



*Ardwick Green*  
*Environmental Standards Statement*

November 2022

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# 1.0 Introduction

This Environmental Standards Statement (ESS) has been prepared by Quality Engineering Design Limited on behalf of Step Places to support an application for planning permission for the development of a new multi residential development, (the “proposed development”).

The following key facts comprise the principal parameters of the proposed development:

- The Development Comprises 16 Residential 3 Storey dwellings
- 16 car parking spaces will be provided including 2 disabled spaces
- 16 cycle spaces will also be provided
- Access to the car park is via Cottor Street, with servicing also via Cottor street
- Pedestrian entrance to be located on Ardwick Green North.



## Site Location

The purpose of the ESS is to demonstrate how the proposed development can comply with local policy requirements pertaining to sustainable development, especially those contained in the Manchester Core Strategy adopted in July 2012 and the Guide to Development in Manchester (Supplementary Planning Document) adopted in April 2007. At this stage, the approaches to energy performance, and wider environmental credentials set out in this ESS are intended as strategies which will be further tested and refined as the detailed design of the proposed development progresses. As such, the specific parameters of the energy model are not intended to be fixed.

## PLANNING POLICY

## Local Policy

The locality of the development site means it falls under the jurisdiction of Manchester City Council. As such the policies adopted by Manchester City Council must be adhered to.

The document that details Manchester's strategy for development is 'Manchester's Local Development Framework - Core Strategy Development Plan Document', throughout the remainder of this report it shall be referred to as Manchester Core Strategy. The Core Strategy was adopted 11<sup>th</sup> July 2012.

The main policy relating to energy and sustainability that must be addressed for this particular development is Policy EN6: Target Framework for CO<sub>2</sub> reductions from low or zero carbon energy supplies

## **Policy EN6**

### **Target Framework for CO<sub>2</sub> reductions from low or zero carbon energy supplies**

*Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO<sub>2</sub> emissions for all phases of the development.*

*Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.*

*The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows:*

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).*
- Target 2 Electricity intense areas: Locations where the predominant building type has an all electric fit-out such as retail units and leisure complexes.*
- Target 3 MICRO-GENERATION AREAS: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.*

## **Domestic CO<sub>2</sub> emission targets**

**Table 12.1**

| <b>Target</b>                                  | <b>% Minimum requirement</b>                                                                  |
|------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Target 1: Network development area</b>      | CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010 |
| <b>Target 2: Electricity intense buildings</b> | + 15% increase on Part L 2010                                                                 |
| <b>Target 3: Micro generation area</b>         | + 15% increase on Part L 2010                                                                 |

*Where the CO<sub>2</sub> emissions reduction required under any future revision to Part L of the building regulations become greater than the ‘% minimum requirement’, the reduction required under building regulations would apply.*

*Where the Council identifies an ‘allowable solution’, for example within an energy proposals plan, that would produce higher carbon reductions at no extra cost than that of achieving the ‘% Minimum requirement’ (or required under building regulations if greater) the higher percentage reduction will be required. The cost comparison is based on the cost of incorporating the ‘allowable solution’ at design stage.*

*The energy statement will be required to be submitted at the outset of any proposed development (outline application or before). Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO<sub>2</sub> mitigation, subject to the energy statement incorporating evidence such as modelling to demonstrate compliance.*

*Guidance on what the energy statement should contain and how to decide which target applies to a development proposal is given in appendix A.*

The above policy states that this specific development requires a 15% betterment with CO<sub>2</sub> emission reduction over 2010 Building Regulations. However, the development will be constructed to adhere to 2021 Building Regulations.

2021 Part L1A Building Regulations is widely recognised within the industry as being 37% better than 2010. Meaning that it is already more onerous to achieve just a Building Regulations pass.

As such, the logic should apply to the Manchester Core Strategy policy. As 2013 Building Regulations has a 37% betterment, then the target should be to simply meet the current 2021 Building Regulations for CO<sub>2</sub> emissions.

This is the target that shall be utilised throughout the remainder of this report.

## Guide to Development in Manchester SPD (2007)

The Guide to Development in Manchester SPD was adopted in 2007, it contains policies that pertain specifically to energy efficiency and CO<sub>2</sub> reductions through various methodologies. For example PolicyPart 1 E1.5 states that developers should aim to reduce CO<sub>2</sub> by 25% above Building Regulations 2006. As the current Manchester Core strategy supersedes these policies, then many of them are referred back to the Manchester Core Strategy.

The Guide to Development in Manchester refers to the majority of the issues covered within the Environmental Standards section of this report as that section refers specially to the issues raised through the Guide to Development in Manchester, such as Biodiversity, Waterways, Waste Management etc.

## Code for Sustainable Homes

Manchester Core Strategy refers to The Code for Sustainable Homes Level 4 within Policy EN2. Following the outcome of the Housing Standards review released March 2015, Code for Sustainable Homes is now no longer applicable for newly proposed residential developments.

As this is a new development being proposed after March 2015 the Local Authority is prohibited from requesting a Code for Sustainable Homes assessment and therefore this requirement will be omitted from this Energy Statement

The ESS is structured around the key, relevant policy themes set out in the Guide to Development SPD, namely:

- Energy Efficiency
- Renewable Energy
- Environmental Design
- Water Management & Weather Resilience
- Waste Management
- Construction Management
- Biodiversity

Policies relating to waterways, which are identified in the Guide to Development SPD within the scope of an ESS, are excluded from this application due to the absence of waterways on or in the environs of the site. The nearest waterway, the River Medlock, is some 230m north-west of the proposed development site. There is little to no risk of pollution from this development being introduced into the waterways. There are no canals within 500m of the site.

## Information sources

The ESS is supported from information contained in:

- Design & Access Statement [CODA Architects, - submitted under separate cover]
- Energy Statement [QED]
- Phase I Desk Top Study [LK Group - submitted under separate cover]
- Outline Drainage Strategy [Civic Engineers - submitted under separate cover]
- Ecological Assessment [E3P - submitted under separate cover]
- Framework Travel Plan [SKTP - submitted under separate cover]
- Noise Assessment [PDA - submitted under separate cover]
- Air Quality Assessment [Redmore - submitted under separate cover]

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## - 2.0 Headline Attributes

### - General

The design of the proposed development of land at Ardwick Green North, Manchester, located in an urban area of the city, has incorporated building fabric enhancement to increase the energy efficiency of the building.

This concludes that the development uses less energy, by adopting sustainable design and construction measures and by supplying energy efficiently.

Given the complexity of calculating and assessing CO<sub>2</sub> emissions, the Manchester City Council requires all proposed developments to be designed and built to minimise greenhouse gas emissions across their lifetime and incorporate sustainable design and construction measures to comply with the current criteria set out within their adopted Core Strategy.

The methodology for this report is to take a 'fabric first' approach as set out in Policy EN6 of Manchester City Councils Core Strategy, making improvements to the envelope first, reviewing the results due to these fabric improvements and then reviewing suitable technologies to enhance this design philosophy where feasible. The calculations have been calculated using current Building Regulations Part L1A 2021.

The overall concept for the mechanical and electrical services of the scheme follows on from the 'fabric first' approach.

Use of a highly efficient Air Source heat pump boiler will be utilised to serve both heating and hot water throughout the development. This uses Electrical Air Source Heat Pumps which reduces the amount of CO<sub>2</sub> produced.

Ventilation is provided by Mechanical Ventilation Heat Recovery systems to each dwelling which allow for full purge ventilation as well as recovering significant amounts of energy from warm exhaust air, again aiding in reducing CO<sub>2</sub> emissions.

Lighting will be full LED low Energy lighting throughout the development with appropriate controls.

The proposed fabric specification is described in the table below:

**Table 1 Building Fabric Specification**

| Proposed Building Fabric     |                                                   |                                                   |                                         |
|------------------------------|---------------------------------------------------|---------------------------------------------------|-----------------------------------------|
| Element                      | L1A: 2021 Limiting U-values (W/m <sup>2</sup> .k) | L1A: 2021 Notional U-values (W/m <sup>2</sup> .k) | Proposed U-values (W/m <sup>2</sup> .k) |
| Floors                       | 0.18                                              |                                                   | 0.13                                    |
| External Walls               | 0.26                                              |                                                   | 0.18                                    |
| Curtain Walls                | 1.6                                               |                                                   | N/A                                     |
| Party walls between dwelling | 0.20                                              |                                                   | 0.00                                    |
| Roof                         | 0.16                                              |                                                   | 0.11                                    |

|                                                             |      |  |              |
|-------------------------------------------------------------|------|--|--------------|
| Windows                                                     | 1.6  |  | 1.27         |
| Doors                                                       | 1.6  |  | 1.2          |
| Y – value (W/m <sup>2</sup> .k)                             | 0.15 |  | 0.15 Default |
| Air permeability (m <sup>2</sup> /h.m <sup>2</sup> @ 50 pa) |      |  |              |
| All dwellings                                               | 10.0 |  | 5.0          |

For each of the 16 No new build dwellings within the development, the following results have been obtained, based on an area weighted average block compliance calculation method to adhere to the site wide requirements set out within the Local Authority Policies:

- Target Carbon Dioxide Emission Rate (TER) **11.49 kg/m<sup>2</sup>**
- Dwelling Carbon Dioxide Emission Rate (DER) **5.66 kg/m<sup>2</sup>**

- a) The emission improvements rate would provide a 50.07% CO<sub>2</sub> reduction (DER/TER) against current Building Regulations for the entire residential aspect of the development. This equates to 87% reduction in CO<sub>2</sub> over Building Regulations 2010.

Following the Fabric First approach of the EN6 Policy of Manchester City Council the following has been calculated

- b) The Fabric Energy Efficiency of the entire development has achieved a pass

- Target Fabric Energy Efficiency (TFEE) **40.7 kWh/m<sup>2</sup>/year**
- Dwelling Fabric Energy Efficiency (DFEE) **40.6 kWh/m<sup>2</sup>/year**

The report demonstrates that the development adheres fully with the requirements of Policy EN6 and associated paragraphs within the Manchester Core Strategy.

It has also been demonstrated that the ventilation strategy for the dwellings will aid with the achievement of the CO<sub>2</sub> target and comply with Part F of Building Regulations.

The report also demonstrates that the Environmental Standards that Manchester employ for developers will be taken account of under the full construction package and significant mindfulness of these issues is carried throughout the full design process.

An all-electric heating and water heating system would provide, quiet, and non-direct polluting system which is considered to be the most complimentary to the site.

An improvement fabric first approach which has an improvement over the Fabric Energy Efficiency target which demonstrates focus and consideration on low heat loss and improved energy demand.

All Environmental Standards have been addressed accordingly, and a mindfulness to a sustainable and environmentally friendly design has been carried through to all aspects of the proposed development.

The proposed development comprises the following key environmental attributes:

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Energy Efficiency</b> <p>Developments are expected to follow the principles of the Energy Hierarchy. High standards of energy efficiency are encouraged, with passive design measures and efficient forms of heat and power provision incorporated with the aim of reducing CO2 emissions. The Core Strategy and the Guide to Development SPD differ in their expectations of carbon reduction with the former requiring an improvement of 15% over Part L of the Building Regulations 2010 and the latter by 25% against Part L, 2006. The ESS should demonstrate how this has been considered.</p>                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Target of 87% improvement over Building Regulations 2010, exceeding local policy aspirations.</li> <li>• Incorporation of efficient Air Source Heat Pumps sized to meet heating and hot water requirement.</li> <li>• Energy modelling in IES Software to support operational energy management.</li> </ul>                     |
| <b>Renewable Energy</b> <p>The Manchester Guide to Developments SPD seeks to encourage developers to optimise renewable and LZC energy generation that it is integrated into developments, aiming for a minimum of 20% of final energy demand to be delivered by on-site renewable energy technologies. However, approaches to CO2 reduction contained in the more recently adopted Core Strategy provide greater flexibility in how targets are met and contains no specific renewable energy targets for developments.</p>                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Full appraisal of renewable energy options undertaken, identifying scope for air source heat pumps and the potential incorporation of roof-top solar PV array to contribute to the overall carbon reduction strategy, depending on the final Building Emissions Rating realised through the detailed design process.</li> </ul> |
| <b>Environmental Design</b> <p>For domestic developments, developers are encouraged in the Guide to Development SPD to use the code for sustainable homes and to achieve a design and post-construction rating of 6 where possible. This is reinforced by Policy DM1 of the Core Strategy, which requires developers to demonstrate the incorporation of sustainable construction techniques with reference to CFSH.</p>                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>• The code for sustainable homes is now no longer applicable to new housing developments.</li> <li>• The development exceeds the requirements of the new 2021 building regulations Part L1A</li> </ul>                                                                                                                            |
| <b>Water Management &amp; Weather Resilience</b> <p>In order to reduce the risk of water pollution and damage and disruption from flood events, whilst also conserving water resources through their efficient uses, developments should not be located in areas of significant flood risk unless it can be demonstrated through a flood risk assessment that any risk can be appropriately managed and/or mitigated. Developments are also required to incorporate sustainable drainage measures and water efficient devices. The Core Strategy requires developments to improve water quality, both biological and ecological, where possible whilst also adapting to climate change through passive design to avoid over-heating and the incorporation of green infrastructure.</p> | <ul style="list-style-type: none"> <li>• Development on an existing urban site with very low levels of flood risk.</li> <li>• No increase in surface water run-off rates. Water efficient devices to be specified achieving 25% improvement over BRE baseline benchmark.</li> <li>•</li> </ul>                                                                           |

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Waste Management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Developers are required to prepare waste management plans which accord with the principles of the waste hierarchy and which addresses both the construction and occupational phases of developments. There is a particular emphasis on reducing and recycling waste at source.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Waste Management Plan prepared in accordance with MCC guidance.</li> <li>• Clearly marked and dedicated storage and loading areas for waste collection.</li> <li>• Segregation of key recyclable materials from general waste.</li> <li>• Design and material selection support material efficiency objectives.</li> </ul>                                                                                                               |
| <b>Construction Management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Developers are required to manage environmental resources and impacts during the construction process, with a particular emphasis on minimising waste through the re-use of existing structures and materials. Site Waste Management Plans are therefore encouraged, and the application of the Considerate Constructors scheme is recommended. The use of environmentally low-impact materials in construction is also encouraged.                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Timber from the construction technologies adopted leading to a sustainable construction and reduction in waste through off site production.</li> <li>• A site waste management plan will be developed, targeting a minimum 80% of construction being diverted from landfill.</li> <li>• Appropriate pre-development intrusive ground contamination surveys to be undertaken with construction practices tailored accordingly.</li> </ul> |
| <b>Biodiversity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| The Core Strategy encourages green roofs, green walls, tree planting and other forms of green infrastructure as part of development proposals. Developers are expected to avoid adverse biodiversity impact and to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on-site or adjacent to their developments. Developments should result in no net loss in overall biodiversity value and maximise opportunities to achieve a 10% net increase in tree cover. Landscaping and new planting should include species appropriate for the proposed development that will encourage wildlife. Construction materials which have a negative biodiversity impact are to be avoided. | <ul style="list-style-type: none"> <li>• The loss of any biodiversity value will be negligible due to the impoverished nature of the current site. An ecological survey has been undertaken to support this.</li> </ul>                                                                                                                                                                                                                                                           |

# 3.0 Energy Statement

## Introduction

This Energy Statement has been prepared by Quality Engineering Design Ltd on behalf of Step Places to support the application for planning permission for the proposed development. The purpose of the Statement is to demonstrate at the early design stages how the proposed development could comply with the energy and carbon emissions requirements of Manchester's Local Development Framework Core Strategy Development Plan Document Adopted 11th July 2012.

## Overview

This Energy Strategy has developed a methodology to improve the Target Emissions Rate (TER) under Part L1A 2010 by the target of 15% which is a requirement of the Manchester Core Strategy. To achieve this, a strategy has been developed which delivers an improvement over the TER of 87%. This is based on an Air source heat pump producing heating and hot water for each dwelling. Ventilation and heat recovery shall be provided by an MVHR unit. Lighting will typically need to be provided by LED or T5 lighting systems with modern controls.

## Target Emissions Rate

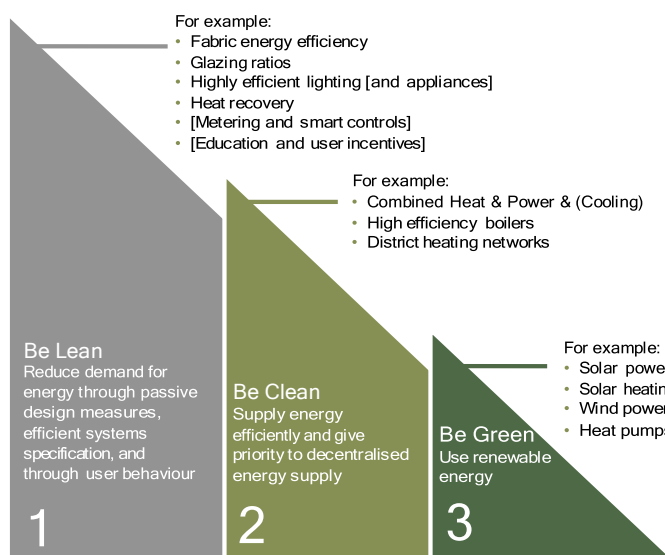
The target under the Core Strategy is a 15% improvement over a Target Emissions Rate (TER) calculated under Building Regulations Part L1A 2010. Known as Target 3, this covers micro-generation areas which are locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

Target 3 has been selected as there is not a district heating scheme within close proximity, meaning it is not possible to comply with Target 1. It is also not possible to comply with Target 2; electricity intense areas. This is because this is defined as being where the proportion of emissions from electricity is > 45 kg CO<sub>2</sub>/m<sup>2</sup>, which is not the case with the proposed development.

## Energy Hierarchy

This report follows a 'fabric first' energy hierarchy to ensure that CO<sub>2</sub> emissions are minimised by reducing energy demand and through passive design measures where possible. This energy hierarchy is often paraphrased as:

- *Be Lean* - make the building work passively
- *Be Clean* - specify energy efficient systems and technologies
- *Be Green* - apply renewable



Our approach to achieving compliance with regulatory and voluntary codes is demonstrated in the pyramid schematic shown in Figure A2.1. Our methodology is to go beyond the requirements of Building Regulations by meeting, where possible, the design standards and values of a notional building described in the National Calculation Method (NCM). These values are typically better than the minimum values set out in Building Regulations 2010 Approved Document Part L1A (2021).

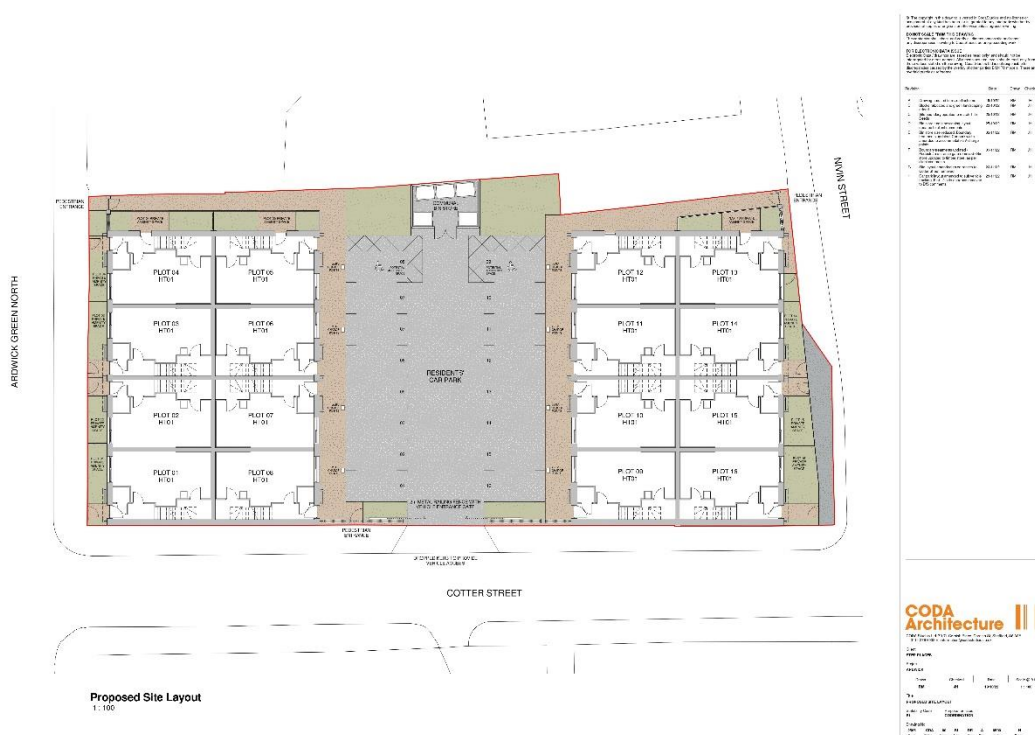
A table summarising the results of our energy modelling is set out below.

| Simulation | Target Emissions Rate (TER) kg CO2/m2 | Building Emissions Rate (BER) kg CO2/m2 | Percentage improvement over TER |
|------------|---------------------------------------|-----------------------------------------|---------------------------------|
| 1          | 11.49                                 | 5.66                                    | 50%                             |

### Baseline information

The proposed development comprises 16 dwelling of 3 story construction situated in two terraced blocks. Typical floor plans are shown below.

Figure A2.2 Ground floor layout



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The building fabric and building services strategy is detailed in the following tables and has been developed from a number of documents, including:

- The HVAC strategy agreed with Step Places
- A design and Access Statement by CORE Architects (not dated)
- Building Regulations 2021 Approved Document Part L1A
- Non-Domestic Building Services Compliance Guide
- The National Calculation Method

It is important to note that throughout the design process, but particularly in the early stages, design fluid. All of the calculations that have been used in our energy modelling are based on assumptions drawn from a number of documents. We would expect that as the design progresses and as additional and more detailed information becomes available, that both the TER and the BER will change. Examples of design changes that will affect the TER and the BER include, changing the specific fan power of MVAR Units, introducing roof mounted PV panels and change from the assumptions set out in this Energy Statement could impact on the calculations.

#### The building fabric and building services strategy

The tables below detail how the energy strategy has sought to comply with the Be Lean and Be Green requirements of the Energy Hierarchy. The Be Green component of the hierarchy is detailed in Section 4.0 of this report.

| Be Lean: By ensuring U-Values exceed the minimum standards of Criterion 2 of Approved Document Part L1A |                |                                                        |                                                   |                                                          |                                                                        |                                                     |
|---------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------|
| Item                                                                                                    | Description    | Part L1A limiting values (area weighted average value) | Notional Design Specification (weighted averages) | Actual Design Specification proposed (weighted averages) | Construction detail (materials with the propensity to affect U Values) | Notes                                               |
| 1                                                                                                       | Roof           | 0.16                                                   |                                                   | 0.11                                                     | Construction details not provided                                      | We have adopted an NCM 2013 compliant Notional Roof |
| 2.a.                                                                                                    | External walls | 0.26                                                   |                                                   | 0.18                                                     | Construction details not provided                                      | We have adopted an NCM 2013 compliant external wall |

| Item | Description                       | Part L1A limiting values (area weighted average value) | Notional Design Specification (weighted averages) | Actual Design Specification proposed (weighted averages) | Construction detail (materials with the propensity to affect U Values) | Notes                                                                                     |
|------|-----------------------------------|--------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 3    | Floor                             | 0.18                                                   |                                                   | 0.13                                                     | values, glazing<br>Construction details not provided                   |                                                                                           |
| 4.a. | Glazing                           | 1.6                                                    |                                                   | 1.27                                                     | Construction details not provided                                      |                                                                                           |
| 6    | Internal walls (non-load bearing) | N/A                                                    |                                                   |                                                          | Construction details not provided                                      |                                                                                           |
| 7    | Internal walls (load bearing)     | N/A                                                    |                                                   |                                                          | Construction details not provided                                      | We have adopted a typical concrete wall for the core areas                                |
| 8    | Internal floors                   | N/A                                                    |                                                   |                                                          | Construction details not provided                                      | We have adopted an NCM 2013 compliant typical ceiling/floor and added carpet and underlay |

#### Be Lean: Through low levels of air permeability

| Item | Description      | Part L1A limiting values                  | Notional Design Specification                                                                                               | Actual Design Specification                                        | Notes                                                           |
|------|------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------|
| 7    | Air permeability | 10 m <sup>3</sup> /h/m <sup>2</sup> @50Pa | 5 m <sup>3</sup> /h/m <sup>2</sup> @50Pa (for a side-lit or unlit building greater than or equal to 10,000 m <sup>2</sup> ) | 5 m <sup>3</sup> /h/m <sup>2</sup> @50Pa for all conditioned areas | To be tested on completion by ATTM approved air pressure tester |

#### Be Lean: Use highly efficient lighting and lighting controls

| Item | Description | Part L2A limiting values | Notional Design Specification                                                                                                                                                                                                                  | Actual Design Specification                                                                                                                                                                                                     | Notes                                                                                                                              |
|------|-------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 8    | Lighting    | 75 luminaire lumens      | The general lighting in the Notional building is based on lighting with an efficacy of 60 luminaire lumens per circuit-watt, and the resulting power density (W/m <sup>2</sup> ) will vary as a function of the geometry of each zone modelled | We have assumed a total design wattage of around 9 W/m <sup>2</sup> . This will be achieved through the use of LED lighting only.<br><br>Lighting controls will be based on photoelectric and motion sensors wherever practical | A lighting design specification will need to be provided to confirm this has been met for the BRUKL 'asbuilt' output document etc. |

### Be Clean: Use efficient heating systems and controls

| Item | Description                                                         | PartL2A limiting values                                                       | Notional Design Specification | Actual Design Specification                                                                                                                                                                                                   | Notes |
|------|---------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 8    | Heating is to be provided primarily by way of Air source heat pumps | A CoP of 2.5 (i.e. for each unit of energy input 2.5 units of heat is output) | A CoP 2.43                    | Based on an ETL compliant Mitsubishi heat pump system with a nominal CoP of 5.6 and a Seasonal CoP of 5.22<br><br>NB this CoP will be affected by the choice of indoor units, number of connected units and pipe lengths etc. |       |

### Be Clean: Use Highly efficient mechanical ventilation and extraction with heat recovery

| Item | Description                                                                                                                                                               | Specific Fan Power (SFP) PartL2A limiting values | SFP Notional Design Specification                                                                                                                                                                                                               | SFP Actual Design Specification                                                                                                                                                | Notes                                                                                                                                                                                                                                                                           |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11   | There is a presumption against openable windows in busy Locations And ventilation is assumed to be provided by way of a locally sited (Zonal) energy efficient MVHR Units | 1.5 W/(l-s)                                      | 0.4 to 0.6 W/(l-s) dependent upon detail and where the AHU's are locally sited<br><br>0.9 W/(l-s) where AHU's are centrally sited<br><br>1.8 W/(l-s) if the AHU delivers heating and cooling as well as fresh air (this excludes heat recovery) | 0.8 W/(l-s)<br><br>Air changes are typically based on DCLG Guidance and cross referenced against CIBSE Guide B <i>Heating, Ventilating, Air conditioning and Refrigeration</i> | Vent Axia advises that SFPs for its range of Lossnay Units vary from 0.3 W/(l-s) to a maximum of 1.61 W/(l-s) and we have assumed 0.5 W/(l-s)<br><br>Due to the presumption against natural ventilation, this item needs to be reviewed in detail across various design stages. |

## Total energy demand, carbon emissions and emissions targets

Building Regulations 2010 Part L2A Conservation of fuel and power in new buildings other than dwellings, requires a calculation to demonstrate the predicted CO<sub>2</sub> emission of any new building (the Built Emission Rate, or “BER”) is below the CO<sub>2</sub> emission of a notional building (the Target Emission Rate, or “TER”). The notional building is based upon the specification of the actual building to be constructed, but with a notional specification providing minimum levels of efficiency governing the thermal envelope and regulated building services. Regulated building services include; heating, mechanical ventilation (including mechanical extraction), air conditioning, domestic hot water and lighting.

The local authority is required to accept, as evidence that the requirements of Part L1A have been met, a certificate from an accredited energy assessor. This is commonly known as a SAP output document. This calculation methodology underpins the Manchester’s Local Development Framework Core Strategy Development Plan Document which requires an improvement factor to be applied to the TER of 15%.

Our Energy Strategy has developed a methodology to improve the Target Emissions Rate (TER) under Part L1A 2010 by a target of 15%. To achieve this, a strategy has been developed which delivers an improvement over the TER of 87%. This is based on a heating, ventilation strategy that incorporates highly energy efficient variable refrigerant flow (Heat Pumps), MVAR Units with heat recovery, and a potential PV system to be situated on the roof.

| Target Emissions Rate: 22.16 kg CO <sub>2</sub> /m <sup>2</sup> |                                           |                                             |                                                                     |                          |
|-----------------------------------------------------------------|-------------------------------------------|---------------------------------------------|---------------------------------------------------------------------|--------------------------|
| Simulation                                                      | Description                               | Total energy demand kWh/m <sup>2</sup> p.a. | Equivalent carbon emissions kg CO <sub>2</sub> /m <sup>2</sup> p.a. | Improvement over the TER |
| 1                                                               | Heat pump boilers with MVAR heat recovery | 59.85                                       | 5.66                                                                | 50%                      |

## Consideration of alternative energy systems

As part of the latest iteration of Part L1A (effective as of June 2021) the person who is to carry out the work must analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems in the construction to include, if available:

- Decentralised energy supply systems based on energy from renewable sources such as PV, solar or wind;
- Cogeneration, such as combined heat and power;
- District or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources; and
- Heat pumps, including air source and ground source.

This Energy Strategy meets this requirement.

Under Manchester’s Local Development Framework Core Strategy Development Plan Document, there is also a requirement to consider all appropriate low carbon, renewable and/or decentralised technologies and to undertake an assessment of least cost technology options. The results of our analysis of potentially suitable technologies are detailed overleaf.

| Be Green: Apply renewable technologies                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                           |                                             |           |                               |                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------|-------------------------------|-----------------------------------|
| Benefits                                                                                                                                                                                                                                                                                          | Issues                                                                                                                                                                                                                                                                                                                                                                                                       | Comments                                                                                                                                                                                                                                                                                                                  | Cost (£) <sup>1</sup>                       | kWh saved | Tonnes CO2 saved <sup>2</sup> | Simple payback (yrs) <sup>3</sup> |
| 1 Photovoltaic (PV) panels                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                           |                                             |           |                               |                                   |
| <ul style="list-style-type: none"> <li>Low maintenance as no moving parts</li> <li>Easily integrated into building</li> <li>Low ongoing costs</li> <li>Excess electricity can be exported to Grid</li> <li>Can attract the Feed-in-Tariff (FiT) which can help improve payback periods</li> </ul> | <ul style="list-style-type: none"> <li>Overshadowing of panels has a disproportional effect on output performance. Research by Southbank University shows that an 11% shade factor can reduce efficiency by up to 28%</li> <li>North, east and west roof reduces performance below optimum</li> <li>May require planning consent</li> </ul>                                                                  | <p><b>Considered suitable</b></p> <p>A circa 3.2 kWp system would require approximately 13m<sup>2</sup> of roof space to allow PV panels to be mounted on A Frames at a 30-degree inclination</p> <p>Sun cast modelling is required to take into consideration surrounding structures as PV may be affected by shade.</p> | £5,000.00                                   | 15,769.00 | 8.18                          | 5 -6 Years                        |
| 2 Solar heat                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                           |                                             |           |                               |                                   |
| <ul style="list-style-type: none"> <li>Low maintenance</li> <li>Low capital costs</li> <li>Low ongoing costs</li> <li>Can attract the Renewable Heat Incentive (RHI)</li> <li>Can augment a heat pump system</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>Must be sized on the hot water requirements of building</li> <li>Ideal for developments with high year-round domestic hot water loads</li> <li>North, east and west roof reduces performance below optimum (although the effect of this is not as pronounced as with PV)</li> <li>Not good at meeting constant loads</li> <li>May require planning consent</li> </ul> | <p><b>Considered Not suitable</b></p> <p>A heat pump system is the primary source of heat.</p> <p>Insufficient space on the roof for system and PV</p>                                                                                                                                                                    | Not costed as not considered to be suitable | N/A       | N/A                           | N/A                               |

## 2 Wind (Roof or independently mounted turbine)

|                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                          |                                             |     |     |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----|-----|-----|
| <ul style="list-style-type: none"> <li>• Low maintenance/ongoing costs</li> <li>• Excess electricity can be exported to the grid</li> <li>• Can attract the FiT which can help improve payback periods</li> </ul> | <ul style="list-style-type: none"> <li>• NOBAL Wind estimator tool suggests an average wind speed of 4.6 m/s at a height of 10 meters, 5.3 m/s at 25 meters and 5.9 m/s at 45 meters when topography is accounted for</li> <li>• Turbulence from local obstructions including subject property for roof mounted turbines, requires consideration</li> <li>• Noise and flicker can cause nuisance especially for larger turbines</li> <li>• Often opposed by neighbours due to the aesthetic impact on the local environment</li> <li>• May require planning consent</li> </ul> | <ul style="list-style-type: none"> <li>• Wind speed is below the British Wind Energy Association (BWEA) suggested minimum economic speed of 7m/s at hub height for larger systems. Smaller generation systems can operate at speeds of <math>\leq 3</math> m/s but the impact of these on BER is small and the low wind speed affects the payback and therefore economic case</li> </ul> | Not costed as considered to not be suitable | N/A | N/A | N/A |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----|-----|-----|

1. Costs are indicative only and exclude VAT and Preliminaries

|                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                    |            |            |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------|------------|------------|------------|
| <ul style="list-style-type: none"> <li>• Can support the local community if biomass is sourced locally</li> <li>• Can be commercially beneficial where local biomass and waste wood products are readily available</li> <li>• Suitable for properties off the gas grid</li> <li>• Can attract the RHI</li> </ul> | <ul style="list-style-type: none"> <li>• Space required for fuel delivery and storage and plant room (unit, hot water buffer storage ect.)</li> <li>• Reliable fuel supply chain required</li> <li>• Regular maintenance required/ash disposal</li> <li>• Accuracy of data can be questionable</li> <li>• Monitoring of stock is important especially where wood is not fed through a feed mechanism</li> <li>• The cost of wood has increased significantly, and this is in part because of the popularity of biomass</li> <li>• Problems with commissioning - a Carbon Trust survey revealed that only 30% of installations in the UK are working well</li> <li>• There are particular issues around Health &amp; Safety which need to be managed</li> <li>• Lack of industry knowledge and appropriately qualified professionals</li> <li>• Poor turndown ratio</li> </ul> | <p><b>Considered Not Suitable</b></p> <p>A biomass system is unlikely to be technically, environmentally or economically feasible (introducing additional health and safety requirements, plus a storage facility for biomass, and sufficient access for the delivery of biomass). It has a poor turndown ratio and would need to be supported by fossil fuel boilers</p> <p>By its own admission DECC is questioning its calculations around the environmental benefits of using biomass where it is not a waste product</p> | <p>Not costed as not considered to be suitable</p> | <p>N/A</p> | <p>N/A</p> | <p>N/A</p> | <p>N/A</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------|------------|------------|------------|

| Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Comments                                                                                                                                                                                                                                               | Cost (£) <sup>1</sup>                       | kWh saved | Tonnes CO2 saved <sup>2</sup> | Simple payback (yrs) <sup>3</sup> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------|-------------------------------|-----------------------------------|
| 5 Cogeneration (Combined Heat & Power)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |                                             |           |                               |                                   |
| <ul style="list-style-type: none"> <li>Efficient use of fuel</li> <li>Fueled by gas, diesel or biomass</li> <li>Easily integrated into building HVAC systems</li> <li>Excess electricity can be exported to grid</li> </ul>                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Sized to a year round base load heating or hot water requirement of development</li> <li>Regular maintenance required</li> <li>Must run for around 4500 hours per year to be viable and have a summer heat demand</li> <li>Requires thermal storage to improve run time and reduce heat waste</li> </ul>                                                                                                                                                                                                                     | <p>Considered not suitable</p> <p>The DWH requirements are not considered sufficient across the year</p> <p>A backup fossil fuel boiler will also be required</p> <p>There is insufficient space for a CHP Unit</p>                                    | Not costed as considered not to be suitable |           |                               |                                   |
| 6 District or block heating or cooling, particularly where based entirely or partially on energy from renewables                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |                                             |           |                               |                                   |
| <ul style="list-style-type: none"> <li>N/A</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>N/A</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | We have been advised that a district heating scheme is not within the immediate locality                                                                                                                                                               | N/A                                         | N/A       | N/A                           | N/A                               |
| 7 Air source heat pumps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                        |                                             |           |                               |                                   |
| <ul style="list-style-type: none"> <li>Reported to have a high energy efficiency ratios under test conditions and therefore can positively impact the predicted BER</li> <li>Considered to be a Low or Zero Carbon Technology (LZC) as low grade heat is transferred from outside to the inside i.e. heat is recycled</li> <li>Air-to-water systems can offer an effective alternative to gas fired central heating system and attract the Renewable Heat Incentive (RHI) payment</li> <li>Easy to install with lower installation costs than a ground source heat pump system</li> </ul> | <ul style="list-style-type: none"> <li>Operational energy efficiency ratios are generally lower than those claimed by manufacturers</li> <li>Lower efficiency ratios than ground source heatpump</li> <li>Multiple systems may lead to noise issues</li> <li>Generally uses refrigerants which are greenhouse gases with extremely high global warming potential</li> <li>The strongest case for heat pumps are for those sites without mains gas, or where there is a requirement to exceed minimum CO2 targets (on paper) such as those under Part L2A</li> </ul> | <p><b>Considered suitable</b></p> <p>An air-to-water heat pump system is technically and economically feasible helping to deliver a lower BER than the TER.</p> <p>This is the preferred heating And hot water solution for the proposed dwellings</p> | £5,000.00                                   |           |                               | N/A <sup>6</sup>                  |

- Unobtrusive technology
- Minimal maintenance
- Reported to have high energy efficiency ratios under test conditions and therefore can positively impact the predicted BER
- Considered to be a LZC as low grade heat is transferred from the outside to the inside i.e. heat is recycled
- Ground source systems can offer an effective alternative to gas fired central heating system and attract the Renewable Heat Incentive (RHI) payment

- Large area required for horizontal pipes
- Full ground survey must be carried out Low temperature water heating circulation required for optimum performance
- Areas of permeable surface recommended to maintain ground moisture conditions
- The strongest case for heat pumps are generally for those sites without mains gas, or where there is a requirement to exceed CO2 targets under Part L2A

### Considered not suitable

Not considered to be either technically or economically feasible. The cost of installation of a ground source heat pump system is higher than an air source heat pump system.

There is likely to be insufficient car parking/external space for horizontal pipes. This means deep boreholes will need to be dug and/or pile foundations (as the pipes can be run alongside the piles)

Not costed as considered not to be suitable

N/A

N/A

N/A

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# Environment Standards Statement

## 4.1 Energy Efficiency

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Developments are expected to follow the principles of the Energy Hierarchy. High standards of energy efficiency are encouraged, with passive design measures and efficient forms of heat and power provision incorporated with the aim of reducing CO2 emissions. The Core Strategy and the Guide to Development SPD differ in their expectations of carbon reduction with the former requiring an improvement of 15% over Part L of the Building Regulations 2010 and the latter by 25% against Part L, 2006. The ESS should demonstrate how this has been considered. | <p>Target of 17.5% improvement over Building Regulations 2010 through Be Lean &amp; Be Clean measures, exceeding local policy aspirations.</p> <p>Incorporation of efficient air source heat pumps sized to meet building heating &amp; hot water domestic hot water requirement.</p> <p>Energy modelling in IES Software to support operational energy management.</p> |

### Response of the proposed development

Through a combination of efficient systems and a 'fabric first' approach to the design of the proposed development, a betterment of the national Building Regulations set out in Part L1A 2021 has been achieved, and which also exceeds the policy aspirations for carbon reduction of new development set out in both the Manchester Core Strategy and the Guide to Development SPD.

A holistic approach to energy and carbon reduction has been taken to the proposed development, driven by a combination of the client brief, affordability considerations and within the constraints of a challenging, compact, site. This is entirely consistent with the "energy hierarchy" set out in the National Planning Policy Framework, and reflected in the Manchester Core Strategy.

Measures have been incorporated into the design of the building form to minimise the need for active energy and environmental control systems. Where such systems cannot be designed out completely, measures have been considered to make these systems as energy efficient as possible. Finally, consideration has been given to on-site renewable energy generation and other low and zero carbon (LZC) systems.

This overall Energy Hierarchy approach, which is central to the energy strategy for the proposed development, is often paraphrased as:

- **Be Lean** - make the building work passively to reduce the need for energy
- **Be Clean** - specify energy efficient systems & controls
- **Be Green** - generate energy from renewable sources

This section of the ESS focuses on the **Be Lean** and **Be Clean** aspects of the hierarchy, with **Be Green** measures set out in Section 2, Renewable Energy.

## Be Lean

- Fenestration responding to building orientation, thereby reduce solar gains;
- Substantial, reveals on windows to provide an element of solar shading;
- High performance envelope, exceeding minimum Part L 2021 requirements and notional building performance across all principal elements such as roof, floors, external walls and glazing;
- Air permeability of 4.0m<sup>3</sup>/hour/m<sup>2</sup> @ 50Pa targeted; and
- Comprehensive commissioning to be undertaken to ensure that M&E systems are calibrated accurately.

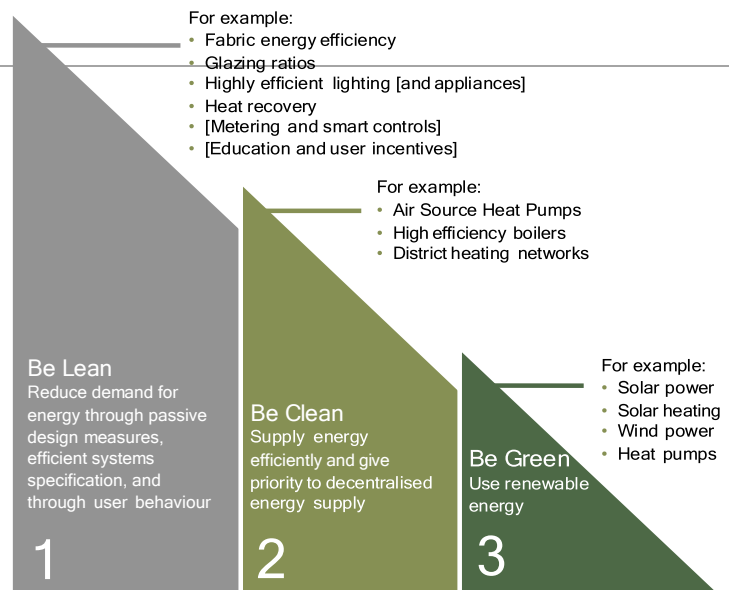


Figure A2.1 Energy Hierarchy

## Be Clean

- Air Source Heat Pumps will be incorporated to meet the heating domestic hot water demand, with detailed load profiles to be developed at the detailed design stage.
- Ventilation shall be MVHR with local Units which recycle heat and provide free cooling.
- LED lighting throughout, with a total design wattage of around 8W/m<sup>2</sup>;
- Intelligent Building Management System (Home control system)

The combination of the Be Lean and Be Clean measures is anticipated to deliver a significant improvement over the current Building Regulations Approved Document L1A 2021 which is significantly more onerous than the previous 2010 Part L standard, over which the Manchester Core Strategy seeks a betterment of 15%. It is therefore evident, without even taking account of the additional renewable energy measures set out in the following section, that the proposed development makes a significant contribution to Manchester's carbon reduction targets, and exceeds local, as well as national policy requirements.

# Environmental standard statement

## 4.2 Renewable Energy

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The Manchester Guide to Developments SPD seeks to encourage developers to optimise renewable energy generation that it is integrated into developments, aiming for a minimum of 20% of final energy demand to be delivered by on-site renewable energy technologies. However, approaches to CO2 reduction contained in the more recently adopted Core Strategy provide greater flexibility in how targets are met and contains no specific renewable energy targets for developments. | Full appraisal of renewable energy options undertaken, identifying scope for potential incorporation of roof-top solar PV array, depending on the final Building Emissions Rating realised through the detailed design process. |

### Response of the proposed development

The proposal has focused on providing a highly efficient fabric and services design that better the energy performance requirements of Part L, reducing the amount of energy required to operate the building. This could be further supplemented by renewable technology installations, subject to financial viability at the time of construction.

The options for considerable energy generation through the use of renewable technologies are limited within the constraints of a compact site, therefore the design of the building has concentrated on exceeding the energy efficiency targets through low energy design.

The 20% benchmark set by the Guide to Developments SPD is not practical within the constraints of the site; however, the proposals exceed Part L targets which demonstrates a commitment to sustainable development within the spirit of the policy.

An assessment of low and zero carbon technologies has been undertaken and the most appropriate technologies for this development would be an Air Source Heat Pump system sized to cater for the buildings heating and the domestic hot water requirement, with the option of a Photovoltaic Array, as explained in the table below.

The combination of all energy and carbon reduction measures – both efficiency and renewables – is anticipated to yield an 87% reduction over the Building Regulations Approved Document L1A 2010.

| Technology                                   | Appraisal Comments                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Photovoltaic (PV) panels                     | <b>Considered suitable</b><br>A circa 3.2 kWp system would require approximately 13 m2 of roof space to allow PV panels to be mounted on an A-Frame. Sun cast modelling is required to take into consideration surrounding structures as PV is affected by shade.                                                                                                                                         |
| Solar heat                                   | <b>Considered suitable (subject to systems selected)</b><br>In order to improve the TER by >15% it is necessary to consider the installation of an Air Source Heat Pump system that is capable of meeting the buildings heating and DHW requirements. If the heat pump is not required, due to a change in central plant, then we believe that a solar heating system could be viable.                    |
| Wind (roof or independently mounted turbine) | <b>Considered not suitable</b><br>Wind speed is below the British Wind Energy Association (BWEA) suggested minimum economic speed of 7m/s at hub height for larger systems. Smaller generation systems can operate at speeds of <3m/s but the impact of these on the BER is small and the low wind speed affects the payback and therefore economic case.                                                 |
| Biomass                                      | <b>Considered not suitable</b><br>A biomass system is unlikely to be technically, environmentally or economically feasible (introducing additional health and safety requirements, plus a storage facility for biomass, and sufficient access for the delivery of biomass). It has a poor turndown ratio and would need to be supported by fossil fuel boilers. By its own admission, DECC is questioning |

| Technology                                                                                                                  | Appraisal Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                             | <del>its calculations around the environmental benefits of using biomass where it is not a waste product</del>                                                                                                                                                                                                                                                                                                                                                              |
| Cogeneration (combined heat and power)                                                                                      | <b>Considered not suitable</b><br>A CHP does not have the heat requirements across the year to be a viable option. In addition it does not integrate well with an Air Source Heat Pump system.                                                                                                                                                                                                                                                                              |
| District or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources | <b>Considered not suitable</b><br>We have been advised that a district heating scheme is not within the immediate locality                                                                                                                                                                                                                                                                                                                                                  |
| Air source heat pumps                                                                                                       | <b>Considered suitable</b><br>An air-to-water heat pump system is technically and economically feasible helping to deliver a lower BER than the TER. This is the preferred heating and hot water solution for the proposed dwellings                                                                                                                                                                                                                                        |
| Ground source heat pumps                                                                                                    | <b>Considered not suitable</b><br>Not considered to be either technically or economically feasible. The cost of installation of a ground source heat pump system is higher than an air source heat pump system. There is no external space for horizontal pipes. This means deep boreholes will need to be dug and/or pile foundations (as the pipes can be run alongside the piles) However there is concern over the area available for the energy transfer requirements. |

# 4.0 Environmental Standard Statement

## 4.3 Environmental Design

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| For domestic developments, developers are encouraged in the guide to development SPD for the code for sustainable homes to achieve a rating of 6 where possible. This is reinforced by policy DM1 of the core strategy, which requires developers to demonstrate the incorporation of sustainable construction techniques with reference to CFSH | <ul style="list-style-type: none"><li>• The development exceeds the requirements of the new 2021 building regulations part L1A.</li><li>• The code for sustainable homes is now no longer applicable to new housing developments</li></ul> |

### Response of the proposed development

#### Environmental Design

Section 4.7 and 4.8 of the Guide to Development in Manchester relates to a sustainable, environmental design ethos. It references the use of the Code for Sustainable Homes Assessments and how this is encouraged.

As stated previously in this report, the Code for Sustainable Homes was retired in 2015 and as such is no longer applicable.

A BREEAM assessment is also stated as being encouraged, however as the majority and predominant use of the building is residential, this also would not be applicable to use in this case.

However, mindfulness and attention has been paid to sustainable design through the following.

The development will be located 100% on previously development land. As the majority of the current land is a derelict building, this will avoid the use of breaking new ground in an alternative location.

The development provides car parking areas on site.

The site is also shown to be very well located in terms of public transport accessibility. Cycle storage is provided for within each dwelling.

The above falls in line with the National and Local transport policies.

Further information can be found within the Framework Travel Plan which has been prepared by SKTP, detailing how the development encourages the use of public transportation, ongoing monitoring of the different usages of transportation and amendments if appropriate.

The site is located close to the centre of Manchester city which benefits from excellent connectivity to public transport options including the Metrolink, bus routes and walking distance to many of Manchester's major railway stations.

The Framework Travel Plan report produced by SKTP should also give details about any current car sharing clubs in the area and personal travel incentives.

Additional environmental considerations have also had significant attention paid to them, specifically Noise Impact. A Noise Assessment has been carried out by PDA and is available for review.

The report should describe the anticipated insignificant nature of noise levels in outdoor living spaces given the context of the location. It should also offer specific guidance upon reducing sound transmission internally, however through the fabric specifications this is anticipated to be insignificant. Some noise mitigation measures will be required to the front elevations

An Air Quality Assessment has been undertaken by Redmore environmental and is again available for review to determine the impact upon air quality from the building and the current effects of air quality for the future residents. The specific nature of the Mechanical services design is to reduce the combustion of fossil fuels on site and therefore reducing the impact upon air quality on site.

It is anticipated that it would state that the proposed development will not lead to an unacceptable risk from air pollution, or to any breach in national objectives as required by national policy given the low polluting services being proposed and with no car parking areas limited air pollution will come from additional transportation.

# Environmental Standard Statement

## 4.4 Water Management & Weather Resilience

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| In order to reduce the risk of water pollution and damage and disruption from flood events, whilst also conserving water resources through their efficient uses, developments should not be located in areas of significant flood risk unless it can be demonstrated through a flood risk assessment that any risk can be appropriately managed and/or mitigated. Developments are also required to incorporate sustainable drainage measures and water efficient devices. The Core Strategy requires developments to improve water quality, both biological and ecological, where possible whilst also adapting to climate change through passive design to avoid over-heating and the incorporation of green infrastructure. | Development on an existing urban site with very low levels of flood risk.<br><br>No increase in surface water run-off rates.<br><br>Water efficient devices to be specified achieving 25% improvement over BRE baseline benchmark. |

### Response of the proposed development

#### Flood risk and drainage

The site of the proposed development is located in an area of low groundwater and fluvial flood risk (EA Flood Zone 1 indicating that the risk of flooding from rivers or seas is less than 0.1%). The site is also at very low risk of surface water flooding, and from flooding from reservoirs, according to Environment Agency surface water and reservoir flood risk maps.

Similarly, the Manchester Strategic Flood Risk Assessment confirms that the proposed development site is **outside of any risk areas in relation to fluvial, tidal, reservoir, canal, groundwater, public sewer, highway or surface water flooding**.

However, flood risk can never be ruled out altogether, and the following tasks will be undertaken.

- A drainage survey will be undertaken prior to detailed design being undertaken, in order that the location of existing drainage infrastructure and connections can be accurately determined.
- A Topographical Survey will also be carried out to ensure accurate measurement of levels.
- Groundwater levels have been monitored and assessed indicating that the water table is at least 6m below ground level and the conclusion is that it is unlikely for ground water flooding to occur.
- The proposed surface water drainage network shall be designed to **accommodate run-off from a 1 in 30-year storm event and a 1 in 100-year flood events**, taking account of the latest Environment Agency guidance for **climate change allowances**. Detailed hardscape design, specifically to levels surrounding the building, will ensure that falls are away from the office building.
- Taking account of geological strata, which make it unlikely that the use of infiltration drainage will be suitable, it is proposed the surface water drainage outfall by way of gravity into the existing surrounding combined public sewer network with adequate capacities
- To accommodate peak storm flows and appropriate maintenance regimes agreed with relevant adoption agencies.

#### Water efficiency

Water efficient fittings shall be specified with a view to delivering a 25% improvement against the BRE baseline for developments:

- Dual flush toilets of 6.0/3.0 liters per flush.
- maximum shower head flow of 8 litres per minute at minimum delivered water pressure of 30 PSI.
- Low flow aerator fittings to all basin taps with indicative flow rates of 3 litres per minute.

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## 4.5 Waste Management

| SUMMARY OF POLICY                                                                                                                                                                                                                                                              | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Developers are required to prepare waste management plans which accord with the principles of the waste hierarchy and which addresses both the construction and occupational phases of developments. There is a particular emphasis on reducing and recycling waste at source. | Waste Management Plan prepared in accordance with MCC guidance.<br><br>Clearly marked and dedicated storage and loading areas for waste collection. Segregation of key recyclable materials from general waste.<br><br>Design and material selection support material efficiency objectives. |

### Response of the proposed development

A **Waste Management Strategy** has been prepared for the proposed development, with full consideration given to Manchester City Council's document GD 04 'Waste Storage and Collection Guidance for New Development'. A **Site Waste Management Plan** will also been prepared to address waste associated with the construction process; this is summarised in Section 6 of this ESS.

#### Waste Management Strategy

Manchester City Council has developed the Waste Storage and Collection Guidance for New Developments document in order to set out the required provisions which are to be met. The development proposals within this application have been considered against this guide to develop a compliant waste strategy.

Key features of the strategy, more detail on which is addressed in the Design & Access Statement, include:

- The site will house a recycling and refuse area in a dedicated bin store on the external car park area.
- A dedicated, clearly marked collection point will be provided on Cottor Street for waste collection.
- In accordance with MCC requirements all appropriate containers will be presented at the designated location on the relevant collection day by the management company.

The size of the bin store has been designed to accommodate 5 Eurobins as a minimum plus additional recycling bins.

#### Material efficiency

The use of a timber frame structure has added advantage of being a very efficient material, with all opening sizes, recesses and wall pillars having been manufactured offsite to avoid wastage. The outer skim will be brickwork, which is a highly durable material, both over time and in the context of extreme weather events, the frequency and severity of which is anticipated to increase as a result of climate change.

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                   | SUMMARY OF DEVELOPMENT RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Developers are required to manage environmental resources and impacts during the construction process, with a particular emphasis on minimising waste through the re-use of existing structures and materials. Site Waste Management Plans are therefore encouraged, and the application of the Considerate Constructors scheme is recommended. The use of environmentally low-impact materials in construction is also encouraged. | <p>The contractor will register and adopt the considerate contractor Scheme, including in relation to environmental management, neighbourliness and monitoring.</p> <p>A site waste management plan will be developed, targeting a minimum 80% of construction being diverted from landfill. Appropriate pre-development intrusive ground contamination surveys to be undertaken with construction practices tailored accordingly.</p> |

## Response of the proposed development

### Contractor procurement

To support the ambition of delivering a sustainable development, the procurement of a contractor at the construction phase will include in the specification requirements that:

- the contractor will register the proposed development with the **Considerate Constructors** scheme, will comply with its essential requirements, and will achieve a minimum score of 35 points, with no less than 7 points scored in each category of assessment.
- the contractor will operate an **Environmental Management System** and will employ best practice pollution prevention measures on the site.
- the contractor will **monitor and report data** on energy & water consumption relating to construction plant, equipment, and site accommodation on site, as well as on the transport of construction materials and waste.

### Site waste management plan

Prior to construction commencing, a Site Waste Management Plan (SWMP) will be prepared which will require monitoring of waste generated on-site, the setting of targets to increase resource efficiency, and establishment of procedures and commitments for minimising waste and/or commitments to sort, reuse and recycle construction waste.

During construction, any **excavated and/or demolished materials will be re-used**, if possible.

Pre-cut and prefabricated materials and systems will be employed wherever possible to **reduce site waste** and construction time on site.

### Mitigation measures to reduce contamination risks

Given some of the historic uses associated with the site of the proposed development, it is worth noting that the following construction management measures are envisaged to **guard against contamination and pollution risks**:

- Construction workers will adopt appropriate health and safety measures during construction works.
- Surface water control measures will be put in place during construction to limit runoff and infiltration through exposed made ground horizons and to limit siltation of the surface drainage system.
- Dust suppression measures will be adopted during all earthworks activities.
- Disused surface water runoff drainage connections will be located and sealed during construction works to remediate potential contamination pathways.
- A number of potential pollution source-pathway-receptor risks have been identified due to the previously developed nature of the site, with most potential contaminants deemed to be negligible to moderate levels of risk.
- There is a potential risk to end users from ground gases and unexploded ordnance. However, these are based solely on desk-based investigations, and an intrusive investigation will be undertaken prior to any works being commenced on site. Construction practices will be responsive to any contamination issues identified.
- Environmental soil samples will also be undertaken for chemical analysis to determine if any contamination of shallow soils and natural ground is present, whilst at the same time undertaking geotechnical analysis in support of foundation design.

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## 4.0 Environmental Standard Statement

### 4.6 Biodiversity

| SUMMARY OF POLICY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SUMMARY OF DEVELOPMENT RESPONSE                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| The Core Strategy encourages green roofs, green walls, tree planting and other forms of green infrastructure as part of development proposals. Developers are expected to avoid adverse biodiversity impact and to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on-site or adjacent to their developments. Developments should result in no net loss in overall biodiversity value and maximise opportunities to achieve a 10% net increase in tree cover. Landscaping and new planting should include species appropriate for the proposed development that will encourage wildlife. Construction materials which have a negative biodiversity impact are to be avoided. | The loss of any biodiversity value will be negligible due to the impoverished nature of the current site. |

### Response of the proposed development

#### DESIGNATED SITES

The site is located within the Impact Risk Zone of Rochdale Canal SSSI and SAC, located approximately 5.2 km north-east of the site boundary. It is designated as it holds important aquatic habitats for aquatic plants, emergent vegetation and supports nationally scarce SAC species, floating water plantain.

Taking into account the reasons for their designations, it is deemed highly unlikely that the development will have an impact on the aquatic habitats or its flora due to the small scale of development and distance present between the site and Rochdale Canal. Furthermore, consultation with MAGIC identified that the proposed development does not meet the requirements that would justify further consultation with Natural England for the development to proceed.

Two SBIs were located within proximity to the site, Rochdale Canal: Stott's Lane to Ducie Street Basin, located approximately 730 m north-west and Ashton Canal West, located approximately 970 m north. Due to the small scale of the development, and as the habitat between the site and the SBIs is not considered functionally linked land, it is anticipated that there will be no negative impacts on the SBIs.

#### HABITATS

The site comprised habitats that were found to be widespread within the local area; however, they did contain value for local bird species and common amphibians. Hedgehogs are also anticipated to be present within the local area. The hardstanding and ephemeral are of lowest value for wildlife, with the dense scrub, scattered scrub and poor semi-improved comprising the areas of highest value.

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## TREES

It is recommended that the landscape planting comprises native species and species known to be of value for the attraction of wildlife. This will include fruiting and flowering species. Species deemed suitable for this development could include berry-bearing native species such as:

-  Hawthorn (*Crataegus monogyna*).
-  Rowan (*Sorbus aucuparia*).
-  Holly (*Ilex aquifolium*).
-  Whitebeam (*Sorbus aria*).
-  Spindle (*Euonymus europaea*).
-  Dog rose (*Rosa canina*).
-  Guelder rose (*Viburnum opulus*).

## BIODIVERSITY NET GAIN

The scheme should strive to achieve biodiversity net gain, as per “Biodiversity Net Gain; Good Practice Principles for Development” CIEEM, CIRIA, IEMA (2016). Full details of this and a calculation of net gain could be completed after detailed landscape plans have been prepared. An ecologist should be consulted during the design stage. The following habitat measures will increase the on-site biodiversity:

-  Retaining the semi-improved grassland and dense scrub where possible.
-  Native Scrub Planting.
-  Wildlife Ponds.
-  Broadleaved Trees.

Habitat measures should be provided within areas of open space or designated wildlife zones. A 30-year management plan should be produced to ensure biodiversity is secured on-site.

## 5.0 Conclusions

The energy strategy for the proposed development at Ardwick Green has adopted a hierarchical approach of using passive and low energy design technologies to reduce the baseline energy demand and hence CO<sub>2</sub> emissions followed by the feasibility of the application of low and zero carbon technologies as appropriate.

Table 7 Proposed Building Reduction

| Regulated Emissions                       | Baseline CO <sub>2</sub> Emissions | Proposed Building CO <sub>2</sub> Emissions | CO <sub>2</sub> Emission Savings | % reduction in CO <sub>2</sub> Emissions |
|-------------------------------------------|------------------------------------|---------------------------------------------|----------------------------------|------------------------------------------|
| kg of CO <sub>2</sub> /m <sup>2</sup> /yr | 11.49                              | 5.66                                        | 5.83                             | 50%                                      |

This is supported by the SAP report to provide compliance in England with the Building Regulations Part L 2021, issued with this report. The analysis has shown that by incorporating passive and low energy design measures, there is a reduction of 50% for the developments annual CO<sub>2</sub> baseline emissions, equating to an 87% improvement over Part L1a 2010. In addition the Fabric Energy Efficiency of the entire development has achieved a pass

|                                          |                                    |
|------------------------------------------|------------------------------------|
| Target Fabric Energy Efficiency (TFEE)   | <b>40.7 kWh/m<sup>2</sup>/year</b> |
| Dwelling Fabric Energy Efficiency (DFEE) | <b>40.6 kWh/m<sup>2</sup>/year</b> |

This is achieved by incorporation of the following elements:

- High performance glazing to reduce solar and transmission gains
- Improved thermal transmittance U-valued as depicted
- Mechanical ventilation with heat recovery
- Electric Air Source Heat Pump Heating and Cooling and Electric Hot Water
- Low building air leakage rate (5 m<sup>3</sup>/h/m<sup>2</sup> at a pressure differential of 50 Pa)
- 100% Low energy lighting through the dwellings
- Low flow aerated showerheads and basin tap inserts to reduce domestic water consumption
- Reducing surface water discharge
- Reducing mains/potable water via water efficient devices and equipment

It has been deemed that this report gives details as to why particular technologies have been discounted, explanations as to why the chosen technology is deemed the most feasible.

It has also been demonstrated the significant inclusion of Renewable Technology that not only assists with achieving both the Core Strategy CO<sub>2</sub> reduction policy and with the Environmental Standards element.

All aspects of the Environmental Standard have been addressed accordingly and further details on each specific elements can be found the supplementary documents referenced within section 4 of this report.

It has been demonstrated that full compliance with Policy EN6 of Manchester Core Strategy has been met and that Part L1A regulations, Part F Regulations and Part G regulations will all be adhered to.

# APPENDIX ONE

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## SAP Report



# Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Fri 25 Nov 2022 15:39:24

| Project Information |                   |                 |                    |
|---------------------|-------------------|-----------------|--------------------|
| Assessed By         | Cory Skrzypkowski | Building Type   | House, End-terrace |
| OCDEA Registration  | STRO031821        | Assessment Date | 2022-11-25         |

| Dwelling Details |                                                              |                  |                    |
|------------------|--------------------------------------------------------------|------------------|--------------------|
| Assessment Type  | As designed                                                  | Total Floor Area | 104 m <sup>2</sup> |
| Site Reference   | Example 1 - Left-End (Good Standard)                         | Plot Reference   | CEPCN0000          |
| Address          | Example 1 - Left-End (Good Standard), Ardwick Green, M13 9XF |                  |                    |

| Client Details |                                      |
|----------------|--------------------------------------|
| Name           | Not Provided                         |
| Company        | Not Provided                         |
| Address        | Not Provided, Not Provided, WF10 5QU |

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

| 1a Target emission rate and dwelling emission rate                       |                                         |  |    |
|--------------------------------------------------------------------------|-----------------------------------------|--|----|
| Fuel for main heating system                                             | Electricity                             |  |    |
| Target carbon dioxide emission rate                                      | 11.49 kgCO <sub>2</sub> /m <sup>2</sup> |  |    |
| Dwelling carbon dioxide emission rate                                    | 5.66 kgCO <sub>2</sub> /m <sup>2</sup>  |  | OK |
| 1b Target primary energy rate and dwelling primary energy                |                                         |  |    |
| Target primary energy                                                    | 60.03 kWh <sub>PE</sub> /m <sup>2</sup> |  |    |
| Dwelling primary energy                                                  | 59.85 kWh <sub>PE</sub> /m <sup>2</sup> |  | OK |
| 1c Target fabric energy efficiency and dwelling fabric energy efficiency |                                         |  |    |
| Target fabric energy efficiency                                          | 40.7 kWh/m <sup>2</sup>                 |  |    |
| Dwelling fabric energy efficiency                                        | 40.6 kWh/m <sup>2</sup>                 |  | OK |

| 2a Fabric U-values               |                                                        |                                               |                                         |     |
|----------------------------------|--------------------------------------------------------|-----------------------------------------------|-----------------------------------------|-----|
| Element                          | Maximum permitted average U-Value [W/m <sup>2</sup> K] | Dwelling average U-Value [W/m <sup>2</sup> K] | Element with highest individual U-Value |     |
| External walls                   | 0.26                                                   | 0.18                                          | External Walls (0.18)                   | OK  |
| Party walls                      | 0.2                                                    | 0                                             | To adjoining (0)                        | N/A |
| Curtain walls                    | 1.6                                                    | 0                                             | N/A                                     | N/A |
| Floors                           | 0.18                                                   | 0.13                                          | Ground Floor (0.13)                     | OK  |
| Roofs                            | 0.16                                                   | 0.11                                          | Roof - Flat (0.11)                      | OK  |
| Windows, doors, and roof windows | 1.6                                                    | 1.27                                          | 6 (1.7)                                 | OK  |
| Rooflights                       | 2.2                                                    | N/A                                           | N/A                                     | N/A |

| 2b Envelope elements (better than typically expected values are flagged with a subsequent (!)) |                            |                              |
|------------------------------------------------------------------------------------------------|----------------------------|------------------------------|
| Name                                                                                           | Net area [m <sup>2</sup> ] | U-Value [W/m <sup>2</sup> K] |
| Exposed wall: External Walls                                                                   | 110.8                      | 0.18                         |
| Party wall: To adjoining                                                                       | 92.02                      | 0 (!)                        |
| Ground floor: Ground Floor                                                                     | 40.81                      | 0.13                         |
| Exposed roof: Roof - Flat                                                                      | 37.21                      | 0.11                         |

| 2c Openings (better than typically expected values are flagged with a subsequent (!)) |                        |             |              |                              |
|---------------------------------------------------------------------------------------|------------------------|-------------|--------------|------------------------------|
| Name                                                                                  | Area [m <sup>2</sup> ] | Orientation | Frame factor | U-Value [W/m <sup>2</sup> K] |
| 1, Windows (1)                                                                        | 4.8                    | West        | 0.7          | 1.2                          |
| 2, Windows (1)                                                                        | 2.07                   | West        | 0.7          | 1.2                          |
| 3, Windows (1)                                                                        | 2.07                   | West        | 0.7          | 1.2                          |
| 4, Windows (1)                                                                        | 1.89                   | West        | 0.7          | 1.2                          |
| 5, Windows (1)                                                                        | 1.89                   | West        | 0.7          | 1.2                          |
| 6, Windows (1)                                                                        | 1.89                   | West        | 0.7          | 1.2                          |
| 7, Windows (1)                                                                        | 4.8                    | North       | 0.7          | 1.2                          |
| 8, Windows (1)                                                                        | 1.89                   | North       | 0.7          | 1.2                          |
| 6, Roof windows (1)                                                                   | 3.6                    | East        | 0.7          | 1.7                          |

| 2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))                     |  |
|-------------------------------------------------------------------------------------------------------------------|--|
| Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction |  |

| Main element  | Junction detail                                                   | Source                         | Psi value [W/mK] | Drawing / reference |
|---------------|-------------------------------------------------------------------|--------------------------------|------------------|---------------------|
| External wall | E2: Other lintels (including other steel lintels)                 | Not government-approved scheme | 0.05             | Not Provided        |
| External wall | E3: Sill                                                          | Not government-approved scheme | 0.04             | Not Provided        |
| External wall | E4: Jamb                                                          | Not government-approved scheme | 0.05             | Not Provided        |
| External wall | E5: Ground floor (normal)                                         | Not government-approved scheme | 0.12             | Not Provided        |
| External wall | E16: Corner (normal)                                              | Not government-approved scheme | 0.09             | Not Provided        |
| External wall | E6: Intermediate floor within a dwelling                          | Not government-approved scheme | 0.07             | Not Provided        |
| External wall | E17: Corner (inverted - internal area greater than external area) | Not government-approved scheme | -0.05            | Not Provided        |
| External wall | E14: Flat roof                                                    | Not government-approved scheme | 0.04             | Not Provided        |
| External wall | E18: Party wall between dwellings                                 | Not government-approved scheme | 0.08             | Not Provided        |

### 3 Air permeability (better than typically expected values are flagged with a subsequent (!))

|                                             |                                                  |    |
|---------------------------------------------|--------------------------------------------------|----|
| Maximum permitted air permeability at 50Pa  | 8 m <sup>3</sup> /hm <sup>2</sup>                |    |
| Dwelling air permeability at 50Pa           | 5 m <sup>3</sup> /hm <sup>2</sup> , Design value | OK |
| Air permeability test certificate reference | Not Provided                                     |    |

### 4 Space heating

#### Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

|                  |                               |
|------------------|-------------------------------|
| Efficiency       | 221.4%                        |
| Emitter type     | Both radiators and underfloor |
| Flow temperature | 45°C                          |
| System type      |                               |
| Manufacturer     |                               |
| Model            |                               |
| Commissioning    |                               |

#### Secondary heating system: N/A

|               |     |
|---------------|-----|
| Fuel          | N/A |
| Efficiency    | N/A |
| Commissioning |     |

### 5 Hot water

#### Cylinder/store - type: Cylinder

|                            |             |
|----------------------------|-------------|
| Capacity                   | 200 litres  |
| Declared heat loss         | 1.5 kWh/day |
| Primary pipework insulated | Yes         |
| Manufacturer               | TBC         |
| Model                      | TBC         |
| Commissioning              |             |

#### Waste water heat recovery system 1 - type: N/A

|              |  |
|--------------|--|
| Efficiency   |  |
| Manufacturer |  |
| Model        |  |

### 6 Controls

#### Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

|                 |  |
|-----------------|--|
| Function        |  |
| Ecodesign class |  |
| Manufacturer    |  |
| Model           |  |

#### Water heating - type: Cylinder thermostat and HW separately timed

|              |  |
|--------------|--|
| Manufacturer |  |
| Model        |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----|
| <b>7 Lighting</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |    |
| Minimum permitted light source efficacy                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 75 lm/W                     |    |
| Lowest light source efficacy                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100 lm/W                    | OK |
| External lights control                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | N/A                         |    |
| <b>8 Mechanical ventilation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |    |
| <b>System type:</b> Balanced whole-house mechanical ventilation with heat recovery                                                                                                                                                                                                                                                                                                                                                                                                               |                             |    |
| Maximum permitted specific fan power                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1.5 W/(l/s)                 |    |
| Specific fan power                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.8 W/(l/s)                 | OK |
| Minimum permitted heat recovery efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 73%                         |    |
| Heat recovery efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 87%                         | OK |
| Manufacturer/Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |    |
| Commissioning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Not Provided / Not Provided |    |
| <b>9 Local generation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |
| <b>10 Heat networks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |
| <b>11 Supporting documentary evidence</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |
| <b>12 Declarations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |    |
| <b>a. Assessor Declaration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |    |
| This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report. |                             |    |
| Signed:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Assessor ID:                |    |
| Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Date:                       |    |
| <b>b. Client Declaration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |

# Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Fri 25 Nov 2022 15:29:15

| Project Information |                   |                 |                    |
|---------------------|-------------------|-----------------|--------------------|
| Assessed By         | Cory Skrzypkowski | Building Type   | House, End-terrace |
| OCDEA Registration  | STRO031821        | Assessment Date | 2022-11-25         |

| Dwelling Details |                                                               |                  |                    |
|------------------|---------------------------------------------------------------|------------------|--------------------|
| Assessment Type  | As designed                                                   | Total Floor Area | 104 m <sup>2</sup> |
| Site Reference   | Example 1 - Right-End (Good Standard)                         | Plot Reference   | CEPCN0000          |
| Address          | Example 1 - Right-End (Good Standard), Ardwick Green, M13 9XF |                  |                    |

| Client Details |                                      |
|----------------|--------------------------------------|
| Name           | Not Provided                         |
| Company        | Not Provided                         |
| Address        | Not Provided, Not Provided, WF10 5QU |

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

| 1a Target emission rate and dwelling emission rate                       |                                         |  |    |
|--------------------------------------------------------------------------|-----------------------------------------|--|----|
| Fuel for main heating system                                             | Electricity                             |  |    |
| Target carbon dioxide emission rate                                      | 11.63 kgCO <sub>2</sub> /m <sup>2</sup> |  |    |
| Dwelling carbon dioxide emission rate                                    | 5.69 kgCO <sub>2</sub> /m <sup>2</sup>  |  | OK |
| 1b Target primary energy rate and dwelling primary energy                |                                         |  |    |
| Target primary energy                                                    | 60.82 kWh <sub>PE</sub> /m <sup>2</sup> |  |    |
| Dwelling primary energy                                                  | 60.13 kWh <sub>PE</sub> /m <sup>2</sup> |  | OK |
| 1c Target fabric energy efficiency and dwelling fabric energy efficiency |                                         |  |    |
| Target fabric energy efficiency                                          | 41.3 kWh/m <sup>2</sup>                 |  |    |
| Dwelling fabric energy efficiency                                        | 41.1 kWh/m <sup>2</sup>                 |  | OK |

| 2a Fabric U-values               |                                                        |                                               |                                         |     |
|----------------------------------|--------------------------------------------------------|-----------------------------------------------|-----------------------------------------|-----|
| Element                          | Maximum permitted average U-Value [W/m <sup>2</sup> K] | Dwelling average U-Value [W/m <sup>2</sup> K] | Element with highest individual U-Value |     |
| External walls                   | 0.26                                                   | 0.18                                          | External Walls (0.18)                   | OK  |
| Party walls                      | 0.2                                                    | 0                                             | To adjoining (0)                        | N/A |
| Curtain walls                    | 1.6                                                    | 0                                             | N/A                                     | N/A |
| Floors                           | 0.18                                                   | 0.13                                          | Ground Floor (0.13)                     | OK  |
| Roofs                            | 0.16                                                   | 0.11                                          | Roof - Flat (0.11)                      | OK  |
| Windows, doors, and roof windows | 1.6                                                    | 1.25                                          | 7 (1.7)                                 | OK  |
| Rooflights                       | 2.2                                                    | N/A                                           | N/A                                     | N/A |

| 2b Envelope elements (better than typically expected values are flagged with a subsequent (!)) |                            |                              |
|------------------------------------------------------------------------------------------------|----------------------------|------------------------------|
| Name                                                                                           | Net area [m <sup>2</sup> ] | U-Value [W/m <sup>2</sup> K] |
| Exposed wall: External Walls                                                                   | 108.73                     | 0.18                         |
| Party wall: To adjoining                                                                       | 92.02                      | 0 (!)                        |
| Ground floor: Ground Floor                                                                     | 40.81                      | 0.13                         |
| Exposed roof: Roof - Flat                                                                      | 37.21                      | 0.11                         |

| 2c Openings (better than typically expected values are flagged with a subsequent (!)) |                        |             |              |                              |
|---------------------------------------------------------------------------------------|------------------------|-------------|--------------|------------------------------|
| Name                                                                                  | Area [m <sup>2</sup> ] | Orientation | Frame factor | U-Value [W/m <sup>2</sup> K] |
| 1, Doors                                                                              | 2.07                   | East        | N/A          | 1 (!)                        |
| 2, Windows (1)                                                                        | 4.8                    | East        | 0.7          | 1.2                          |
| 3, Windows (1)                                                                        | 2.07                   | East        | 0.7          | 1.2                          |
| 4, Windows (1)                                                                        | 2.07                   | East        | 0.7          | 1.2                          |
| 5, Windows (1)                                                                        | 1.89                   | East        | 0.7          | 1.2                          |
| 6, Windows (1)                                                                        | 1.89                   | East        | 0.7          | 1.2                          |
| 7, Windows (1)                                                                        | 1.89                   | East        | 0.7          | 1.2                          |
| 8, Windows (1)                                                                        | 4.8                    | North       | 0.7          | 1.2                          |
| 9, Windows (1)                                                                        | 1.89                   | North       | 0.7          | 1.2                          |
| 7, Roof windows (1)                                                                   | 3.6                    | West        | 0.7          | 1.7                          |

| 2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))                     |                                                                   |                                |                  |                     |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------|------------------|---------------------|
| Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction |                                                                   |                                |                  |                     |
| Main element                                                                                                      | Junction detail                                                   | Source                         | Psi value [W/mK] | Drawing / reference |
| External wall                                                                                                     | E2: Other lintels (including other steel lintels)                 | Not government-approved scheme | 0.05             | Not Provided        |
| External wall                                                                                                     | E3: Sill                                                          | Not government-approved scheme | 0.04             | Not Provided        |
| External wall                                                                                                     | E4: Jamb                                                          | Not government-approved scheme | 0.03 (!)         | Not Provided        |
| External wall                                                                                                     | E5: Ground floor (normal)                                         | Not government-approved scheme | 0.12             | Not Provided        |
| External wall                                                                                                     | E16: Corner (normal)                                              | Not government-approved scheme | 0.09             | Not Provided        |
| External wall                                                                                                     | E6: Intermediate floor within a dwelling                          | Not government-approved scheme | 0.07             | Not Provided        |
| External wall                                                                                                     | E17: Corner (inverted - internal area greater than external area) | Not government-approved scheme | -0.05            | Not Provided        |
| External wall                                                                                                     | E14: Flat roof                                                    | Not government-approved scheme | 0.04             | Not Provided        |
| External wall                                                                                                     | E18: Party wall between dwellings                                 | Not government-approved scheme | 0.08             | Not Provided        |
| 3 Air permeability (better than typically expected values are flagged with a subsequent (!))                      |                                                                   |                                |                  |                     |
| Maximum permitted air permeability at 50Pa                                                                        |                                                                   | 8 m³/hm²                       |                  |                     |
| Dwelling air permeability at 50Pa                                                                                 |                                                                   | 5 m³/hm², Design value         |                  | OK                  |
| Air permeability test certificate reference                                                                       |                                                                   | Not Provided                   |                  |                     |
| 4 Space heating                                                                                                   |                                                                   |                                |                  |                     |
| Main heating system 1: Heat pump with radiators or underfloor heating - Electricity                               |                                                                   |                                |                  |                     |
| Efficiency                                                                                                        |                                                                   | 222.2%                         |                  |                     |
| Emitter type                                                                                                      |                                                                   | Both radiators and underfloor  |                  |                     |
| Flow temperature                                                                                                  |                                                                   | 45°C                           |                  |                     |
| System type                                                                                                       |                                                                   |                                |                  |                     |
| Manufacturer                                                                                                      |                                                                   |                                |                  |                     |
| Model                                                                                                             |                                                                   |                                |                  |                     |
| Commissioning                                                                                                     |                                                                   |                                |                  |                     |
| Secondary heating system: N/A                                                                                     |                                                                   |                                |                  |                     |
| Fuel                                                                                                              |                                                                   | N/A                            |                  |                     |
| Efficiency                                                                                                        |                                                                   | N/A                            |                  |                     |
| Commissioning                                                                                                     |                                                                   |                                |                  |                     |
| 5 Hot water                                                                                                       |                                                                   |                                |                  |                     |
| Cylinder/store - type: Cylinder                                                                                   |                                                                   |                                |                  |                     |
| Capacity                                                                                                          |                                                                   | 200 litres                     |                  |                     |
| Declared heat loss                                                                                                |                                                                   | 1.5 kWh/day                    |                  |                     |
| Primary pipework insulated                                                                                        |                                                                   | Yes                            |                  |                     |
| Manufacturer                                                                                                      |                                                                   | TBC                            |                  |                     |
| Model                                                                                                             |                                                                   | TBC                            |                  |                     |
| Commissioning                                                                                                     |                                                                   |                                |                  |                     |
| Waste water heat recovery system 1 - type: N/A                                                                    |                                                                   |                                |                  |                     |
| Efficiency                                                                                                        |                                                                   |                                |                  |                     |
| Manufacturer                                                                                                      |                                                                   |                                |                  |                     |
| Model                                                                                                             |                                                                   |                                |                  |                     |
| 6 Controls                                                                                                        |                                                                   |                                |                  |                     |
| Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services       |                                                                   |                                |                  |                     |
| Function                                                                                                          |                                                                   |                                |                  |                     |
| Ecodesign class                                                                                                   |                                                                   |                                |                  |                     |
| Manufacturer                                                                                                      |                                                                   |                                |                  |                     |
| Model                                                                                                             |                                                                   |                                |                  |                     |
| Water heating - type: Cylinder thermostat and HW separately timed                                                 |                                                                   |                                |                  |                     |
| Manufacturer                                                                                                      |                                                                   |                                |                  |                     |
| Model                                                                                                             |                                                                   |                                |                  |                     |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----|
| <b>7 Lighting</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |    |
| Minimum permitted light source efficacy                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 75 lm/W                     |    |
| Lowest light source efficacy                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100 lm/W                    | OK |
| External lights control                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | N/A                         |    |
| <b>8 Mechanical ventilation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |    |
| <b>System type:</b> Balanced whole-house mechanical ventilation with heat recovery                                                                                                                                                                                                                                                                                                                                                                                                               |                             |    |
| Maximum permitted specific fan power                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1.5 W/(l/s)                 |    |
| Specific fan power                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.8 W/(l/s)                 | OK |
| Minimum permitted heat recovery efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 73%                         |    |
| Heat recovery efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 87%                         | OK |
| Manufacturer/Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |    |
| Commissioning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Not Provided / Not Provided |    |
| <b>9 Local generation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |
| <b>10 Heat networks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |
| <b>11 Supporting documentary evidence</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |
| <b>12 Declarations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |    |
| <b>a. Assessor Declaration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |    |
| This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report. |                             |    |
| Signed:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Assessor ID:                |    |
| Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Date:                       |    |
| <b>b. Client Declaration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             |    |
| N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |    |