

ECOLOGICALLY SUSTAINABLE DESIGN STRATEGY

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
11.07.2018	A	Gateway 2.1 (For Review)	M.Dempsey	E.Chan
01.08.2018	B	Gateway 2.3 (For Review)	M.Dempsey	A.Girgis
24.09.2018	C	Gateway 2.3	M.Dempsey	I.V.Eerden

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EXECUTIVE SUMMARY

This report outlines St George Community Housing's (SGCH) Ecologically Sustainable Design (ESD) strategy for the proposed development at 11 Gibbons Street in Redfern, NSW. The ESD initiatives identified in this strategy meet and exceed the policy requirements applicable to the development.

As a residential development in NSW, the project must comply with the Building Sustainability Index (BASIX) which stipulates benchmarks for water consumption, thermal comfort and energy use. The development exceeds these benchmarks as identified in the table below and lifts the average dwelling NatHERS rating from 6 Stars to 8 Stars:

Policy Requirement	Category	Benchmark Improvement Value	Targeted Improvement Value	Enhanced Outcome (%)
BASIX	Water	40 (min)	41	2.5%
	Thermal Comfort	26 MJ/m ² /annum (cool) 40 MJ/m ² /annum (heat)	12 MJ/m ² /annum (cool) 11 MJ/m ² /annum (heat)	54% (cool) 73% (heat)
	Energy	25 (min)	45	80%

In addition to exceeding these policy requirements, the project is also targeting the following initiatives:

- Onsite renewable energy (Solar PV)
- Embedded Electricity Network
- Improved NatHERS Targets (8 Stars)
- Tenant Energy Education
- Passive Solar Design
- Sustainable Transport Facilities

The combination of these ESD initiatives is estimated to save each dwelling at 11 Gibbons Street approximately \$900 per year in energy related expenses when compared to a typical 2 bedroom apartment in this area.

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1. INTRODUCTION

1.1 Overview

Northrop Consulting Engineers have been engaged by St George Community Housing (SGCH) to provide an Ecologically Sustainable Design (ESD) Strategy for the proposed development at 11 Gibbons Street in Redfern, NSW. The aim of this strategy is to demonstrate SGCH's commitment to creating sustainable and affordable housing, as well as provide a pathway to compliance with relevant policy requirements.

The proposed development is an 18 storey building containing a mix of one, two and three bedroom apartments totalling 160 dwellings. The development also includes retail, commercial, café, community and office spaces on the ground floor.



Figure 1: SGCH Gibbons Street

The following documents and tools have been referenced in the development of this strategy:

- SGCH – Development & Construction Design Guidelines V3.0
- The NSW Building Sustainability Index (BASIX)
- The National Construction Code 2016

1.2 Limitations

Due care and skill has been exercised in the preparation of this report.

This report is intended as a guide to illustrate the potential BCA section J compliance methods to be considered in the development. It should be read in conjunction with the other design documentation and specific applications may vary during the development of the project. Any products specified or used for the project are to be verified by the contractor as being safe and appropriate for use. Northrop do not take any responsibility for the use of unsafe products.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Northrop for detailed advice, which will take into account that party's particular requirements.

2. BASIX

As a residential development in NSW, SGCH Gibbons Street is required to achieve compliance with the Building Sustainability Index (BASIX). BASIX mandates targets for water efficiency, energy efficiency and thermal comfort through both active and passive design measures.

In addition to meeting minimum BASIX compliance, SGCH stipulates essential requirements for potable water, rainwater harvesting and reuse, thermal comfort, and energy efficiency in all of its developments.

BASIX inputs and SGCH requirements for the Gibbons Street development have been combined and summarised in the following sections. A full copy of the BASIX Report can be found in Appendix A.

2.1 Water Efficiency

- 4 Star WELS rated taps
- 4 Star WELS rated WC
- 3 Star WELS (> 4.5 but <= 6 L/min)
- Separate mains potable water connection to each dwelling
- 25kL rainwater tank to collect from 500m² roof area
- Rainwater tank to include first flush device to drain to storm water
- Rainwater used for common area landscape only
- No bladder tanks permitted
- Minimum 2 year warranty to all rainwater reuse pump sets

2.2 Thermal Comfort

For developments in Redfern, the average loads for heating and cooling across all units must not exceed 40.0 MJ/m² and 26.0 MJ/m² respectively, while the maximum heating and cooling load for any unit must not exceed 45.4 MJ/m² and 29.5 MJ/m² respectively. The following building materials are required to achieve these benchmarks and an 8 Star average NatHERS rating (Section 4.3) are given below.

- Concrete roof: R3.0 insulation, reflective both sides
- Exposed ceilings: R3.0 insulation
- External walls: Concrete, bulk insulation and plasterboard to achieve a total system R-Value of 3.14
- Party Walls: Concrete panel between plasterboard to achieve total system R-Value of 1.16
- Internal walls: Plasterboard
- Ground floor: Concrete slab on ground
- Unit floor: Concrete (coverings include vinyl in living areas and bedrooms, tile in bathrooms)
- Suspended floors: Concrete, R4.0 insulation

- Western bedroom glazing: Double glazing, U-Value = 3.4 (maximum), SHGC = 0.53 ($\pm 5\%$)¹
- Other glazing: High performance, low-e single glazing, U-Value = 4.3 (maximum), SHGC = 0.47 ($\pm 5\%$)²
- Awning windows 90% openable, double sliding doors 45% openable, triple sliding doors 60% openable
- Draught seals around all external doors

2.3 Energy Efficiency

- 50kW peak roof-top solar PV system to serve common area power loads
- Gearless traction lifts with Variable Voltage & Frequency (VVVF) motor to serve 18 storeys
- No mechanical ventilation exhaust for lobbies and corridors, bicycle storage, NBN rooms
- Mechanical ventilation exhaust for garbage rooms, switch rooms, service rooms, chamber substation and fire stair, interlocked to light
- Mechanical ventilation supply and exhaust for community room
- LED lighting with motion and daylight sensor control for lobbies, hallways and community room
- LED lighting with motion sensor control for service rooms, fire stair, bicycle storage and bin rooms
- LED lighting with manual on-off control for main switch room, chamber substation and fire control room
- LED lighting for lifts connected to call button
- Kitchen, bathroom and laundry ducted to façade or roof with manual on and timer off control
- Ceiling fans in living areas and bedrooms
- Gas bayonet in living area against external wall for future gas appliance flue
- Compact Fluorescent/LED fittings for all internal dwelling areas
- 4.5 Star instantaneous gas hot water system per dwelling
- Gas cooktop and electric oven per dwelling
- Dishwasher, clothes washer, clothes dryer and refrigerators not provided

¹ Glazing required anywhere an Rw value from 42 and 44 (inclusive) has been specified in Acoustic Assessment by Renzo Tonin & Associates

² Glazing required anywhere an Rw value from 29 and 39 (inclusive) has been specified in Acoustic Assessment by Renzo Tonin & Associates

3. SECTION J

The proposed development contains retail and commercial spaces on ground floor.

As these areas do not directly serve the residential portion of the Gibbons Street development they cannot be assessed under BASIX. These areas have been identified in Figure 2.

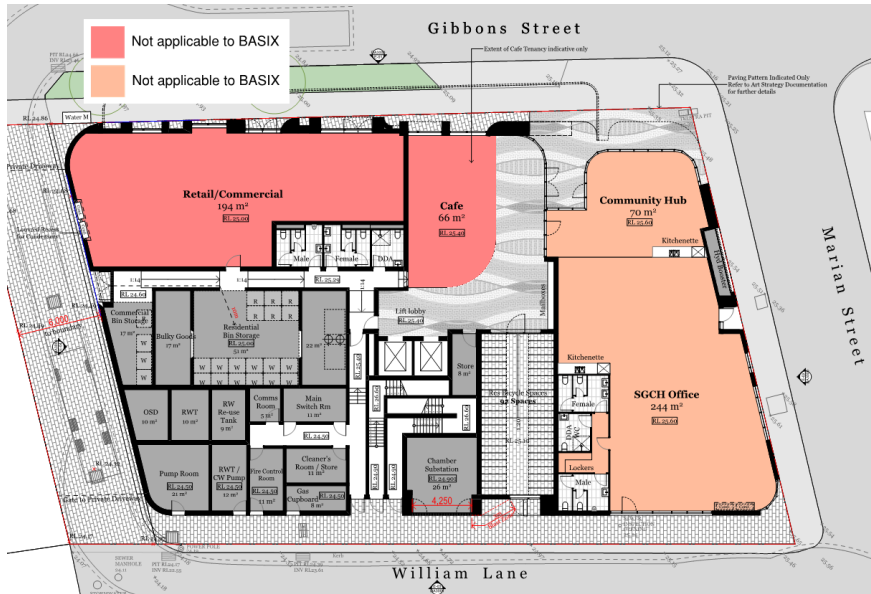


Figure 2: SGCH Gibbons Street Ground Floor

Where these areas are air conditioned, the building fabrics and glazing that separate those areas from the outside or enclosed unconditioned space, must comply with Section J of the National Construction Code (NCC) 2016.

Section J outlines mandatory building fabric and glazing requirements under Part J1 and J2 respectively, to improve energy efficiency of all new developments in Australia. There are two methods of achieving minimum compliance under Section J; Deemed-to-satisfy (DTS) or a performance based solution (JV3).

Based on the nature of the Gibbons Street development, Northrop advises that a performance based solution via JV3 modelling will be the most cost effective pathway to achieving compliance with Section J.

A report by demonstrating compliance will be prepared prior to construction documentation.

4. ESD INITIATIVES

4.1 On-Site Renewable Energy

The Gibbons Street development is aiming to reduce carbon emissions from the building's operational energy through the inclusion of an on-site solar PV system.

On site renewable energy will be produced from a solar PV array of up to 50kW installed on the roof the Gibbons Street development. Architects DKO have made provisions for approximately 430m² of unobstructed roof space to house the system. With a predominately north orientation, a 50kW system is expected to have an average annual electricity production of 71.3 MWh.

Power generated by the solar PV system will feed common area power loads and offset electricity usage in dwellings, lowering energy related expenses for tenants. The operation of the system will be optimised with the use of an embedded electricity network as outlined in the following section.

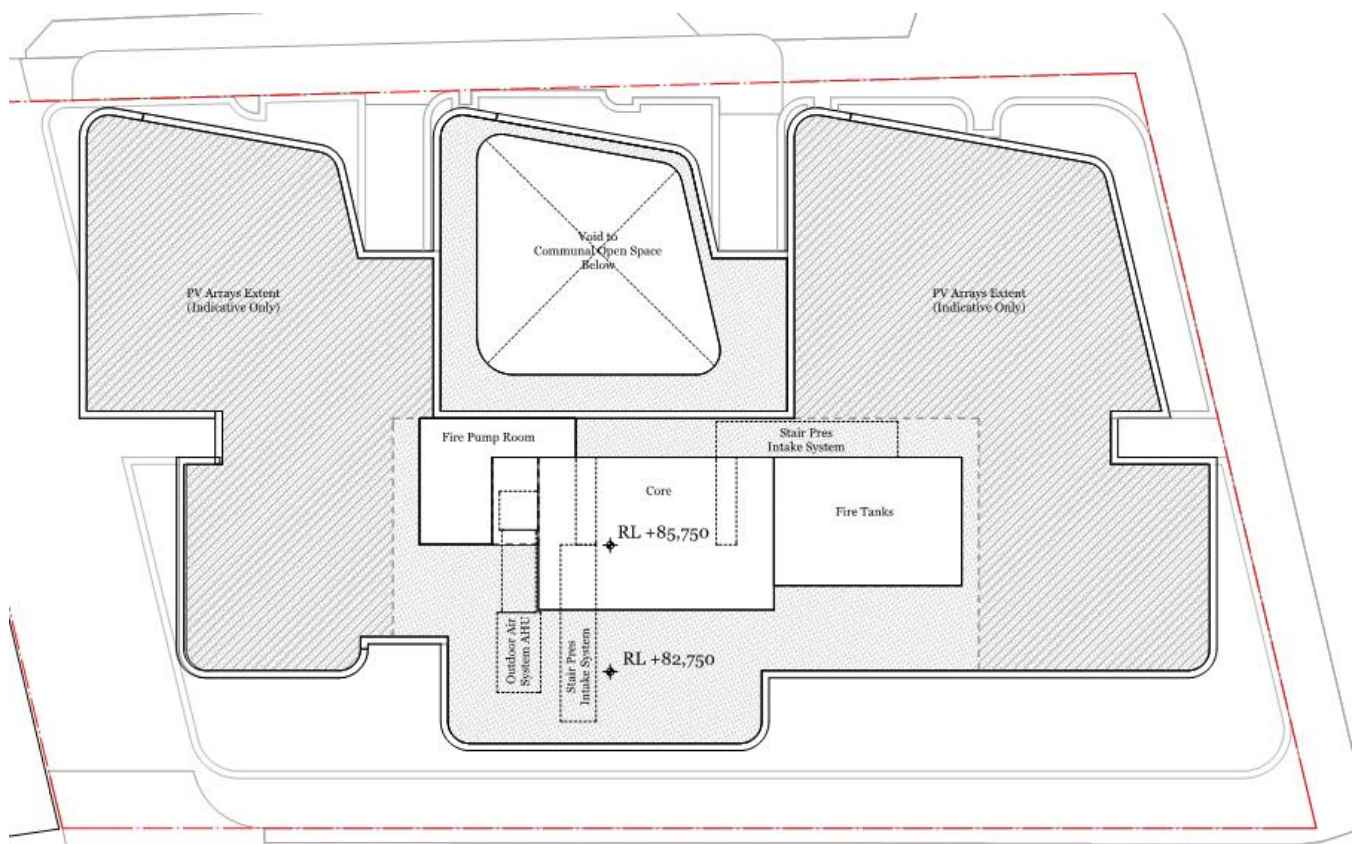


Figure 3: Roof Plan for SGCH Gibbons Street Indicating PV Array Area

4.2 Embedded Electricity Network

An embedded electricity network will help to maximise the economic sustainability and security of energy use at SGCH Gibbons Street. Embedded networks aggregate a building's energy consumption to a single metered grid connection, with sub-meters available to measure individual tenant's energy consumption and bill them accordingly. The network of sub-meters in conjunction with on-site power generation forms a micro-grid which can either operate autonomously, or in synchrony with the macro-grid.

The previously mentioned solar PV system will provide the on-site power generation to optimise the operation of the embedded network at SGCH Gibbons Street. When the solar PV system output exceeds the base building common areas loads, electricity will be exported from the site, offsetting the building's main grid connection. The effect of this will be to lower the billable power consumption of individual units. Furthermore, the use of an embedded network will allow SGCH to negotiate better discounts from electricity providers to keep electricity bills at a minimum for tenants.

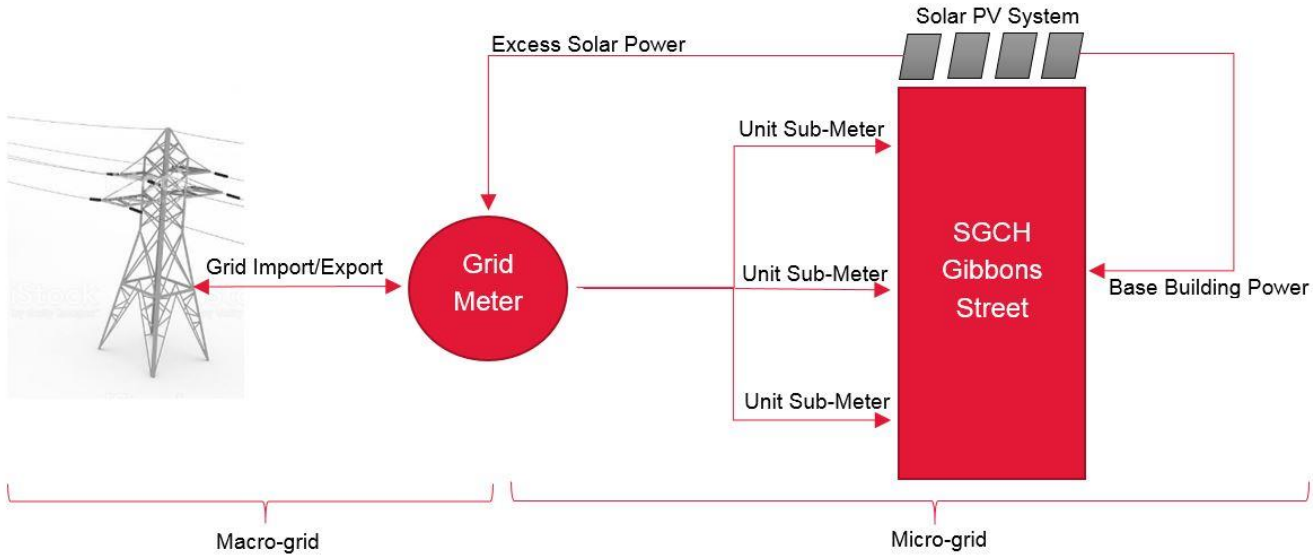


Figure 4: Embedded Network

4.3 Improved NatHERS Targets

In previous developments, SGCH has demonstrated leadership in moving beyond ESD code compliance by targeting an average NatHERS rating of 7 Stars across all dwellings. The Gibbons Street development will improve upon this benchmark by striving to target an 8 Star average NatHERS rating across all dwellings. By targeting a higher NatHERS rating, heating and cooling loads for individual units will be lowered to result in improved thermal comfort, lower emissions and lower energy costs for tenants. The following table contrasts the building requirements for a typical 7 Star average and 8 Star average unit.

Building Element		Properties	
		7 Star Average	8 Star Average
External Walls		R2.0 Insulation	$R_t=3.14$
Roof		R3.0 Insulation	R3.0 Insulation
Exposed Floor		R3.0 Insulation	R4.0 Insulation
Glazing	Western Bedrooms	High performance single glazing	Double Glazing
	All Other	High performance single glazing	High performance, low-e, single glazing

4.4 Energy Education

While pursuing a high NatHERS rating has significant benefits from an ESD perspective, building tenants have an important role to play to ensure they benefit from living in energy efficient homes. SGCH will aim to provide prospective tenants with information around energy efficient lifestyle habits through brochures and/or workshops. This initiative will promote awareness around energy efficiency, create a sense of community and provide tenants with the tools to keep their energy bills to a minimum. Information could include but may not be limited to:

- Selecting energy efficient appliances and fittings, including light bulbs
- Effective use of heating and cooling appliances
- Maximising natural ventilation

4.5 Passive Solar Design

Passive solar design principals have been incorporated into the SGCH Gibbons Street development to further reduce heating and cooling loads on individual units without compromising on daylight levels. Large balcony overhangs create effective horizontal shading devices which exclude summer sun, while careful orientation still allows afternoon winter sun to penetrate the dwellings.

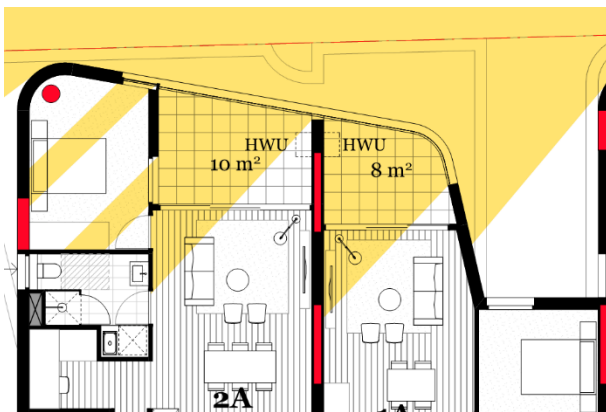


Figure 6: Afternoon Winter Sun Access

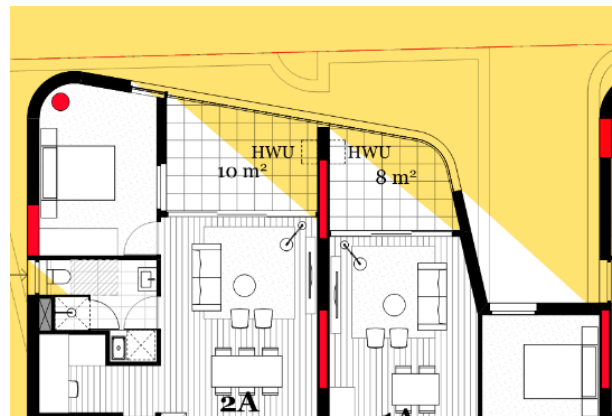


Figure 5: Afternoon Summer Sun Shading

4.6 Sustainable Transport

Occupant transport is large contributor to a building's overall environmental footprint. The proximity of Redfern Train Station gives the Gibbons Street development the highest Green Star Accessibility Rating, meaning more than 15% of the Greater Sydney population can reach the site within 45 minutes or less. To encourage the uptake of active transport methods and improve the accessibility of the site, 92 enclosed and secure bicycle parking spaces will be provided on the ground floor of the development. To further their commitment to low-emissions transport, SGCH is also providing no vehicle parking at the Gibbons Street development.

5. CONCLUSION

Through revision of current designs for SGCH Gibbons Street, a strategy has been provided to outline how the development can meet and exceed ESD policy requirements for new developments in NSW.

The level of improvement targeted upon existing ESD policy requirements reinforce SGCH's commitment to environmental, social and economic sustainability. In addition, these initiatives are estimated to save each dwelling at 11 Gibbons Street up to \$900 per year in energy related expenses when compared to a typical 2 bedroom apartment in the Sydney area.

APPENDIX A – BASIX CERTIFICATE

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BASIX[®]Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 943081M_03

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 06/10/2017 published by the Department. This document is available at www.basix.nsw.gov.au

Secretary

Date of issue: Friday, 21 September 2018

To be valid, this certificate must be lodged within 3 months of the date of issue.



Project summary		
Project name	SGCH Gibbons Street_03	
Street address	11 Gibbons Street Redfern 2016	
Local Government Area	Sydney City Council	
Plan type and plan number	deposited 4209	
Lot no.	1-11	
Section no.	-	
No. of residential flat buildings	1	
No. of units in residential flat buildings	160	
No. of multi-dwelling houses	0	
No. of single dwelling houses	0	
Project score		
Water	✔ 41	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 45	Target 25




Certificate Prepared by

Name / Company Name: Northrop Consulting Engineers Pty Ltd

ABN (if applicable): 81094433100

Description of project

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Local Government Area	Sydney City Council
Plan type and plan number	deposited 4209
Lot no.	1-11
Section no.	-
Project type	
No. of residential flat buildings	1
No. of units in residential flat buildings	160
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m ²)	1578
Roof area (m ²)	753
Non-residential floor area (m ²)	587.0
Residential car spaces	0
Non-residential car spaces	0

Common area landscape		
Common area lawn (m ²)	0.0	
Common area garden (m ²)	125.0	
Area of indigenous or low water use species (m ²)	0.0	
Assessor details		
Assessor number	20579	
Certificate number	0003197160	
Climate zone	56	
Project score		
Water	 41	Target 40
Thermal Comfort	 Pass	Target Pass
Energy	 45	Target 25

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Building1, 160 dwellings, 18 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
1.01	2	71.6	6.2	0.0	0.0
1.05	2	68.4	6.9	0.0	0.0
1.09	2	67.0	6.9	0.0	0.0
2.03	2	70.3	6.9	0.0	0.0
2.07	3	126.3	7.6	0.0	0.0
3.01	1	53.0	7.0	0.0	0.0
3.05	2	72.4	6.7	0.0	0.0
4.03	2	65.8	8.0	0.0	0.0
5.01	2	66.9	7.2	0.0	0.0
5.05	2	67.1	7.0	0.0	0.0
5.09	2	72.4	6.7	0.0	0.0
6.03	2	67.1	7.0	0.0	0.0
6.07	2	65.8	8.0	0.0	0.0
7.01	2	66.9	7.2	0.0	0.0
7.05	2	67.1	7.0	0.0	0.0
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8.03	2	67.1	7.0	0.0	0.0
8.07	2	65.8	8.0	0.0	0.0

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
1.02	1	47.6	6.9	0.0	0.0
1.06	2	70.9	7.6	0.0	0.0
1.10	3	93.9	5.7	0.0	0.0
2.04	1	47.8	6.8	0.0	0.0
2.08	3	104.2	7.6	0.0	0.0
3.02	1	45.3	7.0	0.0	0.0
3.06	2	64.0	10.2	0.0	0.0
4.04	1	48.1	7.1	0.0	0.0
5.02	1	44.3	6.6	0.0	0.0
5.06	1	52.3	8.2	0.0	0.0
5.10	2	64.0	10.2	0.0	0.0
6.04	1	44.3	6.6	0.0	0.0
6.08	1	48.1	7.1	0.0	0.0
7.02	1	44.3	6.6	0.0	0.0
7.06	1	52.3	8.2	0.0	0.0
7.10	2	64.0	10.2	0.0	0.0
8.04	1	44.3	6.6	0.0	0.0
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2.02	1	47.6	6.7	0.0	0.0
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14.09	2	72.4	6.7	0.0	0.0
15.03	2	67.1	7.0	0.0	0.0
15.07	2	65.8	8.0	0.0	0.0
16.01	2	66.9	7.2	0.0	0.0
16.05	2	67.1	7.0	0.0	0.0
16.09	2	72.4	6.7	0.0	0.0
17.03	2	67.1	7.0	0.0	0.0
17.07	2	72.4	6.7	0.0	0.0

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
9.04	1	44.3	6.6	0.0	0.0
9.08	1	48.1	7.1	0.0	0.0
10.02	1	44.3	6.6	0.0	0.0
10.06	1	52.3	8.2	0.0	0.0
10.10	2	64.0	10.2	0.0	0.0
11.04	1	44.3	6.6	0.0	0.0
11.08	1	48.1	7.1	0.0	0.0
12.02	1	44.3	6.6	0.0	0.0
12.06	1	52.3	8.2	0.0	0.0
12.10	2	64.0	10.2	0.0	0.0
13.04	1	44.3	6.6	0.0	0.0
13.08	1	48.1	7.1	0.0	0.0
14.02	1	44.3	6.6	0.0	0.0
14.06	1	52.3	8.2	0.0	0.0
14.10	2	64.0	10.2	0.0	0.0
15.04	1	44.3	6.6	0.0	0.0
15.08	1	48.1	7.1	0.0	0.0
16.02	1	44.3	6.6	0.0	0.0
16.06	1	52.3	8.2	0.0	0.0
16.10	2	64.0	10.2	0.0	0.0
17.04	1	52.3	8.2	0.0	0.0
17.08	2	64.0	10.2	0.0	0.0

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Building1

Common area	Floor area (m ²)
Lift car (No.1)	-
Residential Bin Room	51.0
Chamber Substation	26.0
RWT/CW Pump	12.0
OSD	10.0
Store	19.0
LV1-17 Hallway	1015.0

Common area	Floor area (m ²)
Lift car (No.2)	-
Community Hub	70.0
Fire Control Room	11.0
RW Re-Use Tank	9.0
Bicycle Storage	60.0
Lift Lobby	82.0

Common area	Floor area (m ²)
Main Switch Room	11.0
Comms Room	5.0
Gas Cupboard	8.0
RWT	10.0
Fire Stair	572.4
Corridors	49.0

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Building1

(a) Dwellings

- (i) Water
- (ii) Energy
- (iii) Thermal Comfort

(b) Common areas and central systems/facilities

- (i) Water
- (ii) Energy

2. Commitments for multi-dwelling houses

3. Commitments for single dwelling houses

4. Commitments for common areas and central systems/facilities for the development (non-building specific)

- (i) Water
- (ii) Energy

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

1. Commitments for Residential flat buildings - Building1

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✓	✓	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✓	✓
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✓	✓
(e) The applicant must install: <ul style="list-style-type: none"> (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling. 		✓ ✓	✓ ✓
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✓	✓	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✓	
(g) The pool or spa must be located as specified in the table.	✓	✓	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✓	✓	✓

Dwelling no.	Fixtures					Appliances		Individual pool				Individual spa		
	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
All dwellings	3 star (> 4.5 but <= 6 L/min)	4 star	4 star	4 star	no	-	-	-	-	-	-	-	-	-

Dwelling no.	Alternative water source							
	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
None	-	-	-	-	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✓	✓	✓
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✓	✓
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✓	✓
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✓	✓

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must: (aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and (bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔ ✔	
(h) The applicant must install in the dwelling: (aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below; (bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and (cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔ ✔ ✔	✔
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	gas instantaneous 4.5 star	individual fan, ducted to façade or roof	manual on / timer off	individual fan, ducted to façade or roof	manual on / timer off	individual fan, ducted to façade or roof	manual on / timer off

Dwelling no.	Cooling		Heating		Artificial lighting					Natural lighting		
	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09, 1.10, 2.01, 2.02, 2.03, 2.04, 2.05, 2.06, 2.07, 2.08, 2.09, 2.10, 3.01, 3.02, 3.03, 3.04, 3.05, 3.06, 4.01, 4.02, 4.03, 4.04, 4.05, 4.06, 5.01, 5.02, 5.03, 5.04, 5.05, 5.06, 5.07,	ceiling fans	ceiling fans	-	-	1	1	yes	yes	yes	yes	0	no

Dwelling no.	Cooling		Heating		Artificial lighting					Natural lighting		
	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
5.08, 5.09, 5.10, 6.01, 6.02, 6.03, 6.04, 6.05, 6.06, 6.07, 6.08, 6.09, 6.10, 7.01, 7.02, 7.03, 7.04, 7.05, 7.06, 7.07, 7.08, 7.09, 7.10, 8.01												
All other dwellings	ceiling fans	ceiling fans	-	-	2	1	yes	yes	yes	yes	0	no

Dwelling no.	Individual pool		Individual spa		Appliances & other efficiency measures							
	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
All dwellings	-	-	-	-	gas cooktop & electric oven	-	yes	-	-	-	yes	-

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.	✓		
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.		✓	
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✓	✓
(g) Where there is an in-slab heating or cooling system, the applicant must: (aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.	✓	✓	✓
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✓	✓	✓

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
1.01	13.3	16.2
1.03	7.5	12.0
1.05	7.4	12.1
1.06	2.0	11.5
1.07	10.7	11.4
1.08	10.4	9.1
1.09	14.3	19.7
1.10	17.2	12.0
2.01	13.5	17.9
2.02	2.1	18.7
2.03	8.7	10.4
2.04	5.2	25.7
2.05	15.5	14.8
2.06	7.8	11.7
2.07	19.1	11.6
2.08	17.5	8.7
2.09	20.5	17.8
2.10	16.8	12.8
3.01	11.3	14.0
3.02	2.4	14.5
3.03	8.9	15.2
3.04	6.9	11.7
3.05	7.8	13.8
3.06	16.1	10.4
4.01	11.5	11.3
4.02	4.7	14.9
4.03	9.2	14.9

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
4.04	7.3	11.9
4.05	8.1	13.8
4.06	16.6	10.0
5.01	11.9	11.1
5.02	2.9	14.9
5.03	11.3	9.1
5.04	7.8	13.0
5.05	6.7	12.9
5.06	5.9	17.7
5.07	9.7	14.8
5.08	7.7	11.1
5.10	17.0	9.8
6.01	12.2	11.0
6.02	3.1	13.8
6.04	4.0	13.8
6.06	6.2	17.4
6.07	10.0	15.2
6.08	8.0	11.5
6.10	17.4	9.5
7.01	12.5	10.8
7.02	3.3	13.4
7.03	6.8	10.2
7.04	7.2	12.8
7.05	11.1	9.1
7.06	6.5	17.3
7.07	10.2	14.4
7.08	8.3	11.9

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
7.09	9.1	13.3
7.10	17.7	9.4
8.01	12.7	10.6
8.02	3.4	13.5
8.03	7.0	10.2
8.04	7.3	12.9
8.05	11.2	8.9
8.06	6.6	16.9
8.07	10.4	14.5
8.08	8.5	11.2
8.09	9.3	13.2
8.10	17.9	9.3
9.01	12.9	10.5
9.02	3.6	13.3
9.03	7.1	10.4
9.04	7.5	12.4
9.05	11.0	9.0
9.06	6.6	16.6
9.07	10.6	14.6
9.08	8.7	10.7
9.09	9.5	13.1
9.10	18.1	9.0
10.01	14.3	9.6
10.02	3.6	13.2
10.03	7.2	10.2
10.04	7.7	12.2
10.05	11.2	8.8

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
10.06	6.8	16.3
10.07	10.7	14.5
10.08	8.9	10.9
10.09	9.7	13.1
10.10	18.3	8.9
11.01	14.5	9.6
11.02	4.7	12.7
11.03	8.5	9.6
11.04	8.7	11.5
11.05	12.5	8.2
11.06	7.3	14.5
11.07	10.9	12.7
11.08	10.2	9.6
11.09	11.0	12.2
11.10	19.8	7.5
12.01	14.6	9.9
12.02	4.8	12.9
12.03	8.6	9.6
12.04	8.8	11.7
12.05	12.6	8.1
12.06	7.3	14.3
12.07	11.0	14.1
12.08	10.3	9.4
12.09	11.1	12.2
12.10	19.9	7.3
13.01	14.8	9.5
13.02	5.0	12.8

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
13.03	8.7	9.2
13.04	8.9	11.6
13.05	12.7	7.9
13.06	7.1	14.6
13.07	11.0	14.2
13.08	10.5	9.1
13.09	11.2	12.0
13.10	20.1	7.3
14.01	14.9	9.4
14.02	5.0	12.7
14.03	8.8	9.2
14.05	12.7	8.0
14.06	4.7	14.5
14.07	10.7	14.2
14.08	10.6	9.2
14.09	11.4	11.9
14.10	20.2	7.4
15.01	15.0	9.5
15.02	5.1	12.8
15.03	8.9	9.0
15.05	12.8	8.0
15.06	3.7	14.6
15.07	8.8	14.2
15.08	10.7	9.1
15.09	11.5	11.8
15.10	20.3	7.6
16.01	15.1	9.1

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
16.02	5.2	12.6
16.03	16.8	11.0
16.04	16.5	11.9
16.05	12.9	7.9
16.06	3.4	14.6
16.07	6.4	14.1
16.08	10.8	9.4
16.09	11.5	11.5
16.10	20.4	7.4
17.01	23.6	12.4
17.02	14.4	13.6
17.03	20.3	12.4
17.04	7.0	16.5
17.05	11.9	13.4
17.06	19.1	10.1
17.07	20.1	13.1
17.08	28.9	8.6
1.02, 1.04	1.1	23.8
5.09, 6.09	8.6	13.4
6.03, 6.05	6.4	10.7
All other dwellings	9.0	11.8

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	4 star	4 star	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	25000.0	To collect run-off from at least: - 500.0 square metres of roof area of buildings in the development - 0.0 square metres of impervious area in the development - 0.0 square metres of garden/lawn area in the development - 0.0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 125.0 square metres of common landscaped area on the site

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Lift car (No.1)	-	-	light-emitting diode	connected to lift call button	No
Lift car (No.2)	-	-	light-emitting diode	connected to lift call button	No
Main Switch Room	ventilation exhaust only	interlocked to light	light-emitting diode	manual on / manual off	No
Residential Bin Room	ventilation exhaust only	-	light-emitting diode	motion sensors	No
Community Hub	ventilation (supply + exhaust)	time clock or BMS controlled	light-emitting diode	daylight sensor and motion sensor	No
Comms Room	ventilation exhaust only	interlocked to light	light-emitting diode	manual on / manual off	No
Chamber Substation	ventilation exhaust only	interlocked to light	light-emitting diode	manual on / manual off	No
Fire Control Room	no mechanical ventilation	-	light-emitting diode	manual on / manual off	No
Gas Cupboard	ventilation exhaust only	interlocked to light	light-emitting diode	manual on / manual off	No
RWT/CW Pump	ventilation exhaust only	interlocked to light	light-emitting diode	manual on / manual off	No
RW Re-Use Tank	no mechanical ventilation	-	light-emitting diode	motion sensors	No
RWT	no mechanical ventilation	-	light-emitting diode	motion sensors	No
OSD	no mechanical ventilation	-	light-emitting diode	motion sensors	No
Bicycle Storage	no mechanical ventilation	-	light-emitting diode	motion sensors	No
Fire Stair	ventilation exhaust only	time clock or BMS controlled	light-emitting diode	motion sensors	No

Common area	Common area ventilation system		Common area lighting		
	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Store	no mechanical ventilation	-	light-emitting diode	motion sensors	No
Lift Lobby	no mechanical ventilation	-	light-emitting diode	daylight sensor and motion sensor	No
Corridors	no mechanical ventilation	-	light-emitting diode	daylight sensor and motion sensor	No
LV1-17 Hallway	no mechanical ventilation	-	light-emitting diode	daylight sensor and motion sensor	No

Central energy systems	Type	Specification
Lift (No. 1)	gearless traction with V V V F motor	Number of levels (including basement): 18
Lift (No. 2)	gearless traction with V V V F motor	Number of levels (including basement): 18

4. Commitments for common areas and central systems/facilities for the development (non-building specific)

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✓	✓
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✓	✓	✓
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✓	✓	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✓	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✓	✓
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✓	✓

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	4 star	4 star	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✓	✓
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✓	✓
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✓	✓	✓

Central energy systems	Type	Specification
Alternative energy supply	Photovoltaic system	Rated electrical output (min): 50.0 peak kW

Notes

1. In these commitments, "applicant" means the person carrying out the development.
2. The applicant must identify each dwelling, building and common area listed in this certificate, on the plans accompanying any development application, and on the plans and specifications accompanying the application for a construction certificate / complying development certificate, for the proposed development, using the same identifying letter or reference as is given to that dwelling, building or common area in this certificate.
3. This note applies if the proposed development involves the erection of a building for both residential and non-residential purposes (or the change of use of a building for both residential and non-residential purposes). Commitments in this certificate which are specified to apply to a "common area" of a building or the development, apply only to that part of the building or development to be used for residential purposes.
4. If this certificate lists a central system as a commitment for a dwelling or building, and that system will also service any other dwelling or building within the development, then that system need only be installed once (even if it is separately listed as a commitment for that other dwelling or building).
5. If a star or other rating is specified in a commitment, this is a minimum rating.
6. All alternative water systems to be installed under these commitments (if any), must be installed in accordance with the requirements of all applicable regulatory authorities. NOTE: NSW Health does not recommend that stormwater, recycled water or private dam water be used to irrigate edible plants which are consumed raw, or that rainwater be used for human consumption in areas with potable water supply.

Legend

1. Commitments identified with a "✔" in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
2. Commitments identified with a "✔" in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
3. Commitments identified with a "✔" in the "Certifier check" column must be certified by a certifying authority as having been fulfilled. (Note: a certifying authority must not issue an occupation certificate (either interim or final) for a building listed in this certificate, or for any part of such a building, unless it is satisfied that each of the commitments whose fulfilment it is required to monitor in relation to the building or part, has been fulfilled).