Waterbrook Care Greenwich

Proposed Private Hospital for the Aged and Disabled at 1-8 Nield Ave, Greenwich

Energy Efficiency Assessment

Report No. 20C-08-0051-TRP-415322-1

Vipac Engineers & Scientists Ltd

Sydney, NSW

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EXECUTIVE SUMMARY

VIPAC Engineers & Scientists Ltd. has been commissioned by Murlan Consulting Pty Ltd to assess the energy efficiency and environmental sustainability of the Proposed Private Hospital for the Aged and Disabled at 1-8 Nield Ave, Greenwich .

This report has been prepared with regard to the Department of Planning's Director Generals requirements for Project Application MP 07_0167.

The proposed development consists of hospital rooms and facilities over 6 levels, with 2 levels of parking.

The proposed development will incorporate both passive and active energy saving features.

In response to the Department of Planning Director General's ESD measures requirements, as the proposed development does not contain any residential dwellings, NatHERS ratings and BASIX do not apply. This report will outline proposed ESD measures such as water conservation, energy efficiency, recycling and waste.

The building in general will have the ability to stabilise changing thermal conditions and reduce diurnal (day-night) temperature changes if attention is paid to design details at the wall interfaces.

The developer installed the following to improve the energy efficiency and reduce the green house gas emissions:

- Use of roof skylights for natural lighting.
- Use of light colouring for the internal walls to maximise the use of natural daylight.
- Rainwater harvesting tank for landscape irrigations.
- Minimum R1.3 External Wall insulation.
- Minimum R2.65 Roof/Ceiling Insulation.

The following additional recommendations have been made to improve significantly the sustainability within the proposed development:

- Equipment with automatic power off.
- Low E glazing for the curtain wall glazing to the east and west to help reduce the solar heat gains.
- Use of Air-conditioning systems with high coefficient of performance.
- Negotiating power agreements with local providers.

Recommendations regarding lighting, appliances, internal finishes and waste etc. have been made within the body of the report.

TABLE OF CONTENTS

1. INTRODUCTION 5

2. BUILDING ORIRENTATION AND DESIGN 6

3. ECOLOGICALLY SUSTAINABLE DEVELOPMENT 6

3.1. USE OF RENEWABLE AND LOW-IMPACT ENERGY SOURCES 6

3.1.1. Photovoltaic (PV) 6

3.1.2. Green power 6

3.1.3. Air Conditioning 6

3.1.4. Hot Water Systems 7

3.1.5. Lighting 7

3.1.6. Appliances 8

3.1.7. Atmosphere 8

3.1.8. Solar Access and Shading 9

4. WATER 9

4.1. WATER CONSERVATION 9

5. BUILDING MATERIALS 10

5.1. MAXIMISATION OF USE OF RENEWABLE AND/OR RECYCLABLE MATERIALS AND COMPONENTS 10

5.2. MATERIAL SELECTION 12

5.3. GLAZING 13

6. WASTE 13

6.1. RECYCLING FACILITY 13

6.2. CONSTRUCTION WASTE 14

7. CONCLUSIONS AND DRAFT STATEMENTS OF COMMITMENTS 14

8. REFERENCES 15

LIST OF FIGURES

FIGURE 1:SHOWS THE LOCATION OF THE PROPOSED DEVELOPMENT 5

FIGURE 2: DIAGRAMS OF 3-STAR SHOWERHEAD, DUAL-FLUSH CISTERN AND FLOW RESTRICTOR TAP 10

TABLE 1: RENEWABLE/RECYCLABLE PROPERTIES FOR SOME COMMON BUILDING MATERIALS 11

1. INTRODUCTION

VIPAC Engineers & Scientists Ltd. has been commissioned by Murlan Consulting Pty Ltd to assess the energy efficiency and environmental sustainability of the Proposed Private Hospital for the Aged and Disabled at 1-8 Nield Ave, Greenwich .

The proposed development consists of hospital rooms and facilities over 6 levels, with 2 levels of parking.

In terms of the building's façades, windows are predominantly located on the north, west and east façades of the buildings, with some south facing windows. Therefore mid-late afternoon solar rays will have access to the building during the summer months and might lead to excessive solar heat gain.

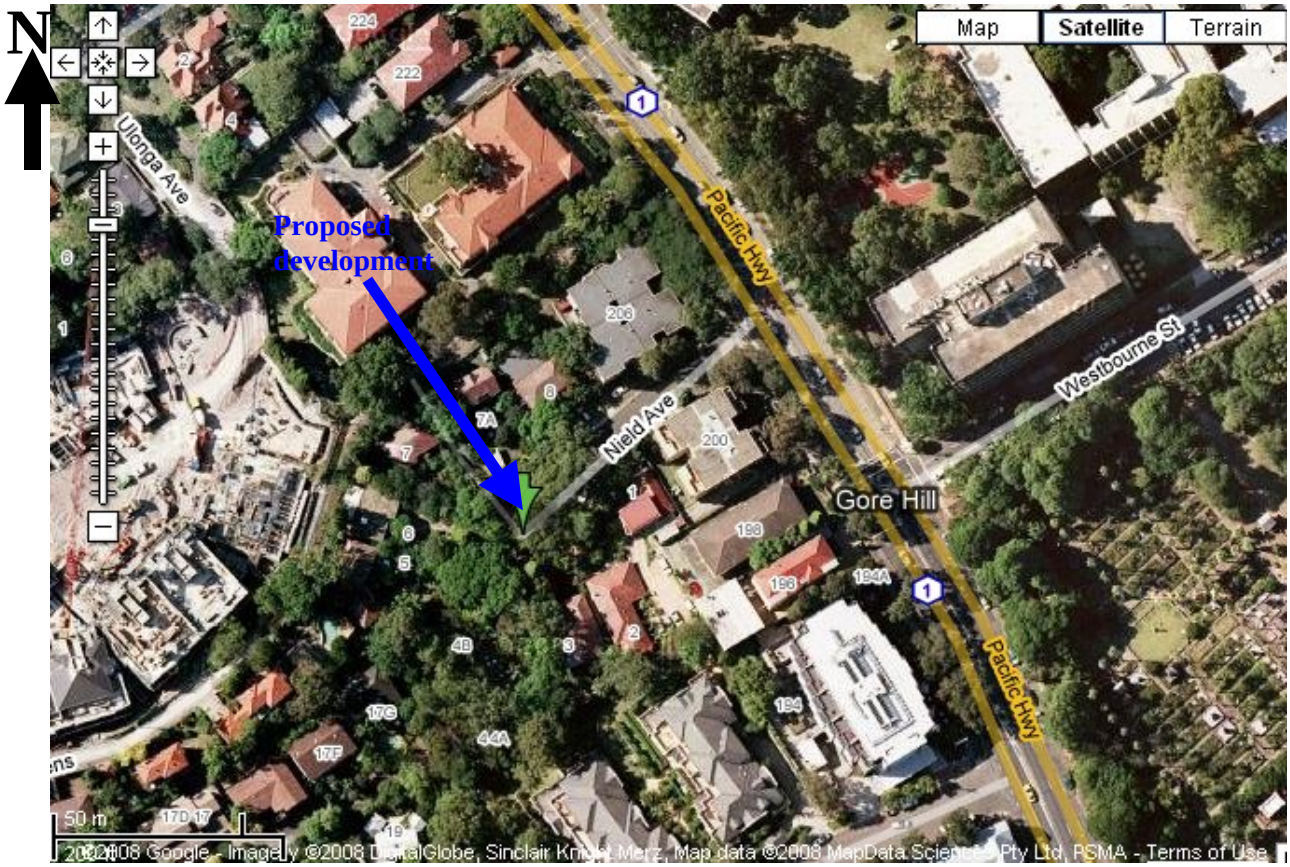

Figure 1:Shows the Location of the Proposed Development

2. BUILDING ORIRENTATION AND DESIGN

The proposed development is placed on its site so as to maximize solar access between 9am and 3pm in mid winter. The north wall and roof will not be shaded by other buildings or by vegetation in mid winter

3. ECOLOGICALLY SUSTAINABLE DEVELOPMENT

3.1. USE OF RENEWABLE AND LOW-IMPACT ENERGY SOURCES

The feasibility of a series of renewable and low-impact energy options is considered for this project.

3.1.1. Photovoltaic (PV)

With respect to the possible use of on-site electricity generation in the form of Photovoltaic (PV) for this development, the following is noted:

- Although the area of solar collectors to provide adequate power for water heating could be accommodated by the available roof area, the amount of batteries, collector piping, system hydraulics and pumps, storage facilities and auxiliary heating systems would be expensive and, potentially unreliable, for a development of this type given today's technology.

VIPAC therefore recommend that Photovoltaic are not a feasible option for improving the environmental sustainability of the development.

3.1.2. Green power

Green Power works by the consumer paying a premium for their electricity. The retailer then agrees to buy this same amount of electricity from an accredited 'green' generator (e.g. biomass, wind, solar, hydro). Major advantages of this scheme over installing onsite generation is that the additional cost of green electricity is spread over many years, not in one large up front cost, and, unlike fixed PV installations for example, tenants can move their green power supply when they move premises.

Green Power is available from a number of Green Power suppliers. More information can be found at http://www.greenpower.com.au/go/suppliers.cgi.

3.1.3. Air Conditioning

The proposed development will be provided with air conditioning. VIPAC recommend use of air-conditioning systems with high coefficient of performance to enhance the energy performance of the development and reduce greenhouse gas emissions.

3.1.4. Hot Water Systems

The hot water system being considered for the proposed development is gas. In Sydney, use of abundant natural gas versus electricity for hot water is recommended from an energy efficiency point of view. The sole use of electricity as the energy source for conventional electric water heaters is inefficient because electricity is a secondary source, deriving its energy after burning coal, while coal based systems require expensive handling equipment and specialised pollution control systems.

3.1.5. Lighting

Lighting levels should be established using the guidelines set out in Australian Standard AS1680.1-1990.

Complying with the Australian Standard will be achieved by:

- Establishing the appropriate amount of artificial light needed for every room while maximising the use of natural daylight wherever possible.
- Choosing energy efficient lighting lamps and fixtures.
- Proper zoning and control system (motion sensor, etc) for offices.

Internal wall colouring will be made as light as possible to maximise the use of natural daylight. The Developer intends to use fluorescent lighting for the proposed development. Wherever aesthetically possible and in locations which occupants might find acceptable, fluorescent, and in particular, compact fluorescent, lighting will be used.

The proposed lighting system consumes less energy than incandescent lighting. The Developer will also consider the use of motion sensor devices for lighting in low-use areas.

The proposed development will also feature skylights on the roof to allow access of natural lighting and reduce the need of using artificial lighting.

3.1.6. Appliances

It should be ensured that any other appliances that are installed by the developer are as energy efficient as possible. Energy efficiency of appliances can be determined by their Energy Rating Label[1], which rates them between 1 and 6 stars, 6 being the highest. Energy rating labels are compulsory for single-phase air conditioners.

VIPAC recommend choosing a minimum 3.5 star energy performance rating for all appliances provided.

VIPAC also recommend use of automatic power-off equipments such as monitors, printers, and etc. to help conserve energy use.

3.1.7. Atmosphere

Given the significant contribution that commercial buildings make to the emission of greenhouse gases it is extremely important to ensure that all new developments are environmentally conscious. This includes ensuring that they are thermally efficient so that excessive energy is not consumed when heating and cooling, ensuring minimal water consumption, ensuring recycling is maximised and waste is minimised. In addition to ensuring minimal impact on the environment, it is also important to ensure a high amenity for the internal and external spaces of the development. This includes ensuring adequate solar access is provided to internal and external spaces, wind conditions are not adversely affected and the indoor air quality is of a high standard. All of these measures will reduce the environmental impact of the building on the atmosphere.

VIPAC recommends that:

- The developer should demonstrate complete avoidance of HCFC based refrigerants and Halon fire suppression systems.
- For pest control, mechanical means should be employed rather than chemicals. The developer will ensure that the building is sealed, caulked and points of entry are protected by adequate mechanical means from insect and pest entry.
- No asbestos products should be used on this project.
- All painting to use water based or low off gassing paints, adhesives and varnishes to floors, walls and ceilings with zero-Volatile Organic Compounds (ie. no VOC's added in the manufacturing process).

[1] http://www.energyrating.gov.au/

3.1.8. Solar Access and Shading

Within the constraints of the site the design form of the building seeks to take advantage of the site's solar access potential. For example:

- All spaces have north, west, south and east aspect windows.
- The west façades have glazing elements, thus there will be some mid to late afternoon solar rays coming in into the spaces.
- Most of the spaces will receive direct solar access for much of the morning period year round.
- There are balconies on most of the rooms, providing some shading to the glazing from the higher altitude solar rays.

VIPAC would recommend:

- Low E glazing for the curtain wall glazing to the east and west to help reduce the solar heat gains.

4. WATER

4.1. WATER CONSERVATION

It is recommended that measures within the development which conserve water and help reduce the development's external water demands, in particular the demands of the project on the city's domestic water supply are adopted.

- The developer intends to install dual-flush cisterns water efficient and flow restrictors for WCs' and kitchenettes' taps (see Figure 2). This will ensure efficient usage of water and in particular limiting discharge costs and saving energy. Common 6/3L dual flush toilets have an average water usage of 4L/flush, whereas with higher drainage grades they can operate with a 5/2L flush or lower which reduces the average flush to 3L[2]. There are many types of water efficient toilets available which range from low flush to ultra-low flush toilets.
- Rainwater tank will installed and the water captured will be used for landscape irrigations.
- Minimum 3-star (water rating) water efficient tap fitting for basins and kitchen sinks will be installed.

[2] University of Technology Sydney; *Sustainable Water Management in Commercial Office Buildings*; 2003


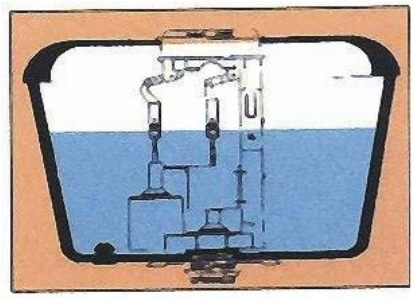


Figure 2: Diagrams of 3-Star Showerhead, Dual-flush Cistern and Flow Restrictor Tap

5. BUILDING MATERIALS

5.1. MAXIMISATION OF USE OF RENEWABLE AND/OR RECYCLABLE MATERIALS AND COMPONENTS

Complete energy efficient design aims to reduce the energy consumed by a building over its entire lifecycle from "cradle to grave". In addition to operational energy (energy consumed through heating and cooling a development) the energy consumed through creating the development, the toxicity and recyclability etc. of the materials selected should be considered. Construction materials and products should therefore be selected based on balancing criteria of:

- Recyclability
- Sustainable sourcing
- Low embodied energy
- Low pollution from manufacturing
- Low transport costs
- Minimal environmental impact
- Durability and minimal maintenance
- Non-hazardous, and
- Eco-labelling and certification.

Embodied energy is the 'up front' capital energy investment at the construction stage associated with the building materials and process used in the production of a building. This includes the mining or harvesting of raw materials, processing these materials into housing fabrics, transport for both raw materials and refined products and the preservation of the energy investment through durability.

The building is designed to be durable providing long term-use with the possibility of later adaptive re-use. Materials to be used extensively throughout the development include concrete,

glass, aluminium (for all glazing frames), and carpet. VIPAC would recommend maximising the use of local materials for this project. This will reduce the transportation requirements for the materials used on the job, with corresponding embodied energy savings.

Table 1: Renewable/recyclable Properties for Some Common Building Materials

Material	Embodied Energy	Durability	Re-useability /Recyclability	Toxicity	Renewable	Polluting
Aluminium	Very high	High	High	Low	No	Moderate
Steel	High	High	High	Generally Low	No	Moderate
Concrete	Moderate	Moderate-high	High potential, depends on market	Low	No	Moderate-low
Wood	Low	Moderate	High	Low	Yes*	Low
Glass	Moderate	Moderate	High	Low	No	Low
Carpet	Moderate-high	Low	Moderate, although market very limited	Low	Partially	Moderate-low

*** Any timber used should be sourced from plantation timber**

In general, maximum use should be made of local materials for the project. This will reduce the transportation requirements for the materials used on the job, with corresponding energy savings.

VIPAC recommends using recycled materials and (recycled) plantation timbers. Only sustainable plantation and Australian regrowth timbers will be specified for this project. This includes timbers used for framing and general construction, concrete formwork, cladding, door frames, flooring, fencing, exposed decking, pergolas and stairs. No rainforest timbers or timbers cut from old growth forests will be used. In regards of plantation timber, it is important to ensure that the timbers are from a well-managed source according to Forest Stewardship Council (FSC) principles.

5.2. MATERIAL SELECTION

In general, the proposed building makes good use of energy efficient materials. Proposed building materials are presented below:

External Walls	will be masonry having reasonable thermal storage capacity.
Roof	Concrete.
Roof Colour	Medium colour (solar absorptance of 0.475 – 0.70).
Ceiling	will be plasterboard.
Floor Slabs	are concrete throughout, having a high thermal storage capacity.
Glazing	Clear *single* glazed with aluminium frame.
Internal Walls	internal division walls will be plasterboard.
External Colours	Generally a series of light and medium colours are planned for all non-glazed exterior walls.

Thus, the building in general will have the ability to stabilise changing thermal conditions and reduce diurnal (day-night) temperature changes if attention is paid to design details at the wall interfaces.

Internal Wall Colouring	will have a light colour (Dulux Natural White).

Thermal mass is used to smooth out daily temperature variations. Generally the denser the material, the higher its thermal mass, and therefore the more heat energy it can store.

External walls of the proposed development will be masonry; internal walls will be plasterboard and the floor slabs will be concrete. Dense materials like concrete have reasonable thermal mass. They absorb heat from surroundings during the day then radiate it when the air temperature cools down, hence stabilising the inside temperature of the proposed development by acting as a heat sink and source as well as providing a time lag in equalising internal and external temperatures.

VIPAC also recommend minimum R1.3 External Wall insulation and minimum R2.65 Roof/Ceiling insulation to be installed to ensure compliance with BCA Section J.

5.3. GLAZING

The final choice of glazing system for the building should be addressed via mainly acoustic considerations to take into account the effect of traffic noise in the area. The choice of glazing will have a significant impact on the solar heat gain of relevant areas, as shown in the table below. Clear single glazing has been proposed for the development. The selected glass should also fulfil acoustic requirement. There are balconies on all commercial suites, providing some shading to the façades from the higher altitude solar rays.

From an energy point of view, a careful balance must be achieved in relation to the choice of glazing systems between...

- Limiting the heat gain during summer,
- Allowing sufficient solar heat into each building during winter, and

While at the same time...

- When considering energy efficiency, a careful balance must be achieved in relation to the choice of glazing systems between allowing sufficient solar heat into the building during winter, and limiting the heat gain during summer. At the same time it should ensure reasonable visibility from all rooms and not adversely impact on the need to increase artificial lighting.

Equally important however to the choice of glazing is the design detailing of the glazing interface to the window framing system and the provision of adequate sealing. Thus, the solar access efficiency of the offices will depend markedly on the ability of enclosed areas to control heat gain and loss in winter by:

- Limiting the infiltration of cold air (inflow) during the day, and
- Limiting the air flow leakage (outflow) at night-time.

VIPAC would recommend:

- Low E glazing for the curtain wall glazing to the east and west to help reduce the solar heat gains.
- A non-reflective glass with a visible light reflectivity co-efficient of less than 10% is used for any glazed surfaces.

6. WASTE

6.1. RECYCLING FACILITY

The proposed development has garbage/recycling facilities with adequate access to the street to provided and available for pick up by local recycling services.

6.2. CONSTRUCTION WASTE

The builder should aim to reduce the amount of construction waste and conserve resources through reuse or recycling to reduce the environmental impact from material manufacturing and transport.

VIPAC recommend that:

- An on-site waste management plan should be developed by the contractor.
- A recycling plan should be developed for construction waste materials.
- Sub-contractors should be encouraged to make use of recyclable packaging for any materials sent to site.

7. CONCLUSIONS AND DRAFT STATEMENTS OF COMMITMENTS

The developer considered the following to improve the energy efficiency and reduce the green house gas emissions:

- Use of roof skylights for natural lighting.
- Use of light colouring for the internal walls to maximise the use of natural daylight.
- Rainwater harvesting tank for landscape irrigations.
- Minimum R1.3 External Wall insulation.
- Minimum R2.65 Roof/Ceiling Insulation.

The following additional recommendations have been made to improve significantly the sustainability within the proposed development:

- Equipment with automatic power off.
- Low E glazing for the curtain wall glazing to the east and west to help reduce the solar heat gains.
- Use of Air-conditioning systems with high coefficient of performance.
- Negotiating power agreements with local providers.

Recommendations regarding lighting, appliances, internal finishes and waste etc. have been made within the body of the report.

8. REFERENCES

- Architectural drawings provided by Marchese + Partners:

DRAWING NO.	DRAWING NAME	SCALE	ISSUE
DA 1.00	COVER SHEET AND DEVELOPMENT DATA SUPPLEMENTARY INFORMATION	NTS	G
U13322	SURVEY PLAN	NTS	-
DA 1.01	SITE ANALYSIS PLAN	1:500	G
DA 1.02	SITE ANALYSIS PLAN WITH PROPOSAL SCHEME	1:500	G
DA 1.03	VISUAL IMPACT STUDY 1	NTS	G
DA 1.04	VISUAL IMPACT STUDY 2	NTS	G
DA 1.05	MACRO ELEVATIONS	1:500	G
DA 2.01	FLOOR PLAN – RL 82.00	1:200	G
DA 2.02	FLOOR PLAN – RL 85.80	1:200	G
DA 2.03	FLOOR PLAN – RL 88.90	1:200	G
DA 2.04	FLOOR PLAN – RL 92.00	1:200	G
DA 2.05	FLOOR PLAN – RL 95.10	1:200	G
DA 2.06	FLOOR PLAN – RL 98.20	1:200	G
DA 2.07	FLOOR PLAN – RL 101.30	1:200	G
DA 2.08	FLOOR PLAN – RL 104.00	1:200	G
DA 3.01	ELEVATIONS – 1	1:200	G
DA 3.02	ELEVATIONS – 2	1:200	G
DA 4.01	SECTION - A & B	1:200	G
DA 4.02	SECTION - C & D	1:200	G