



**28 – 32 SOMERSET STREET
KINGSWOOD, NSW**

**DA REPORT
FOR
ESD SERVICES**



**BOSTON GLOBAL
Client**

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SECTION 1.0 INTRODUCTION

EMF Griffiths has been engaged by Boston Global as the Sustainability Consultants for the proposed development located at 28-32 Somerset Street, Kingswood NSW.

Our role is to develop and implement Environmentally Sustainable Design (ESD) strategies into the project that address the sustainability targets outlined in the Penrith Local Environmental Plan 2010 and the Penrith DCP Principles 2014. The report also outlines other sustainability initiatives the project team is incorporating to ensure the best possible outcomes are obtained, exceeding standard practice. This report will demonstrate how the proposed development protects, manages, and enhances natural systems and promotes the efficient use of materials, water, and energy to minimise environmental impacts for the community and the occupants of the project. It will illustrate the project's specific energy efficiency measures to satisfy the Council's energy efficiency performance requirements (adopted from Section J) for the hotel and restaurant. Further development and reporting will be undertaken for the subsequent stages and this document will continue to be updated to reflect design changes and input from the extensive Design Team.

The project is subject to the following minimum regulatory requirements: -

- NCC 2019 Section J Energy Efficiency.

This report includes descriptions of: -

- Proposed building envelope and fabric requirements as well as the use of passive shading elements.
- Proposed building services energy efficiency measures.
- Sustainability initiatives incorporated by the project in line with the Penrith Council DCP principles.

1.1 BUILDING DESCRIPTION

The proposed development at 28-32 Somerset Street, Kingswood NSW consists of a one hundred and forty (140) key, low 4-star hotel with two (2) Basement Levels and an estimated construction value of approximately \$33m: -

- Fitness room, meeting rooms, dining, and lounge as well as eight (8) hotel rooms on Ground Floor.
- Hotel rooms on Levels 1 to 5.
- Amenities, rooftop bar and dining, meeting room, gym and beverage areas on Level 6 / Roof Top Level.

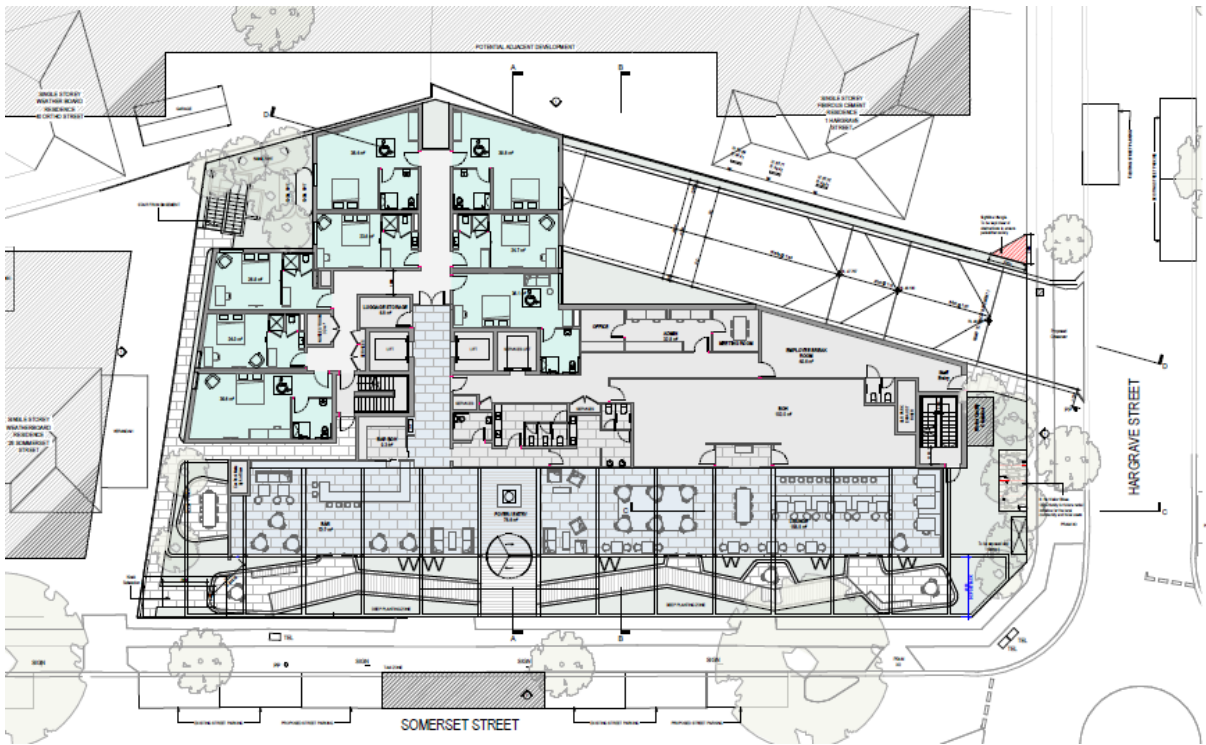


Figure 1: Ground Floor Hotel Layout

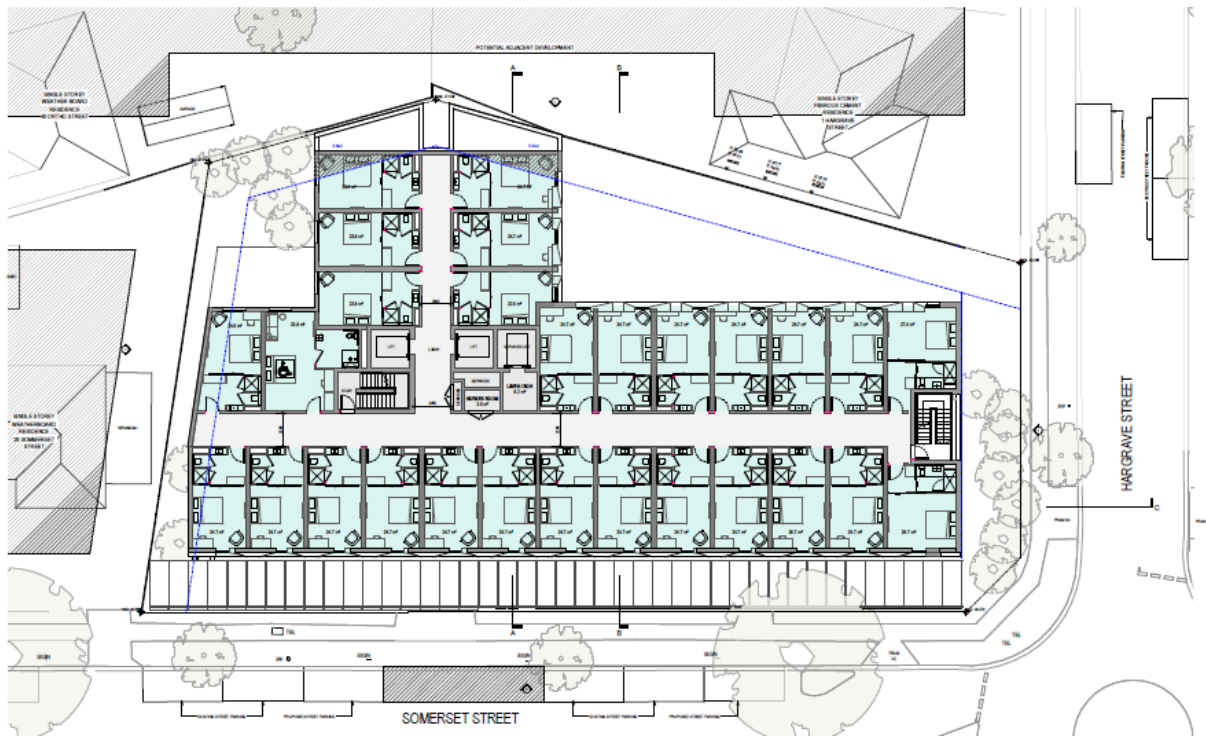


Figure 2 : Typical Hotel Floor Layout (L2-3)

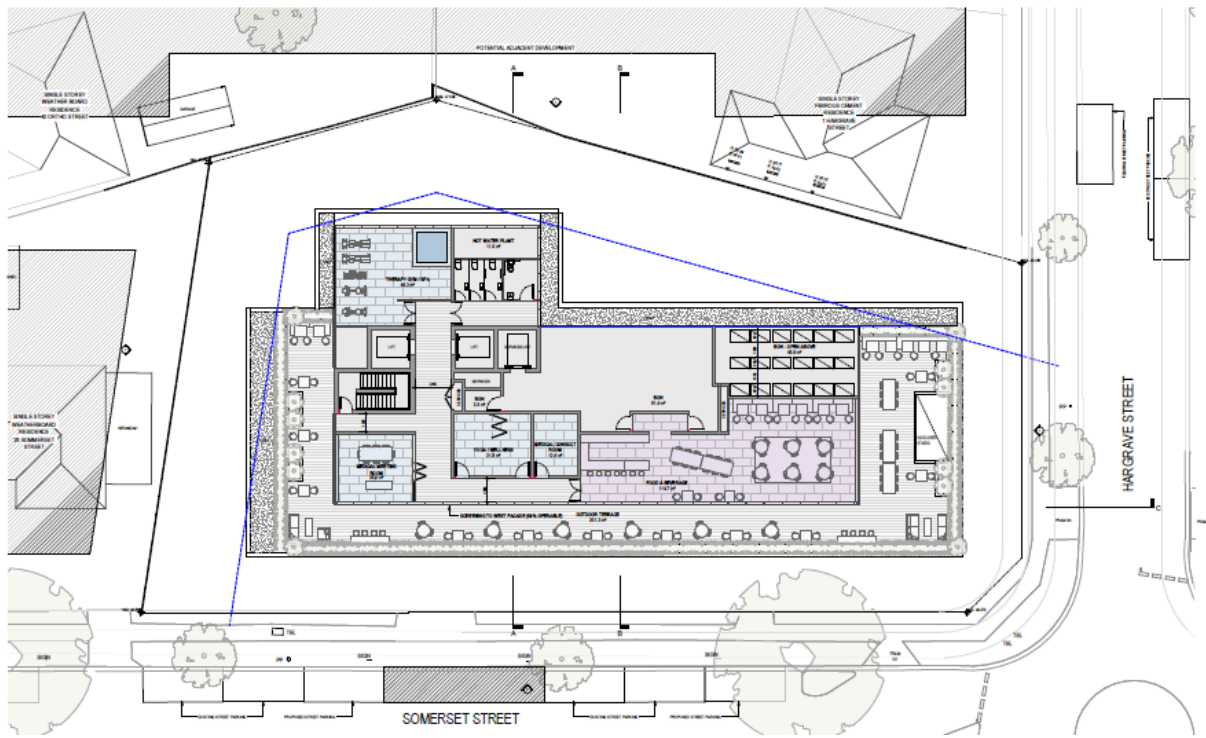


Figure 3 : Level 6 Rooftop Layout

SECTION 2.0 ESD INITIATIVES OVERVIEW

The Penrith Development Control Plan (DCP) Principles describe ten (10) key principles created by the Penrith City Council to support their commitment to sustainability articulated in the Sustainable Penrith Program. This report addresses each of these principles for the development as well as other targets the Project Team has set for themselves and how these are related, detailed under Section 4.0. The project has considered the efficient use of materials (both resources and waste), water and energy to minimise their environmental impacts on the site, the community, and its users.

The DCP Principles are included in Appendix A.

To meet energy targets and compliance with the NCC 2019 Section J, significant measures and initiatives have been implemented into the design and are detailed under Section 3.0.

SECTION 3.0 NCC SECTION J COMPLIANCE

The hotel and restaurant components of the proposed development will demonstrate compliance with NCC 2019 Section J via the JV3 Verification Method once the design has progressed. The process for establishing JV3 compliance is as follows: -

1. Construct an energy model of a building complying with the Deemed-To-Satisfy (DTS) provisions and including services as outlined in the JV Specification identified in the BCA. (This is referred to as the "Reference Building").
2. Construct an energy model of the "Proposed Building" including services complying with the Section J DTS provisions.
3. Run the energy models to compare energy results. Compliance is met when the energy consumption from the "Proposed Building" is less than that of the "Reference Building".

This method is mainly proposed to offset the glazing performance requirements against other building elements that exceed the DTS requirements. It is expected that the higher performing elements of the architectural design will enable a reduction in glazing performance and therefore allow the building to achieve Section J compliance. The project is committed to meeting minimum regulatory requirements, while also ensuring the hotel is an aesthetic addition to the site.

The JV3 modelling will be undertaken in the later stages of the development. The current architectural design is under development, therefore advice below is based on EMF Griffiths' experience with similar projects: Class 3 building in Climate Zone 6. It is expected, the following building constructions and energy efficiency measures will be required to comply with the DTS provisions of Section J. It should be noted that the following requirements are based on NCC 2019 Section J.

3.1 EXTERNAL GLAZING

- A Window-Wall Ratio (WWR) less than 40% across all orientations will be targeted to ensure glazing performance has sufficient flexibility. This will be balanced between the hotel levels and the rooftop.
- The DTS Glazing is likely to be very stringent. Due to the high level of glazing performance required by the DTS provisions, the potentially unappealing resulting aesthetics, and associated costs, the JV3 alternate solution will be adopted.
- DTS glazing will likely achieve a U-value of 2.40 and SHGC of 0.17, which will be a double glazed, dark tinted unit.
- The vertical and horizontal shading around the Western and Eastern facades has been deliberately designed to help offset the SHGC (colour of the window: The lower the SHGC the darker the tint).
- Through the JV3 approach: the project will aim for a U-value of 2.2 and a SHGC of 0.26 (dependant on WWR).

3.2 BUILDING FABRIC

- For the purposes of Section J, the building envelope means the parts of the building's fabric that separate a conditioned space or habitable room from the exterior of the building or a non-conditioned space. At a later stage, floor plans will be marked up to identify conditioned spaces of this development to be assessed under Section J.
- The following building construction performances will be required for the development and anticipated to be met or exceeded in the final design; building constructions will be advised by the Façade Engineers: -
 - External Walls (between conditioned space and outside): Total R-value = R2.5.
 - Internal Walls (between conditioned and non-conditioned spaces): Total R-value = R2.8.
 - Exposed Roof (above conditioned spaces): Total R-value = R3.2, with a solar absorptance < 0.45 (Colorbond 'Shale Grey' or lighter).
 - Internal Floor/Ceiling (between conditioned and non-conditioned spaces): Total R-value = R2.0.
 - Floor on Ground (underneath conditioned spaces): Total R-value = R2.0.
This R-value will include soil-contact. Insulation between slab and soil will be needed.
 - Exposed Suspended Floor (below conditioned spaces): Total R-value = R2.0.

- In order to offset the glazing, the remaining building fabric and minimum insulation requirements will be made compliant with Section J. This will include maximising the installation of additional insulation to the Basement 1 soffit, external walls, and internal walls to non-conditioned spaces. Shading will be provided by awnings, to help minimise the cooling needs for the hotel rooms and common areas.

3.3 BUILDING SERVICES

- At a minimum, the proposed building services are to be compliant with the DTS provisions of the Section J as outlined below.
- Adequate building sealing is to be provided at doors, windows, walls, and fabric construction. Automatic dampers to exhaust fans and air intakes are also required.
- Air-conditioning and ventilation systems are to be compliant with Part J5.
- Lighting and power control devices are to be incorporated and be compliant with Part J6.
- Metering and monitoring systems and vertical transportation, as required by Part J8, are to be implemented and made compliant with Section J.

SECTION 4.0 SUSTAINABILITY DESIGN COMMITMENTS

The project is targeting a best practice sustainable outcome. Multiple sustainability categories have been considered to capture an extensive list of measures for the project to incorporate or consider. All these measures have been reviewed to ensure they are cost effective and support reduced operational costs, while supporting climate change and occupant health and wellbeing. The Penrith DCP Principles have been identified and reclassified as follows: -

- Ecological Impact: protecting and restoring the local habitat (Principle 3, Principle 4, Principle 5).
- Integration and celebration of the community and its local history (Principle 1, Principle 2, Principle 6, Principle 7, Principle 8).
- Sustainable management of material resources and waste (Principle 9).
- Accountability and transparency (Principle 10).

To best respond to this, initiatives on the project are arranged as follows: -

- Ecological impact of the project: -
 - Land and nature
 - Water consumption.
 - Passive design.
 - Greenhouse gas emissions.
- Integration and celebration of the community and its local history: -
 - Culture and community.
 - Equity and local economy.
 - Indoor Environmental Quality.
- Sustainable management of material: -
 - Materials and products.
 - Waste.
- Accountability and transparency: -
 - Tracking and ratings.

4.1 ECOLOGICAL IMPACT OF THE PROJECT

4.1.1 Land and Nature

To begin, the project has reviewed the site conditions and the surrounding environment. The natural habitat is healthy and diverse. The project is committed to reducing its impact on the environment and as far as possible improving it. The following initiatives have been included: -

- A project specific environmental management plan will be created in accordance with the NSW Environmental Management Systems Guidelines.
- Ecological landscaping initiatives will be incorporated into the design. This may include extensive planting and raised walkways. The design will be optimised to reduce run off water impacting the stormwater system.
- A water quality gravity-fed filtration chamber to the South of the project has been included to ensure the water quality is not impacted.
- The project will target best practice water quality performance objectives set out in the Urban Stormwater Best Practice Environmental Management Guidelines for the following: -
 - Suspended Solids – 80% retention of typical urban annual load.
 - Total Nitrogen – 45% retention of typical urban annual load.
 - Total Phosphorus – 45% retention of typical urban annual load.
 - Litter – 70% reduction of typical urban annual load.

- Landscaping has been integrated into the design to reflect the surroundings, provide shading at the entrance to the hotel and encourage gatherings of guests. The landscaping, coupled with a roof finish with high Solar Reflective Indexes (SRIs) – light colours, will also reduce the heat island effect of the development.
- The additional landscaping on and around the building will contribute to increasing the site's ecological value.
- All external lighting luminaires will be carefully considered to minimise obtrusive lighting effects and where necessary additional shielding to be considered to reduce light pollution, to protect the native habitat.
- Strategies will be in place to prohibit idling vehicles and their emissions around the site.

4.1.2 **Water Consumption**

The project will incorporate the following design initiatives to minimise potable water usage, including: -

- Water consumption will be metered separately for major different uses to ensure leaks and malfunctions can be identified and corrected effectively.
- An onsite rainwater tank will be installed for irrigation of the landscaping.
- Water efficient fixtures and appliances will be selected: -
 - Minimum WELS 5-star rated dual-flush toilets.
 - Minimum WELS 3-star (> 4.5 but <= 6 L/min) showerheads.
 - Minimum WELS 5-star taps.
 - Minimum WELS 6-star urinals or waterless urinals.
- Taps in common areas will be sensor activated to reduce water wastage.
- Select native or drought tolerant landscaping species will be selected so they require less water for irrigation.
- A water efficient irrigation system and mulch will be applied to planted areas to limit evaporation, runoff or wastage. The system will be sub-soil drip irrigation with moisture sensor override.
- Potable water used for fire system testing will be reduced by at least 80% through use of a closed loop sprinkler system and re-use of fire test water. The sprinkler system will be fitted with isolation valves or shut-off points for floor-by-floor testing.
- Sensors and controls will be installed on HVAC systems reducing their energy and water consumption.

4.1.3 **Passive Design**

In a next instance, the project has considered how the development can reduce its energy consumption, impacting the climate overall. Passive design measures can prevent excessive solar gains during summer or heat loss during winter. Passive design should also reduce the need for internal lighting by maximising daylighting and should maximise natural ventilation. Passive design has been considered on the project as follows: -

- The project is facing West with few windows on the North and South facades, preventing significant heat gain on the North and heat loss on the South.
- Vertical and horizontal shading along the Western and Eastern façades has been incorporated to assist in controlling the temperatures inside the development.
- Additional shading will be provided by the extensive landscaping across the Western entrance and the upper rooftop bar levels.
- Internal blinds within the hotel rooms will give the occupants better control of the thermal comfort within the rooms, by controlling solar gain allowed in the space.
- Within each of the hotel rooms, large windows will allow the rooms to have significant daylight, reducing the need for artificial lighting.
- Building fabric insulation and glazing will be designed to meet NCC 2019 Section J performance requirements, reducing the heat gain and loss of the building, as per Section 3.0.

- Thermal bridging through all studs and construction junctions will be reduced by ensuring insulation is continual around sensitive areas. Section 3.0 provides more detail on this assessment.
- All doors, windows and fabric will be sealed. Air tightness may be reviewed through the red pen test to ensure sensitive areas are thoroughly protected through airtight membranes and continuous insulation.
- Simulation tools (e.g. Ecotect) may be used to optimise the final design solutions for window sizes and shading in particular.

4.1.4 **Greenhouse Gas Emissions**

With passive design optimised, the project has focused on further minimising the energy demand through optimised systems, including regulated and unregulated energy sources. Where regulated energy covers energy subject to building regulations (e.g. mechanical systems, lighting, hot water, etc.) and unregulated energy refers to building energy consumption resulting from a system or process that is not 'controlled', i.e. energy consumption from systems in the building on which the building regulations do not impose a requirement (e.g. lifts, plug in devices, catering energy consumption, etc.): -

- Photovoltaic panels will be installed on the roof of the development to reduce peak loads.
- In common areas, all mechanical systems will have an economy cycle and be fitted with CO₂ demand ventilation control systems to provide outdoor air only as necessary. Variable speed drive or speed control will be fitted on all major fans.
- Air conditioning within the hotel rooms will have a minimum energy rating labelling of at least 3-star (as per AS 3823.2-2011) and the rated capacity of the air conditioning equipment will not exceed the design cooling capacity by more than 10%.
- High efficiency external and internal light fittings such as LED with highest practical efficacy will be installed throughout the project.
- Lighting design will be optimised to ensure the required maintained lux levels are met but not exceeded beyond 25% of required output.
- Lighting control strategies will include daylight sensors and motion sensors in common lobbies, timers, and motion sensors in car parking areas.
- For hotel rooms, room key activated systems will prevent occupants from leaving lighting and air conditioning on while not in the room.
- Sufficient power outlets will be provided for lamps / lights around predicted furniture layouts to discourage the use of ceiling lighting and increase comfort of occupants.
- An automatic power factor correction unit may be installed to reduce losses and improve voltage regulation.
- High efficiency lift motors will be selected, with energy efficient light fittings included in lift carriages.
- Stand-by mode will be activated during off-peak and idle period e.g. lift car lighting and ventilation fan switch off when the lift is not in motion.
- The development will consider hotel room metering and energy monitoring to inform guests on their power consumption and offer suggestions to reduce their energy consumption through signage.
- Separate energy consumption meters will be provided for major different uses within the project to identify where energy can be reduced and identify where tuning or equipment replacement is required. This will be interfaced to the Energy Monitoring System (EMS) or the Building Management System (BMS).
- The units for hotel rooms and communal spaces will also be interfaced to a central control system as to allow remote setpoint adjustment, failure notification and on/off switching.
- Water pipework will be sized to keep velocities under 1.5m/s, this will assist in reducing the amount of hot water used by occupants and thus reducing the amount of hot water to be heated.
- All appliances in hotel rooms will be energy efficient.

- All equipment and appliances in the other areas will be energy efficient, including kitchen cooking equipment.
- All plug-in equipment and appliances will be selected to aim for within 1 Star of the highest available Energy Star rating and a very low stand-by mode power consumption.
- Any computers used by staff will have computer monitors to have an Energy Rating Labelling of at least 6-stars or have the highest available rating where 6-star equipment is not available.
- There will be no space set to 24/7 operation: non-occupied ventilated or air-conditioned spaces are controlled based on either temperature or emissions levels to suit the space. All set points will be confirmed with the manufacturers to ensure the warranties are maintained.
- Temperature sensors will be positioned at least 1 m away from walls, windows, doors, direct sunlight, air supply diffusers, mechanical fans, heaters, or any other significant source of heat or cold.
- Where suitable, spill air will be provided to storage as opposed to air conditioning.
- Outside air will be provided to each AC unit via ERV (Energy Recovery Ventilator) units that are proposed to be located within the rooftop plant space. The ERV units will utilise the exhaust air from the toilet exhausts to efficiently pre-condition the outside air.
- Where feasible, the fans will operate with variable speed drives to modulate the fans based on the concentration of carbon monoxide within the space as to minimise energy consumption. Natural ventilation intakes will be utilised if deemed suitable.

4.2 INTEGRATION AND CELEBRATION OF THE COMMUNITY AND ITS HISTORY

4.2.1 Culture and Community

The project will incorporate the following design initiatives to support the community and local culture, including: -

- Artwork representative or produced by the local community will be favoured over foreign artwork.
- Biophilia will be included throughout the internal and external design to showcase the beautiful natural habitat of the Penrith area.
- Native vegetation around the site will be selected to suit the surrounding location.
- Locally sourced materials and onsite staff will be favoured during construction.
- Bicycles will be available for rental to encourage visitors to explore the local community.

4.2.2 Equity and Local Economy

The project will incorporate the following design initiatives to support the equity and local economy, including: -

- Fairtrade related schemes will be favoured by the project, there will be a preference for Forest Stewardship Council (FSC) or Australian Forestry Standard (AFS) certified timber products.
- The hotel will promote community events and activities to visitors to showcase the culture and support the local economy. The hotel will allow new populations to discover the surrounding areas and invest in local shops and restaurants.

4.2.3 **Indoor Environmental Quality**

In addition to promoting the existing community and culture, the project has considered how to ensure the community within the hotel (guests and staff) will be ensured a healthy environment. The project will incorporate the following design initiatives to achieve a high level of IEQ and improves building occupants' health and well-being, including: -

- Smoking on and around the premises will be forbidden and strategies will be installed to communicate smoking restrictions.
- All entryways will include grilles, grates, slots or rollout mats to prevent pollution coming into the site.
- Low VOCs for all internally applied paints, adhesives, sealants, and carpets, as well as any new furnishings, and low formaldehyde emission levels for all engineered wood products will be preferred during detailed design.
- Lighting will be flicker-free with appropriate Colour Rendering Index (CRI) and fitted with glare control devices (diffuser or baffle) in reception areas.
- Acoustic treatments will be installed to ensure acoustic comfort is achieved as well as acoustic privacy.
- Ductwork will be thoroughly cleaned and/or sealed prior to installation and considered for maintenance of services.
- All outside air filtered will have at least F6 filters. Filters will be equipped with on-board pressure sensors or filter change indicator that signal when filters require replacement.
- Drinking water dispensers designed for water bottle refilling will be located in the reception area to encourage water drinking.
- The hotel rooms will be positively pressurised to avoid odours from the corridors coming into the rooms. This will be achieved using the outside air supply and toilet exhaust.
- Water pipework will be sized to keep velocities under 1.5m/s to reduce noise caused by water in the pipes as this affects the amenity of the hotel guests.
- Connection to nature will be established through the use of natural finishes – timber, exposed natural concrete elements, decorative pebbles.

4.3 **SUSTAINABLE MANAGEMENT OF MATERIALS**

4.3.1 **Materials and Products**

The project will incorporate the following design initiatives to reduce the environmental impact of the products and materials used in the project, including: -

- New material will be reduced, and sustainable materials will be favoured, including consideration for recycled content in concrete, sustainable timber, and PVC minimisation.
- Embodied energy of materials will be considered throughout the design and selection of materials.
- Forest Stewardship Council (FSC) or Australian Forestry Standard (AFS) certified timber products will be favoured during construction.
- PVC products used in the project will mostly comply with the Best Practice Guidelines for PVC in the Built Environment or, preferably, not to contain PVC.
- Certified products (e.g. GreenTag or GECA) will be favoured during construction.
- Resilient equipment and materials will be incorporated into the design to reduce the need for maintenance or replacement.
- Finishes will be reduced – exposed concrete elements.

4.3.2 **Waste**

The project will incorporate the following design initiatives to reduce waste to landfill and site emissions, including: -

- Adequate spaces for waste recycling bins will be provided throughout the development to ensure operational waste can be managed. A dedicated waste room will also be designed to ensure there is sufficient space for recycling. The hotel will track and review waste generation regularly and set targets to reduce waste generation.
- A demolition and construction waste management plan will be created to identify the type of construction waste and methods to reduce waste. During demolition and construction, the project will divert 80% of the waste from landfill.
- Any hazardous materials (e.g. asbestos, lead or PCBs) found during the demolition works will be adequately disposed of in accordance with the relevant OH&S and environmental legislations.
- Organic waste bins will be provided to collect waste from the restaurant and bar spaces to reduce the amount of waste sent to landfill.

4.4 ACCOUNTABILITY AND TRANSPARENCY

4.4.1 **Tracking and Ratings**

The project has identified multiple areas where sustainable targets will be managed throughout the life of the development and has considered metering strategies and feasibility related to these: -

- Energy and greenhouse gas emissions to be tracked through metering strategies described above.
- Water targets to be managed through metering strategies described above.
- Waste targets to be addressed through waste sorting and monitoring to be managed by the Building Owner.

The project is reviewing options to target the following certified ratings: -

- Green Star Design & As Built v1.3 4-star rating.
- NABERS Hotel Energy 4.5-star rating.
- NABERS Hotel Water 4-star rating.

APPENDIX A
DCP PRINCIPLES

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DCP Principles

1.1. Background

1.1.1. Council's Commitment to Sustainability

Penrith City Council has made a firm commitment to building a Sustainable City. This commitment has been clearly articulated in 'Penrith's Principles for a Sustainable City.' These principles have subsequently been reflected in the Sustainable Penrith Program.

The Sustainable Penrith Program commits Council to apply the principles of sustainability in all of its operations. The program aims to ensure that Council's decisions, policies and actions should maintain or improve environmental, social and economic outcomes for future generations. A number of action plans and policies addressing specific sustainability issues have been developed under this program to guide Council's efforts towards a sustainable City.

1.1.2. Sustainability and Development Control

The preparation of this Plan has provided Council with an opportunity to extend its commitment to sustainability and progress the creation of a Sustainable Penrith. In its role as regulator, Council is able to encourage the inclusion of sustainable design principles and land management practices in future development.

To build a sustainable city, Council needs to ensure that development of land is responsive to the needs of current and future generations. The overriding goal of making Penrith a sustainable city is woven into every section of this Plan and has guided the development of the provisions contained within it.

1.1.3. Key Principles for this Plan

Transforming the City of Penrith into a sustainable city will require cooperation between all levels of government, resource managers, the business sector, community groups and all citizens. 'Penrith's Principles for a Sustainable City' have been adopted as the key principles for this Plan to guide our journey towards sustainability. The principles are supported by a series of objectives to help in interpreting these principles. A brief description of the principles and objectives, how they relate to sustainability and how they are reflected in the provisions contained within this Plan appear below.

1.1.4. How to Use these Principles

The principles and objectives set out below should be addressed as part of any development application to Council.

The principles and objectives will be satisfied by ensuring that any proposed development is in accordance with the development controls set out in the remainder of this Plan. Some examples of these controls and the desired outcomes are listed under each of the principles.

If a proposed development is unable to comply with all of the development controls then it will need to justify how non-compliance will be addressed in other ways to satisfy this Plan's principles.

The controls in this Plan are not intended to prevent new and innovative ways of addressing the principles and objectives in this section as long as the objectives can be addressed.

1.2. Principles

Principle 1: Provide a long term vision for cities, based on sustainability; intergenerational, social, economic and political equity; and their individuality.

A. Objectives

- We plan responsibly for now and the future.

The aims of this Plan, together with Council's strategic plans, set a vision for sustainable development, and ultimately, a sustainable city. Objectives within individual sections express the way towards a more sustainable city and should always be read in that context. The exemplar controls outlined in this Plan and supported by Penrith LEP 2010 demonstrate that Council is prepared to recognise developers and individuals who 'lift the bar' and drive the built form of the City closer towards the vision expressed.

This Plan reflects this principle by expressing an overall commitment to sustainability through:

- The format and structure of this Plan;
- Integration of Penrith's Principles for a Sustainable City throughout the document;
- Linking areas of objectives and controls to the overarching principles of sustainability; and
- Including information which explains how individual controls contribute to the creation of a sustainable city.

Principle 2: Achieve long term economic and social security.

A. Objectives

- We have access to what we need.

Environmental sustainability is only one part of the picture. To have a truly sustainable city, economic and social aspects must also be considered as part of the triple bottom line.

This Plan promotes sustainable economic growth through:

- Encouraging innovative and sustainable use of rural, industrial, commercial and residential land;
- Building on the existing strengths of the local and regional economy, by providing guidance for industrial and commercial development within the City;
- Ensuring that industrial and commercial development is responsibly designed and built;
- Helping protect rural lands from fragmentation;
- Helping reduce the negative impacts of necessary activities (such as manufacturing, waste disposal and some agricultural activities);
- Providing specific controls for transport corridors, in recognition of the key role they play in moving people and goods around our city, our region and our state; and
- Encouraging the integration of housing with other land uses which provide employment, social and cultural opportunities.

This Plan promotes social sustainability through:

- Encouraging the use of the principles of universal design, so that the public domain is accessible to people in all stages of life and with all levels of mobility;
- Encouraging buildings to be designed with the health and wellbeing of their future occupants in mind;
- Providing design guidelines for a variety of housing forms to accommodate people in all stages of life and with all levels of mobility;
- Encouraging the development of communities through allowing for (and designing) community spaces, both indoor and outdoor, providing opportunities for meeting and gathering and community interaction;
- Encouraging a range of uses and employment opportunities to create a mixed income and mixed demographic community;
- Providing guidelines to create a range of recreational and leisure opportunities; and
- Adopting the principles of 'Crime Prevention through Environmental Design' (CPTED), to assist in making the public domain a safer place.

Principle 3: Recognise the intrinsic value of biodiversity and natural ecosystems, and protect and restore them.

A. Objectives

- Our natural habitats are healthy

This Plan recognises the value of the surrounding environment and will minimise the impact of development on that environment by:

- Requiring all design to be based on a comprehensive site analysis, to ensure that development on a site reflects each site's unique conditions;
- Ensuring that any modification of the existing land form required to facilitate development is undertaken to minimise the impact on surrounding lands; and
- Including provisions to reduce the likelihood of development or activities increasing the salinity of land.

This Plan promotes biodiversity conservation through:

- Protection of known areas of biodiversity value;
- Protection of threatened species and ecological communities;
- Protection of watercourses, wetlands and riparian corridors;
- Protection of remnant native bushland; and
- Requiring that all significant areas of vegetation be assessed to determine their value prior to any development being designed for the site.

This Plan helps to reverse previous negative impacts on biodiversity conservation through:

- Encouraging replanting of key identified corridors, including riparian corridors; and
- Encouraging the use of plant species native to the area in all forms of landscaping.

This Plan helps to reduce the negative impact of development on air quality through encouraging alternate means of transport (e.g. cycling and walking).

This Plan helps to minimise the impact of poor air quality on amenity through:

- Encouraging the planting of particular species along main roads, which have proven to be effective at absorbing pollutants from motor vehicles; and
- Requiring the provision of buffer zones between polluting land uses and adjacent areas which may be sensitive to reduction in air quality.

This Plan helps to minimise the negative impact of development on water quality through:

- Minimising the risk of accidental pollution of surface and ground water sources through appropriate setbacks of potentially polluting activities from watercourses;
- Requiring soil testing to determine appropriate locations for water treatment activities;
- Encouraging the retention or replacement of vegetation along riparian corridors;
- Requiring that water quality be monitored throughout the construction process, and occasionally during occupation; and
- Requiring responsible use and storage of possible pollutants.

Principle 4: Enable communities to minimise their ecological footprint.

A. Objectives

- We use our resources wisely and take responsibility for our levels of consumption.

The ecological footprint of a city is a theoretical calculation of the land required to support that city in terms of its consumption of resources like food, energy and water, as well as for the disposal of the waste it produces. Reducing our ecological footprint means reducing this theoretical land area and represents an increase in the overall sustainability of the city.

A reduction in the ecological footprint will almost always mean an increase in the efficiency of a city's operation, either through consumption of fewer resources, production of less waste or both. It should not, however, result in a transfer of problems elsewhere.

This Plan assists in the reduction of Penrith's ecological footprint by:

- Encouraging a reduction in the amount of waste going to landfill through the inclusion of provisions relating to responsible waste management, recycling and resource reuse, and materials selection;
- Encouraging increased water re-use, either through harvesting of rainfall or the re-use of grey water, to reduce the demand for potable water;
- Encouraging the use of water efficient and energy efficient appliances; and
- Applying standards for energy efficiency to all forms of development to encourage buildings that minimise the use of electricity and gas as energy inputs.

Reducing the City's ecological footprint through the inclusion of energy efficiency principles will have the added benefits of mitigating the impacts of climate change, through decreased emission of greenhouse gases.

This Plan will also help Penrith adapt to the likely impacts of climate change by:

- Encouraging buildings to be designed to maximise natural ventilation and temperature regulation;
- Requiring drought resistant planting and landscaping;
- Requiring the harvesting and re-use of rainwater through tanks, dams and other means; and
- Requiring that the design of dwellings aims to minimise their vulnerability to extreme weather events and bushfires.

Principle 5: Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.

A. Objectives

- Our public spaces encourage safe and healthy communities.
- Our physical infrastructure is adaptable and responds to changing needs.

Natural ecosystems are inherently more sustainable than artificial ones. Thus cities as artificial ecosystems can learn from and better reflect the processes and systems of the natural world to improve their sustainability.

The characteristics of natural ecosystems include diversity, an ability to adapt, interconnectedness, resilience, regenerative capacity and symbiosis. In nature all resources are valued – there is no waste. These are all traits which can increase the sustainability of a city and which this Plan will try to encourage in development within Penrith.

This Plan will encourage development in Penrith to learn from natural ecosystems by:

- Including provisions which require development to consider all aspects of the natural environment in their design, including topography and the water cycle;
- Providing standards to guide mixed use development to help provide a diverse urban area;
- Requiring housing to consider the changing life cycle of the occupants in its design;
- Helping to minimise land use conflict through requirements for buffer zones and other measures;
- Requiring the provision of adaptable and inclusive infrastructure which meets the needs of development and is designed to accommodate likely future needs;
- Encouraging innovative responses to the provision of infrastructure, such as car parks, drainage systems, etc. which adapt to changing circumstances and mimic natural ecosystems; and
- Incorporating the principles of Universal Design, adapting our built environments so they are suitable for all.

Principle 6: Recognise and build on the distinctive characteristics of cities, including their human and cultural values, history and natural systems.

A. Objectives

- We build on our strengths, value our heritage, celebrate our cultural diversity and foster

creativity.

Sustainability cannot be achieved if those promoting it ignore the context of the city and the people within it. Penrith City has its own set of unique characteristics, values and history which are all an integral part of where our city has come from and where it is heading. For Penrith to be a truly sustainable city, these characteristics, values and history must be recognised in our past and reflected in our future.

This Plan will help to recognise our past through:

- Including European heritage provisions, which protect our built heritage of the last 200 years and the people who contributed to the framework and fabric of our city;
- Including Aboriginal heritage provisions which recognise the original custodians of the land, their role in protecting it and their ongoing role in providing diversity in our society and a link with the past; and
- Including social planning provisions that seek to recognise and reinforce the cultural and social character of key areas.

This Plan will build on the distinct characteristics of Penrith by:

- Recognising that particular types of land use within the City require specific controls;
- Developing character statements for individual precincts that have unique features or development requirements;
- Including provisions that are aimed at protecting the scenic and landscape character of Penrith; and
- Including provisions that encourage development in Penrith to respond to Penrith's unique environment, particularly climate, soil, topography and natural hazards.

Principle 7: Empower people and foster participation.

A. Objectives

- We have a say in our future.

For a city to be sustainable, it must have the support and commitment of all sections of the community, not just those who have the means to make their voice heard. An increase in sustainability will only be achieved if the majority of the community recognise it as a legitimate goal and work together to achieve it.

This Plan will help to provide people with an opportunity to have a say in their future by:

- Requiring that certain development be advertised, to give neighbours and others that might be affected the opportunity to comment;
- Requiring that all likely affected parties are told about any development which substantially breaches outlined development standards;
- Providing information about the type of development that can be expected in Penrith; and
- Providing people with the opportunity to help guide development in Penrith, through the exhibition of this Plan and any future amendments.

Principle 8: Expand and enable cooperative networks to work towards a common, sustainable future.

A. Objectives

- We play an active role in our communities

Sustainability is a worldwide issue and Penrith cannot hope to achieve it on its own. Other local government areas within Australia and worldwide are also making advances towards sustainability and it is vital that we learn from their experiences.

This Plan will learn from others by being reviewed on a regular basis, taking account of best practice in promoting sustainable development both nationally and internationally. It will also learn from others through seeking and considering comments from the community and developers during the development and ongoing review of this Plan.

This Plan will assist in sharing knowledge through providing links to additional information throughout the text and through being publicly available, free of charge, through Council's web site.

This Plan will assist people to play an active role in their communities through:

- Encouraging the provision of community spaces, both (internal and external) for future developments within the City. Use of these spaces will help to encourage meeting and gathering and help develop a sense of community, which will in turn encourage people to have a say in how their community develops;
- Encouraging development to consider social needs and potential social impacts, to minimise and mitigate against potential impacts within both the existing and future communities;
- Encouraging a diverse community, which in turn helps foster a feeling of inclusiveness;
- Providing opportunities for people to participate in decision making; and
- Encouraging developers to recognise the human need to connect with nature, with their community and with their city, and take this concept into consideration in development design.

Principle 9: Promote sustainable production and consumption, through appropriate use of environmentally sound technologies and effective demand management.

A. Objectives

- We encourage sustainable production and technologies.

This Plan will help encourage sustainable production through:

- Requiring, where appropriate, Waste Management Plans to be prepared that consider all aspects of waste generation, recycling and disposal during design, demolition, construction and operation.
- Encouraging developers to source construction and fit out materials from sustainable sources;
- Encouraging developers and the community to consider the life cycle costs of products installed and used in construction and operation of buildings; and

- Encouraging the adoption of innovative technologies and designs, where they will have a positive sustainability outcome without an adverse impact on the amenity of the surrounding area.

This Plan will demonstrate a commitment to sustainable technologies through:

- Encouraging developers to consider technology at the design stage, so that necessary infrastructure can be installed, regardless of whether or not it can be used to its full effect at the time of construction; and
- Providing controls that, where possible, have flexibility in the way they can be met so new technologies can be adopted as they become available.

Principle 10: Enable continual improvement, based on accountability, transparency and good governance.

A. Objectives

- We demonstrate accountability, transparency and ethical conduct.

Good urban governance requires robust processes towards achieving the transformation of cities to sustainability through continual improvement.

This Plan contributes towards continual improvement through:

- Including within it exemplar provisions which can be measured, to allow benchmarking of the overall change in the level of sustainability measures being implemented by development in Penrith;
- Being subject to ongoing review (as with all planning documents and policies within Penrith), so that achievements can be measured and controls which are not resulting in the expected outcome can be changed; and
- Providing clear and comprehensive information to developers and the community about the development process and what type and standard of development the Council would like to see in Penrith.