

**CUNDALL**



**New Royal Children's Hospital**  
March 2013

**CUNDALL**

# **Background to Redevelopment**

## Condition

- Highly Variable
- End of Useful Life
- Banded

## Expansion & Refit

- Poor Indoor Air Quality
- Asbestos
- Poor Infrastructure

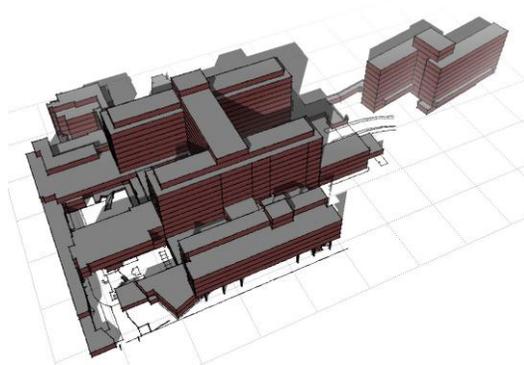
## Redevelopment

- Highly complex
- Staging difficult



## Where to put it?

- Many possible locations & variants tested
  - Greenfield
  - Brownfield
  - Docklands
  - Dental Hospital Site
  - Existing Site
  - Royal Park

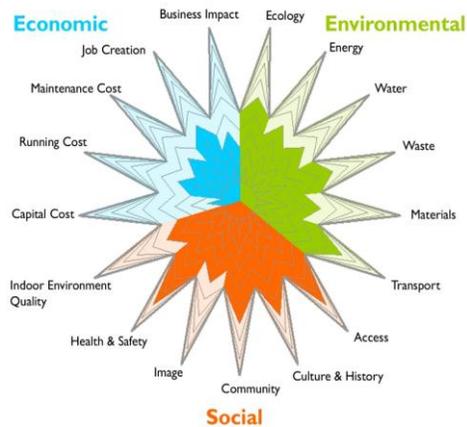


## Dept of Human Services (DHS) Policy

- Min 2.5% of cost allocated to ESD
- Provide leadership to community

## Government Policy

- 15% energy reduction
- Purchase Green Power (except hospitals)
- Increase waste water reuse
- Increase recycling of waste



# Establishing the ESD Agenda (Feasibility Stage)

## Engagement

- Establish the ESD vision and goals for the project
- Question the basic assumptions of conventional hospital design and their applicability to the RCH redevelopment
- Establish initial priorities for different environmental issues (e.g. energy, water, indoor quality, materials, waste, etc.)
- Identify how a “green hospital” could assist in selling the positive contribution of the redevelopment
- Determine targets, objectives and priorities through comparisons with other appropriate benchmark facilities
- Identify how to get staff input and buy-in for “green hospital”
- Obtain ideas and input from RCH staff and project team

## Why wouldn't you do it?

- It makes sense;
- It reduces operating costs;
- Would create better internal spaces;
- Meets Victorian Government policy and
- Reduces environmental impacts of Hospital.

## Greenest Hospital in Victoria

- RCH redevelopment will be a landmark;
- It needs to be something special.
- Can we achieve a 6 star hospital?
- Can we cut energy bills in half?
- Important that ESD is real – tokenistic or superficial.

## Healthy building & healthy environment

- Create internal spaces that enhances well-being and comfort
- Provide clean air and lots of daylight
- Every child's bedroom should have a view of the park
- Design for all users, i.e. staff, kids, families & visitors
- Need to adopt evidence based design approach
- Need for lots of garden areas and ready access / connectivity to outside
- Can the building also provide positive benefit on staff productivity?

## Get the kids & community involved

- Can contribute to community education by involving the kids
- RCH has strong connections with the community and can be used
- Potential to secure corporate community funding should be pursued

## Get the staff involved

- Need staff engagement from earliest stages to achieve real outcomes
- Need ESD Champions within the hospital to adopt it and make it real
- Communicate in non-technical manner and ask the right questions

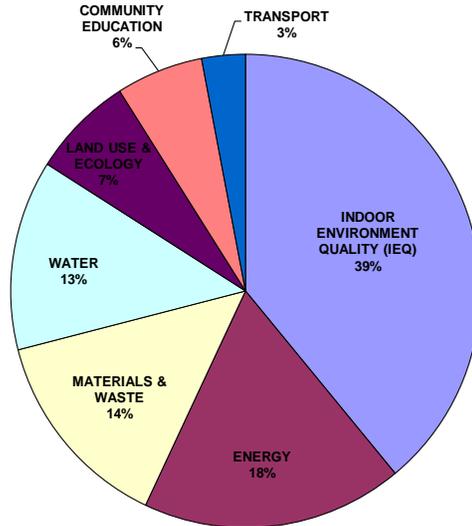
## Enhance Royal Park

- Redevelopment provides opportunity to improve amenity and ecology
- Can we give back more land than the site currently occupies?
- Opportunities to treat water (stormwater or greywater) leaving hospital?

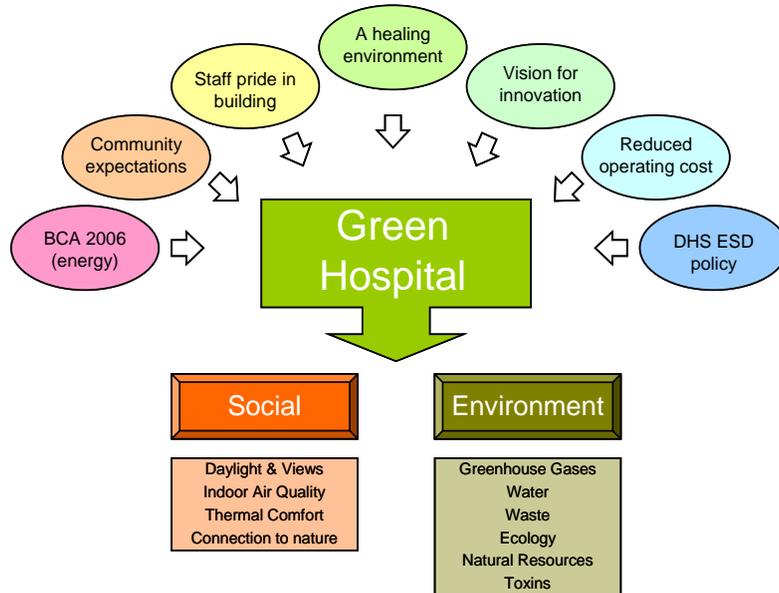
## Set realistic targets

- Targets need to be based on realism and outcome focused
- Need to set stretch targets that challenge the design team
- Energy is easy to measure / benchmark – how do we set other targets?

## ESD Weighting of Importance



## ESD Objectives



### Energy Targets

- 20% improvement on existing hospital performance based on multiple year utility data; energy audit; and site energy strategy.

### Water Targets

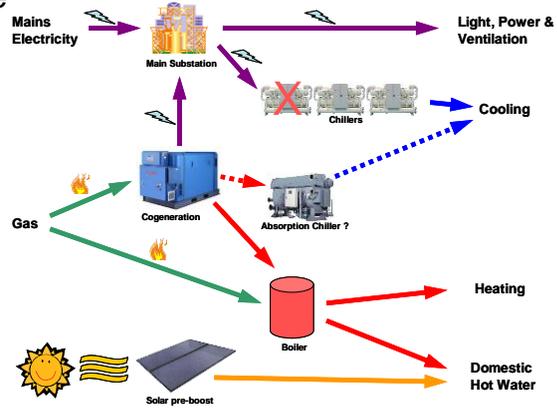
- 20% improvement on existing hospital performance based on multiple year utility data and site servicing strategy

### Waste Targets

- Industry construction waste recycling best practice

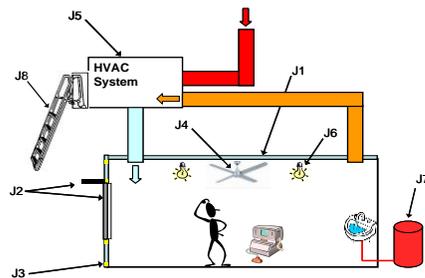
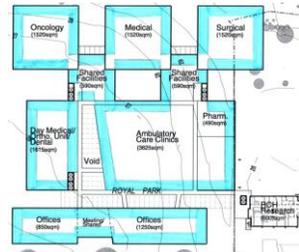
### Site Energy Strategy

- Base Load Cogeneration
- Waste Heat Reclamation
- Chilled Water Storage
- Solar Hot Water



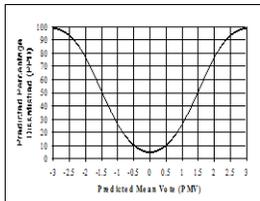
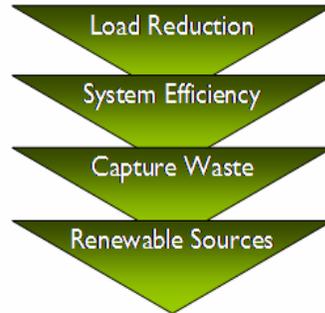
### Building Design

- Maximised Views to Royal Park
- Access & Quality of Daylight
- Potential for Mixed Mode / Natural Ventilation
- Building Fabric



### Building Services Design

- Thermal Comfort Design Criteria
- Chilled Ceiling Technology
- Diffuser Selection / Ventilation Effectiveness
- Openable Windows
- Heat Recovery Systems

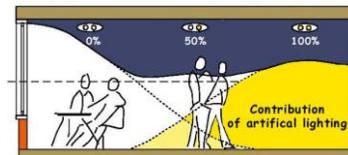


### Lighting Design

- Daylight
- Glare
- Energy Efficiency
- Control
- Circadian Rest-Activity Rhythms
- Design for Healing

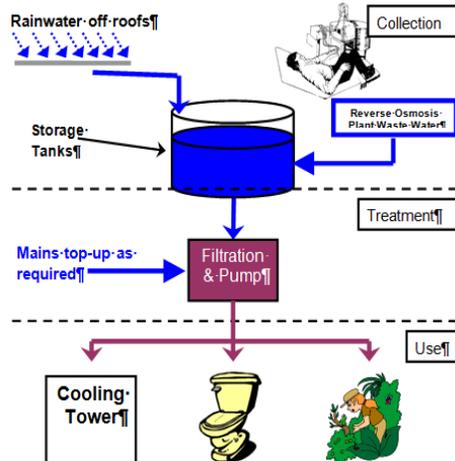


Daylight and Artificial Lighting Integration



## Design for Water Efficiency

- Demand Reduction
- Water Supply
- Achieving the Water Target
- Collection & Re-use



## Materials and Finishes

- Environmental Credible Material Selection
  - Resource Extraction
  - Embodied Energy
  - Ozone Depletion
  - Toxicity & Indoor Air Quality (IAQ)
  - Waste
  - Water Consumption
  - Acid Deposition
  - Recycled Content
  - Recyclability
- Cleaning & Maintenance
  - Micro-fibre Cleaning
  - Cleaning Products



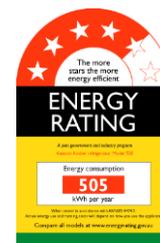
## Waste Management

- Construction and Demolition Waste Recycling Targets
- Design Philosophy
  - Challenge size of room spatial requirements  
*“who you are and not what you actually need”*
  - Provide adequate central waste recycling space
  - Ensure adequate on-floor spatial provisions
  - Use of central vacuum system(s)
  - Ease of replacement and repair
- Operational Waste Provisions
  - Make waste management educational and highly visible in the hospital
  - Provisions within lease agreements



## FF&E Purchasing Policy

- Sustainability Requirements
  - Energy Star ratings
  - Energy / water saving features
  - Use of LCD screens
  - Timer controls
  - Challenge need  
*“Is it needed or desired?”*



# PPP Procurement ESD Agenda

## Scope Definition

- Translate ESD vision and goals for the project into performance and prescriptive requirements
- Research and further evaluate identified ESD initiatives
- Test ESD initiatives against evidence based research outcomes
- Assess ESD initiatives against Whole of Life (WoL) and recurrent cost aspirations / requirements
- Cross reference ESD requirements within other disciplines
- Prepare performance and prescriptive wording of *Functional Brief and Architectural & Technical Specifications* for final ESD scope

# Translating ESD Scope

## *'The Brief'*

### Government Commitment, Policy and Objectives

- Internationally acclaimed "Green Hospital" which achieves State sustainability policies/objectives including greenhouse gas and peak energy reduction, water conservation and waste minimisation

### Environmental Design Principles

- World leadership in sustainable hospital design and set international benchmarks for IEQ, CO<sub>2</sub> reduction and water conservation
- Innovative and ecologically sustainable development, which will provide healthy ward, workplace and laboratory environments and reduce the ecological impact and operating costs of the development
- Maximise advantages of the parkland site and aspect ensuring access to natural daylight, external views and garden access for all occupants
- Embed sustainability objectives into design at outset, then measure, track and improve throughout project life to meet RCH's stated requirements

### Healing Environment

- At least 33% of occupied floor area of hospital to be within 4m of a perimeter wall with at least 30% glazing area with a VLT  $\geq 55\%$  OR have a 2% DF when measured at floor level under a Uniform Design Sky
- At least 50% of the occupied floor area of the hospital to be no more than 8m from a window or vision panel
- At least 75% of inpatient bedrooms to have view of Royal Park and all remaining to have an external view or view into atrium or courtyard
- No point in the building above ground level to be more than 20m from an external façade or an internal wall to an atrium
- Total open external space (places of respite) to be easily and safely accessible by patients, staff and visitors shall be not less than 3,000m<sup>2</sup>, based on stipulated design rules and provisions
- Provide building occupants an environment free of disruptive levels of sound, vibration and electro-magnetic radiation (EMR)

### Passive Design

- Provide 20% improvement in insulation R-values defined in BCA2006 OR 10% less than the annual energy consumption allowance stated in Table JV2 if performance based compliance adopted
- All windows within  $\pm 45^\circ$  of true north to be shaded so there is no direct sunlight on the glass or frame between 11am - 2pm on 13<sup>th</sup> December
- Provide internal blinds to every window to suit the function of each space and provide effective glare, thermal and solar control
- Ensure air tightness of facades, doorways, roofs and other parts of building envelope such that infiltration rates to air conditioned areas are below 0.1 L/s/m<sup>2</sup> in high wind (> 30 Kph) conditions
- Openable windows encouraged in Parent Family Precinct, Community Health, Child Care, Private Consulting Suites and Staff & Relatives Accommodation

### Energy Greenhouse Targets

- Minimum & Stretch Targets (The Facility)

	Maximum Requirement	Aspirational Target
Greenhouse Gas (kgCO <sub>2</sub> -e/m <sup>2</sup> )	350	270
Energy Consumption (GJ/m <sup>2</sup> )	1.3	1.2

- New Research Facility & Existing Buildings (retained / refurbished)
- Energy Modelling Protocol

### Peak Electrical Demand Reduction Targets

- Must incorporate systems and methodologies to minimise peak electrical demand

### Renewable Energy Target

- At least 1.5% reduction in annual CO<sub>2</sub> emissions of Facility (excluding Carparking) through the use of renewable energy

### Energy Infrastructure

- Provide a chilled water storage tank (or equivalent cooling capacity system using ice or phase change material) to reduce peak cooling load (kW<sub>r</sub>) on the chillers by at least 15%

### HVAC Equipment

- Minimum COP's of chillers (AR1550/590) and efficiency boilers stipulated
- Fan and Pump efficiencies to exceed BCA2006 Section J requirements by at least 10%
- Ducts to be sized based on ≤0.6 Pa/m in ceilings and ≤0.8 Pa/m in risers
- Electric reheat to be avoided wherever possible and separately metered
- All refrigerants and insulation to have zero Ozone Depletion Potential

### Outside Air & Design Temperatures

- Minimum outside air and operating temperatures for Patient Care Areas (e.g. Surgery & Critical Areas, Nursing, Diagnostic & Treatment)
- Non Patient Areas, 21 – 26°C, 15 L/s/person & CO<sub>2</sub> control of outside air
- Seasonal Setpoint Control Strategy

Outside Air Temperature	Setpoint (°C)
<5	22.5
6 to 10	22.5
11 to 15	22.5
16 to 20	23
21 to 25	23.5
26 to 30	24
31 to 35	24.5
>36	25

- Transitional public spaces to maintain PMV of +1.25 and -1.00 for 97% of the year or be within +/- 1.5°C of adjacent internal spaces
- Minimum separation distance from discharges to air intakes to be 100% greater than minimum requirements of AS1668.2

### Lighting

- Lighting design philosophy to improve staff alertness levels, work performance, staff satisfaction, health and reduce medical errors by providing appropriate internal lighting systems as well as provide lighting solutions that allow for variation in day and night lighting characteristics
- Meet average lighting power density of 10W/m<sup>2</sup> for all new and refurbished buildings (excluding Carparks)
- Individual areas to have lighting power densities at least 10% less than the maximum permitted in Section J of BCA2006
- Feature lighting halogen spotlights to 35W with 50W not to be used
- All ballasts must be electronic and dimmable
- All lamps must have low mercury content (i.e. ≤5mg) with high intensity discharge lamps to have the lowest practically available
- Design external lighting to comply with Green Star credit Emi-8

### Lighting (Contd.)

- Lighting LUX levels not to exceed 320 lux maintained illuminance for any ceiling based lighting systems excluding all corridors will be designed for 160 lux using indirect lighting and specialist medical and laboratory areas
- Lighting Controls to incorporate:
  - Easily visible and clearly labelled switching
  - No light switch to control a floor area greater than 100m<sup>2</sup>
  - Each individual room to have a light switch(s);
  - Out of hours timed control to all areas not operating 24 hours per day
  - All out of hours timer switches MUST have an off switch
  - Stores, etc to have timer switches and/or motion detectors
  - Lights in courtyards, atriums, under skylights and open plan areas with perimeter lighting zone >20m to have daylight dimming control

### Water

- Collect and re-use at least 75% of rainfall off all new roof areas
- At least 20% of total water consumption to be from non-potable water
- Minimum water efficiency requirements for taps, showerheads, WC's urinals, and whitegoods stipulated
- All stormwater leaving the site at any time up to a 1-in-20 year storm event to be meet Victorian EPA Best Practice Guidelines for Environmental Management for Urban Stormwater

### Metering & Monitoring

- Minimum sub-metering, monitoring and reporting for electricity, gas and water consumption stipulated
- Flow meters and temperature sensors will be provided to enable CHW and HHW energy consumption to be monitored and reported called for

### Materials

- All flooring materials, paints, sealants & adhesives to be low VOC, with at least 50% of finished floor area to contain no PVC products
- At least 80% of timber (i.e. stud walls, etc) by cost to be Victorian Plantation timber (preferably Forest Stewardship Council certified timber)
- At least 60% of joinery by cost to have low formaldehyde emissions
- All building fabric and building services insulation to be zero ODP
- Embodied energy of concrete to be reduced by reducing the Portland Cement content for stipulated % for insitu, pre-cast and pre-stressed

### Equipment

- All computer monitors to be LCD
- All Energy Star rated appliances to be from top 25% energy performers
- Printers / photocopiers to have double sided printing facility enabled
- Select equipment in non-24 hour areas to be provided with timers

### Transport

- Provide secure bike spaces and lockers for use by at least 250 staff as well as a minimum 25 showers
- Provide 15 secure bike spaces near the front entrance for visitors to the hospital which comply with AS2890.3

### Commissioning

- All engineering services to be commissioned in accordance with CIBSE Commissioning Codes or ASHRAE Guideline 1 (Mechanical)
- Actual performance of Facility to be reviewed every three months for the first 12 months, with a final re-commission at the end of this period

### Environmental Benchmarking

- Benchmark, track and report against the Green Star – Healthcare (Pilot) rating tool for nominated Star rating

# Bid Evaluation, Design Development & Technical Completion

## Monitoring & Tracking

- Interactive sessions & clarification reviews during Bid development
- Bid evaluation & issues / bid departures negotiation
- Revised bid evaluation
- Financial Close & Output Specification
- Design testing & departure assessment
- Design Submission (DS) evaluation
- Technical Completion (TC) evaluation
- Post Occupancy Evaluation (POE)
- On-going operational monitoring and tracking

# ESD Outcomes

## New Royal Children's Hospital

### Sustainability Outcomes

- Kid, family and staff focused design outcome
- 80% of all patient rooms have park views
- Highly efficient climatically responsive facade
- Great daylight availability
- Net increase in parkland
- eWater, rainwater collection & re-use, water efficient fittings, black water treatment system and water-conscious landscaping
- 2.4MW tri-generation plant, chilled water storage, solar heating & bio-mass boiler
- Chilled beams in most patient areas
- 500+ bicycle spaces
- State assessed 5-Star equivalency



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