BUSHELLS FACTORY REDEVELOPMENT

SUSTAINABILITY STRATEGY

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PREPARED BY KINESIS FOR COLLIERS INTERNATIONAL

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Note: This report is provided subject to some important assumptions and qualifications:

The results presented in this report are modelled estimates using mathematical calculations. The data, information and scenarios presented in this report have not been separately confirmed or verified. Accordingly, the results should be considered to be preliminary in nature and subject to such confirmation and verification.

Energy, water and greenhouse consumption estimates are based on local climate and utility data available to the consultant at the time of the report. These consumption demands are, where necessary, quantified in terms of primary energy and water consumptions using manufacturer's data and scientific principles.

Generic precinct-level cost estimates provided in this report are indicative only based on Kinesis's project experience and available data from published economic assessments. These have not been informed by specific building design or construction plans and should not be used for design and construct cost estimates.

The Kinesis software tool and results generated by it are not intended to be used as the sole or primary basis for making investment or financial decisions (including carbon credit trading decisions). Accordingly, the results set out in this report should not be relied on as the sole or primary source of information applicable to such decisions.

CONTENTS

INTRODUCTION

Kinesis was engaged by the developer to develop a sustainability strategy for the Bushells Factory Redevelopment. This report provides an analysis of a sustainability strategy for the project.

Analysis was undertaken using the CCAP Precinct integrated sustainability, infrastructure and design tool. CCAP Precinct provides a basis from which the developer can identify and measure the potential performance outcomes and develop a suite of strategies for implementation.

We have worked with the project team through workshops and iterations to develop the recommendations in this report.

KEY INTERVENTIONS AND FINDINGS

Five key interventions were identified to enhance the sustainability outcomes of the Bushells Factory Redevelopment:

1. Efficient appliances & improved thermal design
2. Solar Photovoltaic (PV) & battery ready facilities
3. Recycled water ready infrastructure
4. Green facade treatment for cooler dwellings
5. Best practice parking measures and access to car share facilities

The modelled interventions will deliver a comprehensive precinct approach to sustainability and infrastructure delivery.

When compared to a benchmark scenario (BASIX and NCC compliance), the Bushells Factory Redevelopment has the potential to achieve:

	Impact of interventions
Greenhouse gas emissions	▼34%
Water consumption	▼38%
Peak electricity	▼50%
Solar PV contribution	20%
Recycled/rain water contribution	30%
BASIX Energy score (estimated)	53
BASIX Water score (estimated)	66
Annual household cost savings	$7,200

Table 1: Impact of interventions

The ESD strategy can be achieved through a combination of “standard” building level sustainable interventions such as installing rooftop PV systems, ensuring high thermal efficiency, installing efficient appliances and capturing and reusing rainwater along with “creative” interventions such as unbundled and decoupled parking systems, encouraging the uptake of car share, a recycled water system, a green facade and additional canopy cover and battery storage.

Based on initial cost estimates (excluding recycled water system costs), the outcomes could be achieved at an estimated capital cost of approximately $7,700 per dwelling. It should be noted, however, this cost will vary depending on the delivery model for recycled water, solar PV and other energy solutions.

This report provides the incremental cost and benefit of each intervention. The sustainability strategy developed will deliver the best financial, social and environmental outcomes for Bushells Factory Redevelopment.

PROJECT DETAILS

The development details (dwellings, floor space, site area) for the Bushells Factory Redevelopment site are provided in Table 2, based on the preliminary master plan. Results contained in the report are based on the development details provided here.

DEVELOPMENT DETAILS

Development details	Area
Total Development Area	3.98 ha
Public Open Space (including roads)	2.4 ha
Residential Dwellings	500
Terraces	36
Apartments	464
Affordable (1-bedroom)	46
1-bedroom	73
2-bedroom	275
3-bedroom	70
Building height	Average 6 storeys (ranging from 3 to 9 storeys)

Table 2: Dwelling yield and floor space for Bushells Factory Redevelopment

SCENARIO ANALYSIS

This work was undertaken using CCAP Precinct, a strategic infrastructure and sustainability design tool, used in the analysis of key performance metrics of precincts, integrating land use and development inputs with demographic, utility, transport and affordability models. Strategies were analysed and discussed with the project team on 6 March, 2017 and refined over time.

This discussion and subsequent refinements have been incorporated into the analysis provided in this report.

Analysis of energy and water demands, transport and car use and household living costs were undertaken under a scenario which incorporates a suite of energy, water and transport strategies that were explored for the development.

This modelled scenario was compared to a **Benchmark Scenario.**, which assumes the development is delivered to building compliance standards (approximate BASIX Energy 25 and BASIX Water 40 for apartments and BASIX Energy 50 and BASIX Water 40 for townhouses) and using Council DCP parking rates.

The technical details of the benchmark and modelled scenarios are summarised in Table 3 and the results are discussed below.

TECHNOLOGY ASSUMPTIONS FOR SCENARIOS

Technology	Benchmark	Modelled scenario
Hot water system	Centralised gas	Centralised gas
Thermal Design (NatHERS)	5-star average	8-star average (delivered through design & green façade)
Space heating and cooling	2-Star A/C	5-Star A/C
Lighting	Halogen, T8 & CFL	Efficient (LED)
Appliances	Dishwasher 2.5-star Energy, 2.5-star Water Dryer 1.5-star Energy Clothes washer (not installed) Fridge (not installed)	Dishwasher 4-star Energy, 5-star Water Dryer Heat Pump Clothes Dryer Clothes washer 4.5-star Energy, 5-star Water Fridge 5-star Energy
Solar PV	None	300 kW* (0.5 kW per multi unit dwelling 2 kW per townhouse)
Water Fixtures & fittings	Toilet – 4-star Showerhead – 3+ Star Kitchen Taps – 5-star Other Taps – 5-star	Toilet – 4-star Showerhead – 3+ Star Kitchen Taps – 5-star Other Taps – 5-star
Water reuse	None	Recycled water for irrigation, toilet and laundry
Car parking rates	Affordable – 1 space 1 bed – 1 space 2 bed – 1.5 space 3 bed – 2 space 1 visitor per 3 apartments	Affordable – 0 space 1 bed – 0 space 2 bed – 1 space 3 bed – 1.5 space 1 visitor per 5 apartments Unbundled parking Provision of car share spaces

Table 3: Specifications assumed for Benchmark (BASIX and NCC Compliance) and modelled scenario

*** PV system size shows cumulative total for the whole precinct but would be implemented on a building-by-building basis**

KEY FINDINGS

A summary of the incremental impact of each initiative explored in the modelled scenario is documented below in Table 4. Some further details are discussed below.

Technology	Benchmark	Modelled scenario	Upfront Marginal Capital Cost ($) per dwelling	Annual Savings per dwelling ($/year)	Simple Payback Period (years)	Net Emission Reduction	Net Water Reduction	Est. additional BASIX Energy Points	Est. additional BASIX Water Points
Hot water system	Centralised gas	Centralised gas	$0	$0					
Thermal Design (NatHERS)	5-star average	8-star average	$2,900	$80	36	4%		2	
Space heating & cooling	2-Star A/C	5-Star A/C	$500	$20	25	1%		<1	
Lighting	Halogen, T8 & CFL	Efficient (LED)	$570	$60	10	2%		2	
Appliances	Dishwasher 2.5-star Energy, 2.5-star Water	Dishwasher 4-star Energy, 5-star Water	$200	$20	10	1%		1	
	Dryer 1.5-star Energy	Dryer 5-star Energy	$500	$75	7	3%		4	
	Clothes washer (not installed)	Clothes washer 4.5-star Energy, 5-star Water	$630	$80	8	2%	17%	2	4
	Fridge (not installed)	Fridge 5-star Energy	$770	$30	25	2%		2	
Solar PV	None	300 kW (0.5 kW per multi unit dwelling 2 kW per townhouse)	$650*	$195	3	12%		7	
Water Fixtures & fittings	Toilet – 4-star Showerhead – 3+ Star Kitchen Taps – 5-star Other Taps – 5-star	Toilet – 4-star Showerhead – 3+ Star Kitchen Taps – 5-star Other Taps – 5-star	$0	$0					
Rainwater harvesting/ Recycled water	None	Recycled water for irrigation, toilet and laundry (approx.1,000 kL storage)	$1,000**	$60^	17		21%		22
Car parking rates and car share	Affordable – 1 space 1 bed – 1 space 2 bed – 1.5 space 3 bed – 2 space 1 visitor per 3 apartments	Affordable – 0 space 1 bed – 0 space 2 bed – 1 space 3 bed – 1.5 space 1 visitor per 5 apartments On-street parking controls Unbundled parking Provision of car share spaces	$0	$1,200 (fuel) $5,400 (fixed^^)		*51% (transport emissions)* 7% (energy emissions)		5	
TOTAL			**$7,720**	**$7,200**		**34%**	**38%**	**26 points**	**26 points**

Table 4: Specifications assumed for Benchmark (BASIX and NCC Compliance) and modelled scenario

New BASIX Energy & Water Score 53 66

* **Capital cost of precinct scale solar PV system of 300 kW divided over 500 dwellings**

** **Marginal capital cost of connection to a precinct scale recycled water system including building level metering and dual pipe**

^ **Subject to variation based on recycled water pricing**

^^ **Transport fixed costs includes vehicle ownership costs such as insurance, maintenance and registration**

STRATEGY CONSIDERATIONS AND NEXT STEPS

Strategy	Who Benefits	Considerations	Next steps
Car parking rates	• **Purchaser** – lower apartment cost. • **Resident/Strata** – reduced common area electricity demands and associated strata fees. • **Developer** – reduced construction costs.	• Parking can have a positive or negative impact on project feasibility (construction costs vs sale prices). • Allocating spaces for car share pods would enable residents to consider a new approach for car ownership and set up the community for a future with autonomous cars.	• Facilitate the EOI for provision of car share. • Perform further transport modelling with SCT Consulting to build a case for lower parking rates to for presentation to Council and RMS. • Determine the design implications of lower parking rates, considering the slope of land and site constraints.
Recycled water system	• **Resident/Strata** – unlimited water available to ensure lush/green common area gardens and a green facade which is not dependent on climate variability. • **Developer** – potential for lower sewer & water infrastructure costs.	• Rainwater and stormwater reuse does not provide adequate water for irrigation, toilet and laundry demand. • The scale of Bushells Factory Redevelopment is adequate for the potential for precinct scale recycled water, significantly reducing water demand and sewer loads. • Potential to enter into cost sharing arrangements with the recycled water utility provider to maintain the green facade and public gardens. In addition, the water utility may consider providing additional water to the adjacent Massey Park golf course and Edwards Park (further improving the feasibility of recycled water for the project)	• Facilitate EOI for provision of recycled water for the Bushells Factory Redevelopment. • Include the potential to share capital and operation costs for green spaces and facade in the EOI.
Solar PV & battery	• **Resident/Strata** - cost savings from reduced common area electricity demands and associated strata fees. • **Electricity Utility** – Reducing/ shifting the peak demand reduces pressure on the grid increasing the longevity of the distribution network.	• A single common area meter for each building would allow solar PV to be maximised for common area loads. • Excess electricity produced by the solar PV system during the day can be sold to the grid. Combined with a battery storage system, electricity could be sold at peak times to generate more revenue. • Potential for solar PV to be managed at a precinct level through a private energy utility.	• Facilitate EOI for alternative energy solutions for the Bushells Factory Redevelopment. • Allocate space and wiring for battery ready buildings.
8-star NatHERS	• **Resident –** improved comfort and minor cost savings through lower air conditioning use. • **Electricity Utility** (public or private) – peak demand reductions. • **Developer -** smaller air conditioner capacity could translate to lower cost and more efficient systems.	• Determine with the design team whether an 8-star rating can be achieved through both building design and green facade treatment. • Green facade capital & maintenance costs are uncertain. See link to recycled water utility provider.	• Meet with Ausgrid to discuss network benefits and potential infrastructure cost saving associated with the strategy. • Investigate design implications and maintenance requirements for green walls • Incorporate option for cost sharing arrangements with the recycled water utility provider to maintain the green facade and public gardens in EOI process.
5 star A/C	• **Supports 8-star NatHERS strategy** to improve resident comfort and network benefits (see above)	• Capital costs are low but the material benefits to households and the developer is marginal. • Main beneficiary is the utility through peak demand reductions (see next steps).	• Meet with Ausgrid to discuss network benefits and potential infrastructure cost saving associated with the strategy.
Efficient Appliances	• **Resident -** utility cost savings. • **Developer -** potential for apartment fit out cost savings as kitchens and laundries are designed and built for specific appliances.	• Potential for reduced costs and waste in apartment fit out as kitchens and laundries are designed and built for specific appliances. • Capital costs are high and include appliances the developer would usually not install (clothes washer and fridge). • Of all appliances, the clothes washer has the biggest impact on energy and water performance and household cost savings. • Additional benefits could mean less disruption when people move in to the apartment block (no moving of large appliances, scratching walls etc).	• Investigate the marketability of providing new purchases with all appliances (“move in ready” apartments). • Investigate the potential for fit out cost savings.

APPENDIX

KEY ASSUMPTIONS

Metropolitan Sydney average benchmarks

Electricity	2,132 kWh per person/year
Gas	3,888 MJ per person/year
Water	237.8 L per person/day
Transport	19.98 km per person/day

Tariffs and rates

Household cost savings outlined in this report are based on current tariffs outlined below:

Residential Water	**Rate**	**Unit**
Mains tariff	2.232	$/kL
Recycled water tariff	2.068	$/kL
Service charge per dwelling	765	$/yr
Recycled water service charge	0	$/yr

Residential Grid Electricity	**Rate**	**Unit**
Applied tariff	0.2514	$/kWh
Solar feed-in tariff	0.06	$/kWh
Service charge per dwelling	289.16	$/yr

Residential Gas	**Rate**	**Unit**
Gas (first 3,775 MJ per qtr/remaining)	0.041/0.023	$/MJ
Service charge per dwelling	207	$/yr

Residential Transport	**Rate**	**Unit**
Fuel	1.50	$/L
Annual capital costs (devaluation)	6,642	$/yr
Annual registration/insurance	2,172	$/yr

KEY DATA SOURCES

- ACADS-BSG Australian Climatic Data (Reference Meteorological Year, RMY) for hourly temperature, insulation and humidity.
- Bureau of Meteorology local rainfall and evaporation data
- Data is from the representative weather station for the local climate zone
- The RMY (Representative Meteorological Year) is synthesized from a composite of 12 typical meteorological months that best represent the historic average of the specified location using post-1986 data in addition to the earlier weather data for each of the 69 climate zones in Australia.
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