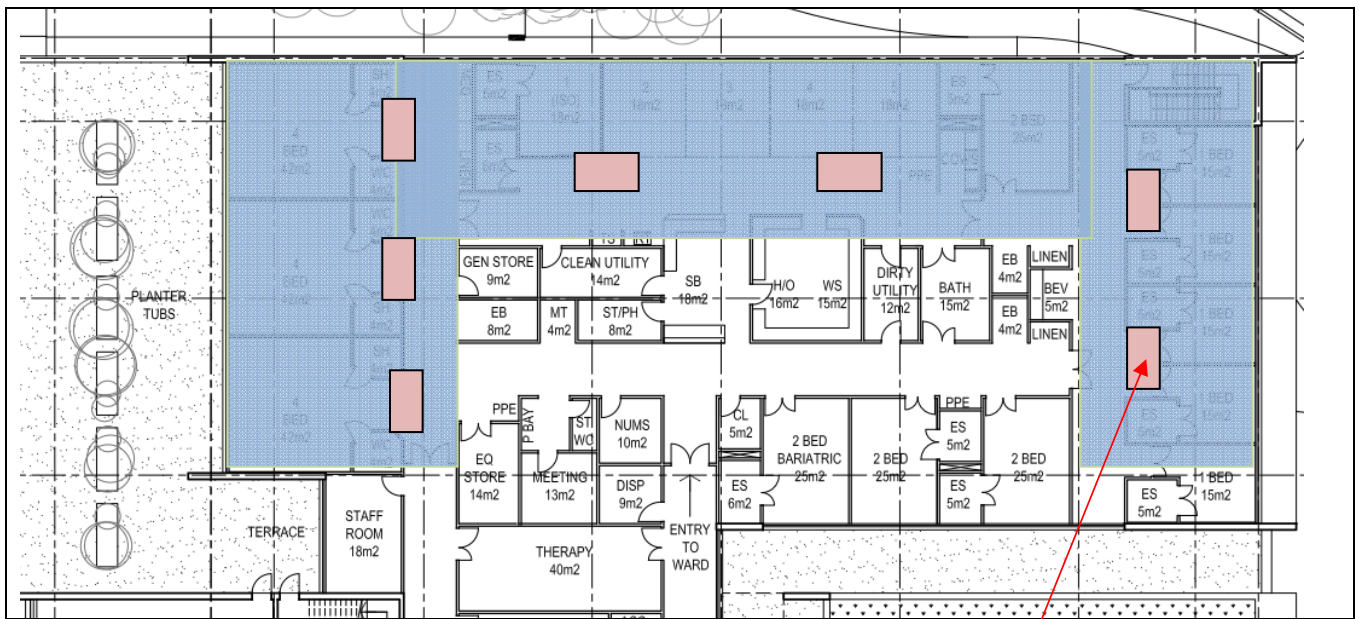
- Since there would be no fire sprinkler system, automatic fail-safe louvres should be provided at the outside air inlets, to ensure pressurisation can be achieved during zone smoke control operation.
- Allowance for the automatic system has not been made in the current budget. Therefore, incorporating the mixed-mode would depend on budget allocation.

4.2.4.1 Level 3

Low level louvres could be incorporated in the wards on Level 3, and a high level vent may need to be provided in the roof to expel warm upward air. The louvres need to be connected to the BMS, in order to operate in accordance with external temperature conditions.



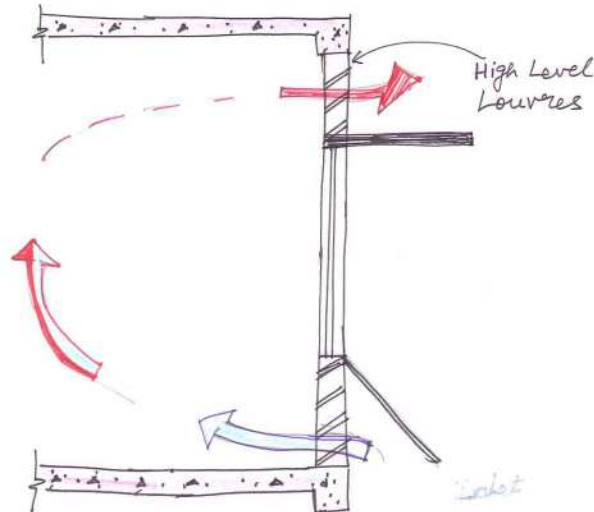
Level 3 Wards



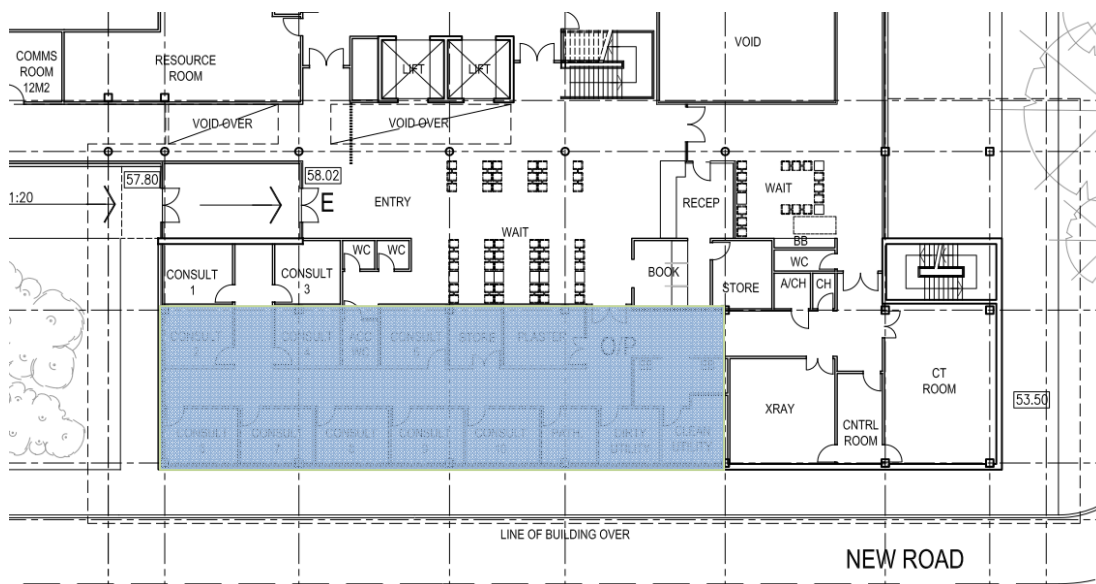
The above diagram illustrates the position of roof vents.

4.2.4.2 Level 2

For the Level 2 Consultant rooms, displacement ventilation can be incorporated. Displacement ventilation systems use the buoyancy of warm air to provide air circulation. The cool outside air is heated by the people and equipment and rises to high level as it absorbs heat and pollutants where it is extracted at high level. The principle is illustrated in the sketch below.



Level 2 Consultant Rooms



The above diagram indicates the rooms on Level 2 which can be served by a mixed mode system.

4.3 ENVIRONMENTAL PERFORMANCE REPORT

At the end of each design stage, an Environmental performance report (EPR) needs to be prepared as stipulated in TS-11 reporting guidelines. The purpose of the EPR is to demonstrate how the consultants have designed the building and the proposed services in order to achieve the required environmental outcomes.

For the Nepean East Block, a Scheme Design Environmental Assessment has been completed using the template on the NSW Department of Public Services Web Site <http://www.asset.gov.com.au> . Since this is at a schematic design stage, some of the initiatives are currently being pursued and would be incorporated in the next design stage.

The Environmental Performance Guide for Government Buildings (EPGB) is a high environmental performance guide for NSW Government Buildings developed by the Policy Services Division of the NSW Department of Public Works and Services. It is structured through a framework of environmental performance categories and suggested strategies.

The EPR reporting consists of the following five categories:

- Resource consumption
- Environmental loadings
- Quality of indoor environment
- Functionality
- Wider planning issues

The environmental performance categories are all not of equal significance. The environmental weightings of each category are as noted below:

Resource Consumption	- 25%
Environmental Loadings	- 25%
Quality of Indoor Environment	- 20%
Functionality	- 10%
Wider Planning Issues	- 20%

Following criteria help in establishing the score for each of the credit points:

Points	Criteria
3	Strategies thoroughly considered and actions substantially incorporated in project - 75-100% EPGB strategies successfully included (min 3 out of 4)
2	Strategies considered and actions partly incorporated in project - 36-74% EPGB strategies successfully included
1	Strategies considered but unable to be incorporated in project - 0-35% EPGB strategies successfully included (max 1 out of 3)

EPGB Assessment Tool

Assessment

Performance Indicator

79

Note: The project and the assessed values entered are hypothetical only to the serve as a sample to users. Please enter your project details and assessmentsto derive your project Performance Indicator score.

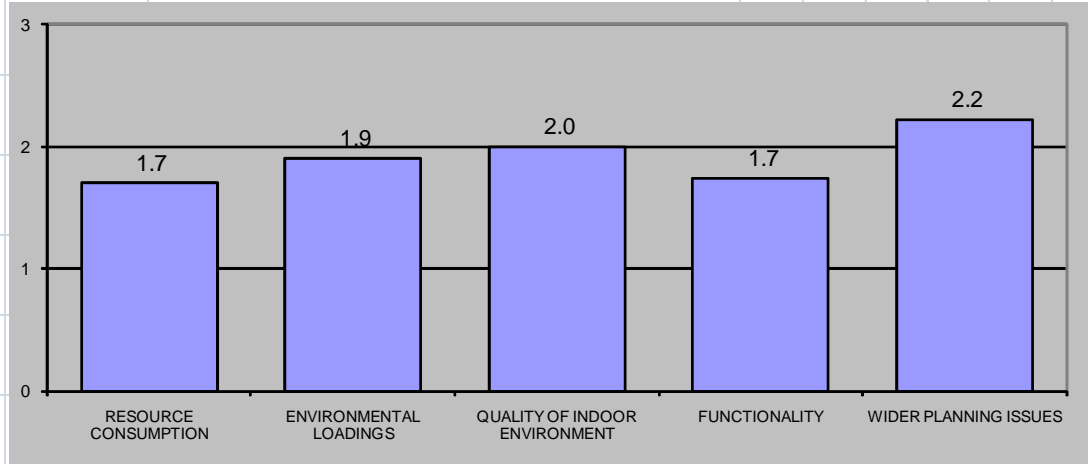
For further information please contact
Rein Jaaniste, DPWS Policy Services,
rein.jaaniste@dpws.nsw.gov.au

EPGBtoolV1.04.xls, Feb 2002, for use by government agencies

This tool is for the assessment of the environmental performance of buildings

Enter your own
assessments in the blue

Nepean Hospital Penrith



ISSUES	CATEGORIES	ASSESSMENT CRITERIA	CRITERIA			CATEGORIES			ISSUES	
			Assess	Weight	Wtd. score	Score	Weight	Wtd. Score	Score	Weight
RESOURCE CONSUMPTION									1.7	0.25
	Energy					2	0.5	1		
		Energy used to manufacture and construct buildings	2	0.2	0.4					
		Energy used to operate buildings	2	0.8	1.6					
	Land					1	0.1	0.1		
		Area of land used	1	1	1					
	Water					2	0.2	0.4		
		Water used to operate buildings	2	0.8	1.6					
		Water used for landscape	2	0.2	0.4					
	Materials					1	0.2	0.2		
		Materials used for initial project construction	1	0.85	0.85					
		Materials likely to be recoverable in future	1	0.1	0.1					
		Renewable resources	1	0.05	0.05					
ENVIRONMENTAL LOADINGS									1.903	0.25
	Greenhouse gasses					1	0.4	0.4		
		Emissions of Global Warming Potential material	1	1	1					
	Ozone depleting substances					3	0.1	0.3		
		Emissions of Ozone Depleting Potential substances	3	1	3					
	Site ecology					1.75	0.15	0.263		
		Initial ecological value of site	2	0.25	0.5					
		Change in ecological value of the site	1	0.25	0.25					
		Restoration of damaged ecosystems	2	0.25	0.5					
		Designed landscape	2	0.25	0.5					
	Solid wastes					3	0.15	0.45		
		Construction process wastes	3	0.5	1.5					
		Building operations wastes	3	0.5	1.5					
	Liquid effluent					2.7	0.1	0.27		
		Storm water flows to mains system	3	0.7	2.1					
		Sanitary waste flows to mains system	2	0.3	0.6					
	Physical impacts					2.2	0.1	0.22		
		Access to daylight of adjacent property.	2	0.2	0.4					
		Overshadowing of adjoining sites	2	0.2	0.4					
		Noise impact mitigation from building	2	0.2	0.4					
		Wind conditions around high buildings	2	0.2	0.4					
		Adverse visual Impacts	3	0.2	0.6					

QUALITY OF INDOOR ENVIRONMENT										2	0.2	
Air quality and ventilation										2	0.3	0.6
	Moisture control	2	0.3	0.6								
	Pollutant source control	2	0.3	0.6								
	Ventilation and fresh air delivery	2	0.4	0.8								
Thermal comfort										2	0.2	0.4
	Air temperature	2	0.6	1.2								
	Relative humidity	2	0.4	0.8								
Lighting										2	0.2	0.4
	Provision of daylighting	2	0.4	0.8								
	Ambient illumination levels	2	0.4	0.8								
	Visual access to the exterior	2	0.2	0.4								
Noise										2	0.15	0.3
	Noise attenuation through the building envelope	2	0.3	0.6								
	Transmission of building equipment noise	2	0.3	0.6								
	Noise attenuation between occupant units	2	0.4	0.8								
Materials hazards										2	0.15	0.3
	Minimise materials hazards	2	0.7	1.4								
	Sick Building Syndrome (SBS)	2	0.3	0.6								
FUNCTIONALITY										1.74	0.1	
Adaptability and flexibility										1.2	0.4	0.48
	Ease of adapting technical systems to changing user requirements	1	0.4	0.4								
	Suitability of layout and structure for changes in building uses	1	0.4	0.4								
	Adaptability to future changes in type of energy supply	2	0.2	0.4								
Maintenance of performance										1.85	0.4	0.74
	Access to building elements for maintenance and replacement	2	0.2	0.4								
	Access to technical systems for maintenance and replacement	2	0.2	0.4								
	Selection of material durability appropriate to planned service life	2	0.1	0.2								
	Protection of materials from destructive elements	2	0.2	0.4								
	Ability to maintain performance under abnormal conditions	2	0.15	0.3								
	Protection from natural disasters	1	0.15	0.15								
Controllability of systems										2.6	0.2	0.52
	Capability for partial operation of building technical systems	3	0.6	1.8								
	Level of building automation appropriate to system complexity	2	0.4	0.8								
WIDER PLANNING ISSUES										2.223	0.2	
Economics										2.6	0.35	0.91
	Life-cycle cost of building	1	0.7	0.7								
	Environmental evaluation	2	0.3	0.6								
Management process										1.95	0.35	0.683
	Pre-design	2	0.4	0.8								
	Design	2	0.25	0.5								
	Construction	2	0.15	0.3								
	Performance tuning	1	0.05	0.05								
	Building operations	2	0.15	0.3								
Commuter transport										2.5	0.15	0.375
	Access to public transport	2	0.5	1								
	Facilities for bicyclists	3	0.15	0.45								
	Environmental impact of motor vehicles	3	0.35	1.05								
Cultural environment										1.7	0.15	0.255
	Conservation of cultural heritage	2	0.4	0.8								
	Community facilities	1	0.3	0.3								
	Equity and access	2	0.3	0.6								

5 GREEN STAR PRE-ASSESSMENT

Green Star is an environmental rating tool developed by the Green Building Council of Australia (GBCA) that has a holistic approach over a wide range of issues that address sustainability, from water to energy, materials to indoor environmental quality and also considers management practices. It is recommended that the tool be used right from the schematic design stage in order to achieve the best possible outcome.

One of the clauses stated in NSW Health TS-11 is for all project greater than \$10m, the project shall undergo the Green Star rating process, using the Green Star PILOT Healthcare Tool and achieve a minimum 4 star rating. The GBCA has recently released the Healthcare Tool Version 1, in June, 2009. We have undertaken a pre-assessment to determine the current score for the East block development, and have identified the initiatives which need to be incorporated in order to achieve a higher rating of 4 or 5 Star.

The total environmental performance of the building is benchmarked by giving it a star rating from 1-6. Ratings below 3 Star are not officially recognised by GBCA.

Only ratings of 4 Star and above are formally recognised and certified by the Green Building Council since they represent better than average environmental credentials. TS-11 guidelines stipulate a minimum 4 Star Green Star rating for the Nepean Hospital East Block. We note that Health Infrastructure has confirmed that a formal certified Green Star rating is not required for the proposed Nepean East Block.

The rating tool consists of 9 categories, namely:

- Management
- IEQ
- Energy
- Transport
- Water
- Materials
- Land use & ecology
- Emissions and
- Innovation

The categories are weighted according to the importance of environmental issues and geographical location within Australia. For instance, potable water has a greater significance in South Australia than the Northern Territory, and therefore the Water category has a higher weighting in South Australia. The ninth category is Innovation and up to 5 points are set aside to reward projects that utilise 'innovative' technology or practices. The weighted points are added together to give an overall score which corresponds to the final Green Star rating, as follows:

<i>Rating</i>	<i>Total Weighted Points</i>
1 Star	10 - 19 pts
2 Star	20 - 29 pts
3 Star	30 - 44 pts
4 Star	45 - 59 pts Best Practice
5 Star	60 - 74 pts Australian Excellence
6 Star	75+ pts World Leader

5.1 GREEN STAR CREDIT CATEGORIES

As mentioned previously, the Green Star rating tools consist of nine categories and are defined in more detail in this section.

5.1.1 Management

The Management category promotes improving building services performance and associated environmental impact throughout its lifecycle. Points awarded relate to improved services performance and energy efficiency through commissioning and hand-over to the building maintenance personnel. Points are also awarded for documentation which will also assist in the optimum performance in the operation of the building.

5.1.2 Indoor environment quality

The IEQ credits address how the HVAC system, lighting and other building attributes contribute to a healthy indoor environment. Poor IEQ is the principal cause of sick building syndrome and according to scientific research can cost millions of dollars each year in lost productivity and health sector costs.

5.1.3 Energy

The aim of this section is to target overall reduction in energy consumption within the development with a view to reducing greenhouse gas emissions. The credits in this category have the potential to bring about substantial environmental savings through energy efficiency measures.

The design team should aim at greater efficiency of energy use, energy demand reduction methods and generation of energy from alternative sources in order to address the credit criteria under this category.

5.1.4 Transport

Private cars and motor vehicles directly affect global warming due to the high amounts of embodied energy as well as greenhouse emissions associated with their exhaust fumes. The credits under the transport category maximise alternative transport options in order to reduce environmental impact due to vehicles.

5.1.5 Water

The water category targets reduction of potable water consumption through the use of efficient fixtures and fittings. Since fresh water supply is scarce in Australia relevant measures should be adopted to ease the pressure on the water sources and also contribute to more efficient operation of building.

5.1.6 Materials

The environmental impact of materials is reduced by limiting the quantities of virgin building materials used in projects and choosing the least harmful when using virgin materials. The focus of this category is on the lifespan, lifecycle and approach towards use of materials.

5.1.7 Land use and ecology

This category aims at reducing environmental impact of the development and enhances the quality of local ecosystems.

5.1.8 Emissions

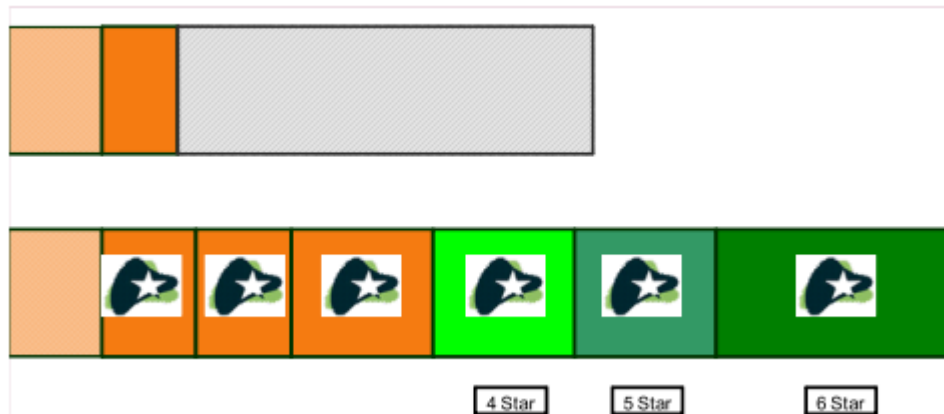
The credits under this category target emissions relating to watercourse pollution, light pollution, ozone depletion, global warming, legionella and sewage. Management approaches which effectively reduce building emissions and their impacts are rewarded under this category.

5.1.9 Innovation

This is an area to achieve additional points for 'innovative' design, strategies and technologies, exceeding Green Star Benchmarks and Environmental design Initiatives. The project should target at a minimum one key initiatives that it can "market" and be recognised for.

5.2 GREEN STAR PRE-ASSESSMENT SUMMARY

For the East Block development of Nepean Hospital, a Green Star score of 18 points has been confirmed based on initiatives agreed to date. Additional credits which would need to be incorporated in order to improve the Green Star score to 4 or 5 star have been identified. Additional costs would be incurred to include these credits into the project scope. These points are currently noted as points to be confirmed. These are being reviewed by the Quantity Surveyor (MBM) to check against the budget allowance.



The above figure represents a graphical summary of the Green Star score as per credits that are so far confirmed. The grey bar represents the possibility to achieve a higher score of 5 Star Green Star, based on the adoption of all the credits which are yet to be confirmed, but are considered viable in the context of this project.

A few buffer points are usually considered during a Green Star pre-assessment, because few of the credits might not be incorporated as per the initial scheme design. Therefore it is evident that the project would definitely attain a 4 Star Rating.

5.2.1 4 Star Green Star Pre-assessment Summary

Green Star Summary (4 Star Target)

Credit Summary					Green Star - Healthcare v1
NEPEAN HOSPITAL					
Category	Title	Credit No.	Points Available	Points Achieved	Points to be Confirmed
Management					
	Green Star Accredited Professional	Man-1	2	2	0
	Commissioning Clauses	Man-2	2	0	2
	Building Tuning	Man-3	1	0	1
	Independent Commissioning Agent	Man-4	1	0	1
	Building Guides	Man-5	1	1	0
	Environmental Management	Man-6	2	0	2
	Waste Management	Man-7	2	0	2
	Building Management Systems	Man-9	1	1	0
	Maintainability	Man-11	1	0	1
	Construction Indoor Air Quality Plan	Man-12	3	0	2
	Sustainable Procurement Guide	Man-13	1	0	0
	TOTAL		17	4	12
Indoor Environment Quality					
	Ventilation Rates	IEQ-1	4	2	0
	Air Change Effectiveness	IEQ-2	2	0	0
	CO2 Monitoring & Control and VOC Monitoring	IEQ-3	1	0	1
	Daylight	IEQ-4	3	0	1
	Thermal Comfort	IEQ-5	2	0	1
	Hazardous Materials	IEQ-6	1	0	1
	Internal Noise Levels	IEQ-7	1	0	1
	Volatile Organic Compounds	IEQ-8	5	0	5
	Formaldehyde Minimisation	IEQ-9	1	0	1
	Mould Prevention	IEQ-10	1	0	0
	Daylight Glare Control	IEQ-11	1	1	0
	High Frequency Ballasts	IEQ-12	1	1	0
	Electric Lighting Levels	IEQ-13	1	1	0
	External Views	IEQ-14	2	0	1
	Individual Thermal Comfort Control	IEQ-15	2	0	0
	Exhaust Riser	IEQ-16	1	1	0
	Air Distribution System	IEQ-17	1	1	0
	Outdoor Pollutant Control	IEQ-18	1	0	0
	Places of Respite	IEQ-19	1	0	1
	TOTAL		32	7	13
Energy					
	Conditional Requirement	Ene-Con	Conditional Requirement	Yes	/
	Greenhouse Gas Emissions	Ene-1	20	0	5
	Energy Sub-metering	Ene-2	1	0	1
	Peak Energy Demand Reduction	Ene-3	2	0	0
	Lighting Zoning	Ene-4	2	1	1
	Car Park Ventilation	Ene-6	3	0	1
	Efficient External Lighting	Ene-9	1	1	0
	TOTAL		29	2	8
Transport					
	Provision of Car Parking	Tra-1	2	2	0
	Fuel-Efficient Transport	Tra-2	1	1	0
	Cyclist Facilities	Tra-3	3	2	0
	Commuting Mass-Transport	Tra-4	5	0	0
	Transport Design and Planning	Tra-6	1	0	1
	TOTAL		12	5	1

Category	Title	Credit No.	Points Available	Points Achieved	Points to be Confirmed
Water					
	Occupant Amenity Water	Wat-1	5	2	3
	Water Meters	Wat-2	1	1	0
	Landscape Irrigation	Wat-3	2	2	0
	Heat Rejection Water	Wat-4	4	0	2
	Fire System Water	Wat-5	1	0	1
	Potable Water Use for Equipment	Wat-6	1	0	1
	TOTAL		14	5	7
Materials					
	Recycling Waste Storage	Mat-1	1	0	1
	Building Re-use	Mat-2	6	0	0
	Recycled Content & Re-used Products & Materials	Mat-3	2	0	0
	Concrete	Mat-4	3	0	1
	Steel	Mat-5	2	0	0
	PVC Minimisation	Mat-6	2	0	2
	Sustainable Timber	Mat-7	2	0	2
	Design for Disassembly	Mat-8	1	0	0
	Dematerialisation	Mat-9	1	0	0
	Flooring	Mat-11	3	3	0
	Joinery	Mat-12	1	1	0
	Loose Furniture	Mat-13	4	0	4
	Ceilings, Walls and Partitions	Mat-14	2	0	0
	TOTAL		30	4	10
Land Use & Ecology					
	Conditional Requirement	Eco-Con	Conditional Requirement	Yes	/
	Topsoil	Eco-1	1	0	0
	Re-use of Land	Eco-2	1	na	0
	Reclaimed Contaminated Land	Eco-3	0	na	0
	Change of Ecological Value	Eco-4	4	0	0
	TOTAL		6	0	0
Emissions					
	Refrigerant ODP	Emi-1	1	1	0
	Refrigerant GWP	Emi-2	2	0	0
	Refrigerant Leaks	Emi-3	2	1	1
	Insulant ODP	Emi-4	1	1	0
	Watercourse Pollution	Emi-5	3	0	2
	Discharge to Sewer	Emi-6	5	0	2
	Light Pollution	Emi-7	1	1	0
	Legionella	Emi-8	1	0	0
	Trade Waste Pollution	Emi-9	1	1	0
	TOTAL		17	5	5
Sub-total weighted points:				18	34
Innovation					
	Innovative Strategies and Technologies	Inn-1	2	0	0
	Exceeding Green Star Benchmarks	Inn-2	2	0	0
	Environmental Design Initiatives	Inn-3	1	0	0
	TOTAL		5	0	0
Total weighted points:				18	34

5.2.2 5 Star Green Star Pre-assessment Summary

Green Star Summary (5 Star Target)

Credit Summary NEPEAN HOSPITAL					Green Star - Healthcare v1
Category	Title	Credit No.	Points Available	Points Achieved	Points to be Confirmed
Management					
	Green Star Accredited Professional	Man-1	2	2	0
	Commissioning Clauses	Man-2	2	0	2
	Building Tuning	Man-3	1	0	1
	Independent Commissioning Agent	Man-4	1	0	1
	Building Guides	Man-5	1	1	0
	Environmental Management	Man-6	2	0	2
	Waste Management	Man-7	2	0	2
	Building Management Systems	Man-9	1	1	0
	Maintainability	Man-11	1	0	1
	Construction Indoor Air Quality Plan	Man-12	3	0	2
	Sustainable Procurement Guide	Man-13	1	0	0
	TOTAL		17	4	12
Indoor Environment Quality					
	Ventilation Rates	IEQ-1	4	2	0
	Air Change Effectiveness	IEQ-2	2	0	1
	CO2 Monitoring & Control and VOC Monitoring	IEQ-3	1	0	1
	Daylight	IEQ-4	3	0	2
	Thermal Comfort	IEQ-5	2	0	1
	Hazardous Materials	IEQ-6	1	0	1
	Internal Noise Levels	IEQ-7	1	0	1
	Volatile Organic Compounds	IEQ-8	5	0	5
	Formaldehyde Minimisation	IEQ-9	1	0	1
	Mould Prevention	IEQ-10	1	0	1
	Daylight Glare Control	IEQ-11	1	1	0
	High Frequency Ballasts	IEQ-12	1	1	0
	Electric Lighting Levels	IEQ-13	1	1	0
	External Views	IEQ-14	2	0	1
	Individual Thermal Comfort Control	IEQ-15	2	0	0
	Exhaust Riser	IEQ-16	1	1	0
	Air Distribution System	IEQ-17	1	1	0
	Outdoor Pollutant Control	IEQ-18	1	0	1
	Places of Respite	IEQ-19	1	0	1
	TOTAL		32	7	17
Energy					
	Conditional Requirement	Ene-Con	Conditional Requirement	Yes	/
	Greenhouse Gas Emissions	Ene-1	20	0	10
	Energy Sub-metering	Ene-2	1	0	1
	Peak Energy Demand Reduction	Ene-3	2	0	2
	Lighting Zoning	Ene-4	2	1	1
	Car Park Ventilation	Ene-6	3	0	1
	Efficient External Lighting	Ene-9	1	1	0
	TOTAL		29	2	15
Transport					
	Provision of Car Parking	Tra-1	2	2	0
	Fuel-Efficient Transport	Tra-2	1	1	0
	Cyclist Facilities	Tra-3	3	2	0
	Commuting Mass-Transport	Tra-4	5	0	0
	Transport Design and Planning	Tra-6	1	0	1
	TOTAL		12	5	1

Category	Title	Credit No.	Points Available	Points Achieved	Points to be Confirmed
Water					
	Occupant Amenity Water	Wat-1	5	2	3
	Water Meters	Wat-2	1	1	0
	Landscape Irrigation	Wat-3	2	2	0
	Heat Rejection Water	Wat-4	4	0	2
	Fire System Water	Wat-5	1	0	1
	Potable Water Use for Equipment	Wat-6	1	0	1
	TOTAL		14	5	7
Materials					
	Recycling Waste Storage	Mat-1	1	0	1
	Building Re-use	Mat-2	6	0	0
	Recycled Content & Re-used Products & Materials	Mat-3	2	0	0
	Concrete	Mat-4	3	0	1
	Steel	Mat-5	2	0	1
	PVC Minimisation	Mat-6	2	0	2
	Sustainable Timber	Mat-7	2	0	2
	Design for Disassembly	Mat-8	1	0	0
	Dematerialisation	Mat-9	1	0	1
	Flooring	Mat-11	3	3	0
	Joinery	Mat-12	1	1	0
	Loose Furniture	Mat-13	4	0	4
	Ceilings, Walls and Partitions	Mat-14	2	0	2
	TOTAL		30	4	13
Land Use & Ecology					
	Conditional Requirement	Eco-Con	Conditional Requirement	Yes	/
	Topsoil	Eco-1	1	0	0
	Re-use of Land	Eco-2	1	na	0
	Reclaimed Contaminated Land	Eco-3	0	na	0
	Change of Ecological Value	Eco-4	4	0	0
	TOTAL		6	0	0
Emissions					
	Refrigerant ODP	Emi-1	1	1	0
	Refrigerant GWP	Emi-2	2	0	0
	Refrigerant Leaks	Emi-3	2	1	1
	Insulant ODP	Emi-4	1	1	0
	Watercourse Pollution	Emi-5	3	0	2
	Discharge to Sewer	Emi-6	5	0	3
	Light Pollution	Emi-7	1	1	0
	Legionella	Emi-8	1	0	0
	Trade Waste Pollution	Emi-9	1	1	0
	TOTAL		17	5	6
Sub-total weighted points:				18	44
Innovation					
	Innovative Strategies and Technologies	Inn-1	2	0	0
	Exceeding Green Star Benchmarks	Inn-2	2	0	0
	Environmental Design Initiatives	Inn-3	1	0	0
	TOTAL		5	0	0
Total weighted points:				18	44

5.3 GREEN STAR PRE-ASSESSMENT MATRIX

Following credit summary identifies the responsibilities within the project team to drive the relevant Green Star initiatives. Feedback received from the project team to date has been noted. The credits which they would capture have been indicated.

The risk associated with delivering the credit criteria has been noted (as low, medium or high). This indicates the complexity in achieving credit compliance.

Additional credits which would need to be incorporated in order to improve the Green Star score to 4 or 5 star have been identified. Additional costs would be incurred to include these credits into the project scope. The project team has noted if any of the credits could be included at an additional cost. These costs would be reviewed against the project cost plan prepared by the quantity surveyors.

**Credit Summary for: NEPEAN
HOSPITAL (EAST BLOCK)**
Green Star Healthcare V1 Tool

	Title	Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	4 Star		5 Star		Net Cost \$ (QS)	Comments
								Extra Points	Weighted Points	Extra Points	Weighted Points		
Management													
1	Green Star Accredited Professional	Man-1	SV	2	2	1.06	LOW	x	x			Included	Certified rating not required by client
2	Commissioning Clauses	Man-2	SV, GDK	2	0	0	LOW	2	1.06			Included	Included in Electrical and Mechanical specifications (SV) Can be included in hydraulic spec (GDK) But this would be an additional cost to the project.
3	Building Tuning	Man-3	Aurora/ HI	1	0	0	LOW	1	0.53			TBC	
4	Independent Commissioning Agent	Man-4	Aurora/ HI	1	0	0	LOW	1	0.53			TBC	TS-11 Requirement: For all projects greater than \$10M an independent commissioning agent shall be engaged.
5	Building Guides	Man-5	All	1	1	0.53	LOW	x	x			\$30,000	At the ESD workshop, SWAHS advised that a building guide should be developed for the East Block building
6	Environmental Management	Man-6	Aurora/ HI	2	0	0	LOW	2	1.06			TBC	To be specified in tender documentation
7	Waste Management	Man-7	Aurora/ HI	2	0	0	LOW	2	1.06			TBC	To be specified in tender documentation
8	Building Management Systems	Man-9	SV	1	1	0.53	LOW	x	x			TBC	Existing TAC system to be extended to East Block.
9	Maintainability	Man-11	Aurora/ HI	1	0	0	LOW	1	0.53				A suitably qualified staff member of SWAHS can review the designs in order to achieve compliance.
10	Construction Indoor Air Quality Plan	Man-12	SV	3	0	0	MEDIUM	2	1.06			Add Cost	Additional costs involved (Not in current scope)
11	Sustainable Procurement Guide	Man-13	Aurora/ HI	1	0	0	LOW	1	0.53			\$30,000	
		TOTAL		17	4	2.12		12	6.36	0	0		

							4 Star		5 Star				
	Title	Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	Extra Points	Weighted Points	Extra Points	Weighted Points	Net Cost \$	Comments
Indoor Environment Quality													
12	Ventilation Rates	IEQ-1	SV	4	2	1.25	MEDIUM	x	x			TBC	100% for Operating Theatres, 50% for wards and other areas. Plants to be configured for heat recovery.
13	Air Change Effectiveness	IEQ-2	SV	2	0	0	HIGH	x	x	1	0.63	TBC	
14	CO2 Monitoring & Control and VOC Monitoring	IEQ-3	SV	1	0	0	LOW	1	0.63			TBC	Budget allowance to be confirmed.
15	Daylight	IEQ-4	Hassell	3	0	0	HIGH	1	0.63	2	1.25	Add Cost	Modelling required to demonstrate compliance
16	Thermal Comfort	IEQ-5	SV	2	0	0	HIGH	1	0.63			Nil	
17	Hazardous Materials	IEQ-6	Aurora/ HI	1	0	0	LOW	1	0.63			TBC	To be confirmed by HI / Aurora
18	Internal Noise Levels	IEQ-7	NDY	1	0	0	MEDIUM	1	0.63				
19	Volatile Organic Compounds	IEQ-8	Hassell	5	0	0	LOW	5	3.15			TBC	Proposed material specifications need to be reviewed against credit criteria.
20	Formaldehyde Minimisation	IEQ-9	Hassell	1	0	0	LOW	1	0.63			TBC	Proposed material specifications need to be reviewed against credit criteria.
21	Mould Prevention	IEQ-10	SV	1	0	0	HIGH	x	x	1	0.63	TBC	
22	Daylight Glare Control	IEQ-11	Hassell	1	1	0.63	MEDIUM	x	x			TBC	Occupant controlled internal blinds to be installed.
23	High Frequency Ballasts	IEQ-12	SV	1	1	0.63	LOW	x	x			Included	SV Standard practice
24	Electric Lighting Levels	IEQ-13	SV	1	1	0.63	LOW	x	x			Included	SV Standard practice
25	External Views	IEQ-14	Hassell	2	0	0	HIGH	1	0.63			Nil	Calculations are being undertaken by Hassells.
26	Individual Thermal Comfort Control	IEQ-15	SV	2	0	0	HIGH	x	x				May be achieved in 4 bed wards.
27	Exhaust Riser	IEQ-16	SV	1	1	0.63	LOW	x	x			Included	Included in SV costs
28	Air Distribution System	IEQ-17	SV	1	1	0.63	LOW	x	x			Included	SV Standard practice
29	Outdoor Pollutant Control	IEQ-18	SV	1	0	0	MEDIUM	x	x	1	0.63		Final design scheme to be reviewed
30	Places of Respite	IEQ-19	Hassell	1	0	0	LOW	1	0.63			Nil	
		TOTAL		32	7	4.4		13	8.19	5	3.14		

									4 Star			5 Star				
	Title	Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	Extra Points	Weighted Points	Extra Points	Weighted Points	Net Cost \$	Comments			
Energy																
31	Conditional Requirement	Ene-Con		Conditional Requirement	Yes		HIGH						GDK have included the following, solar make up for heat loss recovery to hot water system, heat exchanger from Mech system as pre heat for hot water & the hot water plant will be Natural Gas storage.			
32	Greenhouse Gas Emissions	Ene-1		20	0	0	HIGH	5	4.6	5	4.6	Add cost	Energy modelling is required to determine score.			
33	Energy Sub-metering	Ene-2	SV	1	0	0	LOW	1	0.92			Add cost	SV additional cost of \$50,000			
34	Peak Energy Demand Reduction	Ene-3	SV	2	0	0	HIGH	x	x	2	1.84	TBC				
35	Lighting Zoning	Ene-4	SV	2	1	0.92	LOW	1	0.92	x	x	Add cost	Additional cost of \$50,000 for Photovoltaics and PE sensors. Applicable to general wards, corridors (non-heavy clinical area)			
36	Car Park Ventilation	Ene-6	SV	3	0	0	HIGH	1	0.92	x	x	TBC	To be confirmed			
37	Efficient External Lighting	Ene-9	SV	1	1	0.92	LOW	x	x	x	x	Included	SV Standard practice			
		TOTAL		29	2	1.84		8	7.36	7	6.44					

							4 Star		5 Star				
	Title	Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	Extra Points	Weighted Points	Extra Points	Weighted Points	Net Cost \$	Comments
Transport													
38	Provision of Car Parking	Tra-1	Hassell	2	2	1.16	MEDIUM	0	0			TBC	Car-parking would be provided no more than the minimum local planning allowance
39	Fuel-Efficient Transport	Tra-2	Hassell	1	1	0.58	LOW	0	0			Nil	32 parking spaces would be designed for small cars. (26% of the total car parking)
40	Cyclist Facilities	Tra-3	Hassell	3	2	1.16	LOW	0	0			TBC	10 Bicycle parking spaces would be provided for staff. And 2 bicycle spaces would be provided for visitors/patients.
41	Commuting Mass-Transport	Tra-4	Aurora/ HI	5	0	0	MEDIUM	0	0			Nil	
42	Transport Design and Planning	Tra-6	Aurora/ HI	1	0	0	LOW	1	0.58			TBC	
		TOTAL		12	5	2.9		1	0.58	0	0		

								4 Star		5 Star			
Title		Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	Extra Points	Weighted Points	Extra Points	Weighted Points	Net Cost \$	Comments
Water													
44	Occupant Amenity Water	Wat-1	GDK	5	2	1.71	MEDIUM	3	2.58			Add Cost	GDK: Generally , 3 star tapware, provide, 4 star has effect on operation of tapware within hospitals, Note: No 4 star showers available under WELS, Urinals can be 4 star , No black water or grey water treatment included at this stage. This could be included if additional budget is available.
45	Water Meters	Wat-2	GDK	1	1	0.86	LOW	0	0			Included	GDK: Generally water meters are provided for each service including hotwater. Meters would also be provided to Cooling tower discharge.
46	Landscape Irrigation	Wat-3	GDK	2	2	1.71	MEDIUM	0	0				GDK: Generally rainwater harvesting has been included for this item, It is envisaged that all landscape water is via drip irrigation system
47	Heat Rejection Water	Wat-4	SV	4	0	0	HIGH	2	1.71			TBC	SV : Propose to incorporate adiabatic coolers. Decision pending. GDK: Make up water can be provided from the rain water harvesting system, SV to confirm daily demand requirement for this item,May require additional storage to Rain water harvest tank, Currently we are providing approx, 100m3.
48	Fire System Water	Wat-5	GDK	1	0	0	MEDIUM	1	0.86			Add Cost	GDK: Currently the fire pumps are remote from the facility, Additional cost of \$15,000 would be required to provide a remote discharge to the harvest system.
49	Potable Water Use for Equipment	Wat-6	GDK	1	0	0	MEDIUM	1	0.86			TBC	GDK: Depending on specialised equipment, this could be achieved by passive control of discharge from equipment thru cooling pit/tradewaste arrestors.
		TOTAL		14	5	4.28		7	6.01	0	0		

	Title	Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	4 Star Extra Points	Weighted Points	5 Star Extra Points	Weighted Points	Net Cost \$	Comments
Materials													
50	Recycling Waste Storage	Mat-1	Hassell	1	0	0	LOW	1	0.56	0	0	Nil	Two disposal rooms would be provided on L2 & L3.
51	Building Re-use	Mat-2	Hassell	6	0	0	LOW	0	0	0	0	Nil	
52	Recycled Content & Re-used Products & Materials	Mat-3	Hassell	2	0	0	MEDIUM	0	0	0	0		
53	Concrete	Mat-4	HT	3	0	0	MEDIUM	1	0.56	0	0	TBC	GDK: This can be achieved for Backfill of services trenches and drainage under the building. No additional cost should be incurred.
54	Steel	Mat-5	HT	2	0	0	MEDIUM	0	0	1	0.56	TBC	
55	PVC Minimisation	Mat-6	SV/GDK	2	0	0	HIGH	2	1.12	0	0	Included	Standard in SV specifications for Comm's, Power and Security controls where available. But this credit is considered as a high risk because the current SWAHS policies mandate the use of PVC flooring.
56	Sustainable Timber	Mat-7	Hassell	2	0	0	HIGH	2	1.12	0	0	TBC	QS to confirm if cost of timber. If it is less than 0.1% of the project's total contract value point would be considered "not applicable".
57	Design for Disassembly	Mat-8	Hassell/HT	1	0	0	HIGH	0	0	0	0		Roof can be disassembled.
58	Dematerialisation	Mat-9	Hassell/ HT	1	0	0	LOW	0	0	0	0	TBC	Dual function roof (green roof) has been incorporated. Use of water less urinals needs to be confirmed.
59	Flooring	Mat-11	Hassell	3	3	1.68	HIGH	0	0	0	0	TBC	Non PVC alternatives for flooring (eg: Nora rubber) are being investigated. Alternative materials are at a premium of around \$20/m2. Architects awaiting acceptance by SWAHS to use materials alternative to their facility standards.
60	Joinery	Mat-12	Hassell	1	1	0.56	LOW	0	0	0	0	TBC	
61	Loose Furniture	Mat-13	Hassell	4	0	0	HIGH	4	2.24	0	0	TBC	It is difficult to control the quality of loose furniture. Therefore this credit is considered as a high risk.
62	Ceilings, Walls and Partitions	Mat-14	Hassell	2	0	0	LOW	0	0	2	1.12	TBC	Current material specifications need to be reviewed to determine compliance.
		TOTAL		30	4	2.24		10	5.6	3	1.68		

Title		Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	4 Star Extra Points	Weighted Points	5 Star Extra Points	Weighted Points	Net Cost \$	Comments
Land Use & Ecology													
63	Conditional Requirement	Eco-Con	Aurora/ HI	Conditional Requirement	Yes		LOW					Nil	
64	Topsoil	Eco-1	HT	1	0	0	HIGH						
65	Re-use of Land	Eco-2	Aurora/ HI	1	na	na	NA						
66	Reclaimed Contaminated Land	Eco-3		0	na	na	NA						
67	Change of Ecological Value	Eco-4	Aurora/ HI	4	0	0	MEDIUM						
		TOTAL		6	0	0		0	0	0	0		

Title		Credit No.	Responsibility	Points Available	Points Achieved	Weighted Points	Risk	4 Star Extra Points	Weighted Points	5 Star Extra Points	Weighted Points	Net Cost \$	Comments
Emissions													
68	Refrigerant ODP	Emi-1	SV	1	1	0.18	LOW	x	x			Included	Standard in SV specifications.
69	Refrigerant GWP	Emi-2	SV	2	0	0	HIGH	x	x				
70	Refrigerant Leaks	Emi-3	SV	2	1	0.18	MEDIUM	1	0.18			TBC	Requires further inquiry
71	Insulant ODP	Emi-4	SV	1	1	0.18	LOW	x	x			Included	Standard in SV specifications.
72	Watercourse Pollution	Emi-5	GDK	3	0	0	LOW	2	0.36			TBC	GDK: A gross pollutant trap can be included under civil stormwater for this item.
73	Discharge to Sewer	Emi-6	GDK	5	0	0	MEDIUM	2	0.36	1	0.18	Add cost	Grey Water / Black water treatment can be included at additional cost
74	Light Pollution	Emi-7	SV	1	1	0.18	MEDIUM	x	x			Nil	SV: Council Guidelines for light pollution are also applicable.
75	Legionella	Emi-8	SV	1	0	0	HIGH	x	x				
76	Trade Waste Pollution	Emi-9	Aurora/ HI/ GDK	1	1	0.18	LOW	x	x			Included	GDK: Included in current project. ie grease waste, Cooling pits, neutralising pits etc,
		TOTAL		17	5	0.9		5	0.9	1	0.18		