PROJECT:	**GOWAN HOUSE**
SUBJECT:	**CLIMATE ACTION, ENERGY & SUSTAINABILITY STATEMENT**
REFERENCE:	**22135**
DATE:	**12TH OCTOBER 2023**

DELAP & WALLER LTD

<u>DUBLIN</u>
BLOOMFIELD HOUSE
BLOOMFIELD AVENUE
DUBLIN 8

CONTENTS

Revision History

Revision	Date	By	Checked	Approved
00	06/04/2023	Ryan Young	David Neylon	Ryan Young
01	17/05/2023	Ryan Young	David Neylon	Ryan Young
02	22/05/2023	Ryan Young	David Neylon	Ryan Young
03	23/05/2023	Ryan Young	David Neylon	Ryan Young
04	10/08/2023	Ryan Young	David Neylon	Ryan Young
05	10/08/2023	Ryan Young	David Neylon	Ryan Young
06	15/08/2023	Ryan Young	David Neylon	Ryan Young
07	12/10/2023	Ryan Young	David Neylon	Ryan Young

Offices

Dublin: 1st floor Bloomfield House, Bloomfield Avenue, Dublin 8, D08 WT10
Antrim: Unit 12 Antrim Technology Park, Antrim, County Antrim, BT41 1QS
London: 91 Clapham Road, SW9 0HY

Confidential Information

This document is made available to the recipient on the express understanding that the information contained in it be regarded and treated by the recipient as strictly confidential. The contents of this document are intended only for the sole use of the recipient and should not be disclosed or furnished to any other person.

Disclaimer of Liability

The information contained in this document is provided for the sole use of the recipient on the named project only, and no reliance should be placed on the information by any other person or for any other purpose. In the event that the information is disclosed or furnished to any other person, then Delap and Waller Limited accepts no liability for any loss or damage incurred by that person whatsoever as a result of using the information.

Copyright ©

All rights reserved. No part of the content of this document may be reproduced, published, transmitted or adapted in any form or by any means without the written permission of Delap and Waller Limited.

1.0 EXECUTIVE SUMMARY

This report prepared by Delap & Waller, outlines the sustainable fabric and services specification strategy for the proposed student accommodation at Gowan House to demonstrate compliance with Part L 2022 and Dublin City Council's Development Plan 2022-2028. This report forms part of the planning application. The proposed development consists of 941 student bedrooms, along with communal student area and supported facilities, cultural and community spaces which includes digital hubs, co-working areas, cafes and retail spaces.

The proposed development will be designed and constructed to meet Approved Document Part L 2022 Conservation of Fuel and Energy – Buildings other than Dwellings. This standard is also referred to as Nearly Zero Energy Building Standard (nZEB), which has become the regulatory standard since October 2022.

The Part L regulation requires an overall improved energy performance for the fabric, services, lighting and renewable specification. The standard requires a Carbon Performance Coefficient (CPC) level of <1.00 and an Energy Performance Coefficient (EPC) level of <1.15. The nZEB also introduces a mandatory requirement for renewable energy sources, providing 20% of the buildings overall regulated primary energy use. However, where the energy performance and carbon performance are significantly lower than the maximum permissible targets, a renewable energy source providing 10% of the buildings primary energy demand is compliant. The report will outline target U-Values of each fabric element, air permeability and options for the space heating, hot water and ventilation for consideration. Please note the specification and efficiencies outlined within this report are based on calculations and design information available at the time of writing.

Figure 1: Proposed Site Plan - HKR Architects

2.0 PROPOSED DEVELOPMENT

The proposed site is located on Naas Road, on the immediate outskirts of Dublin City. The Naas Road lands identified in this plan are strategically significant in the city context in that they offer a great opportunity for future regeneration and improved integration of the area into the emerging City Edge Framework.

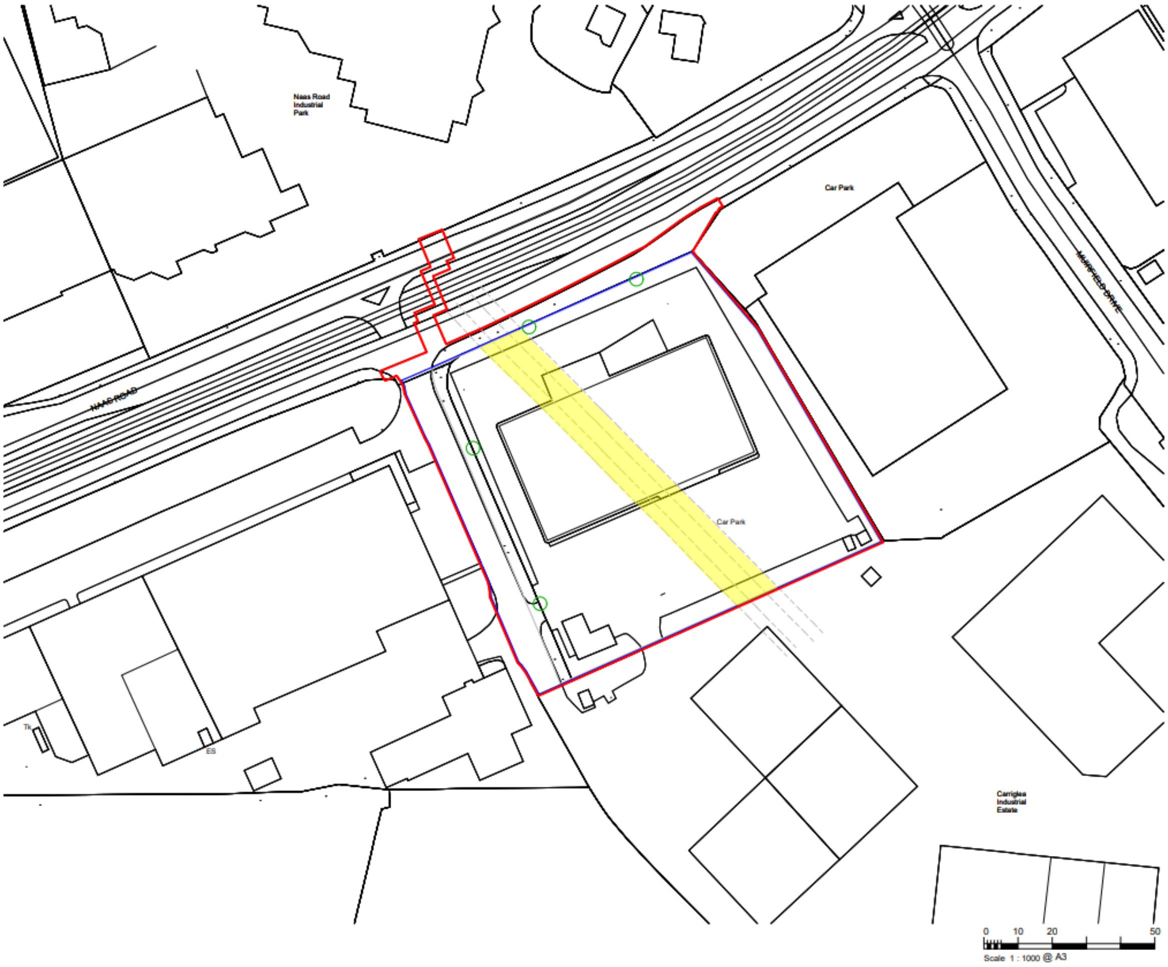


Figure 2: Site Location Plan HKR Architects

The proposed development will principally consist of: the demolition of the existing two-storey office/warehouse building and outbuilding (5,172 sq m); and the construction of a development in two blocks (Block 1 (eastern block) is part 2 No. storeys to part 15 No. storeys over lower ground floor and basement levels with roof plant over and Block 2 (western block) is part 9 No. storeys to part 11 No. storeys over basement with roof plant over) principally comprising 941 No. Student Accommodation bedspaces (871 No. standards rooms, 47 No. accessible studio rooms and 23 No. studios) with associated facilities, which will be utilised for short-term lets during student holiday periods. The 871No. standard rooms are provided in 123 No. clusters ranging in size from 3 No. bedspaces to 8 No. bedspaces, and all clusters are served by a communal living/kitchen/dining room.

The development also provides: ancillary internal and external communal student amenity spaces and support facilities; cultural and community floor space (1,422 sq m internal and 131 sq m external) principally comprising a digital hub and co-working space with ancillary cafe; a retail unit (250 sq m); public open space; the daylighting of the culverted River Camac through the site; an elevated walkway above the River Camac at ground floor level; a pedestrian bridge link at first floor level between Blocks 1 and 2; vehicular access at the south-western corner; the provision of 7 No. car-parking spaces, 2 No. motorcycle parking spaces and 2 No. set down areas; bicycle stores at ground and lower ground floor levels; visitor cycle parking spaces; bin stores; substations; hard and soft landscaping; green and blue roofs; new telecommunications infrastructure at roof level of Block 1 including antennas and microwave link dishes, 18 No. antennas and 6 No. transmission dishes, together with all associated equipment; boundary treatments; plant; lift overruns; and all associated works above and below ground. The gross floor area of the development is c. 33,140 sq m comprising c. 30,386 sq m above lower ground and basement level.

To encourage more sustainable means of transport, the framework is seeking to provide schemes with reduced car parking, access to high quality public transport corridors and access to safe and secure cycle storage. The proposed development is located near to various public transport links including the Bluebell Luas stop within 150m of the site. Additionally, the development is located within close proximity to the Grand Canal cycle path, which can be used for cycling into the city centre.

.

3.0 ASSESSMENT CRITERIA

3.1 Technical Guidance Document L 2022

Technical Guidance Document Part L Conservation of Fuel and Energy – Buildings other than Dwellings 2022, has been issued by the Department of Housing, Planning and Local Government. This document becomes the regulatory standard for all new buildings other than dwellings from October 2022, to achieve Nearly Zero Energy Building standard (nZEB).

A Nearly Zero-Energy Building means a building that has a very high energy performance, as determined in accordance with Annex I of the EU Energy Performance of Buildings Directive Recast. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

The NZEB standard requires a Carbon Performance Coefficient (CPC) level of <1.00 and an Energy Performance Coefficient (EPC) level of <1.15. The nZEB also introduces a mandatory requirement for renewable energy sources, providing 20% of the buildings overall regulated primary energy use. However, where the energy performance and carbon performance are significantly lower than the maximum permissible targets, a renewable energy source providing 10% of the buildings primary energy demand is compliant.

Renewable Energy Ratio is the ratio of the primary energy from renewable energy technologies to total primary energy, as defined and calculated in DEAP. Renewable energy technologies means technology, products or equipment that supply energy derived from renewable energy sources, e.g., solar thermal systems, solar photovoltaic systems, biomass systems, systems using biofuels, heat pumps, aerogenerators and other small scale renewable systems.

A NEAP analysis has been completed for the proposed Gowan House development to demonstrate it will achieve compliance with Part L 2022 Building Regulations.

As of 2006 all domestic and non-dwellings buildings that were newly built and existing buildings that are for sale or rent require a BER (Building Energy Rating) certificate. The BER is based on the primary energy used for one year and is classified on a scale of A1 to G with A1 being the most energy efficient. It also gives the anticipated carbon emissions for a year’s occupation based on the type of fuel that the systems use. In order to identify Primary energy consumption of the building, the BER assesses energy consumed based on; building type, orientation, thermal envelope, air permeability, heating system, ventilation system and efficiency, domestic hot water generation, lighting systems and renewable energy.

3.2 Dublin City Development Plan 2022-2028

The energy strategy of the proposed Gowan House development will consider and adhere to the following relevant policies and objectives as outlined in the Dublin City Development Plan 2022 – 2028.

Chapter 3: Climate Action

It is the Policy of Dublin City Council:	
CA2	**Mitigation and Adaptation** To prioritise and implement measures to address climate change by way of both effective mitigation and adaptation responses in accordance with available guidance and best practice.
CA5	**Climate Mitigation and Adaptation in Strategic Growth Area** To ensure that all new development including in Strategic Development and Regeneration Areas integrate appropriate climate mitigation and adaptation measures.
CA8	**Climate Mitigation Actions in the Built Environment** To require low carbon development in the city which will seek to reduce carbon dioxide emissions, and which will meet the highest feasible environmental standards during construction and occupation, see Section 15.7.1 when dealing with development proposals. New development should generally demonstrate/ provide for: a. building layout and design which maximises daylight, natural ventilation, active transport and public transport use; b. sustainable building/services/site design to maximise energy efficiency; c. sensitive energy efficiency improvements to existing buildings; d. energy efficiency, energy conservation, and the increased use of renewable energy in existing and new developments; e. on-site renewable energy infrastructure and renewable energy; f. minimising the generation of site and construction waste and maximising reuse or recycling; g. the use of construction materials that have low to zero embodied energy and CO_2 emissions; and h. connection to (existing and planned) decentralised energy networks including the Dublin District Heating System where feasible.
CA9	**Climate Adaptation Actions in the Built Environment** Development proposals must demonstrate sustainable, climate adaptation, circular design principles for new buildings / services / site. The council will promote and support development which is resilient to climate change. This would include: a. measures such as green roofs and green walls to reduce internal overheating and the urban heat island effect; b. ensuring the efficient use of natural resources (including water) and making the most of natural systems both within and around buildings; c. minimising pollution by reducing surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems (SuDS); d. reducing flood risk, damage to property from extreme events – residential, public and commercial; e. reducing risks from temperature extremes and extreme weather events to critical infrastructure such as roads, communication networks, the water/drainage network, and energy supply; f. promoting, developing and protecting biodiversity, novel urban ecosystems and green infrastructure

CA10	**Climate Action Energy Statements** All new developments involving 30 residential units and/or more than 1,000 sq.. of commercial floor space, or as otherwise required by the Planning Authority, will be required to submit a Climate Action Energy Statement as part of the overall Design Statement to demonstrate how low carbon energy and heating solutions, have been considered as part of the overall design and planning of the proposed development.
CA11	**Energy from Renewable Sources** To support, encourage and facilitate the production of energy from renewable sources, such as from solar energy, hydro energy, wave/tidal energy, geothermal, wind energy, combined heat and power (CHP), heat energy distribution such as district heating/cooling systems, and any other renewable energy sources, subject to normal planning and environmental considerations.
CA25	**Electric Vehicles** To ensure that sufficient charging points and rapid charging infrastructure are provided on existing streets and in new developments subject to appropriate design, siting and built heritage considerations and having regard to the Planning and Development Regulations (2001) as amended, which have been updated to include EV vehicle charging point installation.
CA04	**Regional Strategy for Electric Vehicle (EV) Charging** To support and implement the forthcoming Regional Strategy for Electric Vehicle (EV) charging over the lifetime of the plan in order to facilitate the transition to low carbon vehicles required to achieve 2030 national targets.

Table 1: Dublin City Council Development Plan energy policies

Chapter 13: Strategic Development Regeneration Areas (SDRAs)

It is the Policy of Dublin City Council:	
SDRA01	**Sustainable Energy** Climate Action Energy Statements for significant new residential and commercial developments, in Strategic Development and Regeneration Areas (SDRAs), will be required to investigate local heat source and networks, and, where feasible, to demonstrate that the proposed development will be 'District Heating Enabled' in order to facilitate a connection to an available or developing district heating network. Further specific guidance regarding 'District Heating Enabled' Development is set out in Chapter 15 and should be complied with. Specific guidance is set out regarding SDRA 6 (Docklands) and SDRA 10 (NEIC) where applicants must demonstrate how a proposed development is District Heating Enabled and will connect to the 'Docklands and Poolbeg' DDHS catchment. Guidance is also set out regarding SDRA 7 (Heuston and Environs), SDRA 8 (Grangegorman/Broadstone), SDRA 11 (St. Teresa's Garden and Environs), SDRA 14 (St. James's Healthcare Campus and Environs), SDRA 15 (Liberties and Newmarket Square) where possible connections or interconnections to existing heat networks in the area, to create a district heating 'node' must be investigated.

	Climate Change Proposed developments within the SDRA shall be required to apply innovative approaches to energy efficiency, energy conservation and the use of renewable energy in order to contribute to achieving zero carbon developments.

Table 2: Dublin City Council Development Plan strategic development regeneration plan

3.3 NEAP

The primary energy consumption and carbon dioxide (CO2) emissions of the proposed development, including the services design, will be calculated using the NEAP (Non-Domestic Energy Assessment Procedure) methodology. The NEAP methodology sets out the procedures to reflect specialist processes when calculating the 'Energy Performance Coefficient' (EPC), 'Carbon Performance Coefficient' (CPC) and Renewable Energy Ratio' (RER). Under Part L 2022, an NZEB Reference building has been specified which defines the 'Maximum Permitted Energy Performance Coefficient' (MPEPC) and 'Maximum Permitted Carbon Performance Coefficient' (MPCPC). The Reference building is a high-performance building based on the same geometry as the actual design with 20% of its primary energy use met by renewables.

In order to demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated EPC will be no greater than the MPEPC of 1.00. Similarly, to demonstrate that an acceptable CO2 emission rate has been achieved; the calculated CPC will be no greater than the MPCPC of 1.15. Figure 3 below is an image from the Sketchup mode used to generate the NEAP model for Gowan House.

Figure 3: Gowan House Revit model view

4.0 ENERGY STRATEGY

4.1 Energy Hierarchy

The design of the proposed Gowan House development will incorporate the principles of the energy hierarchy. The energy hierarchy consists of three key principles:

1. **Be Lean**
2. **Be Clean**
3. **Be Green**

The Be Lean stage encourages a passive strategy whereby space heating, cooling and lighting energy demand is minimised through a fabric first approach. A carefully designed fabric first approach will ensure a robust, efficient and sustainable design throughout the lifetime of the building, which is affordable to the developer. Furthermore, it reduces the reliance on technologies, which overtime will require maintenance or replacing.

The Be Clean stage encourages that energy supplied to the development, such as heating or domestic hot water is delivered efficiently through communal or highly efficient systems.

The Be Green stage ties in with the Renewable Energy Ratio requirement of Part L 2022, whereby any remaining requirements are addressed through on-site renewable energy.

4.2 Be Lean: Passive Design Measures

The table below outlines the target u-values for Gowan House required to achieve compliance with Part L 2022 (nZEB). The values are compared with the Part L 2022 limiting values for new build developments.

	Proposed Fabric Design	Part L 2022 Limiting Values
Ground Floor / Exposed Floor	0.12 W/m^2K	0.21 W/m^2K
External Walls / Heat Loss Walls	0.18 W/m^2K	0.21 W/m^2K
External Roof	0.15 W/m^2K	0.20 W/m^2K
Glazed Elements	1.40 W/m^2K	1.60 W/m^2K
	G Value = 0.50	N/A
Doors	1.40 W/m^2K	1.60 W/m^2K
Air Permeability	3.00 $m^3/h.m^3$ at 50 Pa	5.00 $m^3/h.m^3$ at 50 Pa
Thermal Bridging	Y-Factor 0.05 – 0.07	Default y-value of 0.15

Table 3: Proposed Fabric Specification

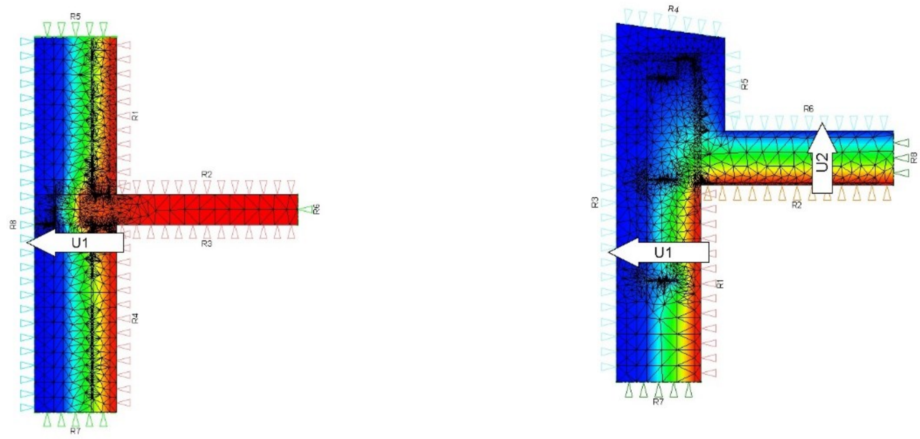
To ensure energy use is minimised from the outset, where feasible the proposed development has been designed with regard to the principles of passive design including orientation, location of openings, local shading to maximise the potential for solar gain and limit overheating.

The fabric specification has been optimised in order to strike a balance between maximising natural daylight benefits to reduce the use of artificial lighting, the provision of solar gains to reduce space heating demands during the winter months, whilst limiting summertime solar gains to reduce space cooling demands. This can be exhibited in the design window U-Value of 1.40 W/m^{2}K and a solar transmission value of 0.50.

Thermal Bridging

Heat loss via thermal bridging is a critical aspect of the energy performance, for the purposes of the Provisional NEAP analysis an indicative Y-Factor of 0.08 W/mK has been used. However, at detail design stage, where architectural details are bespoke, a specific thermal modelling calculation will be carried out to ensure the Psi Value (φ) is within acceptable parameters. Refer to figure 3 below for examples of bespoke calculations for an intermediate floor and parapet roof detail.

Figure 4: Example Thermal Bridging Details



Air Permeability

Convective losses through drafts and junctions are another main source of heat loss within a dwelling. This is referred to Air Permeability or Infiltration. Part L 2021 outlines that an air permeability level of 5.00 m^3 (m^2.hr) @ 50 Pa represents a reasonable upper limit for air permeability. Therefore, the proposed Gowan House development has been designed to achieve an air permeability of 3.00 m^3 (m^2.hr) @ 50 Pa.

Thermal Comfort

Incremental changes to construction regulations and methodologies have introduced, greater thermal standards, high proportions of glazing, lightweight construction and inadequate ventilation strategies. This has led to an increasing number of occupants experiencing overheating in new build developments. The Gowan House development has been designed to achieve thermal comfort in accordance with the industry standard CIBSE Technical Memorandum 59 (2017). Compliance has been achieved through; reduced glazing solar transmission to control excessive solar gains, high thermal mass capacity of the structure, openable windows for purge ventilation and mechanical ventilation to provide continuous background ventilation.

CIBSE TM59 sets out differing criteria for thermal comfort compliance depending on whether the bedrooms are predominately naturally ventilated or mechanically ventilated. This assessment methodology is adopted by the Greater London Authority for major developments; therefore, it has been adopted to assess thermal comfort compliance at Gowan House. For bedrooms only to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

4.3 Be Clean: Energy Efficient Measures

Once demand for energy has been minimised, applicants are expected to demonstrate how their energy supply system will be designed to supply energy efficiently and reduce carbon emissions. The Dublin City Development Plan seeks to encourage site-wide heat networks, these should be embedded into development proposals from the beginning of the design process to avoid significant redesign later on.

Dublin City Council is currently developing the Dublin District Heating System (DDHS) to supply low-carbon heat to houses and businesses throughout the Docklands and the wider Poolbeg peninsula. Waste heat will be taken from the Poolbeg waste-to-energy facility and delivered through insulated pipes to the buildings connected to the system, replacing fossil fuel heating systems and, therefore, reducing air pollution and GHG emissions.

Chapter 13 of the development plan outlines the strategic development regeneration areas (SDRA) which either have existing or proposed district heating networks. It is therefore possible to identify any opportunities that may exist for connecting a proposed development to an existing network, proposals for future networks that could be connected to the proposed development, or identify centres of significant energy demand which could help the viability of a proposed new heat network.

A desktop review has been carried out to assess the feasibility of connecting to an existing or future heat network in accordance with the heating hierarchy. The table below lists out the existing or proposed SDRAs which have proposed district heating networks along with their proximity to the development. The proposed Gowan House development, falls under SDRA 5, where there is no existing or currently proposed infrastructure for district heating networks.

SDRA	Status of District Heating Network	Approximate Distance from Proposed Development (km)	Comment
SDRA 6 Docklands	Existing	6.89	Network is not within feasible proximity to development
SDRA 10 NEIC	Existing	6.48	Network is not within feasible proximity to development
SDRA 7 Heuston	Future Proposed	3.60	Network is not within feasible proximity to development
SDRA 8 Grangegorman	Future Proposed	4.84	Network is not within feasible proximity to development
SDRA 11 St Teresa's Garden	Future Proposed	3.49	Network is not within feasible proximity to development
SDRA 14 St James' Healthcare Campus	Future Proposed	3.14	Network is not within feasible proximity to development
SDRA 15 Liberties and Newmarket Square	Future Proposed	4.56	Network is not within feasible proximity to development

Table 4: District Heating for Dublin existing and proposed.

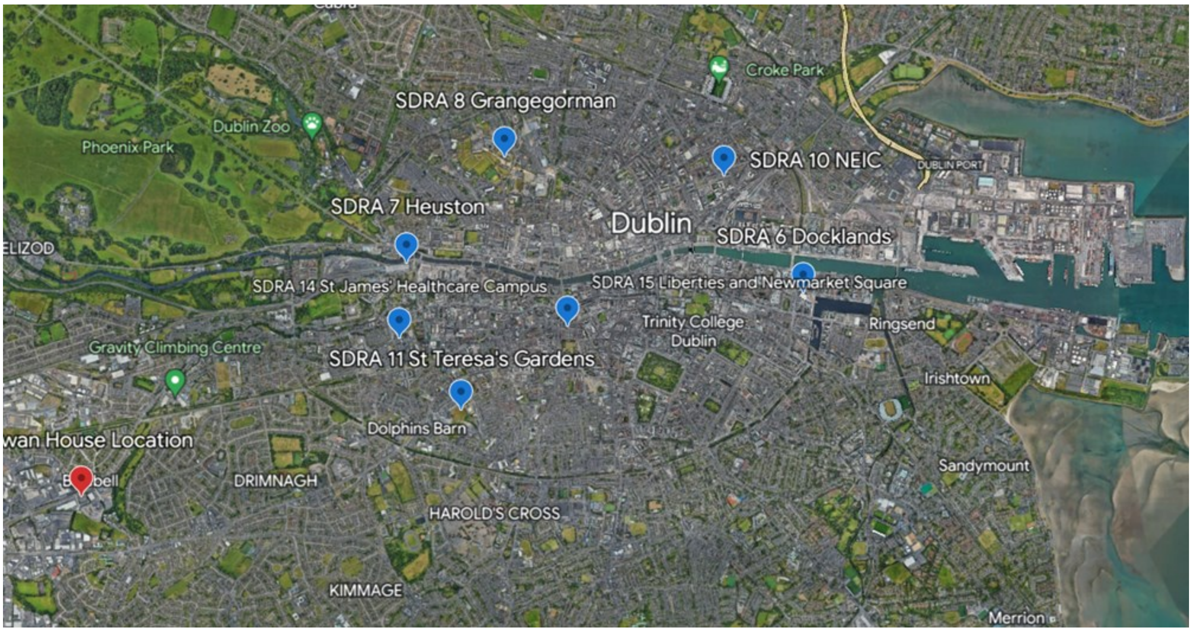


Figure 5: Proposed and existing district heating network locations

The desktop study has outlined that there are no existing or currently proposed district heating networks within the vicinity of the proposed Gowan House development, with the closest future proposed network being within SDRA 14 St James' Healthcare Campus located 3.14km from the proposed development. Therefore, in accordance with the DCC document "*Dublin District Heating System Technical Information Pack for Developers"* the proposed energy strategy for Gowan house will be a decentralised energy strategy, compliant with Nearly Zero Energy Building standards, and be district heat enabled. This will ensure that the development complies with Part L 2022, nZEB, and DCC's Climate Action Policies upon completion. In the future, should a district heating network be proposed within a feasible proximity to the Gowan House Development, then the building can connect to this system.

Space Heating & Cooling

A feasibility study was carried out to determine the most appropriate energy strategy for the development, the study took into consideration; energy demand, spatial requirements, end user requirements, maintenance, operational energy costs and planning implications.

With the passive measures above incorporated into the design of Gowan House in conjunction with heat recovery ventilation, the space heating demand within Gowan House is notably low. Therefore, following an assessment of available space heating generation options, electric panel heaters are proposed within the bedrooms., ensuite, communal corridors and cluster living areas.

Due to the variety of occupancy and internal gains, the cultural, amenity and commercial areas will require active cooling in addition to space heating. As such these areas will be conditioned using the Low Zero Carbon and renewable Air Source Heat Pump technology, in the form of Variable Refrigerant Flow split systems. The table below summarises the heating and cooling strategy and efficiencies in each of the room types at Gowan House.

Room Type	Heating Strategy	System Seasonal Efficiency (%)	
		Heating	Cooling
Accommodation Bedroom	Electric Panel Heaters	100	-
Accommodation Living Areas	Electric Panel Heaters	100	-
Accommodation Circulation	Electric Panel Heaters	100	-
Amenity Areas	Split VRF	320	420
Commercial Areas	Split VRF	320	420
Cultural/Community Areas	Split VRF	320	420

Table 6: Heating and cooling strategy summary

Heating Controls

The localised heating allows for zonal control that will ensure that heating is not active in zones which are not in use or occupied. Furthermore, local temperature control will ensure that system only operate to the required design temperature of that room.

Metering and Sub-metering

In order to understand the energy use by the buildings users across various end users, metering and sub-metering of all major HVAC energy uses will be integrated with the building management system (BMS). It is recommended that the BMS system will include automatic monitoring and targeting alarms for out of range values.

Ventilation

In order to ensure a consistent supply of fresh air, maintain thermal comfort and minimise the space heating demand, Mechanical Ventilation with Heat Recovery (MVHR) has been proposed within each of the student accommodation clusters. In order to provide additional purge ventilation, all bedroom windows will be manually openable, with restriction, in conjunction with the thermal comfort strategy.

The amenity, commercial and cultural areas will be ventilated via mechanical ventilation with heat recovery, the duty and specification will be sized based on the determined occupancy levels of these spaces. In general, they will be sized in accordance with TGD Part F at 10 litres / second / person. For the purposes of the NEAP assessment at this stage, indicative efficiencies have been used.

Room Type	Heating Strategy	Specific Fan Power	Heat Recovery Efficiency
Accommodation Bedroom	MVHR	1.40 W/l/s	80.00%
Accommodation Living Areas	MVHR	1.40 W/l/s	80.00%
Accommodation Circulation	Natural	-	-
Amenity Areas	MVHR	1.60 W/l/s	75.00%
Commercial Areas	MVHR	1.60 W/l/s	75.00%
Cultural Areas	MVHR	1.60 W/l/s	75.00%

Table 7: Ventilation strategy summary

Lighting

The design intent is to achieve good levels of natural daylighting within each of the habitable spaces of Gowan House, in order to minimise artificial lighting requirements. A separate daylight and sunlight analysis has been carried out as part of the planning submission which summarises the SDA – Spatial Daylight Autonomy for the bedrooms and communal areas within Gowan House.

High Energy efficient LED fittings are proposed in all areas of Gowan House and paired with the most appropriate level of control based on the room's activity. The table below summarises the lighting efficiency and level of control for each of the room types at Gowan house.

Room Type	Lighting Efficiency Lm/W	Lighting Control
Accommodation Bedroom	120.00	Manual
Accommodation Living Areas	120.00	Man-On-Auto-Off
Accommodation Circulation	120.00	Auto-On-Off
Amenity Areas	120.00	Man-On-Auto-Off Daylight Sensors
Commercial Areas	120.00	Man-On-Auto-Off Daylight Sensors
Cultural Areas	120.00	Man-On-Auto-Off Daylight Sensors

Table 8: Interior lighting specification summary

Electric Power Factor

The building electric power factor is assessed as >0.95 for the purposes of the NEAP assessment.

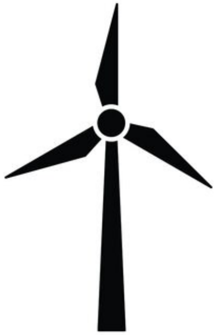
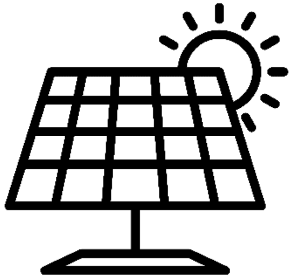
Domestic Hot Water

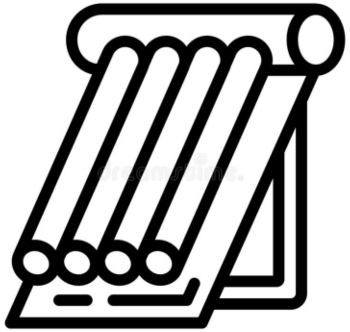
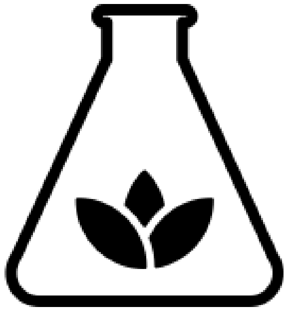
Hot water generations accounts for 37.50% of the overall regulated energy demand at Gowan House, therefore the design team have selected a highly efficient and low carbon strategy to address this demand, in accordance with Part L and Dublin City Council's climate action plan.

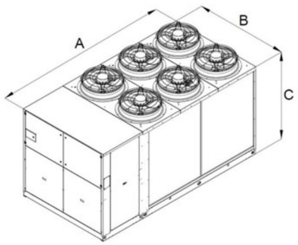
Air Source Heat Pumps (ASHP) provide an efficient, low carbon and future proofed means of providing domestic hot water heating. The heat pumps absorb heat from the atmosphere by directing a flow of air across the primary (evaporator) side of the heat pump. The heat pump, through the normal refrigerant cycle elevates the temperature of the rejection (condenser) side circuit water to upwards of 65°C. This elevated temperature water is then distributed throughout the building as a primary 4th generation heating circuit. Centralised buffer vessels will be required to avoid short cycling during periods of low heating demand.

The proposed DHW air source heat pump will have a seasonal efficiency of COP_{DHW} of 2.90.

4.4 Be Green: Low or Zero Carbon Technologies

Technology	Comment	Feasibility
Wind Turbine 	Ground mounted wind turbines can be located in an open area away from obstructions such as buildings Due to the city location of Gowan House, it is deemed that a ground mounted wind turbine installation is not feasible	Low
Solar Photovoltaics 	Photovoltaic (PV) panels offer a "passive" method for generation of electricity. Photovoltaic systems use solar cells to convert sunlight into electricity. The PV cell consists of one or two layers of a semi-conducting material, usually silicon. When photovoltaic modules are exposed to the sun rays, they generate a direct current (DC). The DC power is typically converted into AC power dependant on the application, which is then utilised by the systems on site and/or exported to the electrical grid and sold. In summary the greater the solar intensity, the greater the flow of electricity. With upcoming changes to feed in tariffs, PV panels have a payback period of approximately 6 years. Much of the roof area will be utilised for plant space in the form of heat pumps and water storage, furthermore the requirement for green roof dictates that there is limited opportunity for solar photovoltaics to be installed at Gowan House.	Medium

Solar Thermal 	The term 'solar thermal' (ST) is used to describe a system where the energy from the sun is harvested to be used for its heat. Solar thermal systems differ from solar photovoltaics which convert sunlight directly into electricity. The use of the term 'solar thermal' is also associated with the integration of 'passive' heating and cooling technologies in buildings. The main application for solar thermal systems in Ireland is domestic hot water heating although there are also 'combisystems' that use non-potable thermal stores directly linked with low temperature space heating. Solar thermal systems typically have a payback greater than 10 years and also require regular maintenance. Given the proposed energy strategy is an all-electric solution, solar photovoltaic panels would provide a greater energy and carbon saving compared to solar thermal. For this reason, solar thermal has been discounted for Gowan House.	Medium
Biomass 	Energy from biomass is produced by burning organic matter. Biomass products such as trees, crops or animal dung. Biomass products such as trees, crops or animal dung are harvested and processed to create bioenergy in the form of electricity, heat, steam and solid fuels. Biomass is the solid form of ‘bioenergy’, but liquid fuels can also be generated from plant matter, this is referred to as ‘biofuel’. Biomass is carbon-based so when used as fuel it also generates carbon emissions. However, the carbon that is released during combustion is equivalent to the amount that was absorbed during growth, and so the technology is carbon neutral. Unlike fossil fuels, biomass can be replaced relatively quickly. The most common form of biomass system is a wood-fired system, which uses wood chips or wood pellets as a fuel source. Systems that use wood chips tend to be larger than their pellet counterparts as they must be engineered to use a fairly variable fuel. Wood pellets are a high-quality fuel, usually made by pressing dry shavings or saw dust. Depending on the moisture, the energy content of pellets is between 4.70 and 4.90 kWh/kg. The potential for biomass in the Ireland is good, although a reliable and reasonably local supply of fuel from forestry, farming or industrial sources is required. The government is committed to biomass because it is a low carbon energy source and because of its potential to boost rural communities.	Low

	It should be considered, that when using a biomass boiler, additional gas or oil-fired boilers may be required. Additionally, unlike gas, biofuel cannot be piped to site, so there is a need to store sufficient quantities of fuel on site in order to maintain supply. Therefore, considerations must be made to make space allowances for delivery and storage. Given the city centre location of Gowan house Biomass is not feasible for this scheme and has been discounted.	
Air Source Heat Pump 	This system utilises a series of air source heat pumps (ASHP) designed to cater for the heating and hot water loading of the entire building. The heat pumps absorb heat from the atmosphere, by directing a flow of air across the primary (evaporator) side of the heat pump. The heat pump, through the normal refrigerant cycle elevates the temperature of the rejection (condenser) side circuit water to typically 50degC. The 50degC water produced by the ASHPs would typically be stored within buffer vessels. This heated water would be the primary source for heating the domestic hot water cylinder for hot water generation. The systems efficiency (COP) varies depending on the external temperature and the temperature to which the water is heated but can range between 2.50 – 3.80. As ASHP extract heat from external air at a high efficiency, they are classified as a renewable energy source and contribute towards the renewable energy ratio under TGD Part L 2022. This technology is deemed as feasible for the proposed Gowan House development for domestic hot water generation.	High

Ground Source Heat Pump 	Ground source heat pumps (GSHP) are a proven and efficient method of heating and cooling both domestic and non-domestic developments. Heat pumps use refrigerant gases and an electrical compressor to take heat from a source and deliver it to an output. Chillers and refrigerators are examples of systems that remove heat, but other types of system use the heat removed from a source to heat a building. Traditional heat pumps use the air as the source of heat. However, the ideal source for maximum efficiency would be one having a stable temperature, and the ground provides such a resource. The ground itself acts as a solar collector and thermal store. The surface is warmed by the sun and the adjacent air during daytime and in the summer. Similarly, it is cooled during the nighttime. Fluctuations in ground temperature reduce with depth and stabilise at the annual mean for the location by about 12m below the surface. This temperature ranges between 9°C - 12°C in Ireland Ground-source heat pumps make use of the heat stored at this relatively stable temperature of around 9°C -12°C and raise it to a useable output temperature of around 40-50°C for use in heating buildings. Output temperatures of this range are ideal for low temperature systems such as underfloor heating coils and radiant panels. Heat can be extracted from the ground either by a buried loop of pipework through which a refrigerant fluid or water is circulated, or directly by abstraction of ground water. With appropriate designs the rate of depletion of the heat source is matched by the rate of heat flow back from the surrounding earth. Under these circumstances the technology is a renewable source of energy. However, uncertainty regarding the feasibility of the geothermal conditions within the proposed Gowan House, reduces the feasibility for this technology. As such Ground Source Heat Pumps have been discounted.	Low
Exhaust Air Heat Pump	Exhaust air heat pump (EAHP) operate in a similar manner to air source heat pumps. However, as opposed to extracting heat from the external air which varies between -5°C to 26°C, EAHP's extract air from the building's wet rooms for hot water generation. EAHPs have a high COP of 3.9 due to the high extract air temperature of around 20°C which is constant all year, guaranteeing high seasonal efficiency. There are number of variants of EAHP systems from small scale domestic type units to commercial scale units.	Medium

	The strategy would require an EAHP unit per cluster, which increases maintenance and cost. Furthermore, the system has a lower capacity compared to ASHP systems, therefore reduces the systems resilience to meet peak loads. This system was considered, however discounted for various reasons including the above.	

Table 8: Feasibility of low zero carbon and renewable technologies

5.0 CLIMATE ACTION PLAN

As the electrical grid is now being produced more and more by renewable power sources rather than gas or coal fired power stations, the grid is decarbonizing and as such the carbon emission factor for electricity as a fuel has significantly reduced compared to 10 years ago. Most recent industry findings estimate the carbon emissions associated with electricity is in the region of 0.233 kgCO2/kWh. The natural gas emissions will remain relatively consistent.

As part of the process to move towards net zero, there will be policies put in place which will push new developments to move away from fossil-fuel based heating systems such as gas or oil.

Potential alternatives will include electric solutions which will be supplied by an electricity grid which will have been largely decarbonised due to the significant contribution from renewable technologies onto the network. As a result, the use of different replacement fuels including heat pump options are included in this analysis as potential heating solutions for the development to ensure an element of futureproofing in design.

In the past 10 years, Ireland has achieved significant carbon savings through the decarbonisation of the electricity grid. Decarbonising heat is now acknowledged as one of the biggest challenges if Ireland is to continue its trajectory and meet its climate action targets. There is currently no clear, single contender to replace the wide coverage and convenience of gas heating, and a low carbon heating future is likely to require a mix of options. These include electric heating (with a large role for heat pumps); hydrogen, whether used in fuel cells or for decarbonising the gas grid; and heat networks, particularly in dense and mixed- use areas, where they can take advantage of alternative fuel sources and heat rejection from cooling systems or other processes.

The carbon emission factors related to fuels are now beginning to be re-set to take cognisance of grid electricity now being generated from renewable sources such as offshore wind farms, with the next planned change in fuel emission factors (CEF) bringing the CEF for electricity down from 0.519 to 0.233, this will bring it in line with gas with a CEF of 0.216 being updated to 0.210.

Following a review of the most feasible low zero carbon and renewable solutions, it was determined that the most feasible and applicable solution is to use Air to Water Heat Pumps to generate domestic hot water for Gowan House. This is an all-electric and highly efficient solution for Gowan House, which aligns with DCC's and the government's Climate Action Plan. While there are no proposed district heating networks in the vicinity of the development, the centralised nature of this energy strategy will allow the development to connect into any future district heating network.

Designing for resilience, adaptation and future climates is another feature of Gowan House in its Climate Action Plan. Incremental changes to construction regulations and methodologies have introduced; greater thermal standards, high proportions of glazing, lightweight construction and inadequate ventilation strategies. This has led to an increasing number of occupants experiencing overheating in new build developments. The Gowan House development has been designed to mitigate against the risk of overheating using advanced simulation software and using current climate weather scenarios. As part of the Climate Action plan for Gowan House, the development will additionally be assessed against future climate scenario weather files. This will allow the design team to implement design measures that will ensure the residents will experience acceptable thermal comfort levels over the lifecycle of the building.

6.0 CONCLUSION

This report prepared by Delap & Waller, outlined the sustainability design and construction strategy for the proposed student accommodation at Gowan House. The proposed student accommodation is required to demonstrate compliance with Part L 2022 and Dublin City Council's Development Plan 2022-2028.

Be Lean, Be Clean, Be Green principles of the energy hierarchy have been incorporated throughout the design whereby space heating, cooling and lighting energy demand is minimized through a passive fabric first approach. This is exemplified through improved u-values, good thermal detailing, air tightness, high levels of natural daylight and a passive thermal comfort strategy. A feasibility study was carried out to determine the most feasible and effective low zero carbon and renewable energy technologies for the development. The analysis and proposed strategy uses a centralised, low zero carbon, Air Source Heat Pump to generate domestic hot water in conjunction with roof mounted solar photovoltaics.

The Part L regulation requires an overall improved energy performance for the fabric, services, lighting and renewable specification. The standard requires a Carbon Performance Coefficient (CPC) level of <1.00 and an Energy Performance Coefficient (EPC) level of <1.15. The nZEB also introduces a mandatory requirement for renewable energy sources, providing 20% of the buildings overall regulated primary energy use. However, where the energy performance and carbon performance are significantly lower than the maximum permissible targets, a renewable energy source providing 10% of the buildings primary energy demand is compliant.

Using proposed fabric, energy and renewable strategy, Gowan House achieves compliance with TGD Part L 2022. Compliance has been demonstrated through a NEAP calculation using IESVE 2023 software. Table 6 below summarises the results.

Carbon Performance Coefficient (CPC)	Energy Performance Coefficient (EPC)	Renewable Energy Ratio (RER)
0.97	0.92	0.27

Table 9: Part L 2022 NEAP assessment results

APPENDIX A NEAP OUTPUT DOCUMENTS

BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2017

This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.

Gowan House

Date: Thu Aug 10 10:58:40 2023

Administrative information

Building Details

Address: Carriglea Business Park, Naas Road, Dublin 12, Rev 04, Dublin 12, D12 RCC4

NEAP

Calculation engine: SBEMIE

Calculation engine version: v5.5.h.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: 7.0.21

BRIRL compliance check version: v5.5.h.2

Client Details

Name: Name

Telephone number: Phone

Address: Street Address, Co. Carlow, Eircode

Energy Assessor Details

Name: Ryan Young

Telephone number: Empty

Email: ryoung@delapandwaller.com

Address: Bloomfield House, Bloomfield Avenue, Dublin 8, Dublin 8, D8

Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

Calculated CO2 emission rate from Reference building	26.1 kgCO2/m2.annum
Calculated CO2 emission rate from Actual building	25.1 kgCO2/m2.annum
Carbon Performance Coefficient (CPC)	**0.96**
Maximum Permitted Carbon Performance Coefficient (MPCPC)	**1.15**
Calculated primary energy consumption rate from Reference building	140.9 kWh/m2.annum
Calculated primary energy consumption rate from Actual building	127.6 kWh/m2.annum
Energy Performance Coefficient (EPC)	**0.91**
Maximum Permitted Energy Performance Coefficient (MPEPC)	**1**
Renewable Energy Ratio (RER)	**0.27**
Minimum Renewable Energy Ratio	**0.2**

Heat Transmission through Building Fabric

Element	$U_{a\text{-Limit}}$	$U_{a\text{-Calc}}$	$U_{i\text{-Limit}}$	$U_{i\text{-Calc}}$	Surface with maximum U-value*
Walls**	0.21	0.18	0.6	0.21	LG000000_W6_A0
Floors (ground and exposed)	0.21	0.17	0.6	0.2	L0000000_F_A4
Pitched roofs	0.16	-	0.3	-	"No heat loss pitched roofs"
Flat roofs	0.2	0.14	0.3	0.2	L0000000_C_A7
Windows, roof windows, and rooflights	1.6	1.3	3	1.3	LG000000_W1_O0
Personnel doors	1.6	-	3	-	"No ext. personnel doors"
Vehicle access & similar large doors	1.5	-	3	-	"No ext. vehicle access doors"
High usage entrance doors	3	-	3	-	"No ext. high usage entrance doors"

$U_{a\text{-Limit}}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-Calc}}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-Limit}}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-Calc}}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface with the maximum U-value. ** Automatic U-value check by the tool does not apply to curtain walls whose area-weighted average and individual limiting standards are 1.8 and 3 W/m2K, respectively.

Air Permeability	Upper Limit	This Building's Value
m3/(h.m2) at 50 Pa	5	3

Building Services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Building Regulations documents for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- 1.2 Split Unit

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.2	4.2	-	-	-
Standard value	2.75	4.14**	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
** Standard shown is for split and multi-split air conditioners <6 kW. For systems 6-12 kW, limiting efficiency is 3.87.					

2- 1.0 Electric Rads

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	N/A	N/A**	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
** No automatic check on chiller efficiency has been performed by the tool in this case. Refer to Building Regulations documents for limiting efficiency.					

1- SYST0002-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	2.9	0.001
Standard value	0.8*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Local mechanical ventilation, exhaust, and terminal units

ID	**System type in Building Regulations documents**
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
LG: Amenity	-	-	-	1.6	-	-	-	-	-	0.75	N/A
LG: Amenity	-	-	-	1.6	-	-	-	-	-	0.75	N/A
L01: Amentity Space	-	-	-	1.6	-	-	-	-	-	0.75	N/A
L01: Amentity Space	-	-	-	1.6	-	-	-	-	-	0.75	N/A
L00: Amenity	-	-	-	1.6	-	-	-	-	-	0.75	N/A

Zone	Risk of overheating
L08: E	Low risk
L08: E	Low risk
L09: E	Low risk
L09: E	Low risk
L09: E	Low risk
L10: E	Low risk
L10: E	Low risk
L10: E	Low risk
L11: E	Low risk
L11: E	Low risk
L11: Landlord Store	Low risk
L12: E	Low risk
L13: E	Low risk

Primary Energy Contributions to RER

Technology	kWh/annum
Photovoltaic systems	0
Wind turbines	0
Solar thermal for water heating	0
Biomass for space and/or water heating	0
Biogas for space and/or water heating	0
Heat pumps for space and/or water heating	1.65052e+006
CHP generators for space and/or water heating	0
District heating for space and/or water heating	0
Process energy	0
Total for renewables	**1650520.0**
Total for renewables & non-renewables	**6128260.9**