Cube Homes Ltd

Environmental Standards Statement

Proposed Residential Development, High Lane, Chorlton.

20 December 2023

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Issue Control

Director	Daniel Watt

First Issue Date	Revision Issue Date	Issue Revision	Issued By
25 July. 23	-	-	DW
	16 Aug. 23	*A*	*JD*
	20 Dec. 23	*B*	*JD*

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Index

1 Executive Summary 5

2 Planning Statement 7

2.1 The Site and Proposed Development 7

2.2 Relevant Policies and Guidance 9

2.2.1 Local Planning Policy 9

2.2.1.1 Manchester Core Strategy 9

2.2.1.2 Guide to Development in Manchester, Supplementary Planning Document 2007 10

2.2.1.3 Manchester Residential Quality Guide 2017 10

2.2.1.4 Manchester's Great Outdoors 2015-25 11

2.2.1.5 Manchester Climate Change Framework 2020-25 11

2.2.2 Manchester City Council's Planning Document Targets 12

2.2.3 National Planning Policy 13

2.3 Sustainable Design Strategy 14

2.3.1 Energy and Carbon Emissions 14

2.3.2 Choice and Impact of Renewable Technology 18

2.3.3 Energy and CO_2 Reduction Summary 19

2.3.4 Manchester City Council' Policy and Targets Summary 23

2.4 Adaptation to Climate Change 24

2.4.1 Flood Risk Zone 25

2.4.2 Green Blue Infrastructure 25

2.4.2.1 Sustainable Drainage Systems (SUDs) 25

2.4.2.2 Biodiversity 28

2.4.3 Internal Water Efficiency 28

2.4.4 Waste Management 29

2.4.4.1 Occupational Waste 29

2.4.4.2 Construction Waste 29

2.4.5 Materials 29

2.4.6 Pollution Control 30

3 Feasibility Assessment of Renewable Energy and Low Carbon Technologies 31

4 Conclusion 34

1 Executive Summary

This Environmental Standards Statement has been prepared by Watt Energy on behalf of Cube Homes Ltd to support a planning application for the development of High Lane, Chorlton. The statement specifically addresses the following Manchester City Council approved climate change action plans in addition to planning policies, as stipulated in the Manchester Core Strategy (July 2012):

- Guide to Development in Manchester SPD (2007)
- Our Manchester Strategy 2016-2025
- Manchester: A Certain Future (2013)
- Manchester Climate Change Board – The Zero Carbon Framework 2020-2038
- Climate Change and Low Emissions Implementation Plan 2016-2020
- Meeting Our Objectives and Targets – Manchester Climate Change Framework – 2020-25
- Manchester Residential Quality Guidance 2017
- Core Strategy Policy DM 1 - Development Management
- Core Strategy Policy EN 4 - Reducing CO2 Emissions by Enabling Low and Zero Carbon Development
- Core Strategy Policy EN 6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies
- Core Strategy Policy EN 8 – Adaptation to Climate Change
- Core Strategy Policy EN 9 – Green Infrastructure
- Core Strategy Policy EN 14 – Flood Risk
- Core Strategy Policy EN 15 – Biodiversity and Geological Conservation
- Core Strategy Policy T 1 – Sustainable Transport

The statement details how the development will incorporate sustainable design and resource efficiency in line with the Energy Hierarchy, so to meet the policy requirements and council targets whilst reducing its overall environmental impact. The methodology and calculations are consistent with the MCC Appendix A EN6 Energy Target Explanation and all figures used within this report have been based on the most recent issue of drawings and modelled using SAP 10.2 to accurately predict Energy Usage and CO_2 reductions.

In relation to the planning documents and policies outlined above, the development is required to achieve a **10%** reduction in carbon emissions over Part L 2013 of the Building Regulations (Old building regulations). The development has exceeded these requirements by modelling the development in the latest SAP10.2 software and targeting the above 10% reduction over part L 2022 of the Building Regulations (Current building regulations).

In order to achieve compliance the development has been designed with a holistic low energy design concept involving a fabric first approach. The U-values, design air permeability and ventilation targets all aspire to Passive House design standards along with the consideration and application of low zero carbon renewable technologies.

Following the LZC feasibility assessment, it is proposed that the development will also benefit from a **Dimplex Edel Air Source Heat Pump Hot Water (ASHPHW)** only unit implemented in the store cupboard of each dwelling.

As a result of the above the predicted site wide reduction in CO_2 over Part L 2022 of the Building Regulations can be summarised as:

- **60.9%** with SAP 10.2 carbon factors (current Building Regulations)

This statement also examines how the design, specification and characteristics of the proposal will contribute to sustainability and meet the relevant objectives outlined within the National Planning Policy Framework (NPPF) 2021, in addition to the Manchester City Council approved climate change action plans and core strategy planning policies outlined above. The sustainability measures assessed included:

- Flood Risk Zone
- Green and Blue Infrastructure
- Sustainable Drainage Systems (SUDs)
- Biodiversity / Ecology
- Internal Water Efficiency
- Waste Management
- Materials
- Pollution Control

The development therefore complies with all Manchester City Council's current and future policy requirements relating to creating a sustainable development.

In relation to the planning target centred around carbon emissions reduction, the proposed development is achieving a **63%** reduction in these emissions, over the Part L1A 2022 of the Building Regulations. This surpasses all of Manchester City Council's planning targets and therefore allows compliance to be reached.

2 Planning Statement

The following statement relates to the proposed development at High Lane, Chorlton at the former Islamic High School for girls site.

2.1 The Site and Proposed Development

The site is located southeast of the centre of Manchester, within Chorlton. The site occupies approximately 0.44 hectares of land. A plan, with the site's extents seen in Figure 1 (shown later in this subsection).

The site is bounded to the north by High Lane, Acres Road to the east, Hardy Avenue to the south and Stockton Road to the west and is adjacent to existing residential properties. The site is currently occupied by the former Islamic High School for Girls with Carlton house to be refurbished and extended to form two new dwellings. The playground and other buildings are to be demolished and replaced by new build dwellings.

The proposal is for a residential-led mixed use development consisting of fourteen new build three storey townhouses, six new build apartments, and the refurbishment and extension of the existing Carlton house to form two new three storey dwellings. The housing stock will be a mix of four bed houses and two bed apartments(use class C3). Also provided will be associated ancillary facilities including a refuse/recycling store and bike store.

Figure 1: Site Plan

2.2 Relevant Policies and Guidance

2.2.1 Local Planning Policy

2.2.1.1 Manchester Core Strategy

Manchester's Core Strategy (CS) was adopted on 11th July 2012 and is the key Development Plan Document (DPD) guiding the measures assessed in this report.

CS Policy DM 1 - Development Management: Stipulates that all new development should have regard for several development principles relevant to sustainability, including: waste management, designing for health, flood risk, green infrastructure, biodiversity. Additionally, subject to scheme viability, developers will be required to demonstrate that new non-domestic development will achieve a BREEAM Rating of 'Very Good' or for domestic development to achieve the Code for Sustainable Homes standard.

CS Policy EN 4 – Reducing CO2 Emissions: This policy targets the reducing of CO2 emissions through the following of the energy hierarchy; firstly reducing the need for energy through efficient design measures, followed by clean energy and lastly, the application of renewable or LZC technologies. In addition to this point, MCC state within this policy all new development is required to use building materials that have low embodied carbon.

CS Policy EN 6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies: This Policy requires electricity intense residential development of 10 or more units to meet, as a minimum, a 15% reduction in domestic CO2 emissions over Part L of the 2010 Building Regulations, unless proven to be unviable. As Part L 2013 of the Building Regulations represents a 6% improvement on 2010 levels, this target is subsequently equivalent to a 9% improvement in CO2 emissions over Part L 2013. Section 2.3 provides evidence of how this target is achieved.

CS Policy EN 8 – Adaptation to Climate Change: Expects all new development to be adaptable to climate change in terms of its design, layout, siting, and function of both building associated external spaces.

CS Policy EN 9 – Green Infrastructure: Requires new developments to maintain existing green infrastructure whilst using every opportunity, in accordance with current Green Infrastructure Strategies, to enhance the quality and quantity of green infrastructure, improve the performance of its functions and create and improve linkages to and between area of green infrastructure.

CS Policy EN 14 – Flood Risk: This policy expects all new developments to minimise surface water run-off through the use of SUDs and Green Infrastructure.

CS Policy EN 15 – Biodiversity and Geological Enhancement: Developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on or adjacent to the proposed site.

CS Policy T 1 – Sustainable Transport: Policy aims to deliver sustainable, high quality, integrated transport systems to encourage a shift away from car travel to public transport, cycling and walking.

2.2.1.2 Guide to Development in Manchester, Supplementary Planning Document 2007

The Development Guide in Manchester Supplementary Planning Documents (SPD) establish and set out the ongoing generation of the City by providing a set of set principles which will guide developers, architects, and residents in the design of the city. The MCC Core Strategy stipulates that all new residential developments should comply with the design guidance set out in the SPDs. These principles include the following environmental standards relevant to this report: energy strategy, water consumption, drainage management, weather resilience, waste management, construction management, biodiversity, and waterways.

2.2.1.3 Manchester Residential Quality Guide 2017

The Manchester Residential Quality Guide has been developed to help shape the creation of new homes and communities across the Greater Manchester city region, beginning with the Centre and its immediate surroundings. This document outlines the considerations, qualities, and opportunities that will help to deliver high quality residential development as part of successful and sustainable neighbourhoods across Manchester. The guidance includes the following nine components:

Make it Manchester – developers must understand the city's unique character, heritage old and new, density and scale in various parts of the city and appreciate how new homes will fit in to what is already there.

Make it bring people together – new homes must encourage a sense of community and neighbourliness, offering a mix of tenures to promote a mix of people.

Make it animate streets and spaces – understand the relationship between new homes and its environment and create public space.

Make it easy to get around – make sure developments have good transport links, along with good walking and cycling provision.

Make work with the landscape – development should improve the connection with the local environment with improved biodiversity, as well as greening and water schemes.

Make it practical – dealing with waste, car parking, bike storage and visitors should be made as easy as possible.

Make it future proof – design must anticipate the impacts of climate change and extreme weather with efficient design and adaptability.

Make it a home – sufficient space, natural light, privacy and storage are essential for people to settle down and flourish.

Make it happen – ensuring proposals are delivered, to a high quality, with high design standards and high sustainability.

2.2.1.4 Manchester's Great Outdoors 2015-25

A Green and Blue Infrastructure Strategy for Manchester aims to invest to date in the city's Green and Blue infrastructure over the next 10 years (by 2025). Four objectives have been established to enable the vision to be achieved: 1. Improve the quality and function of existing green and blue Infrastructure, to maximize the benefits it delivers. 2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighbourhoods and support the city's growth. 3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond. 4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy, and the local environment.

2.2.1.5 Manchester Climate Change Framework 2020-25

Following the declaration of a climate emergency by MCC In July 2019, this framework was adopted and is an in-depth strategy to accompany the Draft Manchester Zero Carbon Framework 2020-38, which was published in February 2019. It is a framework that will continue to develop over the next five years, in line with changes in policy, climate science, rate of progress and other factors. The framework has set out four objectives to facilitate this:

Objective 1 – Staying within our carbon budgets.

- Direct CO2 emissions: staying within our 15-million-ton carbon budget for 2018-2100, including reducing the CO2 emitted from our homes, workplaces and ground transport by at least 50% during 2020-25.
- Indirect CO2 emissions: understanding and taking action on the things that we consume, and which generate greenhouse gases through their production, transportation and disposal.

Objective 2 – Climate adaptation and resilience

- Increase the amount of urban green infrastructure cover, aiming for a 10% increase by 2038 from 2018 levels, in line with the Greater Manchester aim.
- Respond to these risks by incorporating adaptation and resilience within our plans and strategies, and acting to make necessary changes to our buildings, infrastructure and our natural environment.

Objective 3 – Health and wellbeing

- Adapt the city's built and natural environment and prepare our residents to become more resilient to these changes. Increasing the amount and quality of green space to enable residents to benefit from the improved physical and mental health that will come as a result.
- Improving the energy efficiency of the city's homes and providing access to affordable, secure supplies of renewable energy are essential help get 38,000 Manchester households out of fuel poverty.

Objective 4 – Inclusive, zero carbon and climate resilient economy

- Ensure that Manchester establishes an inclusive, zero carbon and climate resilient economy where everyone can benefit from playing an active role in decarbonising and adapting the city to the changing climate.

2.2.2 Manchester City Council's Planning Document Targets

Manchester City Planning Policy currently uses the following documents to look to establish the carbon reduction targets to be achieved in new developments across the City.

These documents use different terminology to describe achieving the various reduced carbon emissions.

Please see below a summary of the terminology and targets set out within the current Manchester Planning Policy documents:

Planning Document:	Time of Production or Adoption:	Low Carbon Target:	Sustainable Design Definition:
Manchester Council's Core Strategy 2012-2027	Adopted 2012	Targets a **9%** reduction in carbon emissions over Part L Building Regulations.	Low Carbon (9% over Part L 2013)
Climate Change and Low Emission Strategies 2016-2020	Adopted 2016	Targets a **48%** reduction in carbon emissions from 1990 - 2020	Low Carbon (48% over 1990 emissions)
Manchester: A Certain Future	Produced in 2009, updated in 2013	Targets emitting 41% less CO_2 in 2020 than in 2005 – Equates to **10%** over Part L 2013 (if going by Part L requirements)	Low Carbon (10% over Part L 2013)

Table 1: Overview of Manchester Planning Documents Carbon Targets

2.2.3 National Planning Policy

The NPPF (December 2023) sets out the Government's planning policies for England and how these are expected to be applied. The overall emphasis of the NPPF is to reiterate the Government's key objectives, including securing sustainable development.

The NPPF defines the purpose of the planning system as being to contribute to the achievement of sustainable development. It explains at Paragraph 8 that there are three dimensions to sustainable development. These are economic, social and environmental and should be pursued simultaneously through the planning system.

Paragraph 10 states that at the heart of the Framework is a presumption in favour of sustainable development.

2.3 Sustainable Design Strategy

2.3.1 Energy and Carbon Emissions

Building Services Strategy

In response to the policy requirements and climate change plan targets set out in section 2.2, developments should aim to assist and achieve the following carbon reduction targets:

1. Achieve a minimum of 10% CO2 reduction over the Part L 2013 Target Emission Rate (TER), as per Target 2 (Electricity intense buildings) in Table 12.1 of Policy EN6.
2. Achieve a minimum 10% C02 reduction over part L 2022 Target Emission rate (TER).
3. Assist in achieving carbon neutrality by 2038.

To achieve the most accurate calculations and estimates, the proposed units have been modelled using *SAP 10.2* the governments Standard Assessment Procedure for residential dwellings.

The proposed strategy for minimising energy use and carbon emissions is based on the energy hierarchy described in CIBSE Guide F 2012 (Energy efficiency in buildings). The energy hierarchy has been adopted for the development to ensure that the correct approach to design is taken to promote an energy-efficient low carbon solution (see figure 2). This has ensured that the benefits of effective methods of energy use reduction have been maximised first. The approach adopted is as follows:

Fig 2: Energy Hierarchy

Minimise energy demand – Implement passive design measures and optimise the building envelope in terms of orientation, air tightness, and insulation. For example, the proposal is targeting a low carbon classification through a holistic low energy design concept as it will be designed with a fabric first approach whereby standards designed to exceed Building Regulations compliancy are aspired to for all fabric U-values and air permeability targets.

Meet demands efficiently – Specification of energy efficient decentralised plant, heating, ventilation, lighting, and system controls to facilitate efficient operation.

Particular attention is being paid to the wellbeing of occupants. The ventilation strategy has been developed to minimise noise ingress from the proposed location as far as possible while minimising the risk of overheating.

Additional Renewable Energy Measures

Opportunities for incorporating low and zero carbon technologies (LZCT) have been considered for this development. The viability of several separate technologies was examined in a LZCT study (see section 3).

Efficient and Sustainable Design Measures

In line with the above Sustainable Design Strategy, the following Energy Efficient design measures are specified.

- High levels of insulation throughout with minimal thermal bridges
- Passive solar gains and internal heat sources
- Excellent level of airtightness
- Good indoor air quality by openable windows

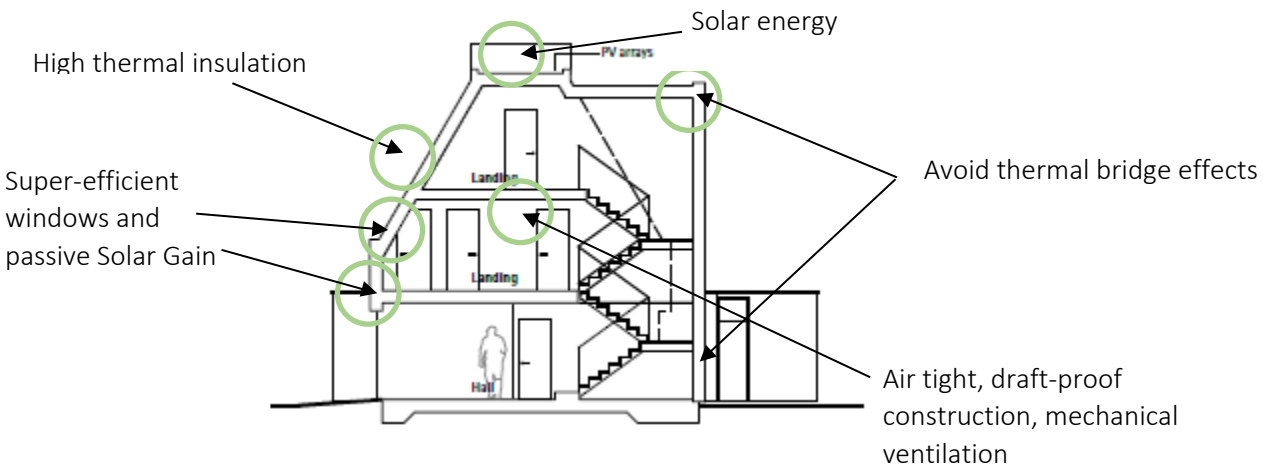


Fig 3. Efficient Design Measure examples

The Proposed specifications and key energy efficient design measures are as follows:

New Build Residential units:

- Ground floor U-values of 0.12 W/m²K
- External Wall U-values of 0.16 W/m²K
- Flat Roof U-values of 0.12 W/m²K
- Pitched Roof U-values of 0.12 W/m²K
- vaulted Roof U-values of 0.12 W/m²K
- Low Double Glazed Window U-values of 1.1 W/m²K
- Low Double Roof Light U-values of 1.1 W/m²K
- 100% low energy lighting throughout
- 100% efficient electric panel heater
- Dimplex Edel 170/270l ASHPHW
- MVHR – Nuiare MRXBOX ECO to House Types A & B only
- Air permeability of 3m³/hm² to House Types A & B only
- Natural ventilation to House Types C
- Air permeability of 5m³/hm² to House Types C

Mansion Refurbishment:

- Upgraded Exposed Floor U-values of 0.25 W/m²K
- New Ground Floor U-values of 0.18 W/m²K
- External Wall U-values of 0.16 W/m²K
- New Dormer Flat Roof U-values of 0.15 W/m²K
- Upgraded Pitched Roof U-values of 0.16 W/m²K
- Upgraded Vaulted Roof U-values of 0.16 W/m²K
- Low Double Glazed Window U-values of 1.4 W/m^{2}K
- Low Double Glazed Roof Lights U-values of 1.4 W/m^{2}K
- 100% low energy lighting throughout
- Natural ventilation

2.3.2 Choice and Impact of Renewable Technology

All reasonable technologies were investigated for their suitability to the site and development; please refer to section 3 for details.

In addition to energy efficiency measures, it is proposed that the development will feature the following Low/Zero carbon Technologies:

- Dimplex Edel ASHPHW only units to each dwelling

The above LZC contribution has provided an **52.3%** reduction in CO2 following Energy Efficiency Measures.

- Energy Saving from onsite LZC Technologies = **47790.3 kWh/Yr**
- CO2 Saving from onsite LZC Technologies = **16524.3 kgCO2/Yr**

2.3.3 Energy and CO_2 Reduction Summary

A summary of all stages of the energy demand assessment from baseline figures to final carbon reduction are shown in Figures 1 & 2 below:

	SAP 10.2
Summary of CO2 Emission Reductions	**Total CO2 emissions (kgCO2/year)**
Carbon Factors (Gas / Electric)	**0.210 / 0.136**
Baseline emissions	38491.6
Improved emissions (after application of energy efficiency measures) - residual emissions	31571.1
Improved emissions (after incorporation of renewable energy technology) % CO2 displaced in total	15046.8
% CO2 displaced in total	60.9%
% CO2 displaced by energy efficiency measures	18.0%
% CO2 displaced by renewable energy	52.3%

Table 2: Summary of CO2 Reductions

	Energy demand (kWh pa)	Energy saving achieved (%)	Regulated CO_2 emissions (kg pa)	Saving achieved on resi dual CO_2 emissions (%)
Building Regulations Part L compliance (“Baseline” energy demand & emissions)	185437.8		38491.6	
Proposed scheme after energy efficiency measures (“ Residual” energy demand & emissions)	158428.4	14.6%	31571.1	18.0%
Proposed scheme after on-site renewables	110638.1	30.2%	15046.8	52.3%
Proposed scheme offset for financial contribution or other “allowable solution”			0	0
Total savings on residual emissions				**52.3%**

Table 3. Total Energy and Carbon Emissions Savings Based on SAP 10.2 Carbon Factors

For a full Breakdown of the figures and calculations please see Appendix A – Energy Demand Assessment Spreadsheet.

Baseline energy demand

'Standard Assessment Procedure - SAP 2012' was used to produce example SAP reports to generate the figures used within the calculations.

Baseline energy demand (kWh pa)	185437.8
Baseline carbon emissions (kg pa)	38491.6

Be Lean stage

The following table demonstrates how the development achieves the reduction in carbon dioxide emissions from energy efficiency measures.

Energy savings from energy efficiency measures (kWh pa)	27009.4
Emission savings from energy efficiency measures (kg pa)	6920.5
Total regulated emissions after CHP savings and energy efficiency measures (kg pa) ("residual emissions")	31571.1

Be Clean stage

The heating and cooling hierarchy has been applied to the design process of the development. It has resulted in large focus on energy efficiency measures and as can be seen in Figure 1.

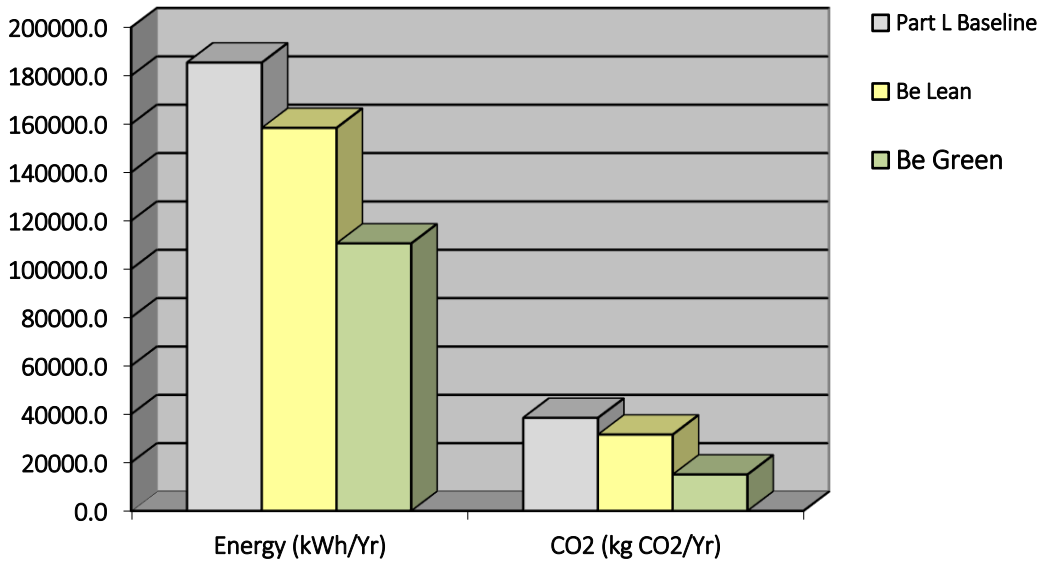
Energy savings from the use of CHP systems (kWh pa)	-
Emission savings from the use of CHP systems (kg pa)	-
Total regulated emissions after CHP savings (kg pa)	31571.1

Be Green stage

The following table demonstrates how the development achieves the reduction in carbon dioxide emissions from LZC technologies.

Energy saving from the use of renewables (kWh)	47790.3
Saving on residual emissions from the use of renewables (kg)	16524.3
Saving on residual emissions from the use of renewables (%)	52.3%

The chart below illustrates the improvements over the Part L Compliant Baseline:



2.3.4 Manchester City Council' Policy and Targets Summary

With regards to the Manchester City Council's planning documents policy and targets (outlined in section 2.2.1 to 2.2.3) the table below details how the Sustainable Design Strategy (outlined in section 2.3.1) achieves the current planning policy requirements and targets.

Planning Document:	Sustainable Design Strategy
Manchester Council's Core Strategy 2012-2027	The Sustainable Design Strategy achieves a **60.3%** reduction in carbon emissions over Part L 2022 - **exceeding** the EN6 documents Low Carbon target of 9% over Part L 2013.
Climate Change and Low Emission Strategies 2016-2020	The Sustainable Design Strategy achieves a **60.3%** reduction in carbon emissions over Part L 2022 – **exceeding** the documents Low Carbon target of 48% over 1990 Emissions.
Manchester: A Certain Future	The Sustainable Design Strategy achieves a **60.3%** reduction in carbon emissions over Part L 2022 – **exceeding** the documents Low Carbon target of 10% over Part L 2013.

Table 4. Summary of MCC and Planning Targets

As a result of the sustainable design parameters outlined within section 2.3.1 and the energy and CO2 reduction figures summarised above, 22 dwellings (6 apartments, 14 townhouses and conversion of Carlton House into 2 dwelling houses) at the High Lane site achieves a total reduction of **60.3%** in carbon emissions over Part L 2022.

The low carbon classification for High Lane development can be derived from its prioritisation of fabric first carbon reduction through exceeding Building Regulation design standards, before the incorporation of on-site renewable technologies.

2.4 Adaptation to Climate Change

In addition to the primary building design and fabric, many other issues that will influence creating a Sustainable Development, including flood prevention, material use, waste minimisation and transport. All these issues feature regularly within the separate climate change action plans, outlined within section 2.2, as areas that Manchester is aiming to significantly improve on in order to become a more carbon neutral and clean city.

All the sections of creating a sustainable development should be taken into consideration from the start of the development and promoted throughout the building construction on site in order to maximise their benefits. Additionally, features which enable more efficient usage should also be specified to encourage the building users to maintain efficient use once construction has been completed.

2.4.1 Flood Risk Zone

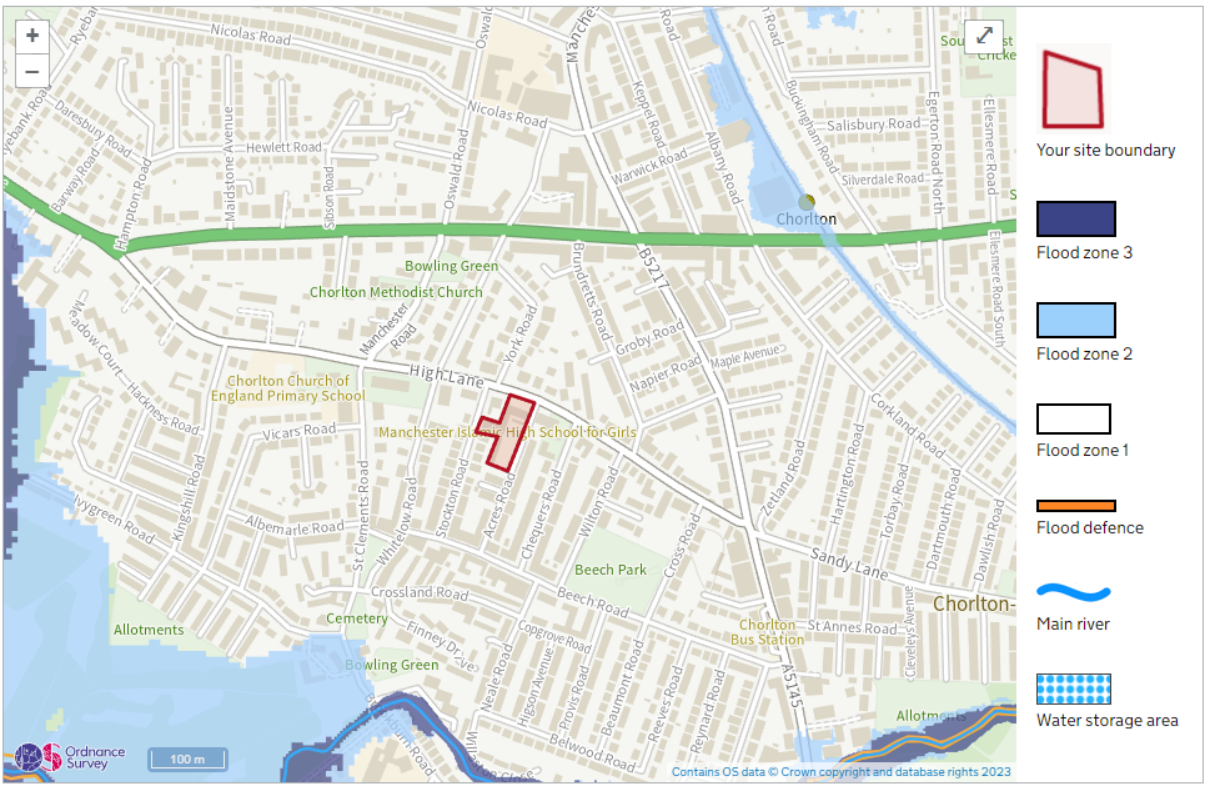


Fig 4: Flood Risk Map

The above map and snippet have been taken from a Government licenced flood risk map for Manchester. It can be seen that the site is just located within flood risk zone 1 and therefore has minimal to no risk of flooding.

2.4.2 Green Blue Infrastructure

2.4.2.1 Sustainable Drainage Systems (SUDs)

Even though it has been shown that the proposed scheme is located on a site with a low to zero flood risk, it should still be ensured that the levels of surface water run-off do not increase from the existing development to the proposed, especially due to the new scheme having a different footprint and potentially resulting in new areas of impermeable surfacing. Therefore, a drainage strategy assessment should be undertaken, by a suitably qualified professional, to assess the feasibility of introducing on-site SUDs measures, that will reduce surface water run-off and any flood risks associated.

By incorporating SuDs, flood risk can be managed and mitigated. Section 1.1 of the SuDs Manual (Ciria C753) states the following:

"Sustainable drainage systems (SuDS) can deliver multiple benefits.

Surface water is a valuable resource, and this should be reflected in the way it is managed and used in the built environment. It can add to and enhance biodiversity, beauty, tranquillity and the natural

aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate."

The general concept of SUDs is to manage the flood and pollution risks in developed areas. This is done by efficiently managing surface water run-off by either slowing down the surface water run-off, or by reducing the quantity of surface water run-off. There are different methods to achieve this such as:

- Harvesting – capturing rainwater and facilitate its use within the development
- Infiltrating – rainwater infiltrates into the ground
- Storing – capturing rainwater and control the flow through the means of storing and releasing it slowly i.e. attenuation
- Conveying & treating – capturing rainwater and removing any contaminants, then convey the flow towards a downstream system

The SuDS Manual describes the four pillars of SuDS design as Water Quality, Water Quantity, Amenity and Biodiversity as illustrated in Figure 3 below:

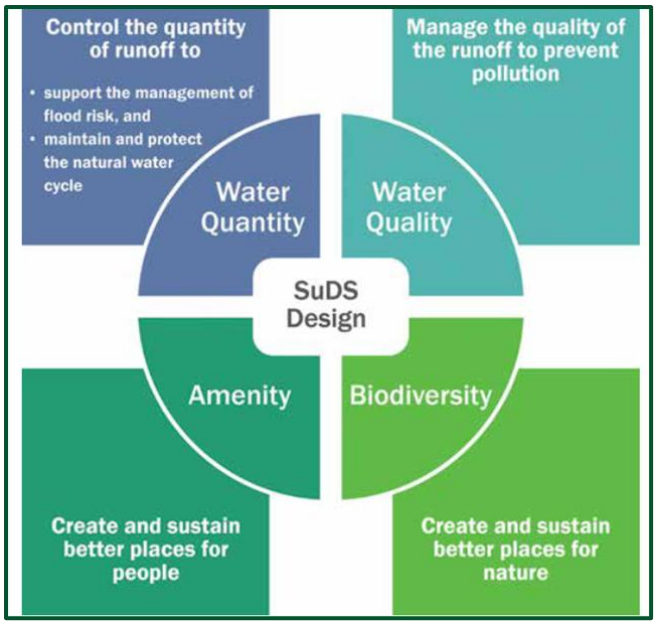


Fig 5. Representation of figure 2.1 of the SUDs Manual

SuDS are increasingly gaining popularity as a holistic solution to a wide range of pressing issues including flood risk, water pollution, groundwater depletion, biodiversity loss and urban decline.

Drainage Hierarchy

To alleviate pressure on existing sewer networks and to address issues of climate change the following hierarchy has been developed and implemented from a planning perspective.

The Planning Practice Guidance, states that:

"generally, the aim should be to discharge surface run-off as high up the following hierarchy of drainage options as reasonable practicably:

1. *Into the ground (infiltration)*
2. *To a surface water body*
3. *To a surface water sewer*
4. *To a combined sewer"*

The "Building Regulations Approved Document H" refer to this discharge hierarchy.

Description	Benefit
Flood risk management	SuDS aim to have an attenuating affect by slowing down and storing surface water run-off
Drainage resilience	Future proofing designed to be resilient against climate change
Natural flow regime protection	Mimic natural drainage arrangements to emulate natural flow
Water quality	Filter out pollutants and discharge cleaner water
Water reuse	Can be strategically placed to clean and capture water for reuse
Biodiversity and ecology	SuDS use vegetation and natural landscape to support biodiversity and ecology
Amenity	Improve visual integrity and desirability of the site by implementing green and blue features
Carbon reduction	SuDS can reduce carbon use throughout the life cycle including construction, maintenance, and demolition
Microclimate	Aim in reducing heat island effects
Education	Educate and engage the general public about surface water management

Table 5. Outline of types of green/blue infrastructure and associated benefit

2.4.2.2 Biodiversity

Similarly, to the previous section on SUDs, the nature of the proposal: including the demolishing of an existing building and potential change in area of impermeable surface, there could be adverse impacts on the surrounding ecology as well potential for the enhancement. Therefore, an ecology report should be produced, by a suitably qualified professional, in order to ensure that any existing ecology on or near the site is adequately protected and to determine the possibility of new habitat creation, planting schemes, green wall areas. In addition a bat survey, ecological walkover and subsequent nocturnal bat survey,; tree survey and Arboricultural Impact Assessment have been carried out on the site

2.4.3 Internal Water Efficiency

Part G of the Building Regulations requires all new dwellings to have an internal water consumption of no greater than 110 litres / person / day, unless specified to be less. Therefore, fittings proposed should have low flow rates, capacities, effective flush volumes etc. Example targets for these to achieve the required internal consumption are as follows:

Appliance	Unit of measure	Amount (litres)
WC (Dual flush)	Full flush volume	4
WC (Dual flush)	Part flush volume	2.6
Taps (excluding kitchen)	Flow rate l/min	5
Kitchen taps	Flow rate l/min	6
Bath	Capacity to Overflow	170
Shower	Flow rate l/min	8
Washing Machine	Litres / kg dry load	8.17
Dishwasher	Litres / place setting	1.25

Table 6. Internal Water Efficiency Flow Rates

The above rates will achieve a total internal water consumption of 106.31 with a bath present and 98.25 with only a shower present.

The specifying of 'A' rated appliances should be prioritised where possible.

2.4.4 Waste Management

2.4.4.1 Occupational Waste

Manchester City Council's Waste Storage and Collection Guidance for New Developments 2017 encourages all new developments to incorporate a waste management strategy into the build at the earliest stage possible.

2.4.4.2 Construction Waste

A target of at least 90% of waste generated on site, throughout the construction stage of the development, to be diverted from landfill' will be included as part of a Construction Environmental Management Plan (CEMP) to be agreed with MCC.

The proposal will also endeavour to maximise the use of recycled materials on site, whereby further promoting the minimising of waste production.

2.4.5 Materials

The construction of new buildings and building elements has a large environmental impact in terms of both, energy, and embodied carbon of new materials. Therefore, Manchester City Council promote the prioritising of environmentally friendly materials, where possible, and encourages the use of recycled building materials. This information should also be incorporated into the SWMP mentioned in the previous subsection (Waste Management) as a means of promoting the re-using and recycling of materials.

Where new materials are to be used, careful consideration of their environmental impact should be taken. This can be achieved by ensuring that only materials that score well under The Green Guide to Specification. This useful online tool can be used as a reference that provides guidance on the relative environmental impacts for a wide range of different building specifications. The BRE's Environmental Profile Methodology determines the Life Cycle Assessment (LCA) of materials, which is what the Guide's specifications are based on.

In order to take full advantage of low impact materials, elements key to the scheme should be specified to achieve ratings of between A+ and C under The Green Guide's ratings. Insulation materials that are specified will also have a global warming potential (GWP) of 5 or less, with an ODP of 0. Additionally, 100% of all timber used as part of the scheme will be responsibly sourced from suppliers that are either Forest Stewardship Council (FSC) accredited, Programme for the Endorsement of Forestry Certification accredited, or a similar recognised accreditation body.

To further promote embodied energy and carbon savings, the scheme will first prioritise the reusing of any demolished materials within the site, however if this is not possible secondary priority must be given to the redirecting from landfill, in line with the waste hierarchy.

Finally, in addition to the above policy points, the development is also recommended to register with the Considerate Constructors Scheme, or a similar approved scheme.

2.4.6 Pollution Control

To reduce emissions of gases with high global warming potential (GWP) and nitrogen oxide (NOx) into the atmosphere, new buildings will be specified with insulating materials that have a GWP of less than 5. This will follow throughout the development to reduce the impact that the construction phase has upon climate change.

Additionally, the following measures will be implemented:

- Pollution Prevention Guidance will be adhered to in respects of air (dust) and water (ground and surface) pollution during the demolition and construction phase.
- External light fittings will be controlled through a time switch, or daylight sensor, to prevent operation during daylight hours to limit the impact of artificial lighting for the development's residents and surrounding environment.

Sound insulation will be specified to achieve Building Regulation Part E compliance standard (this will be verified by pre-completion testing) in addition to meeting the requirements of the council. This will reduce the impact of sound pollution for the occupants within adjoining dwellings.

3 Feasibility Assessment of Renewable Energy and Low Carbon Technologies

Solar Hot Water (Thermal)

Solar water heating systems are one of the more familiar renewable technologies used at the moment. They use the energy from the sun to heat water, most commonly for hot water needs. Solar heating systems use a heat collector that is usually mounted on a roof in which the sun heats a fluid. This fluid is used to heat water that is stored in either a separate hot water cylinder or in a twin-coil hot water cylinder (the second coil is used to provide additional heating from a boiler or other heat source).

Solar hot water panels could be used however, PV will provide slightly better savings and avoid the need for water storage cylinders when compared.

Renewable Technology Not Chosen.

Photovoltaic Panels (PV)

Photovoltaic modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases of silicon. Through a process called doping, very small amounts of impurities are added to the semiconductor, which creates two different layers called n-type and p-type layers.

Certain wavelengths of light are able to ionize the silicon atoms, which separates some of the positive charges (holes) from the negative charges (electrons). The holes move into the positive or p-layer and the electrons into the negative or n-layer. These opposite charges are attracted to each other, but most of them can only re-combine by the electrons passing through an external circuit, due to an internal potential energy barrier. This flow of electrons produces a DC current.

A PV array can be mounted on the suitable roof space however the development is already achieving significant reductions in carbon emissions through the use of energy efficiency measures and low carbon water hot water.

Renewable Technology Not Chosen.

Ground Source Heat pumps

A heat pump is a device that takes up heat at a certain temperature and releases it at a higher temperature. The essential components of a heat pump are heat exchangers (through which energy is extracted and emitted) and a means of pumping heat between the exchangers. The effectiveness of the heat pump is measured by the ratio of the heating capacity to the effective power input, usually known as the coefficient of performance (COP). Ground-source heat pumps (GSHP) extract heat from the ground. They are classified as either water-to-air or water-to-water units depending on whether the heat distribution system in the building uses air or water. Ground source heat pumps either use long shallow trenches or deep vertical boreholes to take low grade heat from the ground and then compress it to create higher temperatures.

Ground source heat pumps would not be suitable due to the lack of land space around the properties and the associated costs.

Renewable Technology Not Viable

Air Source Heat pumps

Air source heat pumps absorb heat from the outside air. This is usually used to heat radiators, underfloor heating systems, or warm air convectors and hot water in your home. An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside.

The system performs down to air temperatures of -20°c which means that they are more than suitable for installations within the UK. Hot water and Heating can be provided 365 days a year. The hot water is produced without the aid of electrical immersions and at 55°c is more than hot enough for baths and showers.

There are two main types of air source heat pump system:

- An air-to-water system distributes heat via your wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system would. So they are more suitable for under-floor heating systems or larger radiators, which give out heat at lower temperatures over longer periods of time.
- An air-to-air system produces warm air which is circulated by fans to heat your home. They are unlikely to provide you with hot water as well.

The Dimplex Edel Air Source Heat Pump hot Water only units are good option to produce domestic hot water and reduce dwelling emissions.

Chosen Renewable Technology

Biomass Heating

Biomass is any plant-derived organic material that renews itself over a short period.

Biomass energy systems are based on either the direct or indirect combustion of fuels derived from those plant sources. The most common form of biomass is the direct combustion of wood in treated or untreated forms. The use of biomass is becoming increasingly common in some European countries.

The environmental benefits relate to the significantly lower amounts of energy used in biomass production and processing compared to the energy released when they are burnt. This can range from a four-fold return for biodiesel to an approximate 20-fold energy return for woody biomass. Biomass-fuels can be used to produce energy on a continuous basis (unlike renewables such as wind or solar energy) and it can be an economic alternative to fossil fuels as it is a potential source of both heat and electricity.

However, Biomass systems have particular design management and maintenance requirements associated with sourcing, transportation and storage and are therefore more commonly used in commercial developments rather than domestic installations. It can be less convenient to operate than mains-supplied fuels such as natural gas and are more management intensive and require expertise in facilities management. Sources of biomass can also fluctuate, so boilers should be specified to operate on a variety of fuels without risk of overheating or tripping out.

A communal biomass system would not be feasible for this development due to the expense associated with the necessary output to heat all dwellings on the site.

Renewable Technology Not Chosen

Wind

Wind turbines convert the kinetic energy in wind into mechanical energy that is then converted to electricity. Turbines are available in a range of sizes and designs and can either be free-standing, mounted on a building or integrated into a building structure.

The wind speed in the area is under the advised minimum and the built-up area means that a wind turbine wouldn't be feasible.

Renewable Technology Not Viable

4 Conclusion

This statement has assessed the proposed development at the High Lane site against the relevant climate change and sustainability policies and targets, as outlined within: the Manchester City Council Core Strategy (July 2012), Our Manchester Strategy, Manchester: A Certain Future and The Zero Carbon Framework, through the following of the energy hierarchy, the modelling of apartments in the FSAP 10.2 software and addressing all aspects of a sustainable development. In addition, the proposal has been assessed against national sustainable design definitions to determine how it can be classified.

As part of this process, the development was designed with a fabric first approach; with U-values, design air permeability and ventilation targets all aspiring to exceed Building Regulations Part L 2022 standards. Following on from this, efficient MVHR systems were proposed to house types A&B for each, to further reduce the total energy demands whilst simultaneously providing the dwellings with healthy internal environments. This approach demonstrates a holistic low energy design concept, involving very low limiting values and thus led to high-energy performance targets and being defined as a low carbon development.

Furthermore, an LZC feasibility assessment was carried out, with all suitable technologies investigated for their suitability to the site and development. The assessment determined that a Dimplex ASHPHW will be proposed to each dwelling and would provide an additional 52.3% reduction in carbon emissions over the residual emissions: bringing the total carbon reduction to **60.3%**, when using SAP 10.2 carbon factors. In addition to this renewable technology provision, the development can also be defined as carbon neutral because it will have net zero carbon emissions. This is to be achieved by obtaining all the energy used on site from a 100% renewable energy electricity supply provider.

The development will also be adapting to climate change by incorporating sustainable drainage measures into the design, protecting existing ecology, enhancing biodiversity where possible and providing cycle storage provision to residents.

In addition to the following of the energy hierarchy through the efficient design and renewable technology measures mentioned and meeting all relevant Manchester City Council carbon targets the proposal will include many sustainability measures throughout construction and once completed, which will contribute heavily to the development's sustainability performance and accord with the requirements of the NPPF. The key measures to be included and therefore can be taken from this report include:

- The proposal sits within Flood Risk Zone 1 and therefore has minimal to no risk of flooding.
- A SUDs strategy will be produced to outline all measures to be incorporated that will ensure any additional surface water is collected, treated and removed.
- The development will incorporate green infrastructure involving hedges, trees, sedum/green roofs and ornamental planting that will instil a sense of wellbeing whilst also assisting with offsetting carbon dioxide and balancing local temperatures through evapotranspiration.

- Internal water efficiency will be prioritised by ensuring that efficient water fixtures are proposed so that each dwelling achieves less than 110L per person per day and 'A' rated appliances will be specified where possible.
- Waste minimisation will be targeted from throughout construction and occupational phase. It is targeted that at least 90% of construction waste will be diverted from landfill. Whilst tri-separator refuse shoots will be installed on each floor to promote recycling.
- In addition to targeting Secure by Design accreditation through adoption crime prevention measures, the site layout promotes busy spaces and routes and facilitates natural surveillance. These will therefore reduce the fear of crime and subsequently improving mental health of residents, visitors and workers.
- Prioritising reusing existing materials and locally sourced materials for construction to reduce waste and transportation to landfill in addition and promote a low embodied carbon development.
- When new materials are specified that are not locally attainable then only those that score well on the BRE: The Green Guide to Specification are to be used; to further encourage the use of sustainable materials and reductions in embodied carbon.
- The buildings will have a daylight and sunlight analysis carried out and will aim to achieve high pass rates. Additionally, highly efficient MVHR systems are being proposed to house types A & B to provide a continuous source of fresh air and maintain healthy indoor environments. These will promote healthy housing and subsequently boost physical and mental wellbeing of residents.

As a result of all the above, the proposed sustainable design and energy strategy allows the development to comply with Manchester City Council's planning policy requirement and is in line with all targets put forward in their planning documents.

House Type/Name	Type A - End Tce x6	Type A - Mid Tce x6	Type B x2	Type C GF x2	Type C MidF x2	Type C TopF x2
Frequency	6	6	2	2	2	2
BASELINE Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)
Main Heating Fuel Requirement (DER)	6,260.75	5,215.48	5,468.91	2,367.06	1,675.33	2,010.86
Secondary Main Heating Fuel Requirement (DER)	0	0	0	0	0	0
Secondary Heating Fuel Requirement (DER)	0	0	0	0	0	0
Water Fuel Requirement (DER)	3,026.93	3,034.99	3,018.53	2,698.81	2,715.58	2,705.56
Electricity Pumps Fans Requirement (DER)	86	86	86	86	86	86
Electricity Lighting Requirement (DER)	309.125	309.125	302.677	177.21	177.21	177.21
TOTAL PER DEVELOPMENT						
AFTER ENERGY SAVING MEASURES Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)
Main Heating Fuel Requirement (DER)	3,358.93	2,528.24	2,559.65	2,210.84	1,555.91	2,199.83
Secondary Main Heating Fuel Requirement (DER)	0	0	0	0	0	0
Secondary Heating Fuel Requirement (DER)	0	0	0	0	0	0
Water Fuel Requirement (DER)	2,913.64	2,913.64	4,026.11	1,879.56	1,879.56	1,879.56
Electricity Pumps Fans Requirement (DER)	902.76	815.25	743.26	686.00	686.00	686.00
Electricity Lighting Requirement (DER)	336.77	340.31	329.69	210.52	210.52	210.52
TOTAL PER DEVELOPMENT						
FINAL Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)
Main Heating Fuel Requirement (DER)	3,210.91	2,446.13	2,747.66	2,069.43	1,467.12	2,033.15
Secondary Main Heating Fuel Requirement (DER)	0	0	0	0	0	0
Secondary Heating Fuel Requirement (DER)	0	0	0	0	0	0
Water Fuel Requirement (DER)	695.85	695.85	671.78	683.28	683.28	683.28
Electricity Pumps Fans Requirement (DER)	816.76	729.25	657.26	0	0	0
Electricity Lighting Requirement (DER)	336.77	340.31	329.69	210.52	210.52	210.52
TOTAL PER DEVELOPMENT						
PV Energy Produced (DER)						

Mansion House A	Mansion House B	TOTAL (kWh/yr)		TOTAL (kgCO2/yr)	SAP 10.0	TOTAL (kgCO2/yr)	10.2	TOTAL (kgCO2/yr)
1	1	22						
Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
12,307.37	14,904.91	119114.0	0.216	39879.4	0.210	25013.9	0.210	25013.9
0	0	0.0	0.519	0.0	0.233	0.0	0.136	0.0
0	0	0.0	0.216	0.0	0.210	0.0	0.136	0.0
792.55	796.56	60237.6	0.216	20167.5	0.210	12649.9	0.210	12649.9
0	0	1720.0	0.519	892.7	0.233	400.8	0.136	233.9
467.81	422.90	6268.8	0.519	3253.5	0.233	1460.6	0.136	852.6
		-1,902.63					0.136	-258.75768
		185437.8		64193.1		39525.2		38491.6
Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
12,307.37	14,904.91	79587.8	0.216	26646.0	0.210	16713.4	0.210	16713.4
0	0	0.0	0.519	0.0	0.233	0.0	0.136	0.0
0	0	0.0	0.519	0.0	0.233	0.0	0.136	0.0
792.55	796.56	55882.4	0.216	18709.4	0.210	11735.3	0.210	11735.3
86	86	16082.6	0.519	8346.9	0.233	3747.2	0.136	2187.2
467.81	422.90	6875.7	0.519	3568.5	0.233	1602.0	0.136	935.1
		158428.4		57270.7		33798.0		31571.1
Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
12,307.37	14,904.91	77789.2	0.519	40372.6	0.233	18124.9	0.136	10579.3
0	0	0.0	0.519	0.0	0.233	0.0	0.136	0.0
0	0	0.0	0.519	0.0	0.233	0.0	0.136	0.0
792.55	796.56	15382.6	0.519	7983.5	0.233	3584.1	0.136	2092.0
0	0	10590.6	0.519	5496.5	0.233	2467.6	0.136	1440.3
467.81	422.90	6875.7	0.519	3568.5	0.233	1602.0	0.136	935.1
		110638.1		57421.2		25778.7		15046.8
		0.0	0.519	0.0	0.233	0.0	0.136	0.0
		110638.1		57421.2		25778.7		15046.8

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