SUSTAINABLE TOWNSVILLE

TOWNSVILLE CITY COUNCIL

greenT: ESD Strategies for a Sustainable Commercial Building

Sustainable CBD "Solar Cities" commercial building (greenT)

Design Charrette Proceedings and Participants' Output
8 November 2006
Southbank Convention Centre

Organised by Townsville City Council
in partnership with Cafalo Pty Ltd and The Natural Edge Project

Report prepared by Townsville City Council Environmental Management Services
and The Natural Edge Project

The Natural Edge PROJECT

City of Townsville

A CENTRE FOR EXCELLENCE IN TROPICAL DESIGN
Sustainability & Innovation

Table of Contents

Executive Summary

This report documents the Sustainable CBD "Solar Cities" Commercial Building – Vision and Practice seminar and Design Charrette that was held at Townsville's Southbank Centre on the 8th of November, 2006. The event was organised by Townsville City Council and supports a vision for a Centre of Excellence in Tropical Design (CETD). The event was designed to inform and support the Townsville: Queensland Solar City project, particularly the Sustainable CBD Building component. The event consisted of a half-day seminar on the tropical application of sustainable building practices. This was followed by a design charrette focussed on the concept plans for the Sustainable CBD "Solar Cities" commercial building (greenT) that is proposed to be developed by Cafalo Pty Ltd. The design charrette process was facilitated Cheryl Paten and Nick Palousis from The Natural Edge Project (TNEP). The results of the scoping charrette include a wide range of design opportunities based on the exploration of six themes: Liveable Environment, Urban Ecosystem, Energy Flows, Water Smart Design, Transport, and Resource Management. The output provides a holistic vision of possible ESD strategies at an early stage of the design process. This output can be incorporated in future iterations of the design for the greenT building, and raises awareness of future sustainable commercial building design opportunities and considerations for the Townsville CBD.

Introduction

This report documents the Sustainable CBD "Solar Cities" Commercial Building – Vision and Practice seminar and Design Charrette that was held at Townsville's Southbank Centre on the 8th of November, 2006. The event was organised by Townsville City Council and supports a vision for a Centre of Excellence in Tropical Design (CETD). The event was designed to inform and support the Townsville: Queensland Solar City project, particularly the Sustainable CBD Building component. The event consisted of two aspects:

1. A half-day seminar on the tropical application of sustainable building practices, and
2. A design charrette focussed on the concept plans for the Sustainable CBD "Solar Cities" commercial building (greenT) that is proposed to be developed by Cafalo Pty Ltd. The workshop was facilitated by Cheryl Paten and Nick Palousis from the Natural Edge Project.

This aim of the scoping charrette was to explore the sustainable design potentials of Townsville's proposed green T building at a preliminary stage of the planning and design process, and build capacity amongst participants to consider wide-ranging sustainability considerations at the concept stage of design planning for commercial buildings.

Participants were invited from the CETD and Townsville Solar Cities network, ranging from Federal, State and Local Government, Utilities, Community/ NGO, professional bodies, Education and Research, design experts (e.g. engineering, architecture, planning etc) and business (see Appendix 1 for list of participants).

It is intended that results from the scoping charrette will be used to assist in the concept planning of the proposed sustainable building, as part of the CBD Commercial Sustainable Building and CITISOLAR Community Capacity Building Programme. The seminar and design charrette will also raise awareness and build capacity for future sustainable commercial building design opportunities and considerations for the Townsville CBD.

Process

The event comprised of two segments- a seminar and a design charrette workshop.

Seminar

The first half of the day consisted of a seminar supporting a vision for a Centre for Excellence in Tropical Design (CETD) Sustainability and Innovation. A series of short presentations were delivered on the topic of best-practice sustainable design for commercial buildings in the tropics. The keynote speaker was Mick Pearce, from Design Inc (Melbourne). The presentations provided vision and practice for the workshop component.

A summary of the presentation follows:

Greg Bruce, Townsville City Council

Introduction and framework of presentations, and sustainability themes and concepts behind Townsville: Queensland Solar Cities and the Sustainable CBD Building.

Cheryl Paten, The Natural Edge Project (TNEP)

Cheryl discussed the contextual need for green buildings, drawing on various international trends and examples. Broad themes of green building design were presented, including the opportunities for biomimetic design, with special focus on a tropical setting.

Craig McClintock, MGF North Queensland Consultants

Craig discussed mechanical, electrical and air-conditioning design elements for sustainable commercial buildings in the tropics & specifically described the application of chilled water systems.

Michael Pearce, Design Inc., Melbourne

Michael's presentation demonstrated appropriate ecological architecture featuring low maintenance, low capital and running costs and renewable energy systems of environmental control. Using CH2 and other green building as examples, Michael shared his approach to architectural expression as a balance of the natural, the social and the economic

environments in which the project is sited. Michael described the new science of Biomimicry that adapts models and processes from nature to inspire architectural solutions.

Greg Bruce, Townsville City Council

Greg Bruce described current sustainability initiatives of Townsville City Council towards the vision of a Sustainable Townsville. The presentation focussed on the Citisolar programme, which is Council's Solar Cities project that will provide a community capacity building element. Greg described the proposed greenT building as a catalytic development that will be affordable in the long term. Importantly, the concept is based on a replicable and collaborative design process that produces outcomes greater than the sum of its parts.

Terry Kelly, Department of Public Works

Terry discussed general principles of sensitive tropical design and architecture that caters specifically for this challenging climate and identified ESD targets for government infrastructure.

Bruce Barrett (Barrett Architects) and Paul Hotston (Phorm)- greenT architects

Bruce and Paul presented broad concepts for a Solar Cities sustainable commercial building, introducing the characteristics of the GreenT project and site. Preliminary design imagery of the proposed GreenT building, produced by the GreenT architects, is provided in Appendix 2. These images were used throughout the day for discussion purposes.

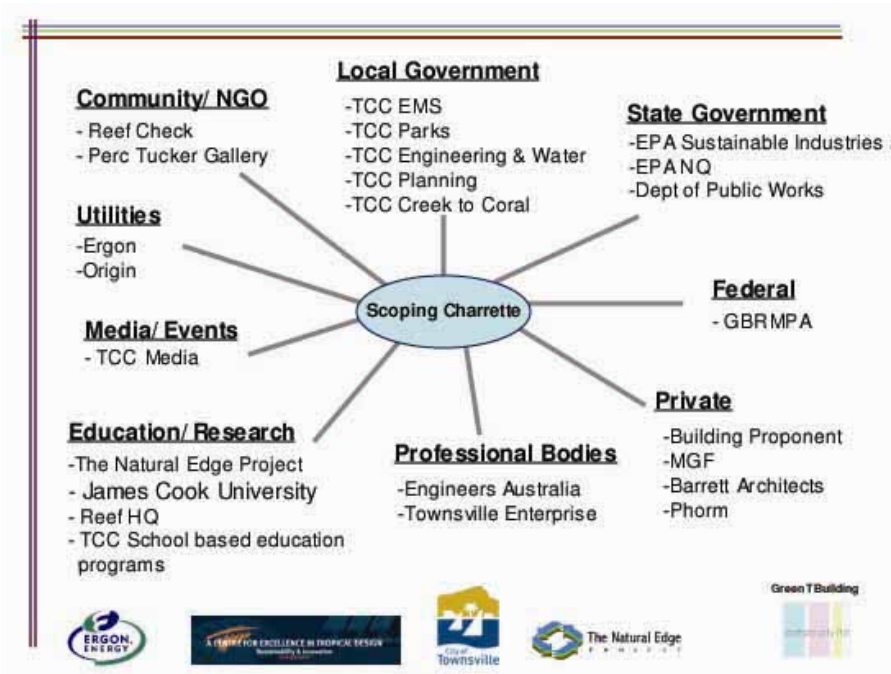
Design Charrette

The second half of the day involved a site visit and an interactive 'Scoping Design Charrette' workshop to consider the future eco-design opportunities for the CBD Commercial Sustainable Building (greenT). Participants ranged from Federal, State and Local Government, Utilities, Community/ NGO, professional bodies, Education and Research, design experts (e.g. engineering, architecture, planning etc) and business.

The site visit allowed participants to identify site characteristics and possibilities first-hand. Participants were presented the site extents, surrounding land uses, and general issues of consideration. Photographs of the site visit are provided in Appendix 2.

The aim of the scoping charrette is to facilitate *a scoping design space around the 'CBD Commercial Sustainable Building'.* The charrette process uses input from a range of sectors, including governmental, professional and community bodies (Figure 1). Participants used a Rotating Control Group Facilitation method to generate and comment on design opportunities for the proposed building site, based on exploring six sustainability themes: Liveable Environment, Urban Ecosystem, Energy Flows, Water Smart Design, Transport, and Resource Management. The charrette facilitated a systematic and holistic design process that was embedded in sustainable design understandings. The charrette process was facilitated by Karlson 'Charlie' Hargroves, Cheryl Paten and Nick Palousis from TNEP.

Figure 1. The charrette process uses a 'whole of society' approach to explore key themes.



The rotating control group method consists of participants assigning themselves to a 'Control Group' table that was designated with one of the six sustainability themes. This process allowed participants to work with a theme that they were most interested in or comfortable with. Each of the control groups were provided with a large sheet of paper that introduced their particular theme and provided a list of possible eco-design options relevant to their sustainability topic. Participants were encouraged to use the summary as a starting point to 'brainstorm' eco-design possibilities suitable for the greenT development. Notes were made on the summary sheet and pieces of 'butcher paper'. Once each control group had consolidated a list of ideas, the groups were asked to progressively rotate to the next thematic tables to consider the other groups list and add further comments. Groups rotated every ten minutes. Once each group returned to their own thematic table, they were provided with an opportunity to further consolidate their list, based on the information gleaned from other tables.

During the charrette, architects were observing the group discussions and graphically recorded ideas in sketched form.

Results

The output from the scoping charrette consisted of thematic lists of eco-design opportunities and associated sketches. The full list of design opportunities is presented in Appendix 3.

Table 1. Possible design opportunities arising from scoping charrette process

Theme	List of Possibilities
Liveable Environment	- 'Healthy Work Spaces' (avoiding 'sick building syndrome') – non-toxic surfaces & finishes non/low VOC paints; air intake locations and operable windows upwind and away from potential pollutants/contaminants e.g. street traffic, loading docks; the use of building setbacks and landscaped buffers to prevent vehicle emissions - 'Colour of the Day' - Colour variations using strategically placed colour in the through the façade to allow the 'colour of the day' to move through the building, avoiding a monochromatic work space - 'Multi-Functionality' - Mixed use development, Multi-functionality (rooms/ spaces/ equipment/ walls/ surfaces) - 'Complementary Design' - Complementary building design and scale to match Perc Tucker building, and make heritage buildings more accessible from development; Complementary scale to match Denham St heritage frontage, especially apartments - 'People Places' – Ensure a human scale to build form; Encourage community recreation and social engagement; Provide shaded walkways - 'Purple Spaces' - Community/ Culture / Diversity (arts, craft, music); Links to the gallery; Entry points interconnected - linked to gallery, shops, homes, bookshop, mall, walking/ transport corridor node - 'Sense of Place' - Design of building to maximise views of external and internal 'green spaces'; interpretive centre space – architectural elements/ hydraulics – nodes - 'Intermediate Zone' - Provision and development of a low serviced, passively controlled, green 'intermediate zone' as interface and climatic filter along northern elevation of GreenT building
Urban Ecosystem	- Vertical landscape, materials, surfaces and roof garden - Water running through the building, flow and motion - Breezeways to allow fresh (non-AC) air to be filtered, dehumidified and circulated, - 'Carbon Sink' - Native planting and special species with interpretive signage, self-sustaining landscapes based on plants tolerant of oils, climate, and water availability. - Use of primary onsite natural water filtration systems (e.g. Eco-Machines for effluent, Biolytix for grey water polishing) understanding the scale of application and scope of decentralised treatment. - Options to collaborate with broader infrastructure to enhance and compliment processes as regional sustainability outcomes - Provide habitat for wildlife (e.g. birds) to preserve and enhance biological diversity – Urban Nature - Use of shading
Energy	*Supply Possibilities:* - Building (and roof design) oriented on site for solar capabilities - Use of photovoltaic cells; onsite fuel-cells, urban wind turbines

	- Combined-heat-and-power systems ('CHP', also known as cogeneration), and - Sun tracking solar cell arrays to follow the moving sun to demonstrate leading technologies as part of the CitiSolar initiative - Maximise controlled use of day-lighting - Solar hot water systems - Use of small scale photovoltaics to power outdoor lighting, including parking lots, walkways & garages. *Demand Possibilities:* - Peak Load Management (Air conditioning – Target Peak Load Source) - Diurnal range and humidity control - Net energy provider to the grid - Good cross-ventilation potential – natural and mixed-mode ventilation - Trees to provide shade and channel for summer breezes - Central chilled-water system using thermal storage for chilled water at off-peak electricity to shift load - Cooling Towers, Passive Ventilation, Filtering and Evaporative Systems - Passive solar cooling: insulation (including roof gardens, shading trees, glazing and films), sunshading, building reflectance - Use light-coloured paving and shading on paved areas to reduce the urban heat island effect. - Real-time building performance data (real time energy & resource use) – in the foyer area - Smart sensors and photosensors (light & ventilation control) - Energy efficient fixtures, appliances and practices - Heat recovery from commercial tenants (e.g. computer servers or café kitchens), also systems that exchange heat between the relatively constant temperature of the ground and a building - Long facades oriented perpendicular to the prevailing winds to support natural ventilation
Water Smart Design	- Rainfall entering the building (creek) could then be transferred to the water feature in the foyer (coral), passing through a number of uses - Water efficient, low maintenance landscaping - waterless urinals - Assess feasibility of 'grey water' reuse onsite - Water efficient appliances and fittings - Monitoring of individual occupant's water usage - Water monitoring to identify leakages and opportunities - Rainwater harvesting for reuse (e.g. for gardens & or hotwater), using technologies such as rain water tanks; cisterns and ponds - Grey water harvesting and reuse (e.g. for toilet flushing) - Dual supply pipe with recycled water from stormwater reuse (e.g. for garden, toilet & laundry use) - On-site treatment of stormwater to achieve pollutant load reductions
Transport	- Minimise automobile dependence - Potential to provide bicycle parking and change room space in lieu of car parking, or provide bicycles owned by building - Provide facilities for transportation alternatives including bicycles and public transportation e.g. secure bike racks, showers and accessibility (for the building, or as a 'city hub' in a collaborative partnership) - Connectivity – easy access to rail, roads and cycleways - Accessibility to public transport

	- Accessible car parking facilities elsewhere
Resource Management	*Building Construction & Decommissioning* - Use of reclaimed building material (on and off-site), or locally-based materials (preferably renewable) - Design for reuse and recycling of exterior and interior building components at the end of their useful life (within the design life of the building) e.g. carpets, louvres, windows - Design for future adaptation (the building of tomorrow today) - use of building components over time - Design for future climate - Use of low embodied-energy materials e.g. wood *Building Operation* - Functional rubbish recycling facilities for all building occupants (commercial/ private) - Modular design solutions for adaptability and upgradeability - Onsite composting area (for rooftop garden and internal garden features) – commercial facilities – vermiculture (onsite worm farm)

Some general suggestions that were incorporated into the sketches (see Appendix 4) and discussed at the conclusion of the workshop include the provision of:

- Inclusive access to the development (bus, car, bikes, wheelchairs)
- Strong physical linkages to and from the site, which might include elevated covered walkways
- A solar energy harvesting system
- A rooftop urban forest
- Shaded eating areas adjacent the pedestrian thoroughfare to engender passing foot traffic
- Native planting in lieu of exotics
- A visible water cycle in the landscape
- Night-time security to reduce risk of vandalism
- Natural diffused light and plants to improve amenity
- A 'natural food outlet' in the form of a rotating urban vegie garden with fish tank below
- Rainwater storage within building columns
- A glazed 'water wall' to the building entry for visual and cooling qualities

Conclusion

The Scoping Charrette workshop proved a success in bringing together a wide variety of stakeholders to explore key sustainability themes at an early stage of the design process for the proposed greenT sustainable commercial building. The charrette process allowed stakeholders to provide input based on a presentation of concept plans followed by a site visit. The output from the process incorporates a wide range of design opportunities based on the exploration of six themes: Liveable Environment, Urban Ecosystem, Energy Flows, Water Smart Design, Transport, and Resource Management.

The workshop demonstrated the willingness by the developer and architects of the greenT to be involved in an inclusive design process to maximise the input of design possibilities for a wide range of ESD strategies. The output provides a holistic vision of possible ESD strategies at an early stage of the design process. This output can be incorporated in future iterations of the design for the greenT building.

Appendix 1 : greenT Scoping Charrette Workshop Attendees List

Given Name	Surname	Company
Bill	SPEE	Cafalo Pty Ltd
Bruce	BARRETT	Barrett Architects
Warren	APPLEGATE	
Mick	PEARCE	Design Inc
Michael	BAKER	M2 Marketing
Adrian	TURNBULL	Reef Check
Frank	DALMEYER	Townsville Enterprise Limited
Bob	HARVEY	Ergon
Paul	HOTSON	Phorm Architects
Guy	LANE	SEA O2
Lal	WADWA	JCU
Lyn	WHITFEILD	EPA
Nick	PALOUSIS	TNEP
Cheryl	PATEN	TNEP
Rob	BUFI	MGF Consultants (NQ) Pty Ltd
Craig	MCCLINTOCK	MGF Consultants (NQ) Pty Ltd
Neil	DAVIS	
Bill	DUNN	
Peter	WILLIAMS	Isothermal
Caroline	MCGANN	SEA O2
Stephen	COVENTRY	Cyber Factory
Luis	SANCHES	Cyber Factory
Terry	KELLY	Dept Public Works
Karen	BIRD	TCC
Greg	BRUCE	TCC
Anne	CAILLAUD	TCC
Ray	COLLINS	TCC
Katrina	CULLEN	TCC
Ben	DANIELL	TCC
Tristram	DENYER	TCC
Nicola	DOSS	TCC
Michael	FORWOOD	TCC
Andrew	HANNY	TCC
Holly	MANUEL	TCC
DJ	MCKENZIE	TCC
Jo	PREGO	TCC
Catriona	SHIRLEY	TCC
Sri	SURYATI	TCC
Damien	SWEENEY	TCC
Frances	THOMSON	TCC

Appendix 2: Site Visit Photographs

Flinders Mall frontage. The site adjoins the Perc Tucker Gallery.

The laneway between the site and Perc Tucker Gallery can provide a shaded thoroughfare linking the mall and Sturt St, and serve as a meeting place.

The site looking towards Sturt St.

The site looking towards Flinders Mall.

The proposed building will overlook the current Denham St frontage, and provide a "low-rise" and integrated architecture to the current buildings.

Denham St frontage.

Appendix 3: Participant Output on Eco-design Suggestions

Domain: 'Liveable Environment'

- Encourage community recreation – yoga, tai-chi classes, social engagement
- Provide a 'green walk':
  - pleasant, attractive
  - Vertical wall of plants
  - Botanical knowledge/expertise needed/
  - May utilise native plants
  - Break up light
  - Shade, airiness
  - Hanging gardens
  - Light harvesting
  - Southern views?
- Provide water features
  - Provide white noise in the interstitial area
  - Continuous flow, recycling water
  - Fishpond
  - Solar/wind powered pump
- Maximise retail opportunities:
  - Interact with Denham Street shop fronts
  - 2-way shops from Denham Street?
- Optimum building depth of 16 m for commercial and living purposes
- Demonstrate the quality of Townsville – regionalism
  - Could be an example for high density living that still provides privacy etc.
  - Can the building actively encourage recycling?
  - Consider temperature and humidity control
  - Provide resting places as you move through the area
  - Consider air improvement in the interstitial areas
  - Consider the use of timber and natural products
  - Locate public facilities at roof level
- Make heritage buildings more accessible from the development
- Use shaded walkways
- Provide safety lighting
- Provide access to meaningful outdoor space
- Ensure a human scale of the built form
- Consider safety/security in laneway – how could you make this public access area safe, especially at night?
  - Restrict night access with gates
  - Security guard
- Building design needs to incorporate "Queenslander" or "Tropical" features, e.g. bull-nosed verandas
  - Building needs to blend with heritage surrounding and enhance "Old world-ness" of Flinders Street Precincts. This is particularly the case with the rooftop apartments.
- Residential design to incorporate common/social area with apartments surrounding the "Village Green".
- Consider providing a community garden/hydroponic garden
- Open plan design connecting commercial/business areas
- Provide a "green" function/conference room for sustainability forums/workshops

Domain: 'Urban Ecosystem'

- Consider cascading gardens (planter boxes on Flinders Street)
- If providing water running through the building design it to be efficient – easy to be move in and out through the building
- Provide greenery in lobby courtyard
- The car park may be enhanced with light well and planting
- There are issues regarding the passive surveillance of green corridors
- It is essential that the sympathetic design of Perc Tucker is taken into account
- The potential presence of acid sulphate soils may affect excavation methods
- Capture and recycle water
- A cascade/waterfall may provide evaporative cooling to the corridor
- Consider roof gardens. To protect from winds, consider locating gardens on the western side.
- Provide an inclusive experience – wheelchair accessible, less steps etc.
- Provide vines in laneway that attract butterflies
- Allow buildings to have interchangeable use (i.e. commercial to residential)
- Consider an 'eco-sity' approach
  - Biomimicry – "living centre" inspiration
  - "Creek to Coral" system – operates like a coral reef
- Consider providing an edible landscape (fruits and herbs grown in building.
  - Hardy, edible native plants such as Dianella and Eugenia may be appropriate
- Provide wide footpaths
- Provide a child care centre within the building
- Exposed building services
- Allow daylight into the intistitial area to make it inviting and allow plant growth
- Consider the use of stormwater
- Provide a "biosphere" type ecosystem: fish ponds provide nutrients to worm farm which provides nutrients to hydroponic fruit and vegie garden.
- Use recycled timber and natural materials such as stone
- Respect the scale and proportion of the heritage buildings
- Plant a significant tree in the courtyard
- Encourage outdoor eating in the laneway

Domain: 'Energy'

- Consider use of photovoltaic cells on the western wall or on windows with a thin layer of photovoltaic cells
- Use high performance glass
- Double glazed windows
- Aim to achieve no direct sunlight into windows
- Consider use of urban wind turbines
- Consider use of mini hydro generators using excess recycled water
- Consider the use of sun tracking solar cell arrays, though it may conflict with storage
- Good potential to maximise the controlled use of day-lighting
- Solar hot water systems should be used
- Reticulated LPG – will have a bearing on the commercial model
    - solar boost
    - gas cooktops in restaurants and residential areas
    - use in airconditioning
- Thermal energy use:
    - Cold water
    - Hot water (chiller heat recovery; LPG boilers)
    - Geothermal energy for air conditioning
- Water energy use: to transport water up to towers
- How much energy is available in the organic wastes from the building (e.g. paper, cardboard, food scraps from domestic and commercial sources)?
    - Could be an energy source – mini biogass generator (VRM)
- Potential to not limit the organic biomass to this building. A drop-off depot could be available to the public, to increase total biomass available.
    - Create links with other nearby residents and restaurants
    - Need to ensure waste will decompose and address the potential issue with contaminants
- Consider carbon off-set incentives for residents in conjunction with Greening Townsville.
- Maximise natural lighting – use flexible/channelled sky lights
- Harness embodied energies
- Consider displaying energy use of air conditioning
- Maximise air flow and shade
- Evaporative air conditioning may not be viable
- Keep air conditioning temperature at 25 degrees celcius
- Consider use of desiccant enthacipy wheel
- Consider reducing ambient light levels and provide more lighting when needed
- Provide ceiling fans to allow the temperature set-point to be raised without a reduction in comfort levels
- Ensure there is hot water on demand to minimise water waste
- Do not provide clothes driers
- Discharge vents to restaurants may be treated before dispatch.

Domain: 'Water Smart Design'

- Consider gravity fed irrigation collected from roof surfaces with efficient sub-surface irrigation system
- Capture energy from water moving from the top floor to the basement via micro-hydro turbines.
- Utilise solar water pumps to reticulate rainwater to areas
- Incorporate water conservation devices into the development
- Water to be neutral / self sustaining
- Fresh water is limited. Maximise the use of water on site
  - No water is to leave the site – complete reuse
- Greywater is generated all year round and can be used for:
  - Flushing toilets
  - Irrigation
- Utilise treated water – e.g. Cleveland Bay Council use
- Mine 'black water' for further treatment of water
- Investigate new generation evaporative condensers for A/C plant that conserve more water than cooling tower technologies
- Consider water storage in vertical wall.
- Consider use of air conditioning water:
  - It contains chemicals and may not be usable
  - Perhaps reticulate for the air conditioning system only
  - The treatment of water and reuse in water features may be a potential opportunity (e.g. Hermit Park School)
- Integrate water storage with water features (e.g. fish tanks, fountains etc)
- Implement management and education program regarding site water use, perhaps provide a water education centre
- Consider the whole site as a catchment
  - Make water visible to occupants (i.e. in lobby)
    - water as a 'calming device'
    - water within contained treatment system
  - Provide water storage areas
- Calculate the average annual rainfall on roof areas and then consider the potential uses
- Consider water as an energy store - chilled stratified water column
- Consider water in a narrative sense, as a 'companion' (water curtains; creek; water catchment etc)
  - A river that runs around the whole building; waterfalls; ripple pools; rises etc
- Consider potential for bioltics
- Consider the linkage with Dalgety Tower to maximise new construction.

Domain: 'Transport'

- Consider connecting the development with its context:
  - Bridges across Strut Street
  - Denham Street
  - GreenT with Ferry building
  - Link with other buildings above ground
- Provide one delivery access point for the delivery of goods into the building (loading bay)
- Provide on-site LPG recharging
- Make public transport easy – provide information/maps/CBD navigation touch screens within the building entry. Possibly provide technological connections to buildings to show when bus is coming.
- Provide viewing spaces to see public transport coming
- Provide protocols for riding bicycles in areas with pedestrians – make the mall bike-friendly
- Provide a bikeway link to the Strand and other cycleways
- Provide small electric vehicles with each apartment
- Provide small vehicles to the commercial sites/accommodation areas to assist reducing the size of car parking spaces
  - Car share station (to reduce the no. of cars and encourage bicycle use)
  - Free electric car charging stations for each small car parking bay
- Consider boat and ferry transport methods
- Promote walking though interpretive building/landscape/urban design
- Seek integration with the laneway at local scale to connect with other shops/eateries down the lane
- Provide disability compliant access
- Make Dean Street car park a stop of the city loop bus for after hours access/ bus terminal at the building
  - Dean Street decentralised car park
- Ensure Flinders Mall remains car free to reduce traffic flow
- Tramway citiloop concept: small carriages; frequent service; automated systems
- Implement commercial rate for 'selling' parking space
  - Separate title for apartment and car park spaces
- Alternatively impose 'zero parking' – development must be linked with public transport infrastructure
- Encourage car pooling; groceries on time; integrated database to align users with transport nodes
- All participants in the complex must adopt 'green values' encouraged by free walking shoes, water, sunnies; pedometer; and gym membership.
  - Free sunscreen in building lobby
- Council may provide a reward for carbon offset of development
- Provide views to 'transport' people

Domain: 'Resource Management'

- Take a green construction approach:
  - Recycle materials sourced from demolition – e.g. doors, steel, concrete, windows, timber floors and posts, and bricks.
  - Investigate reuse of construction packaging
  - Consider the reuse of rock excavated during construction
  - Sensitive asbestos survey and removal
- Use materials sourced from recycled products (e.g. Interface carpets; recycled plastics in bollards/lattice; flyash cement etc.)
- Provide standard unit sizes and design building with moveable walls to allow for future building adaptation
- Consider the future climate, including the possible storm rating – design the building to withstand cyclones and flood events
- Use local plantation timber
- Consider the opportunity to embed photovoltaic cells within building materials (ie. Windows, west-facing walls, roofing)
- Use materials with multiple functionality – e.g. tecEco Cement (CO2 absorbing)
  - Façade paint
  - Reflective roofing paint
- Use CFL lighting
- Make the most use of natural light
- Provide smart meters in residential areas
- Optimise workspace 'liveability' with natural light, balconies, plants and relaxation areas.
- Provide residents with green purchasing information
- Ensure natural resources are sourced locally and are renewable
- Implement a covenant with the body corporate for the exclusive use of five star appliances and eco friendly cleaning products etc
- Use native plants within the development to minimise water use
- Provide for natural gas stoves
- Implement a green body corporate management plan from the beginning of the project – set goals
- Resource management strategy should complement the permanent residential community:
  - Implement a zero waste strategy for on-site waste management
  - Provide compost bins and worm farms
  - Bulk recycling
- Provide local public art