ESD Report

Life City Wollongong (PROPOSED DEVELOPMENT)

Response to Director General's Recommendations; Ref No. MP 10_0147

Vim Sustainability; 26.11.12

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LIFE CITY WOLLONGONG

ATTENTION: ELAINE TREGLOWN
TCG PLANNING

ESD REPORT FOR DIRECTOR GENERAL'S RECOMMENDATIONS

Contents

Rev No	Description of Revision	Date	Approved
Rev No 1	Preliminary Issue-DRAFT For review and comment	4.10.12	JB
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LIFE CITY BERKELEY- PROPOSED DEVELOPMENT GRAPHIC

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1.0 INTRODUCTION

The Life City Wollongong proposed Hi Tech Holistic Cancer and Medical Hospital Facility is intended to provide a unique healing solution for the Wollongong region. Including facilities such as a medical centre, Hospital, Aged Care, child care, educational and recreational outcomes the development, located at Warwick St, Berkeley, NSW, is designed to provide a 24 hour community health and healing facility. The project suggests a range of facilities designed to suit the local climate and landscape with a selection of buildings up to five storeys high.
The Director Generals Requirements (DGR) dated 26.10.10 specifies evidence is required of the client's commitment to Environmentally Sustainable Development as part of the next stage in the approval process.
Vim Sustainability has been appointed the sustainability consultants on the project and has been asked by the proponent, Delbest Pty Ltd, to provide an ESD Report that will identify the principle sustainable initiatives that will be implemented wherever possible during the design development programme.

2.0 CLIENT BRIEF

The client has requested Vim Sustainability consider a range of sustainability initiatives that will provide overall resource efficiency including energy and water usage combined with a high level of internal comfort and maximised internal environment quality. In addition renewable energy methodologies and suitable landscaping outcomes are to be implemented as appropriate.

The client is wants to ensure this development provides a sensible and unique approach to sustainability and is keen to investigate the value of a range of alternative passive and low tech solutions as their first point of reference. This way resource usage will be minimised and the process invoiced in achieving this will be less traditional and rigid and therefore more suited to achieving a high level of sustainability across the overall development.
Sustainable performance targets are yet to be agreed but it is anticipated this facility will be at the cutting edge of sustainable development of this type.
This means that resource use such as energy will be substantially less and water use will also be measurably lower than in a similar commercial development. In addition, waste will be minimised due to a specific waste recycling programme and procurement initiatives.

3.0 SUSTAINABILITY

In order to provide a sustainable outcome for the Life City Wollongong development it is important there is a clear understanding of sustainability and what it represents across the development's parameters. The most commonly used definition is as follows:-

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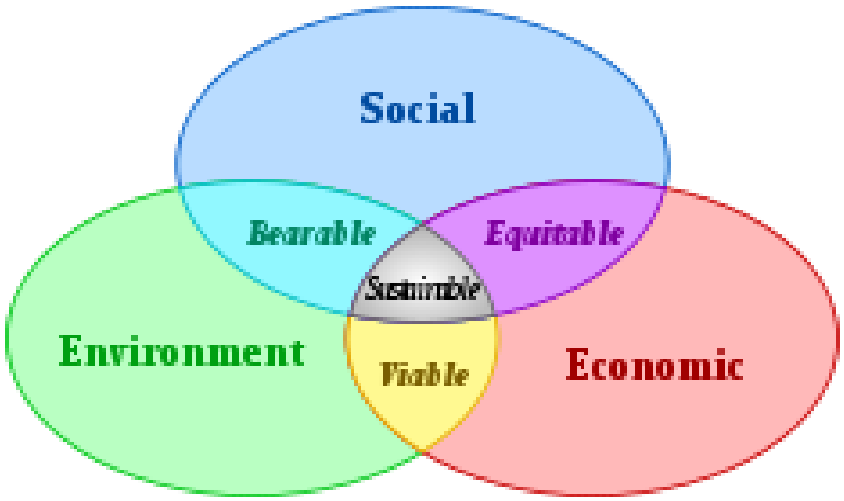
'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. Bruntland Commission of the United Nations, 1987.

Sustainability must consider financial, community and environmental outcomes for the benefit of all wherever possible.



In addition there are further more prescriptive initiatives that contribute to a sustainable outcome.

The Six Governing Principles of Sustainable Design and development are:-

1. Respect of the Wisdom of Natural Systems- The Bio Mimicry Principle
2. Respect for People- The Human Vitality Principle
3. Respect for Place-The Eco System Principle
4. Respect for the Cycle of Life –The 'Seven Generations' Principles.
5. Respect for Energy and Natural Resources-The Conservation Principle
6. Respect for Process-The Holistic Thinking Principle

Jason McLennan 'The Philosophy of Sustainable Design-The Future of Architecture'; 2004

These governing principles will be the basis of sustainability considered on this project.

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4.0 STRATEGY

The proposed sustainability strategy for this particular development is based on adopting a climate responsive design methodology as the first step of the process. The next step is to identify what are appropriate comfort levels for the inhabitants within the facility with a view to providing a more resource efficient adaptive comfort operational protocol.
Implementation of these two core sustainable design and operational principles are key to a successful sustainable outcome across this development and will enable the most appropriate built form initiatives to be provided. This will result in improved occupant comfort levels, reduced heating, cooling and electrical loads and subsequent lower resource usage levels.

The next step in the proposed strategy is to identify firstly what passive and then low tech heating and cooling options can be applied to this development A more traditional but energy efficient refrigerant cooling and heating option will be considered if there is found to be minimal value from the use of low tech or passive options.
The site will be looked at as a whole during the design development process whereby there is close interaction between the landscaping, transport, recreation and amenity, renewable power generation, community and function.
As the buildings on this development will be the main uses of resources during the construction and operational period more focus has been placed on the parameters relevant to the built form to ensure they contribute appropriately to the project's overall sustainable solution.

5.0 CONSIDERATIONS

This project has a commitment to providing a leading sustainable health community for the Wollongong and NSW regions.
A large range of sustainable initiatives will be considered during the design development process. Some preliminary engineering analysis work has been undertaken to identify the engineering efficacy of some of the passive and low tech heating and cooling options. Further design development is of course required for these items.
The items listed below contained in this document (which are certainly not an exhaustive or completed list) will be considered for the project and implemented wherever feasible or possible.

6.0 WIND IMPACTS.

Special note has been made in the Director Generals Recommendations (26.10.10) of the impact of wind on the development and on the surrounding areas from the development.

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The availability of the breezes from the nearby coast, lake and mountains need to be utilised however possible to assist with building cooling and if possible power generation or water circulation. The wind is a great natural attribute that should be taken advantage of.

The proposed development has a relatively high ridge area running NE-SE through the site and it is intended that the buildings will be kept below the height of this ridge in order to minimise visual impact for surrounding neighbours. This will assist in minimising any negative wind impacts from the buildings on the proposed development. The design of the buildings will trap as much wind as possible and use it to offer cooling in summer and ventilation across the year. In addition landscaping will give consideration to the value of breezes to assist with maximising external and internal inhabitant comfort.

At this state it is not feasible to undertake any wind analysis using suitable software modelling as the block forms and boundary conditions are not sufficiently developed to provide any value.
Once the development is underway, detailed wind modelling using suitable software will be undertaken to identify the impact, if any, on both external and internal environmental conditions for inhabitant comfort within the development. It will also identify any possible negative wind impacts for surrounding neighbours from any of the built forms or landscaping. Some preliminary local wind climate analysis has been undertaken (see Appendix 1) and the outcome of that review is that the breeze levels for this area are typical of a seaside location and are at this stage not expected to create any negative issues.

7.0 SUSTAINABLE DESIGN - INCLUSIONS

1) Sustainability Master Plan

A project of this size requires an overarching Sustainability Master Plan to encapsulate all the areas of relevance and provide a high level guidance tool to inform and offer focus to all stakeholders from the design stage through to operations through to inhabitants. The provision and regular updating of same will ensure there is a clear sustainability charter for this development ensuring agreed sustainable outcomes are undertaken across the overall project lifecycle.

2) Sustainable Design Development Process

The most important decisions are made in the first day of any project. This is where the most cost is expended or saved. As can be seen by the chart below the issues need to be understood first and the goals decided early on in the project. The more works and time

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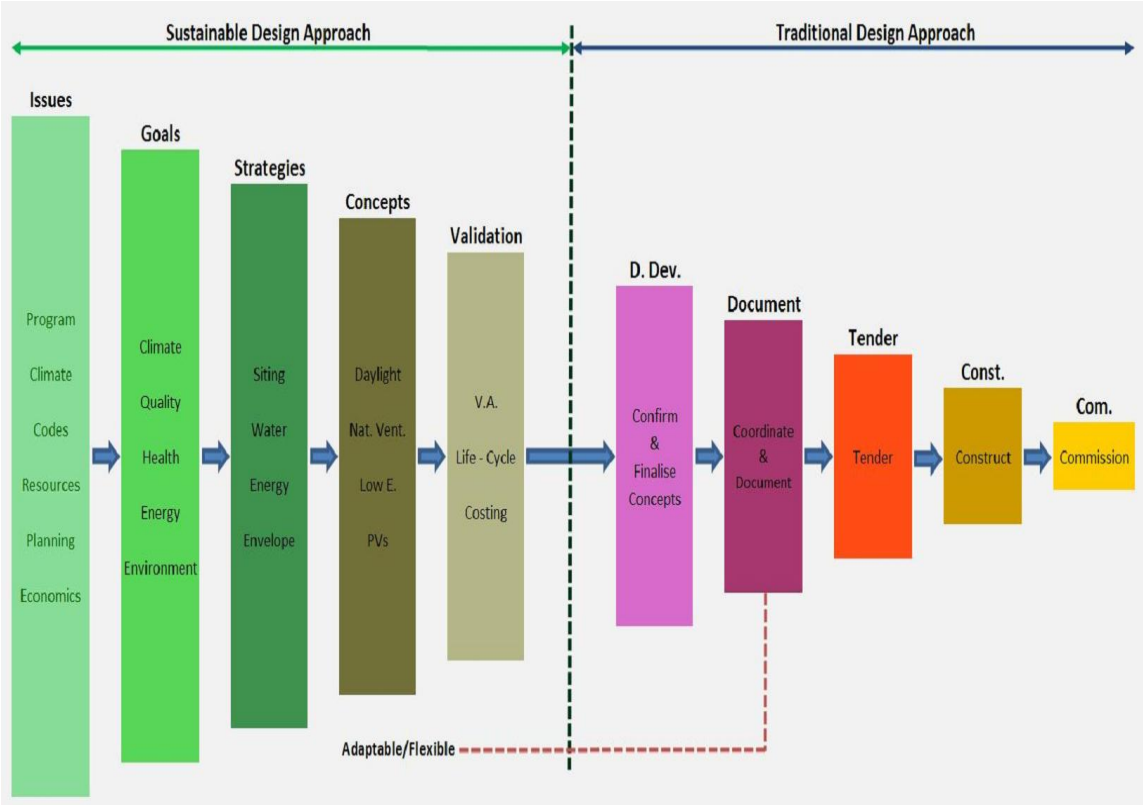
spent on the left hand side of the chart below the greater the ability to maximise value in a project. This is a great attribute of the sustainable design process.
As can be seen in the chart below the traditional design approach tends to leave the majority of the value- adding out of the process and go straight to design development without a clear understanding of issues or goals. The outcome of that are inappropriate strategies and concepts may be incorporated into the project without suitable interrogation and deliberation. This process is linked to the Integrated Design Process detailed in Item 4 below.



3) Sustainable Design And Operational Performance Parameters

In order to ensure the facility has a clear development focus suitable sustainable design and operational performance targets will be agreed at the beginning via a series of ESD workshops. The primary focus of those workshops will be to identify all opportunities and risks imposed by the site and create a sustainability frame work from those outcomes to guide the

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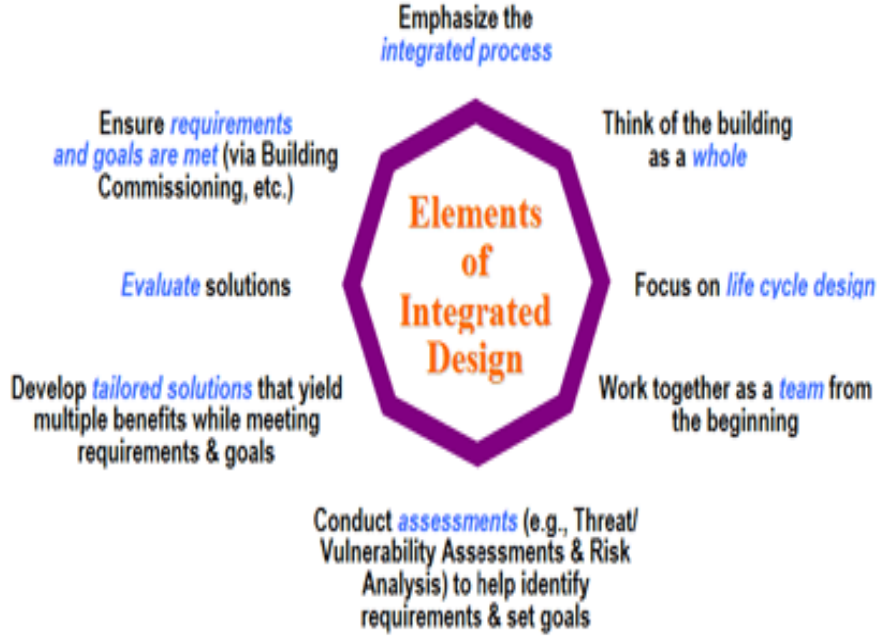
design team and ensure focus on the clear and agreed project objectives. This information will also feed into the Sustainability Master Plan.

4) Adaptive Thermal Comfort

The latest American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Adaptive Comfort Standard 55-2010 will be adopted wherever possible on this project as a key design driver. (See Appendix 1) This will help to improve internal comfort levels, improve healing outcomes but also to measurably reduce energy and water usage.

5) Integrated Design Process.

The design of buildings requires the integration of many kinds of information into useful and durable whole. An Integrated Design Process includes the active and continuing participation of users and community members, architects, authority officials, building technologists, contractors, quantity surveyors, engineers, interior designers, and specialised consultants as well as the client and other important stakeholders. The best buildings result from continual and organized collaboration among all players**.**



6) Energy efficient air conditioning.

A range of air conditioning systems will be considered but only as an adjunct to natural ventilation option wherever possible. This will include options, such as, for example, VRV three pipe heating

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and cooling air conditioning systems with the option of utilising in ground heat exchange to reduce carbon and utilise existing site attributes. This type of system has a high COP and can provide heating and cooling for alternate rooms at the same time.
Other systems such as geo exchange or solar/gas powered hydronic heating and cooling will also be considered and applied as part of the projects sustainability parameters decided early on in the process.

7) Use of Natural Ventilation.

The proximity of the proposed development to the sea and Lake Illawarra offers excellent opportunities to naturally ventilate the facilities. Natural Ventilation will provide many advantages over traditional air conditioning systems –see appendix 1
This can be achieved using assorted design methodologies such as façade design, (see below) solar thermal chimneys and automated windows.
An automated yet user over rideable operable window system in conjunction with the option in some buildings with a ventilated façade, possible use of thermal exhaust chimneys located throughout the floor plan and night purging function will serve to cool and ventilate the facilities over at least 70 per cent of the year. Consideration will be given to relatively narrow floor plates where functionality allows for maximising cross flow natural ventilation.

8) Use of bespoke facades.

A range of facade types for particular buildings offering improved thermal and daylight performance as well as maximised architectural outcomes will be considered subject to site constraints and building functions. These could include double skinned ventilated facades, reverse brick veneer facades or in some cases some green 'living' facades.

It is important to note that whichever façade typology is chosen will assist in ensuring the buildings will only require artificial heating and cooling during the extremes of winter and summer therefore noticeably reducing energy use normally associated with this type of facility.

The utilisation of the building façade shapes and window types, roof shapes and a range of other built form design solutions can significantly improve the efficacy of ventilation outcomes for a minimum cost.
Further investigative and design works will be undertaken as a component and result of detailed 3D air flow, air pressure and thermal analysis modelling using the latest building diagnostic software as required.

9) Use of Solar Chimneys.

To accelerate the air movement and energy free cooling in the buildings, internal thermal chimneys, separate to the ventilated façade design will be considered for this project. These chimneys will

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work together with the windows on the building perimeter in order to maximise air flows and night purging ability. The chimneys could be part of the lift shafts or fire stairs and could also be located as part of the risers. The height of the chimneys above the building roof top and the final shape and detail of these cannot be clarified until further design development occurs. They will though, fit inside the building envelope height restrictions and will be as inconspicuous as possible. Final design options are yet to be confirmed.

10) Double glazed window units, maximised fabric insulation and night purging

Suitable glazing design, i.e. (double glazed window units) wall and roof insulation levels and all relevant windows and opening ventilation/shading components will be implemented once building thermal modelling is employed to understand the efficacy of each option. The windows will be automated where required as will the shading and will be programmable through the IBMS. The night purging though the solar chimneys will also be automated.

11) IBMS

The use of an Intelligent Building Management System (IBMS) to control a range of operational requirements such as heating, cooling, shading, window automation, ventilated façade control, solar cooling chimneys, security and lighting etc. will be implemented.

12) Renewable Energy Photovoltaic Units/Wind Generators

Photovoltaic Cells for energy generation will be implemented. Panels will be located either on the roof of facilities or in bespoke locations such as above picnic sheds, garages etc.

The close location of the development to the Illawarra Lake and the coast offer excellent opportunities to capture wind using domestic and small commercial size quiet wind turbines. These will be integrated into the building and site design as much as possible to ensure efficacy but minimal visual impact. These systems can be used to generate electrical energy while also pumping water around the site. The details of these will be a function of the loads, roof space, building design and other requirements.

13) Use of energy generating lifts

Specific lift types that generate energy during use will be considered subject to the client's functional demands.

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14) Commissioning

A suitable commissioning process based on the CIBSE Guidelines will implemented across all the development when required. This will have a major impact on reducing resource wastage and improving overall efficiencies.

Thermal mass construction

Exposed thermal mass will be a key feature of the internal building design to improve summer and winter comfort while reducing heating and cooling loads. This will be further quantified and appropriately located during the design development process. It will be part of the overall integrated design strategy.

15) Maximized Integral Environment Quality

Low toxic materials, paints and glues as well as furniture, carpets and curtains will be utilised as part of the overall ESD improvement strategy for maximised internal environment quality. In addition the implementation of a live and dynamic internal environment as much as possible will progress this outcome further. Consideration will be given to acoustic, olfactory and visual treatments as well with maximisation of views for the inhabitants. The latest research on inhabitant comfort focusing on thermal delight and Aliesthesia will be considered as part of this approach.

16) Materials

Detailed investigation will be undertaken into material selection where not just embodied energy but longevity, low maintenance, climatic and location suitability, recyclability and low toxicity are considered.

17) Metering

A suitable metering strategy to monitor and manage water and energy use around the facility will be implemented. High use areas of water or electrical usage shall be independently metered.

18) Compliance with Section J Energy Efficiency 2012 requirements as a minimum standard

Section J 2012 performance standards will be achieved as a base compliance level.

19) Maximised daylight

Where possible daylight will be maximised into the useable spaces. Engineered daylight solutions will be utilised as a major design outcome wherever possible.

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20) Dynamic 'Live' Internal Environment.

One of the key design parameters of this development will be to provide a dynamic and 'live internal environment, far removed from the traditional 'fixed temperature and lux levels' found in current buildings. This environment will offer thermal delight assisting in healing outcomes and improving inhabitant amenity.

21) Sensor control of lighting and equipment

Sensor and automatic control of equipment will be utilised wherever functional and valuable

22) Electrical lighting

Electrical lighting design will be reviewed and where possible low energy and high lumens equipment with suitable control sensors will be utilised. Task lighting will implemented wherever feasible. Daylight mimicking lighting systems will also be considered for many areas of the development.

23) Landscaping

Suitable water efficient landscaping will be integrated into the development wherever possible. The landscaping will be integrated into the design to ensure maximum benefit is achieved utilising planting to offer shading , air flow controls, views, habitat, respite, water retention, flora and fauna opportunities, perfumes, food production and community value as required.

24) Shading

Suitable shading design will be utilised as required. This may also involve some shading automation.

25) Water

a) Water efficiency devices

All water outlets will be selected to minimise water flow as required. Maximised WELS level taps and spouting etc. (Min WELS level 4) will be implemented wherever possible. Sensor control on taps will be considered wherever practicable.

b) Capture of rainwater on roof and surface run off and reuse of same

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Rainwater capture will be utilized and the storage of same will be considered for sprinkler pipe supply, landscaping and also for toilet flushing subject to storage and spatial requirements. This will be carried in in conjunction with the WSUD parameters noted below.

c) Water Sensitive Urban Design (WSUD) (*Victorian Stormwater Committee, 1999- Best Practice Guidelines)*

Water Sensitive Urban Design principles will be applied wherever possible to this development.

These principles consist of the following:-

Protect natural systems *- protect and enhance natural water systems within urban developments. Promoting and protecting natural waterways as assets allows them to function more effectively and supports the ecosystems that rely on them.*

Integrate stormwater treatment into the landscape *- use stormwater in the landscape by incorporating multiple use corridors that maximise the visual and recreational amenity of developments. The natural stormwater drainage system can be utilised for its aesthetic qualities within parklands and walking paths, making use of natural topography such as creek lines and ponding areas.*

Protect water quality *- improve the quality of water draining from urban developments into receiving environment. Through filtration and retention, water draining from urban developments can be treated to remove pollutants close to their source. This approach reduces the effect that polluted water can have upon the environment and protects the natural waterways.*

Reduce runoff and peak flows *- reduce peak flows from urban development by local detention measures and minimising impervious areas. Local detention and retention enables effective land use for flood mitigation by utilising numerous storage points in contrast to the current practice of utilisation of large retarding basins. This approach subsequently reduces the infrastructure required downstream to effectively drain urban developments during rainfall events.*

Add value while minimising development costs *- minimise the drainage infrastructure cost of the development. The reduction of downstream drainage infrastructure due to reduced peak flows and runoff minimises the development costs for drainage, whilst enhancing natural features such as rivers and lakes that add value to the properties of the area.*

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26) Black and Grey water Treatment

Serious consideration will be given to the use of site contained 'blackwater' and/or grey water treatment systems. Minimising loads on existing infrastructure while also being cost effective and a unique sustainable opportunity due to the size of this development ensures these options will be given rigorous investigation during the design development process. Outputs from these systems can be used for toilet flushing, sprinkler pipe recharging and irrigation once treated.

27) Waste

Waste is function of procurement and attitude as well as appropriate management. In order to improve overall waste management a full waste management plan will be implemented to comply with the most recent authority requirements during both construction and operations.

28) Transport

The size of this development requires innovative internal transport solutions. Electrically powered transport including solar powered or grid charged will be considered as part of the development along with bio diesel powered buses etc. with Bio diesel coming from the developments kitchens. Charging facilities for electrical cars will also be provided for both visitors and inhabitants of the site across a range of locations.

29) Sustainable management

In order to ensure sustainability is a kept component of the ongoing management of the development a Sustainability Operational Plan will be implemented once each stage of the development is completed.

30) Construction

One of the areas that are neglected in sustainable projects is the impact of the construction process on sustainable outcomes. A Sustainable Construction Process document will be provided and the successful builder will be contractually bound to adhere to this document. In addition all builders in this project will be ISO 14001 accredited.

31) Comparable Performance Standards

Around the world there are numerous sustainability initiatives (tools) for the built environment such as Green Star, Leed, Breeam, Living Building Challenge and Green Guide for Health Care

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to name a few. All have their good and bad points and all offer varying levels of sustainable outcome. While none of these types of initiatives have yet been nominated as performance targets in this document the intention is to review what rating or design protocol system is relevant and offers the best sustainable outcomes closer to the time of commencement of design. This is because all of these tools change and improve and committing to one of those now may not be the best sustainable solution when the design process commences. In addition the client may consider implementing different tools for different parts of the development over time. Nonetheless the knowledge and expertise offered by these tools will certainly be utilised by the project team (where relevant) in the design and performance targets for the project.
It is suggested that the sustainable outcomes in this project will certainly meet the levels that are at the least equal in to these tools and in many cases may surpass them.

32) Community Interaction

One of the prime intents of this development is to offer something back to the community and consideration will be given to provide community access and interaction for the surrounding residents. This may include, for example, a small Amphitheatre in the landscaping to offer live theatre or string quartets during the afternoon along with children's play equipment for families of inhabitants and visitors.

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8.0 CONCLUSION

The key to a sustainable building design is adopting the appropriate design strategy. They key to that strategy understands a range of relevant criteria. By utilising the correct climate response to design and considering passive and low tech options as the first step in the design process the client can be confident that wherever possible the sustainable outcomes are suited to the location and function of the building while ensuring minimal resource usage.

Life City Wollongong will set a benchmark for health community sustainability across not just Australia but also around the world.

The developers have expressed very clearly their desire to ensure value to their users and inhabitants, the community, the environment and their financial sustainability is maximised through detail consideration of a unique sustainable development which it is hoped will add inestimable long term value to the Wollongong community.

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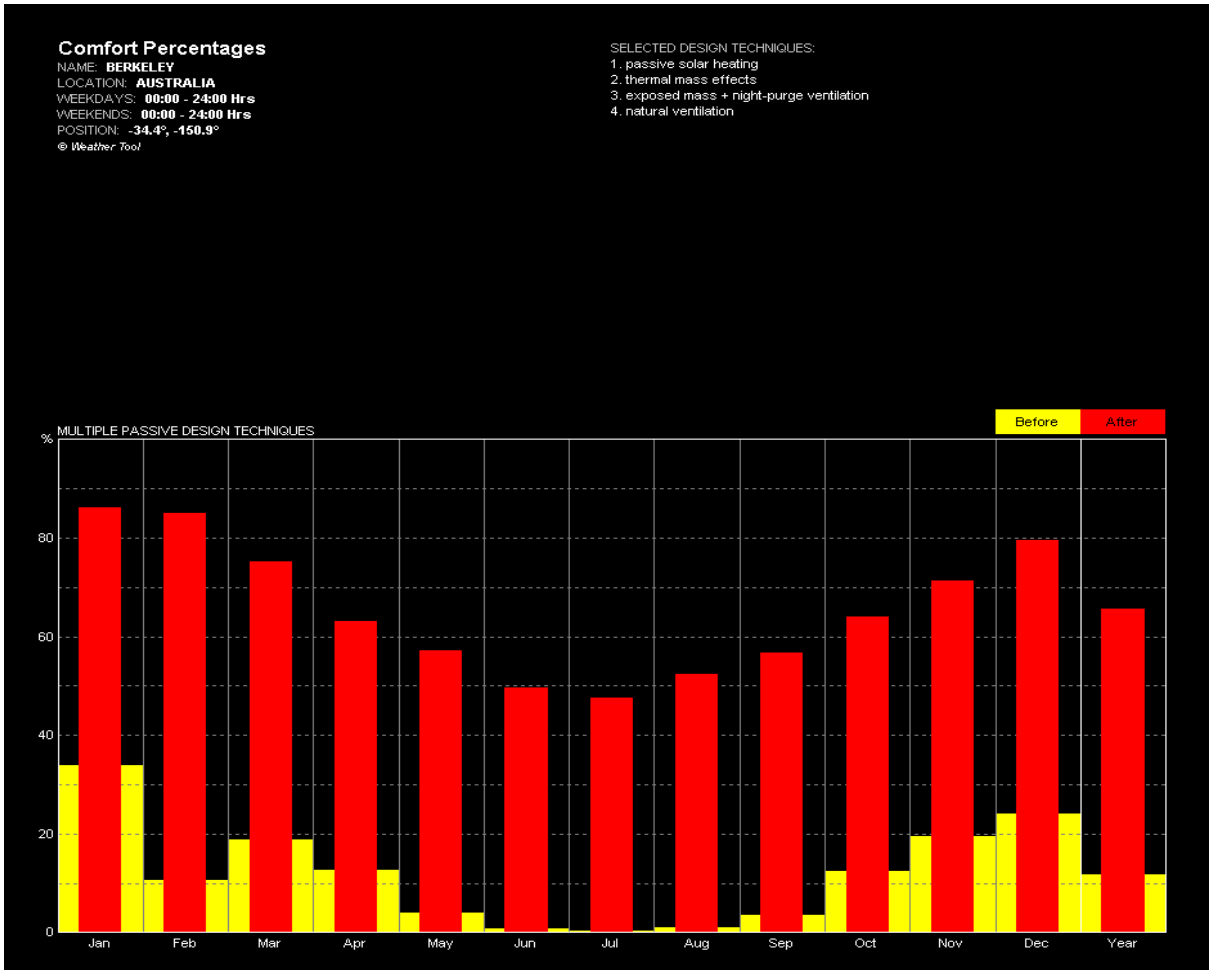
9.0 APPENDIXES

1. CLIMATIC DATA

The following climatic data provides an insight into the local conditions and how the development can be improved by the use of this information. This date has been provided by the CSIRO and is taken from the weather station nearest Berkeley with the most suitable and available data.
It is also the data provided by ASHRAE in its energy modeling climate information.



This chart indicates the before and after comfort percentages available in the Berkeley climate using a range of sustainable design initiatives. The inference is that for around 65% of the year the main user of energy in buildings, air conditioning, is not required if simple passive design initiatives are implemented into buildings.

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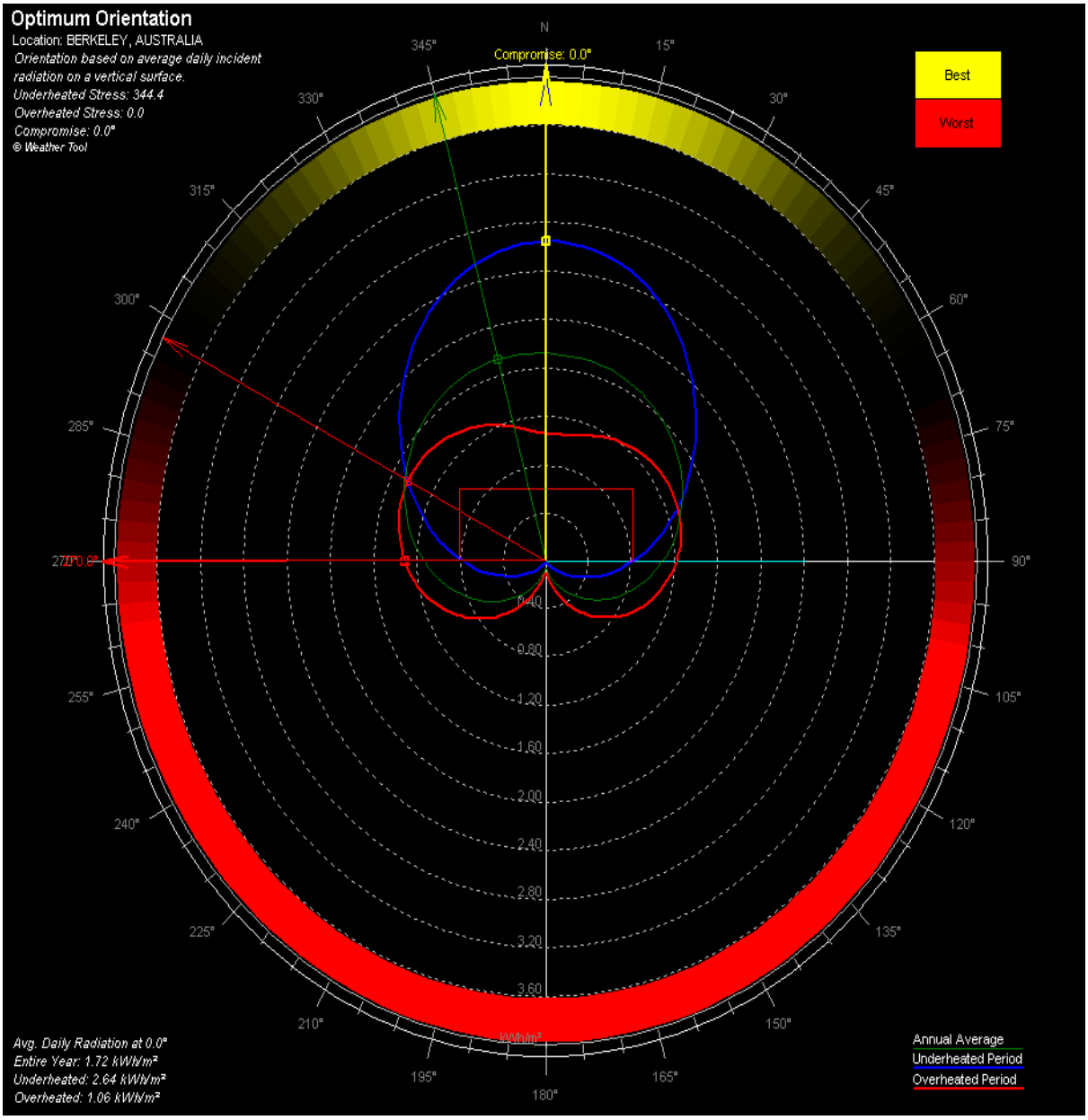

This graph highlights the optimum orientation for the buildings on this development. Utilising this orientation will assist in reducing summer cooling loads and winter heating loads.

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ABN 69 133 00 44 03

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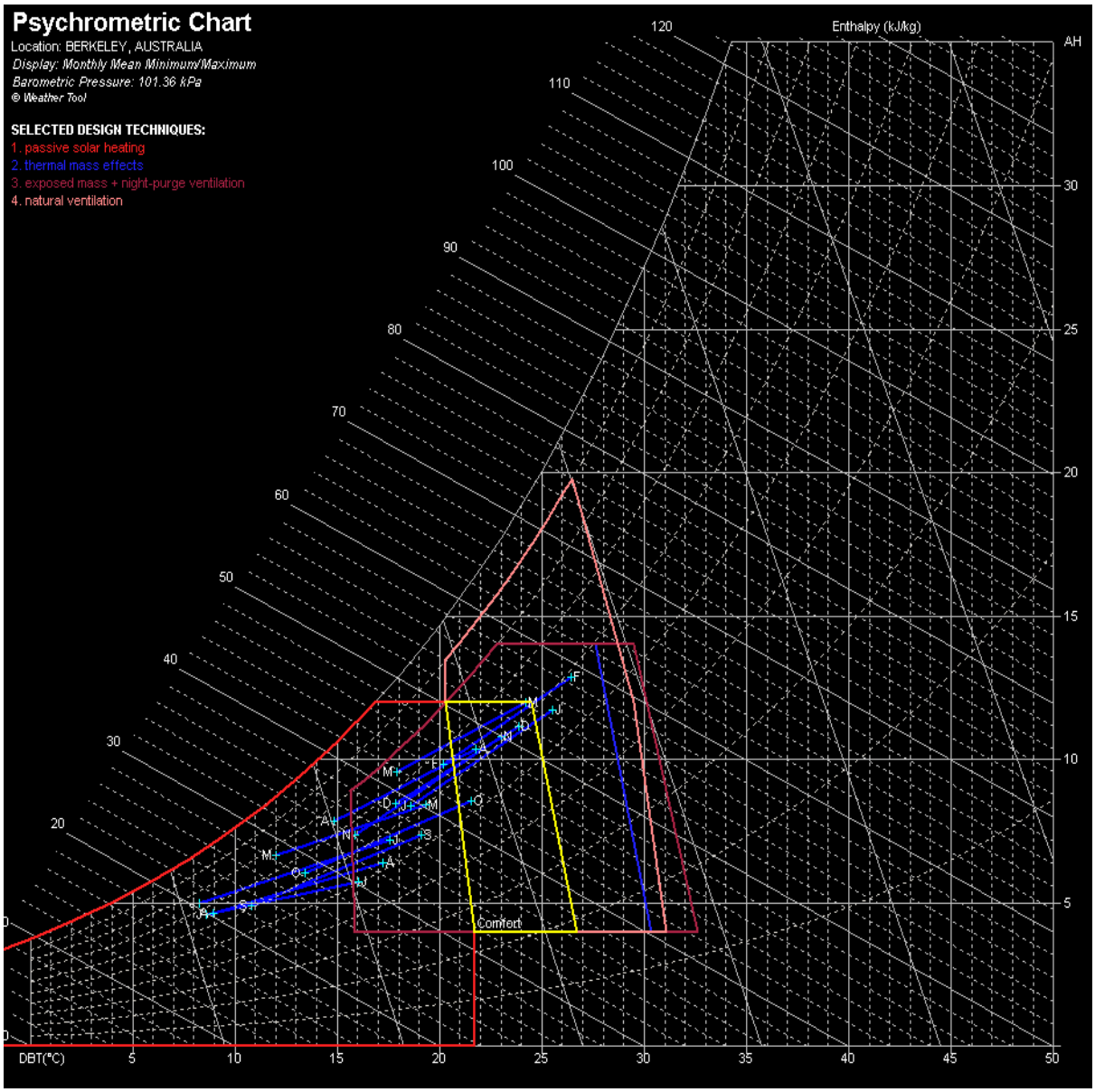

This Psychrometric (thermal comfort) chart shows the range of temperatures across the year for Berkeley and how a passive design building utilising a range of design technologies such as:

1. Thermal mass
2. Exposed mass and night cooling
3. Passive solar heating
4. Natural ventilation

   The comfort zone temperature (yellow lines) in the chart above highlight the traditional comfort zone conditions for the Berkeley location. The passive design methodologies

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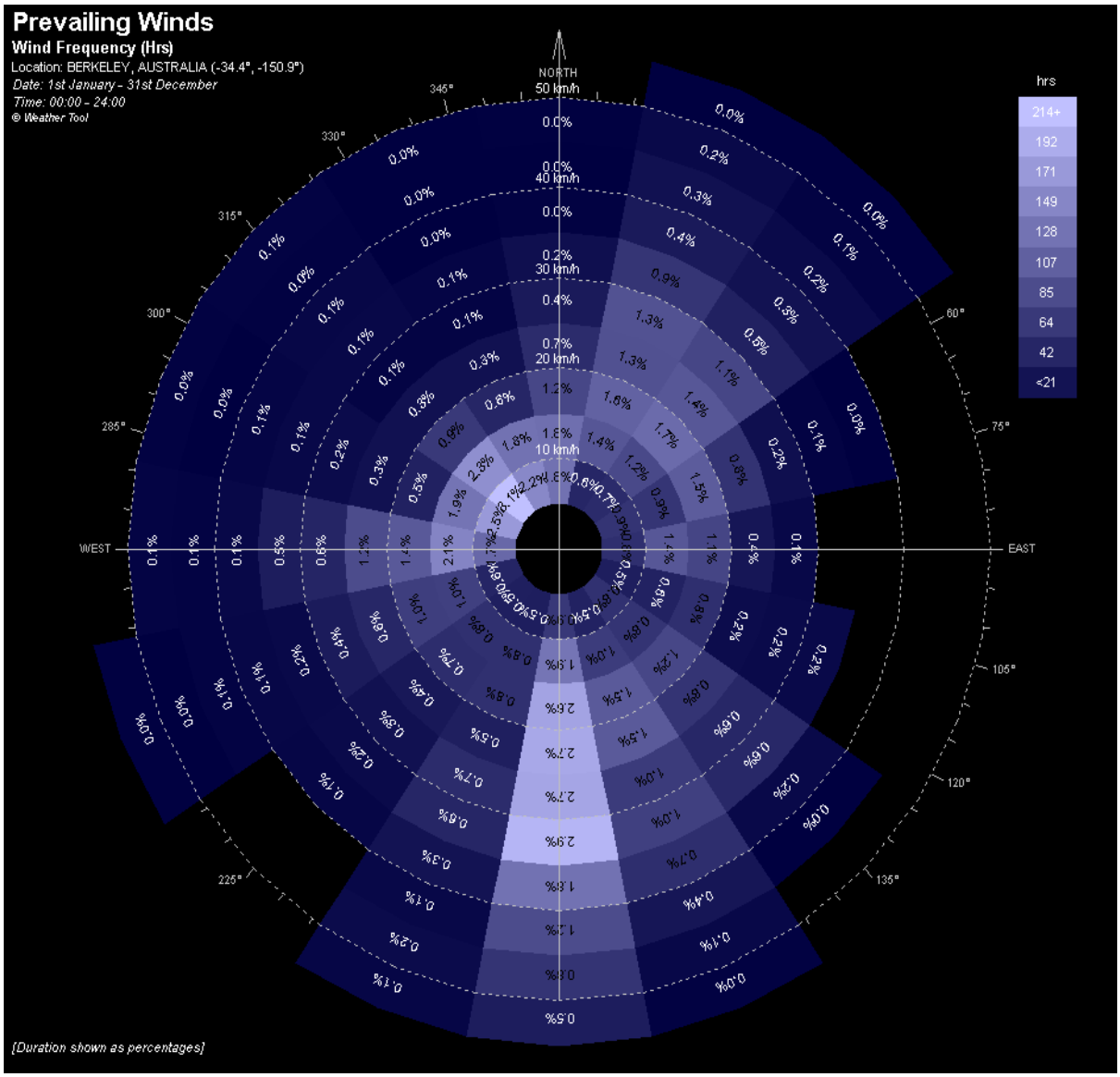
noted above can be seen on the chart to encapture the blue lines which represent the monthly extremes of hot and cold in this locations climate. The coloured lines represent the initiatives and show how those initiatives increase the comfort levels of the inhabitant to encapsulate the temperature extremes at Berkeley.



This chart above is a yearly wind rose for the Berkeley location. Across the year the breezes in this region are primarily from the south and north east which is typical for locations close to the east coast.

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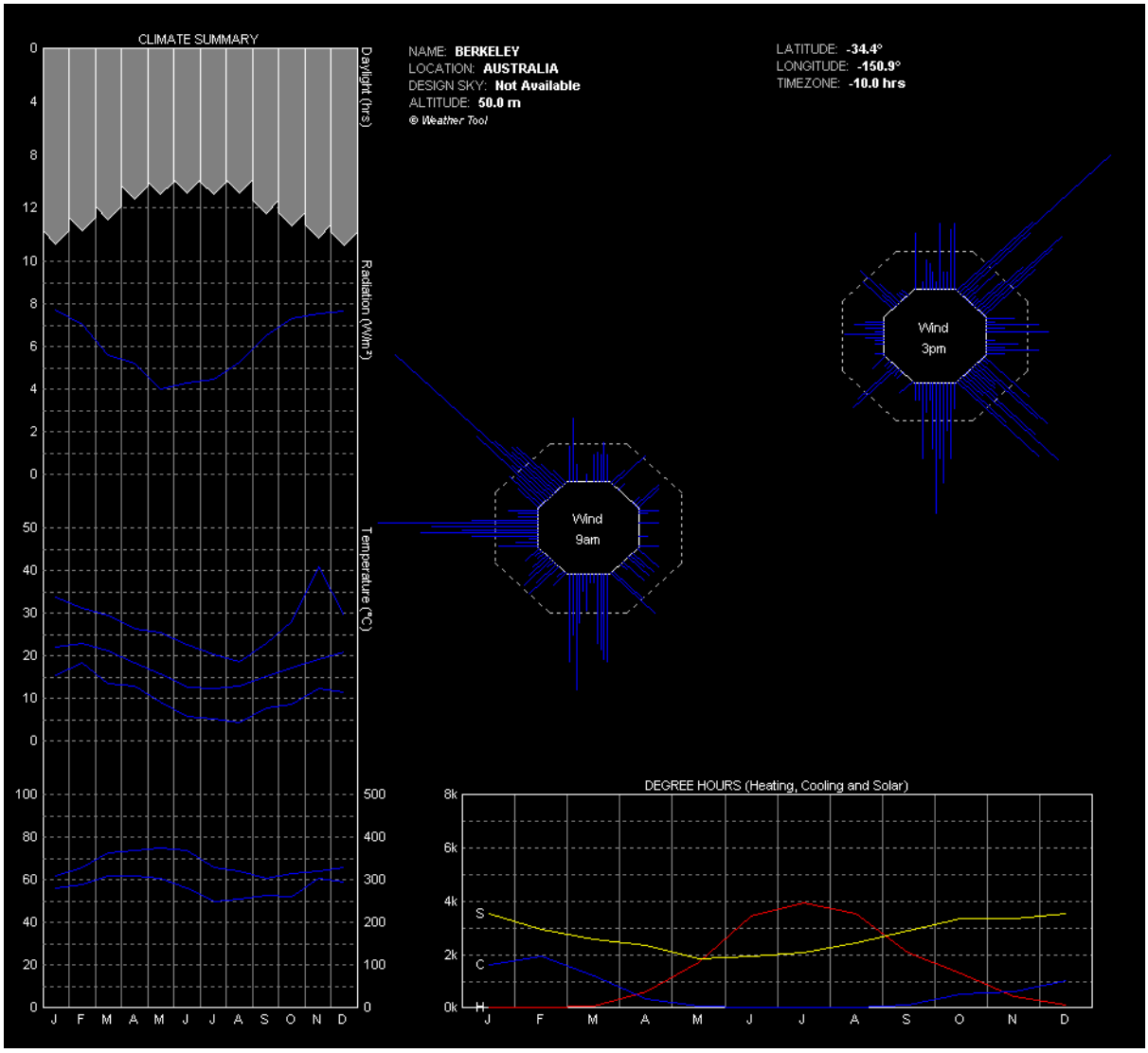

This is a climate summary chart (Based on the work of Szokolay) for Berkeley. It highlights the daylight hours, the predominant wind directions during different times of the day and other relevant climatic information. This kind of information will assist in informing the design to maximise resource efficiency and ensure the development is well suited to its location therefore significantly minimising resource usage.

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2. Adaptive Comfort Chart

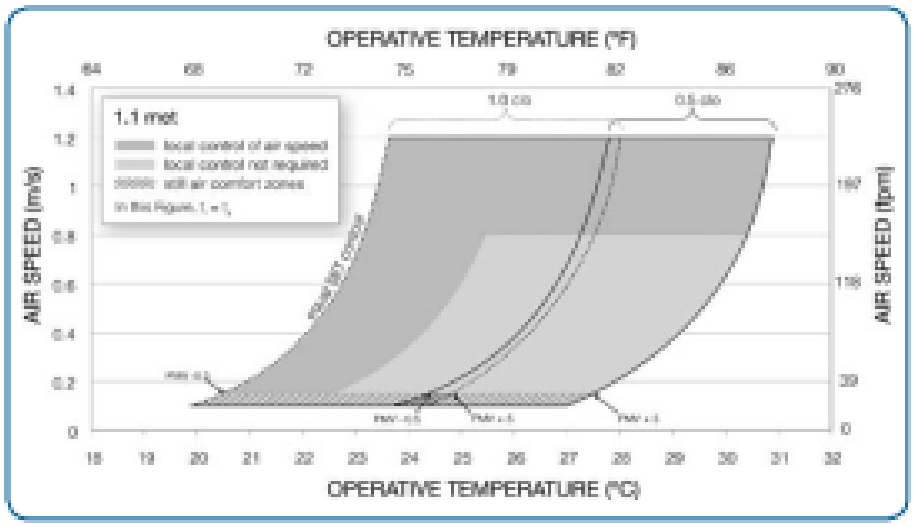

Figure 1: Acceptable range of operative temperature and air speeds for the comfort zone shown in *Figure 2*, at humidity ratio 0.010 (Standard 55-2010).

ASHRAE -55- 2010

This graph indicates the value of air flow and thermal comfort in buildings using a naturally ventilated building option.
It details the latest design parameters for thermal comfort in naturally ventilated buildings.

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3. Vim Sustainability's Sustainable Design and Operations Methodology

Vim Sustainability
Sustainable Design Process Chart

This chart highlights the overall process undertaken by Vim Sustainability when it comes to providing a sustainable development .This is similar to the process that will be followed for this project.

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4. **Natural Ventilation Benefits**

'Thermal Comfort in Natural Ventilation - A Neurophysiological Hypothesis'.

Professor Richard de Dear

University of Sydney, Sydney, NSW 2006, Australia

Presented April; 2010.

….'Apart from dramatically reduced energy consumption in naturally ventilated buildings, there are several other co-benefits, including:

• Greater availability of daylight resulting from the narrow floorplate necessitated by cross-flow ventilation,

• reduced greenhouse gas emissions by avoiding mechanical cooling and minimising electrical lighting,

• reduced thermal boredom for the occupants i.e. improved productivity (Leaman and Bordass, 1993),

• fewer health issues (building related illness),

• negligible risk of sick building syndrome,

• reduced absenteeism resulting from improved health of occupants.'

Accessed www. 5.10.12 http://nceub.commoncense.info/uploads/37-01-05-de%20Dear.pdf

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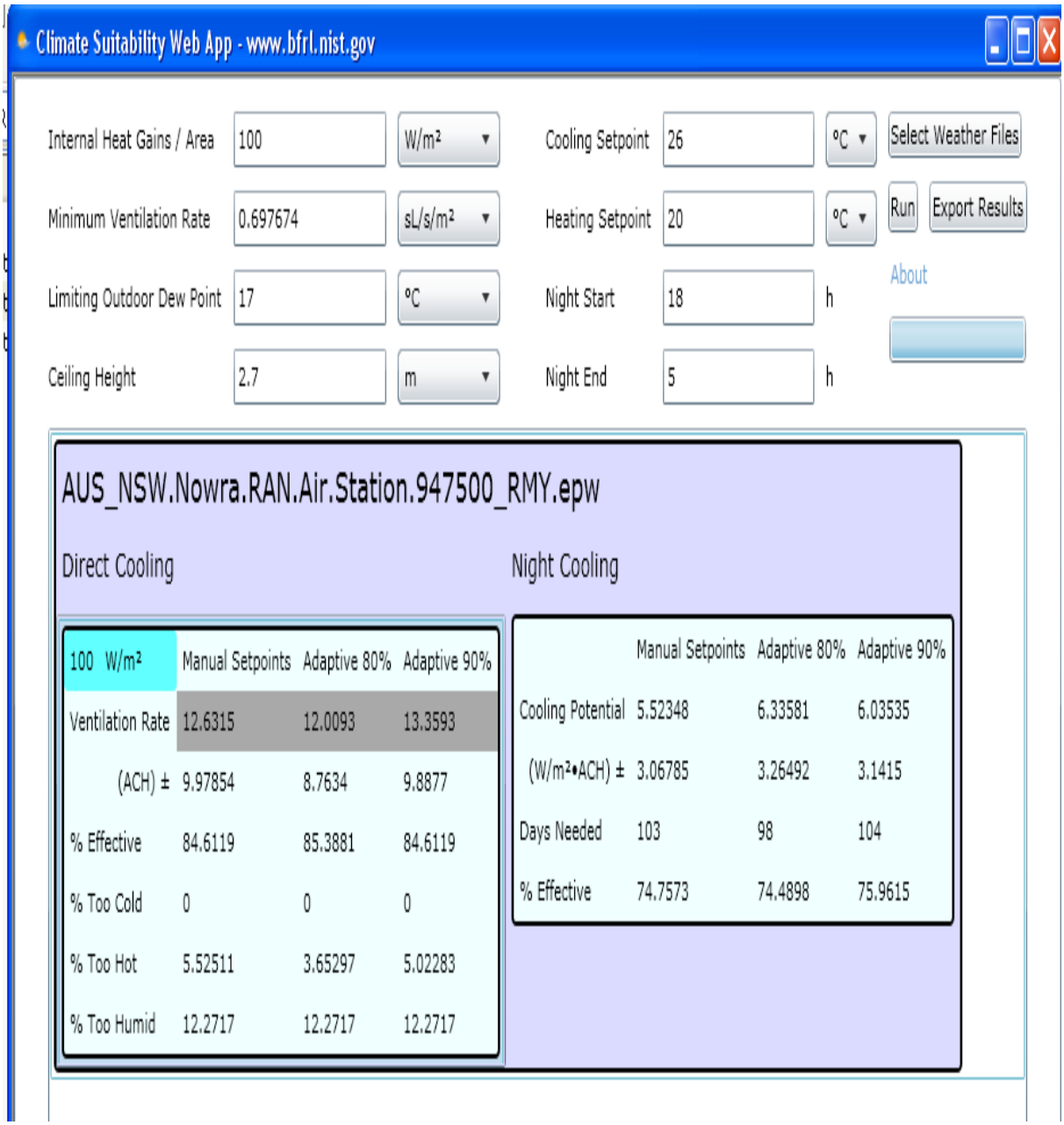

100 W/m²	Manual Setpoints	Adaptive 80%	Adaptive 90%
Ventilation Rate	12.6315	12.0093	13.3593
(ACH) ±	9.97854	8.7634	9.8877
% Effective	84.6119	85.3881	84.6119
% Too Cold	0	0	0
% Too Hot	5.52511	3.65297	5.02283
% Too Humid	12.2717	12.2717	12.2717

	Manual Setpoints	Adaptive 80%	Adaptive 90%
Cooling Potential	5.52348	6.33581	6.03535
(W/m²•ACH) ±	3.06785	3.26492	3.1415
Days Needed	103	98	104
% Effective	74.7573	74.4898	75.9615

This chart highlights that natural ventilation in the local climate will work for around 84% of the year subject to internal comfort temperatures and internal heat loads noted in this analysis chart. This is a high internal heat load and is believed to be a conservative outcome.