



CUNDALL

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The Rozelle Village EA ESD Report

Prepared for

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<p>The success and realisation of the proposed initiatives will be dependent upon the commitment of the design team, the development of the initiatives through the life of the design and also the implementation into the operation of the building. Without this undertaking the proposed targets may not be achieved. The use of computer simulation is by its nature predictive with output based on historic weather data and standard assumptions. The results of any computer simulations within this report do not guarantee future performance.</p>					

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Contents

Executive Summary	1
1 Introduction	2
1.1 Minimum Requirements	2
1.2 Sustainability Principles	3
1.3 Evaluation Principles	3
1.4 Methodology	4
2 Sustainability Objectives	5
3 Sustainability Strategies	7
3.1 Objective: Life Cycle Carbon Footprint Reduction.....	7
3.2 Objective: Operational Carbon Footprint Reduction.....	7
3.3 Objective: Embodied Carbon Footprint Reduction	11
3.4 Objective: Achieve a Green Star Rating.....	12
3.5 Objective: Potable Water Reduction	13
3.6 Objective: Provide Quality Internal Environments	15
3.7 Objective: Water Sensitive Urban Design (WSUD).....	18
3.8 Objective: Green Star Communities Framework	19
4 Conclusion	19
5 Appendix A - Green Star Strategy Report	20
6 Appendix B – BASIX Minimum Requirements	22

Executive Summary

A framework has been created to guide the development of a sustainability management plan for Rozelle Village during design, construction and operation. The framework has been derived from a body of investigative work that has resulted in a clear sustainability vision and key objectives that respond to planning requirements, local community and prospective buyer's expectations as well as the aspirations of the developer with respect to sustainability.

The development will create an innovative approach to residential living by introducing a bio-filter system providing filtered fresh air to all units, which works in combination with a high-performance façade to minimise the requirement for air-conditioning.

The design performs well in excess of minimum requirements, considerably exceeding BASIX, BCA Section J and SEPP 65 requirements to meet ambitious targets in energy, water and material resource savings, as well as high standards of Indoor Environmental Quality.

Rozelle Village seeks to:

- Offer a leading wholistic & sustainable development for Australia;
- Showcase innovation in community ownership and carbon accounting;
- Commit to a long term approach to improving performance;
- Consider Australia's international obligations for global sustainability.

The following targets have been set for the Rozelle Village:

- Reduce operational carbon emissions by at least 40%, using a combination of high-performance façade, biofiltration, trigeneration and renewable energy generation;
- Reduce embodied energy by at least 25%, using efficient design and high recycled content construction materials;
- Reduce total carbon footprint by at least 25% (including operational and embodied energy),
- Work with the GBCA to achieve a 5-Star rating under the Green Star Custom Rating tool, with a focus on energy, water, indoor environmental quality and innovation;
- Cut potable water demand by 65%, by treating on-site wastewater and harvesting rainwater for use in laundry, toilets, urinals, cooling towers, wash-down and irrigation;
- Provide high quality indoor environments, including optimum thermal comfort, minimised contamination, excellent cross ventilation and solar access;
- Apply principles of Water Sensitive Urban Design, using stormwater filtration and capture to improve runoff quality and reduce peak flows;
- The development is being designed in line with the principles of the Green Star Communities framework.

This report outlines the Ecologically Sustainable Development (ESD) initiatives proposed for the Rozelle Village development.

1 Introduction

The Director General's Requirements state:

'14. Ecologically Sustainable Development (ESD)

The EA shall detail how the development will incorporate ESD principles in the design, construction and ongoing operation phases of the development and demonstrate the development has been assessed against a suitably accredited rating scheme to meet industry best practice. In particular it shall address:

- *Water quality management for the site including an integrated water management plan to include any alternative water supply, proposed end uses of potable and non-potable water, demonstration of water-sensitive urban design and any water conservation measures;*
- *Operational waste management and reduction measures;*
- *Address how the proposed buildings will produce and conserve energy'.*

This report will demonstrate that the Rozelle Village development incorporates all of the above requirements in addition to many other Ecologically Sustainable Design (ESD) initiatives that exceed minimum requirements.

The site is subject to minimum regulatory requirements for sustainability, which include BASIX and the Building Code of Australia (BCA) Section J for Energy Efficiency.

Beyond these regulatory requirements, the development team seeks to greatly exceed minimum requirements and is striving to deliver world leadership sustainability outcomes in design, construction and operation. This report outlines the design principles and targets that will be further developed throughout detailed design and construction.

1.1 Minimum Requirements

Minimum regulatory ESD requirements applying to this site include the following:

- BCA Section J for Energy Efficiency;
- Building & Sustainability Index (BASIX)

1.1.1 Building Code of Australia Section J

The Building Code of Australia (BCA) Section J sets minimum energy performance requirements for all new development, which cover air-conditioning, ventilation, lighting, power and hot water, as well as building fabric considerations including thermal construction and insulation, building sealing, glazing and shading. The proposed design will be developed to exceed the BCA energy efficiency requirements.

1.1.2 BASIX

New residential developments in NSW must reduce their energy and water use, according to BASIX requirements developed by the Department of Planning. The objectives of the BASIX scheme are relative to an average development in NSW.

- 40% reduction in water consumption;
- 20% reduction in greenhouse gas emissions for 5 stories & over;
- Minimum thermal performance requirements for heating and cooling loads.

The project targets for emissions, water savings and thermal comfort greatly exceed the minimum BASIX requirements.

A detailed BASIX assessment will be carried out during design development.

1.2 Sustainability Principles

The following sustainability objectives will form the basis of evaluation and decision making:

- Implementing ESD solutions that reduce operating costs for owners, residents and patrons;
- Reducing greenhouse gas emissions through energy efficiency of infrastructure, building services and building façades;
- Minimising embodied energy and embodied water in construction;
- Minimising natural resource consumption, waste, pollution and toxicity during construction and operation;
- Reducing potable water use and flows to sewer;
- Providing high quality internal and external environments in terms of internal air quality, light and comfort;
- Improving quality of stormwater, minimising peak runoff quantities and preserving natural waterways;
- Improving the ecological value of the site and surrounds;
- Engaging and respecting the community.

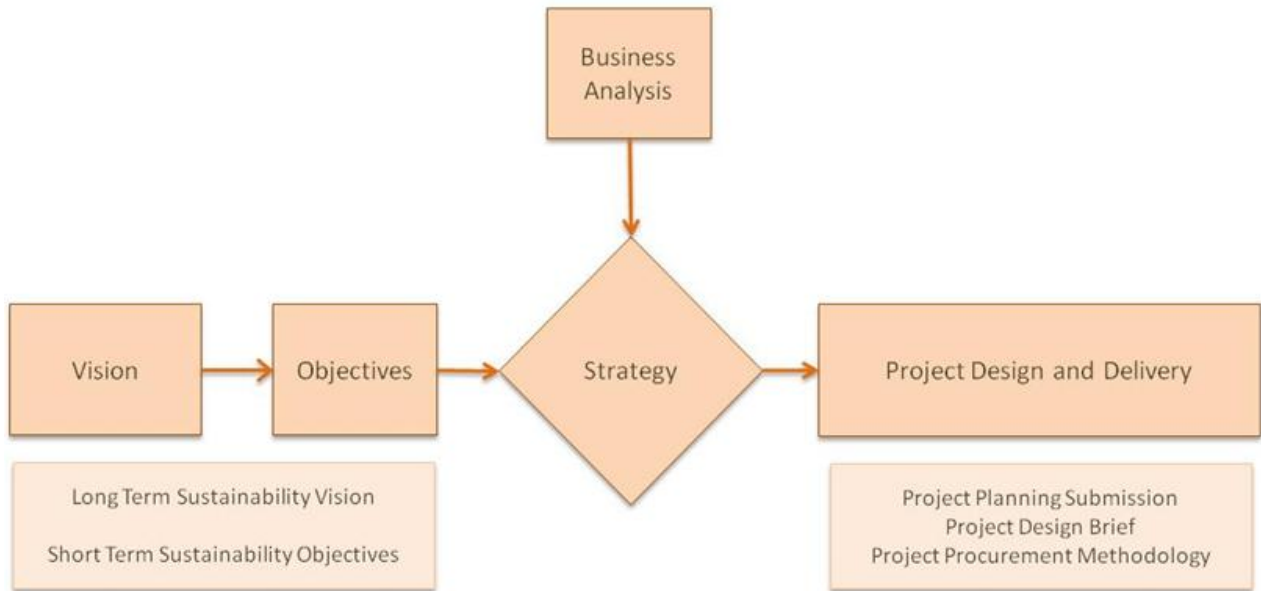
1.3 Evaluation Principles

Sustainability initiatives will be evaluated during the detailed design phases in accordance with the following principles.

- **Future-proofing & adaptability** - Design into the future 2020+, Maximise design flexibility to enable adaptation to future technology;
- **Operational Certainty** – Ensure operational performance certainty and verify sustainability outcomes over the long-term;
- **Design Quality** - Maximise connection and passive use of the natural environment to enhance the quality of facilities that support the development of building social and community networks;
- **Visible/communicable strategies** - Provide key visual sustainability elements that engage visitors, staff and residents;
- **Cost-benefit assessment** methodology will be the overarching framework for assessment, taking into account carbon tax pricing to inform investment decisions. Place an emphasis on opportunities which lower total occupancy costs over the long-term;
- **Community Contribution** – proposed initiatives will be considered in the context of the surrounding community.

1.4 Methodology





The flowchart below illustrates the methodology behind the body of investigative work that was used to determine key sustainability objectives, set targets for each objective and identify potential strategies to achieve these targets.

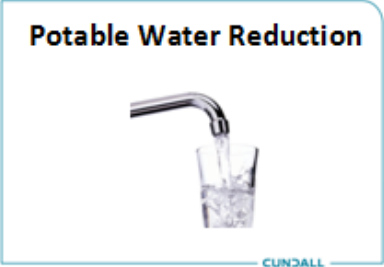





2 Sustainability Objectives

Key objectives have been identified by the project design team that respond to planning requirements, local community and prospective buyer's expectations as well as the aspirations of the developer with respect to sustainability.

The intent of each objective has been outlined and a target set in order to provide measurable goals for sustainability performance. Targets have been established with regard to current best practice environmental performance.

Sustainability Objective	Intent	Target
<p>Life Cycle Carbon Footprint Reduction</p>  <p>CUNDALL</p>	<p>To reduce the life cycle carbon footprint of the development, including operational and embodied.</p> <p><i>Savings represent a reduction from the NSW average energy consumption and are based on benchmarking of similar developments. Targets are for the base building development only.</i></p>	<p>Minimum 25% reduction in total carbon footprint with a stretch target of 30%.</p>
<p>Operational Carbon Reduction</p>  <p>CUNDALL</p>	<p>To reduce operational energy consumption and inherent carbon emissions.</p> <p><i>Savings represent a reduction from the NSW average energy consumption and are based on benchmarking of similar developments. Targets are for the base building development only.</i></p>	<p>Minimum 40% reduction in greenhouse gas emissions with a stretch target of 50%.</p>
<p>Embodied Carbon Reduction</p>  <p>CUNDALL</p>	<p>To reduce the embodied carbon footprint of the development.</p> <p><i>The target is compared to the current baseline for an equivalent mixed use development.</i></p>	<p>Minimum 25% reduction with a stretch target of 30%.</p>
<p>Green Star Rating</p>  <p>CUNDALL</p>	<p>To demonstrate environmental stewardship by adopting a green rating tool widely accepted in the Australian market.</p> <p><i>Green Star is being used to rate new residential buildings at Barangaroo, Frasers Broadway, Macquarie Central and in leading projects such as One Alfred St and Antias. In adopting this rating system, Rozelle Village will position itself as a leading example of sustainable design against other developments aspirations.</i></p>	<p>5 Star minimum rating using the 'Custom' rating process, with a stretch target of 6 Stars.</p>

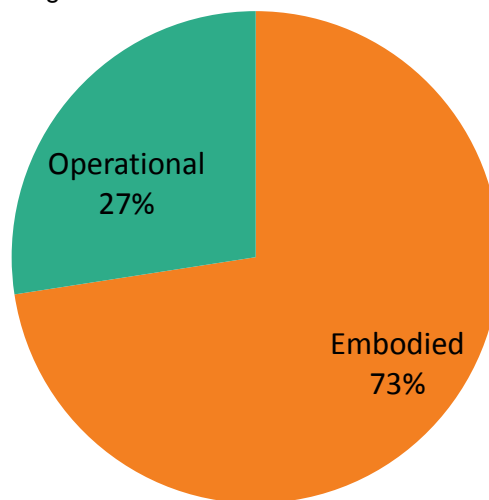
Sustainability Objective	Intent	Target
<p>Potable Water Reduction</p> 	<p>To reduce the potable water requirements by minimising the total water requirements and maximising the use of recycled and/or natural water sources.</p> <p><i>(Savings represent a reduction from the NSW average energy consumption and are based on benchmarking of similar developments. Targets are for the base building development only).</i></p>	<p>Reduce potable water demand by 65%.</p>
<p>Quality Indoor Environments</p> 	<p>To maximise the quality of the indoor environment through clean fresh air, natural light and views.</p> <p>To minimise the number of hours throughout the year where occupants require heating or cooling to maintain comfort conditions.</p> <p>Provide outstanding amenity by exceeding SEPP65 requirements for solar access and cross-ventilation.</p>	<p>Average 7.5-Star NatHERS Thermal Comfort performance for units (average maximum 30MJ/m² per annum);</p> <p>Achieve at least 50% of Green Star credits available for IEQ;</p> <p>Provide cross-ventilation to at least 70%, and solar access to at least 70% of dwellings.</p>
<p>Water Sensitive Urban Design</p> 	<p>To incorporate water sensitive urban design principles (WSUD).</p>	<p>Stormwater runoff to meet minimum reductions of: 80% in Total Suspended Solids, 85% in Gross Pollutants, 30% in total nitrogen and 30% in total phosphorus.</p>
<p>Green Star Communities</p> 	<p>To deliver a responsible, liveable, community that is economically prosperous, socially engaging and environmentally accountable.</p> <p><i>A rating tool has not yet been developed however the Communities framework is currently being considered in the planning of new communities.</i></p>	<p>Design in accordance with the Green Star communities framework</p>

3 Sustainability Strategies

3.1 Objective: Life Cycle Carbon Footprint Reduction

Target: 25-30% reduction compared to current best practice:

- Minimum 40%-50% reduction in operational carbon emissions;
- Minimum 25- 30% reduction in embodied carbon emissions;
- Engage residents and tenants with Green fitout/refurbishment guidelines;
- Establish a community carbon fund for ongoing carbon reduction and target carbon neutrality by 2030;
- Investigate the potential to future-proof the development by building in flexibility to adapt and connect to future technologies.



Preliminary analysis indicates a 27%/73% split between operational and embodied emissions.

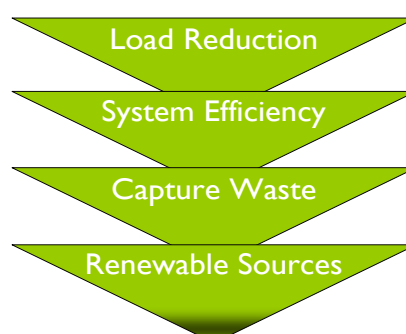
3.2 Objective: Operational Carbon Footprint Reduction



Target: 40% - 50% reduction compared to current best practice



The Rozelle Village development is targeting a minimum 40% reduction in operating greenhouse gas emissions, compared to standard development benchmarks. A stretch target of 50% reduction in greenhouse gas emissions will be investigated during detailed design.

Once loads have been reduced as far as possible through efficient building forms and services, alternate sources of energy will be adopted, such as recovery of waste heat and low-carbon and renewable energy technologies.

Key strategies to be considered during design development are outlined overleaf.

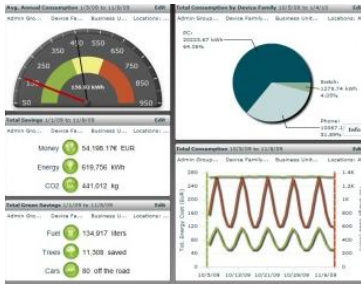


System	GHG Emissions Reduction Strategies
<p>Passive Design</p>	<p>Effective passive design will reduce the amount of air-conditioning required and improve internal comfort and amenity. Passive design strategies adopted for Rozelle Village include:</p> <ul style="list-style-type: none"> • A biofilter will provide tempered fresh air to bedrooms, reducing air-conditioning requirements within units. See Section the section on Indoor Environmental Quality (IEQ) for further details); • Insulation, high-performance low-e double glazing in combination with external shading devices, ventilation openings and light coloured external finishes to minimise heat island effects; • Minimisation of heating and cooling requirements through facade optimisation (average thermal loads in apartments not to exceed 30MJ/m² per annum).
<p>Heating, Cooling & Ventilation</p>  <p>Lighting</p> 	<p>High efficiency HVAC services including centralised chilled water for retail and commercial spaces;</p> <p>Ventilation systems will be optimised with carbon monoxide and/or thermostatic sensor control;</p> <p>Air conditioning in retail/commercial spaces will be zoned so that only occupied areas are cooled, and spaces with different occupancy patterns or different cooling loads are zoned separately, with absence-off control. Switches will be incorporated to shut-down any non-essential power and lighting to apartments when they are unoccupied;</p> <p>Car parks will have mechanical ventilation incorporating CO monitoring and Variable Speed Drives (VSD) to reduce overall fan energy;</p> <p>Apartments will be designed with only the capability of providing water cooled A/C in the future utilising the condenser water system available for the commercial/retail areas. Occupants will be encouraged to utilise natural ventilation only, without installing AC.</p> <p>Residential bathrooms and laundries will be individually ducted to the façade, with efficiency controls.</p> <p>Residential common areas and lobbies will be naturally ventilated.</p> <p>Efficient light fittings will installed throughout, including fluorescent or LED lamps, with efficiency controls such as daylight dimming, timers and motion sensors in car parks, common areas and infrequently used areas such as plant rooms. Lighting zones will be individually addressable.</p> <p>Connect external lighting to daylight sensors & time switches, with minimal light pollution impacts</p>

System	GHG Emissions Reduction Strategies
<p>Appliances</p> 	<p>Highly efficient appliances will be provided to all units, including dishwashers, clothes washers and dryers within 1-Star of the top efficiency rating.</p> <p>Refrigerators will be installed, with a minimum 4-Star energy rating in a well-ventilated cavity to improve operational efficiency and eliminate the potential for occupants to bring old/inefficient models.</p> <p>Gas cooktops will be provided, with consideration given to gas ovens.</p>
<p>Metering</p> <p>☀️ Power generated: 14.4kW</p> <p>☀️ Energy saved today: 60.0kWh</p> <p>☀️ CO₂ saved today: 51.1kg</p>	<p>Smart-meters will be provided to apartments so that residents can monitor and track their energy and water consumption, increasing awareness of consumption patterns and savings;</p> <p>Sub-metering will be provided for major energy uses (greater than 100kVa), to help identify areas of inefficiency with potential for improvement;</p> <p>BMS control for lighting and ventilation (including deactivation in unoccupied spaces).</p>
<p>Vertical Transportation</p>	<p>Lifts will be of the regenerative drive type.</p> <p>Lift car lighting will be LED or better and on occupancy sensor 100% of the time to ensure they are off when standing-by, fans should have occupancy control. Vertical transport will demonstrate operational efficiency in both stand-by and travel mode. Lift shaft and motor room lighting best-in-class efficient AND on motion control/PIR sensors and off after hours.</p>
<p>Co/trigeneration</p>	<p>Cogeneration plant is being considered to provide low-carbon onsite electricity generation. Waste heat would be utilised for pool heating and domestic hot water for apartments, retail and commercial spaces. Absorption cooling would be incorporated to convert waste heat from the cogeneration system into chilled water for cooling of the retail and commercial spaces.</p>
<p>Renewable energy technologies</p> 	<p>A photovoltaics (PV) array will be installed to provide carbon-free energy for base building services such as lighting, ventilation and lifts. Approximately 100kW photovoltaic array will be installed for onsite renewable energy generation (1200m²).</p> <p>Other renewable energy technologies will be considered during design development stages.</p>

System	GHG Emissions Reduction Strategies
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Education



Engage commercial and retail tenants to reduce operational energy consumption. Consider widened temperature bands within transitional zones and potentially commercial tenancies.

Promotion of sustainability through education and information enables tenants of buildings and consumers to make more informed decisions;

Consider integrating sustainability and community interpretation into lift car finish design. Investigate “building dashboard” reporting on Interlink style electronic information boards, for building and sustainability real-time information;

Incorporate sustainability, cultural and community interpretation into finishes, design, features, art and furniture, way-finding which incorporates green travel, community and services signage and information.

Transport



Secure, accessible bicycle parking facilities will be provided for residents and staff, including showers, lockers and change rooms. 110 staff bicycles are being provided. A further 168 bicycle racks are being provided for visitors.

Good access and path networks will encourage residents and visitors to cycle, improving health and reducing greenhouse gas emissions from transport.

A ‘Green Travel Plan’ will be developed, outlining sustainable transport initiatives available to building users and occupants. Real-time travel information will be provided electronically to residents, staff and visitors.

A number of car spaces will be provided with access to electric car charging points, subject to community consultation and uptake of this technology. In addition, there is a car parking space dedicated to vehicles using a car-sharing scheme (such as ‘Goget’ in order to minimise emissions-intensive private vehicle use.

Waste



A Waste Reduction Plan will be implemented to reduce the volume of waste being collected.

Waste compactors will be provided in kitchens;

A dual-shute system will be used in the residential towers for separation of general and recyclable waste;

Tenants will be engaged to encourage the reduction of packaging or using recycled packaging.

Future-proofing

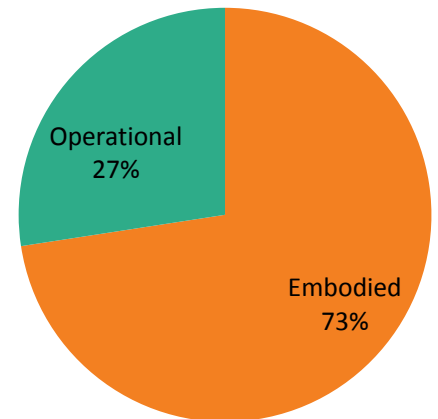
Design for adaptability and flexibility, allowing change of use, future efficiency upgrades and ease of refurbishment. Plant rooms and risers allow for future low-carbon technology upgrades.

3.3 Objective: Embodied Carbon Footprint Reduction

Target: 25-30% reduction compared to current best practice

Key strategies to be considered during design development include:

- Require buildability to be a priority when contracting a builder;
- Encourage innovation and the use of modular & durable systems;
- Encourage the sourcing of local products and materials;
- Apply the Green Star Design for Disassembly and Dematerialisation credit criteria as a guideline to encourage minimal material use and end-of-life component reuse;
- Consider the following items in detail:
 - Sub-structure
 - Maximise recycled content of materials in structural components.
 - Super-Structure
 - Maximise recycled content in concrete and formwork.
 - Envelope
 - Adopt a low-carbon, lightweight approach;
 - Consider necessity of massing elements;
 - Consider composite materials or dual function elements.
 - Internal Walls
 - Consider necessity of internal walls;
 - Consider recycled content or reused materials;
 - Consider low carbon steel framing.
 - Internal Finishes
 - Consider setting a recycled content target for all finishes;
 - Consider epoxy or sealed vinyl finishes over vitrified and tiled surfaces;
 - Consider architectural expression of structure rather than needing additional finishes.
 - Services
 - Minimise high carbon intensity metals, extent of electrical cabling and ductwork, pipework, plant;
 - Ensure right-sizing of services;
 - Consider vertical transport as a critical element due to the scale of the development - reduce lift car weights and finishes;
 - Review maintainability at schematic design stage;
 - Implement sustainable procurement policy for maintenance and replacement.



3.4 Objective: Achieve a Green Star Rating

Target: 5-Star minimum rating under the Green Star 'Custom' tool, with an aspiration to reach 6-Stars



Refer to the *Green Star Strategy Report* (Appendix A) for specific details of credit selection. As a summary, the proposed strategy places emphasis on the key sustainability objectives for the project: minimising operational energy and embodied carbon, minimising potable water consumption and optimising thermal comfort and amenity.




3.5 Objective: Potable Water Reduction

Target: 65% reduction compared to current best practice

Key strategies are outlined in the following table:

System	Water-saving Strategies
<p>Fittings, fixtures & appliances</p> 	<p>All fixtures and fittings will be within 1-Star of the highest efficiency water-rating, with options on control to minimise total consumption (all areas tenants; common areas, landscaping, cooling towers, retail & commercial areas).</p> <p>Water efficient appliances will be installed in all apartments, including 5 star water-efficient dishwashers.</p> <p>Select equipment and size pipe-work to maximise efficiency;</p> <p>Install a pool evaporation blanket.</p>
<p>Recycled water use</p> 	<p>Wastewater from the development will be captured and treated to a high standard for reuse in:</p> <ul style="list-style-type: none"> • Toilet/urinal flushing; • Cleaning & wash-down; • Laundry; • Cooling tower water make-up.
<p>Cooling Towers</p>	<p>Rainwater will be harvested from the rooftop for use in:</p> <ul style="list-style-type: none"> • Landscape irrigation; • Swimming pool top-up; • Dedicated car-washing bays. <p>Cooling towers will be designed to have 6 cycles of concentration or greater, reducing water consumed in air-conditioning by up to 50%, as well as reducing chemical use in treatment;</p> <p>Cooling towers will be maintained to minimise water loss through leaks, overflow, evaporation, bleed, drift and splash. Refer to the Best Practice Guidelines for Cooling Towers (Sydney Water, 2007) and Water Efficiency Guidelines (DEH 2006) for further guidance.</p>
<p>Fire System Test Water</p>	<p>Fire test & maintenance drain-down water will be captured and stored for reuse on-site;</p> <p>Isolation valves or shut-off points will be provided to each floor for floor-by-floor testing.</p>

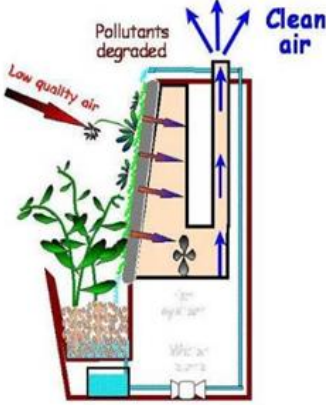

System	Water-saving Strategies
<p>Flows to Sewer</p>	<p>Estimated wastewater discharge to sewer will be significantly reduced relative to a standard building through the implementation of water efficiency measures and wastewater recycling.</p>
<p>Landscape</p> 	<p>The use of native, drought-resistant planting will be encouraged to reduce water consumption used in irrigation. Sub-soil irrigation systems with moisture sensors should be considered where non-native species are selected.</p>
<p>Metering</p>	<p>Sub-metering will be provided for major water uses, to identify abnormal usage patterns usually associated with leaks, helping to reduce the considerable water lost in this way. In addition, they will allow water efficiency measures to be monitored and tracked;</p> <p>Smart meters (displays) to each apartment and tenancy to encourage awareness and therefore reduction of consumption.</p>
<p>Education</p>	<p>Publicise water-saving initiatives and provide education for tenants.</p>

3.6 Objective: Provide Quality Internal Environments

Targets:

- Achieve an average of 7.5-Stars (average 30MJ/m2 per annum) NatHERS rating in residential apartments;
- Achieve a minimum of 50% of the Green Star credits for Indoor Environmental Quality;
- Provide cross-ventilation to at least 70% of apartments;
- Provide solar access to at least 70% of apartments.

Key strategies to be considered during design development include:

Item	Strategies to improve IEQ
<p>Biofilter</p>  	<p>An extensive biofiltration system draws purified outside air into the apartments for ventilation and cooling.</p> <p>Biofiltration is the term used to describe the process of improving air quality through biological means. The technique uses a combination of living material and ventilation to remove dissolved pollutants and chemicals from the atmosphere.</p> <p>A vertical hydroponic system at Rozelle Village incorporates a network of plants grown in a felt fabric, acting as a 'breathing wall' allowing air to be drawn through the layer of foliage and across the root mass.</p> <p>Air borne pollutants are broken down by symbiotic microbes contained in the roots of plants, rendering the pollutants inert and thus improving air quality. In addition to improved IAQ the air temperature will stabilise as it passes through the vegetation and moist layer of fabric. Once filtered, the air is returned to the internal environment via ductwork located behind the wall.</p> <p>Benefits of the system include:</p> <ul style="list-style-type: none"> • A combination of living material and increased fresh air rates removes dissolved pollutants and chemicals from the atmosphere, providing improved indoor air quality and occupant comfort; • The system doesn't rely on chemicals to remove pollutants and contaminants; • Traditional air filters have a limited life expectancy ; • Reduces HVAC energy consumption and may discourage residents from installing AC; • Provides occupants with a connection to the external environment; • The design ensures high fresh air rates can still be maintained even when wind speeds are too high at the upper levels of the building, to allow for natural ventilation; <p>This is a highly innovative approach to residential development in Australia.</p>

Item	Strategies to improve IEQ
<p>SEPP 65 Amenity</p>	<p>SEPP65 requirements for amenity in multi-residential apartments are exceeded as follows:</p> <ul style="list-style-type: none"> • Cross-ventilation is provided to at least 70% of apartments; • Solar access is provided to 73% of apartments.
<p>Thermal Comfort</p> 	<p>Thermal comfort in apartments will be improved using the following initiatives:</p> <ul style="list-style-type: none"> • Optimise the balance between solar heat gain in winter and summer as well as thermal transfer; • Optimise the balance between minimising glazed area to minimise heat transfer and maximising views; • Provide minimum R2.5 external wall thermal insulation, R3.5 roof insulation and R1.0 beneath exposed slabs (including those above car parks); • Consider ceiling fans to all apartments to create air movement and enhance comfort in both winter and summer; • Ensure windows can be left open a small amount to allow user control of fresh air in winter; • Ensure windows can be opened sufficiently for natural ventilation in summer; • Provide venetian blinds for solar glare control and privacy.
<p>Acoustic Quality</p>	<p>Internal noise will be restricted to acceptable levels in accordance with Australian Standard AS/NZS 2107:2000, including general building and services noise.</p>
<p>Daylight, glare and views</p> 	<p>Optimise glazed areas and shading elements to allow maximum daylight, views, and winter sun, while minimising uncomfortable glare and excessive solar heat gains in summer. Glazing will be selected with a high Visual Light Transmission to maximise daylight penetration and views, while mitigating glare and excessive solar heat gains.</p> <p>Building orientation has been heavily influenced by a desire to maintain excellent views to residents, while still providing good levels of thermal comfort by controlling solar gains.</p>

Item	Strategies to improve IEQ
<p>Air quality</p> 	<p>Careful consideration of significant ventilation openings to maximise natural cross-ventilation and reduce AC energy;</p> <p>Contamination of indoor air will be removed at source through:</p> <ul style="list-style-type: none"> - Specification of appropriate finishes such as low-VOC carpets, paints, adhesives and sealants; - Non-toxic internal material selections; - Low-formaldehyde joinery and engineered wood products; - Kitchens, bathrooms and other high-contamination areas will be separately exhausted without recirculation. <p>Fresh air intakes will be located to minimise external contamination;</p>
<p>Emissions & Toxicity</p> 	<p>Where alternative materials are available at comparable quality, performance and cost, the following materials should be avoided in construction:</p> <ul style="list-style-type: none"> • Asbestos; • Cadmium; • Chlorinated Polyethylene and Chlorosulfonated Polyethylene; • Chlorofluorocarbons (CFCs); • Chloroprene (Neoprene); • Formaldehyde (added); • Halogenated Flame Retardants; • Hydrochlorofluorocarbons (HCFCs); • Lead (added); • Mercury; • Petrochemical Fertilizers and Pesticides; • Phthalates; • Polyvinyl Chloride (PVC) and • Wood treatments containing Creosote, Arsenic or Pentachlorophenol.



3.7 Objective: Water Sensitive Urban Design (WSUD)

Targets:

- Stormwater runoff to achieve a high quality of treatment, targeting the following reductions. Achievement of the stretch target is subject to detailed design development:

	Minimum Requirement	Stretch target
Total Suspended Solids	80%	80%
Gross Pollutants	85%	90%
Total Nitrogen	30%	45%
Total Phosphorus	30%	60%

- Peak stormwater runoff not increased for a 1.5 Average Recurrence Interval (ARI).

<i>Item</i>	<i>Strategies to improve WSUD</i>
<p>Stormwater Quantity</p> 	<p>Peak runoff quantities will be reduced by rainwater harvesting from rooftops for reuse on-site.</p> <p>Pervious areas are being increased in order to ensure that pre-development water balances on-site are maintained as much as possible.</p>
<p>Stormwater Quality</p> 	<p>Stormwater filtration equipment will be installed in the basement to improve the quality of stormwater runoff.</p> <p>Green roof areas (including communal gardens at the podium roof) will also assist in improving stormwater runoff quality.</p>

3.8 Objective: Green Star Communities Framework

Target: To deliver a responsible, liveable, community that is economically prosperous, socially engaging and environmentally accountable, in accordance with the Green Star ‘Communities’ framework.

Framework Category	Strategies
 Enhance liveability	Diverse, affordable, healthy, safe. Fostering inclusiveness- fun for all ages, community adaptability.
 Create opportunities for economic prosperity	Promote education, encouraging local goods and services, attracting investment
 Foster environmental responsibility	Reduce ecological foot print, enhance the natural environment, sustainable food production
 Embrace design excellence	Framework to deliver a shared design vision in collaboration with all partners, sense of place.
 Demonstrate visionary leadership and strong governance.	Implement framework that is transparent, accountable and adaptable. Encourage and reward innovation. Consideration of total environmental footprint provides visionary leadership. Green Star rating provides a recognized framework for measurement of environmental stewardship.

4 Conclusion

The ESD initiatives outlined in this report demonstrate that the Rozelle Village development greatly exceeds minimum requirements and sets an example of leadership in sustainable development in Australia. The project has taken a holistic approach to sustainability, considering not only operational performance but also the impacts of construction including embodied energy and the toxicity of supply chains.

Key strategies such as a high performance façade, biofilter ventilation system and careful selection of finishes will ensure an optimum indoor environmental quality (IEQ) is achieved. Efficient fittings, fixtures and appliances will minimise water consumption which, when combined with full wastewater treatment, will assist in meeting ambitious water saving targets. Efficient building form, fabric and services will support key low-carbon technologies such as trigeneration and photovoltaic energy systems to meet stringent operational energy requirements.

Further to energy, water and IEQ, the project considers a broad range of environmental impact categories, including ecology, community, materials, transport, WSUD and ongoing management.

5 Appendix A - Green Star Strategy Report

The proposed Green Star strategy is outlined in the following table, showing credits that have been identified to achieve a 5-Star rating, as well as a number of credits identified to provide a safety margin. During detailed design, the specific credits claimed may be modified, provided that the 5-Star Green Star rating is maintained. During design development, additional credits will be investigated to move the development towards a stretch target of 6-Stars.

Category	Title	Credit No.	Points Available	Points Achieved
Management				
	Green Star Accredited Professional	Man-1	2	2
	Commissioning	Man-2	2	2
	Building Tuning	Man-3	3	3
	Independent Commissioning Agent	Man-4	1	1
	Building Users' Guides	Man-5	2	2
	Environmental Management	Man-6	2	2
	Waste Management	Man-7	2	2
	Building Management and Control System	Man-9	2	2
	Learning Resources	Man-10	1	1
	Maintainability	Man-11	1	1
	Metering	Man-16	5	5
		TOTAL	23	23
Indoor Environment Quality				
	Ventilation Rates	IEQ-1	3	1
	Air Change Effectiveness	IEQ-2	2	0
	Indoor Pollutant Monitoring & Control	IEQ-3	1	1
	Daylight	IEQ-4	3	1
	Thermal Comfort	IEQ-5	3	2
	Hazardous Materials	IEQ-6	1	1
	Internal Noise Levels	IEQ-7	3	3
	Volatile Organic Compounds	IEQ-8	4	4
	Formaldehyde Minimisation	IEQ-9	1	1
	Daylight Glare Control	IEQ-11	1	1
	Electric Lighting Levels	IEQ-13	1	1
	External Views	IEQ-14	1	1
	Exhaust Riser	IEQ-16	0	NA
	Air Distribution System	IEQ-17	1	0
	Small Occupied Spaces	IEQ-23	0	NA
		TOTAL	25	17
Energy				
	Conditional Requirement	Ene-	Required	Yes
	Greenhouse Gas Emissions	Ene-1	20	10
	Peak Electricity Demand Reduction	Ene-3	2	1
		TOTAL	22	11
Transport				
	Provision of Car Parking	Tra-1	2	0

Fuel Efficient Transport	Tra-2	1	0
Cyclist Facilities	Tra-3	3	3
Commuting Mass Transport	Tra-4	5	5
Transport Design and Planning	Tra-6	2	2
	TOTAL	13	8
Water			
Potable Water	Wat-1	10	7
Fire System Water Consumption	Wat-5	1	1
	TOTAL	11	8
Materials			
Recycling Waste Storage	Mat-1	3	3
Building Re-use	Mat-2	6	0
Recycled/Re-used Products and Materials	Mat-3	2	0
Concrete	Mat-4	3	2
Steel	Mat-5	2	2
PVC	Mat-6	2	2
Timber	Mat-7	1	1
Design for Disassembly	Mat-8	1	1
Dematerialisation	Mat-9	1	0
Flooring	Mat-11	3	3
Assemblies	Mat-12	3	3
Furniture	Mat 13	4	4
	TOTAL	31	21
Land Use & Ecology			
Conditional Requirement	Eco-	Conditional	Yes
Topsoil	Eco-1	1	1
Re-use of Land	Eco-2	1	1
Reclaimed Contaminated Land	Eco-3	2	0
Change of Ecological Value	Eco-4	4	1
	TOTAL	8	3
Emissions			
Refrigerant ODP	Emi-1	1	1
Refrigerant GWP	Emi-2	2	0
Refrigerant Leaks	Emi-3	2	2
Insulant ODP	Emi-4	1	1
Stormwater	Emi-5	3	1
Discharge to Sewer	Emi-6	4	4
Light Pollution	Emi-7	2	2
Legionella	Emi-7	1	0
	TOTAL	16	11
TOTAL			64

6 Appendix B – BASIX Minimum Requirements


The residential tower within the Rozelle Village development is required by NSW regulation to achieve BASIX targets for energy, water and thermal comfort. These are greatly exceeded by the proposed development, as shown in the following table:

Environmental Impact Category	NSW BASIX Minimum Target	Rozelle Village target
Water Savings	40%	65%
Energy Savings	20%	40-50% emissions savings across the whole development
Thermal Comfort	Pass	Average 30MJ/m2 total annual heating plus cooling load

Energy and water targets represent a percentage saving compared to a NSW average benchmark. Thermal comfort targets are a pass/fail measure and are assessed by thermal energy modelling of performance against heating and cooling load limits set by location. The project is targeting an average heating and cooling load of less than 30MJ/m2/annum (combined) in order to minimise the need for air-conditioning and achieve optimum thermal comfort for residents. This also contributes to the achievement of Green Star credits.

Water Strategies

Proposed strategies to achieve the BASIX water target of 65% reduction in potable water consumption are outlined in the table below¹:

BASIX Base Case	Water Conservation Strategies
Fixtures²	3-Star showerheads (6<7.5L/min) 6-Star kitchen and wash-hand basin mixers 4-Star dual-flush toilets.
Appliances	5-Star water-efficient dishwashers.
Recycled water	Wastewater treatment for toilets/urinal flushing, laundry, cleaning & wash-down; cooling tower make-up. Rainwater harvesting for irrigation and dedicated car washing bays as well as swimming pool top-up.
Minimum BASIX Water Savings Required	40%
Water Savings Achieved	69%
Pass?	

¹ These will be developed in further detail as the design progresses, and may vary in the final design.

² More information on water efficient appliances can be found at www.waterrating.gov.au

Energy Strategies

Key BASIX energy strategies are outlined in the following table³:

BASIX Base Case	Energy Conservation Strategies
Common Areas	<p>Natural ventilation to residential lobbies, hallways and stairs;</p> <p>Variable Speed Drive (VSD) car park ventilation (exhaust only) and carbon monoxide sensors</p> <p>Thermostatically controlled ventilation to service/plants, switch rooms and lift motor room;</p> <p>Fluorescent/LED lighting to all common areas including (but not limited to) car park, garbage rooms, lobby/stairways, hallways, gym, service/plants and switch rooms;</p> <p>Efficiency controls including timers and motions sensors to car park, common areas, lifts and plant rooms;</p> <p>BMS controlled air-conditioning system for gym area.</p>
Appliances	<p>Gas cooktop and electric oven</p> <p>4-Star refrigerator (well ventilated)</p> <p>4-Star energy efficient dishwashers</p> <p>3-Star energy efficient clothes dryers</p>
Air-conditioning and Ventilation	<p>Biofiltration system for improved air quality within apartments;</p> <p>Individual exhaust fans ducted to facade / roof for bathroom, kitchen and laundry exhaust</p> <p>Optional high-efficiency AC to individual apartments.</p>
Lighting	Dedicated LED or fluorescent lighting throughout dwellings.
Low-carbon Energy	<p>Cogeneration plant for all water heating (minimum 38% electrical efficiency)</p> <p>Photovoltaic cells (Approximately 100kWp system (1200m²))</p>
Minimum BASIX Energy Savings Required	20%
Energy Savings Achieved	44%
Pass?	✓

Note: These figures are considered conservative as the BASIX calculator cannot accurately reflect some of the more complex systems proposed at Rozelle Village.

³ These will be developed in further detail as the design progresses, and may vary in the final design

Thermal Comfort Strategies

Basix requires that each unit achieve a minimum thermal performance. This is calculated using National House Energy Rating Scheme (NatHERS), which predicts annual heating and cooling loads for a dwelling.

In order to pass BASIX requirements, these loads may not exceed the maximum heating and cooling caps proposed for a certain location. The following objectives must be met:

- Heating and cooling loads for individual dwellings must not exceed the limit specified in the BASIX scheme
- The average of heating and cooling loads of all the proposed dwellings in a development must not exceed the specified average limit.

The project is targeting an average thermal comfort performance of 30MJ/m²/year (total heating and cooling load). This will be achieved using the passive design principles outlined in the body of this report, including but not limited to:

- High performance low-e double-glazing;
- High levels of insulation for floors, walls and ceilings;
- Appropriate shading elements for solar control;
- Effective ventilation openings.