

Land on Brendon Avenue, Moston, M40 9DN

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1 Introduction

1.1 Overview

HAD & CO Property Consultants Ltd ('the client') is seeking planning consent for redevelopment at Land on Brendon Avenue, Moston, M40 9DN (hereafter referred to as the 'proposed development'), which is within the Manchester City Council (MCC).

The proposal is for the construction of 6no. new semi-detached C3 residential dwellings.

Aval Consulting Group Limited (ACGL) was instructed by the client to produce an Energy Strategy to accompany the planning application to MCC for permission to undertake the proposed work.

This report presents the energy strategy of the development and demonstrates how the proposals relate to applicable planning policy guidance as listed below:

- National Planning Policy Framework (NPPF) (2021).
- Manchester City Council Core Strategy

It is proposed that the development will follow the energy hierarchy, giving priority to energy-efficient design and then incorporating low/zero-carbon technologies. Air Source Heat Pumps (ASHP) will provide a low carbon heating and hot water system. The development is expected to produce 32.1 tonnes of CO₂ per year which is approximately a 37.5% reduction compared to a Building Regulations compliant design.

This report provides a worst-case scenario in terms of carbon emissions as SAP2012 carbon factors have been used.

2. Applicable Standards and Policy

2.1 National Planning Policy Framework

The principal national planning policy guidance in respect of the proposed development is the National Planning Policy Framework (NPPF)¹. The most recent update of the NPPF was published in July 2021 by the Ministry of Housing, Communities & Local Government.

The section of the NPPF “Planning for Climate Change” states that:

153. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures or making provision for the possible future relocation of vulnerable development and infrastructure.

154. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government’s policy for national technical standards.

155. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers.

156. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

157. In determining planning applications, local planning authorities should expect new development to:

¹ National Planning Policy Framework. Accessible at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

158. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

2.2 Manchester City Council- Core Strategy

The Core Strategy was adopted in 2012 and is the key document for planning and development within the MCC. It provides planning policy for a range of issues. There are a number of policies relating to energy. **Policy EN4 Reducing CO2 Emissions by Enabling Low and Zero Carbon Development**, states:

All development must follow the principle of the Energy Hierarchy, being designed:

- to reduce the need for energy through design features that provide passive heating, natural lighting and cooling*
- to reduce the need for energy through energy efficient features such as improved insulation and glazing*
- to meet residual energy requirements through the use of low or zero carbon energy generating technologies*
- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.*
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.*
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero-carbon energy schemes and/or to incorporate provision to enable future connection to any existing/potential decentralised energy schemes.*
- The use of building materials with low embodied carbon in new development and refurbishment schemes.*

Policy EN6 Target Framework for CO2 reductions from low or zero-carbon energy supplies

indicates the percentage reductions that new developments should aim to achieve. It states:

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 CO2 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 CO2 emission reduction targets

Target	% Minimum Requirement
Target 1 Network development areas	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target 2 Electricity intense areas	+15% increase on Part L 2010
Target 3 Micro-generation areas	+15% increase on Part L 2010

Where the CO2 emissions reduction required under any future revision to Part L of the building regulations becomes 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 CO2

mitigation, subject to the energy statement incorporating evidence such as modelling to demonstrate compliance.

3. Energy

An energy strategy has been developed following the energy hierarchy. It addresses energy issues and responds to the planning policies and guidance by minimising the proposed development's overall environmental impact.

The proposed development will attempt to reduce energy consumption through good design. This approach places the primary emphasis on mitigating energy use in the first instance via passive and energy-efficient design in line with the energy hierarchy. The scheme is designed to maximise passive solar energy and shading.

Once the energy demand of the development has been reduced as far as practically possible, renewable energy sources are utilised to offset the demand for the development in line with the Manchester City Council Core Strategy.

The objective is to have buildings as energy-efficient as possible without relying on systems or technologies which require energy to operate and deliver low carbon performance. Where energy is required to operate systems, the most efficient plant has been selected to minimise demand.

3.1 Energy Modelling

Energy modelling for the proposed development was executed using SAP2012, based on Building Regulations 2013 Part L compliance. Although it is recognised that the Manchester City Council Core Strategy stipulates that compliance should be against the Building Regulations 2010, betterment in the building regulations means that the proposed development would be compared to stricter regulations when compared with the Building Regulations 2013.

The notional energy prediction for the proposed development used the dimensions of the proposed development, as well as notional U-values and heating specifications stated in the Building Regulations 2013. The model defined the Target Emissions Rate (TER) for Building Regulations 2013 Part L through the following formula:

$$TER_{2013} = C_H X FF + C_{PF} + C_L$$

The TER was determined by applying a fuel factor (FF) to space heating and hot water (C_H) which is then added to the energy use of pumps and fans (C_{PF}) and then added to the internal lighting load (C_L).

3.2 Energy Efficient Design

The Building Regulation Part L presents the minimum requirements for the building fabric components highlighted in Table 3.1. The table presents the minimum specification of new dwellings, which should be improved on during the detailed building fabric design to achieve a reduction in CO₂ emissions in comparison to the Target Emission Rate.

The following passive design features have been incorporated into the design of both the residential and commercial elements of the scheme:

- High levels of insulation for exposed solid envelope elements;
- High level of air-tightness;
- Maximised natural ventilation potential;
- Double glazed windows;
- Reduction of thermal bridges;
- High-efficiency lighting throughout; and
- Low carbon heating system.

Table 3.1: Minimum and target U-value for the proposed development.

Element	Minimum Specification for New Dwellings	Targetted U-Values for the Proposed Development
External walls	0.18 W/(m ² K)	0.13 W/(m ² K)
Ground Floor	0.13 W/(m ² K)	0.13 W/(m ² K)
Roof	0.13 W/(m ² K)	0.12 W/(m ² K)
Windows	1.4 W/(m ² K)	1.2 W/(m ² K)
Airtightness	5.0 m ³ /(hm ²)	3 m ³ /(hm ²)
Indicative Thermal Mass Parameter	-	Low

3.3 Low and Zero Carbon Technology

In order to comply with the energy heirachy, low/zero carbon technologies have been considered. When determining the most feasible option, the following points have been considered:

- Local, regional, and national policies;
- The energy demand of the development;
- Practical implementation, installation, delivery, and maintenance procedures;
- The implication of site layout and design impact;
- Site geography, public acceptability, security, environment, and visual impact; and
- Availability of fuel supply and interaction of technologies with one another.

Table 3.2: Feasibility of potential renewable and low carbon technology

Renewable/ Low Carbon Technology	Feasibility	Further consideration
Photovoltaics	Solar photovoltaic technology can provide a guaranteed, although modest, contribution to the proposed development's electrical demand. It can be connected to the electrical mains distribution board via an inverter. The system does not contain any moving parts and is silent during operation. Therefore, will not contribute to any noise pollution. However, due to their low efficiency, it is thought that there are more suitable options.	No
Solar Hot Water	Solar water heating systems convert solar radiation to heat carried by water for use in space heating or the provision of domestic hot water. Although there is adequate space for this provision, there is concern regarding the cost. Potential gains of this method are also capped for domestic appliances as there is only a certain amount of water that can be used within a household. Thus, energy can be wasted.	No
Biomass	Biomass boilers require a constant supply of fuel, which has traditionally been an issue, and therefore the transport of fuel can potentially be an issue. Emissions of biomass boilers (particularly NOx and particulate matter) pose a threat to air quality. Therefore, they have not been considered further.	No
Wind turbines	Small scale wind turbines, building-integrated wind power, are proven, and viable technology. However, the average surface roughness in built-up areas is high, leading to both reduced wind speeds and increased turbulence. Due to the location of this site, in an urban area, there is a lack of open space. It is for these reasons, as well as noise pollution and lack of aesthetic appeal associated with wind turbines, that it has been deemed not feasible.	No
Heat Pumps	Ground or Air Source Heat pumps are common methods of providing buildings with heating and cooling via heat pumps. However, Ground Source Heat pumps require a large amount of external space, which is not available at this site. Air Source Heat Pumps, on the other hand, require much less space. Typical efficiencies are within the region of 150% and 350%.	Yes

The exact specification of the Air Source Heat Pumps is yet to be decided and therefore the 'Mitsubishi Electric Ecodan 8.5 kW' air source heat pump has been selected from the database within the SAP software. This ASHP has an efficiency within the region of 304.1%. Therefore in order to achieve carbon savings similar to those reported within this energy statement, it is recommended that an ASHP with a similar efficiency is installed into the development.

It should also be noted that the current carbon factors used within the SAP software are set to change to account for the decarbonisation of the National Grid. As can be seen below, SAP10 carbon factors for electricity are nearly half that of SAP2012. This has neither been updated within the SAP software,

nor planning policy relating to this development. Therefore carbon emissions reported in this energy statement have been calculated by using SAP2012 carbon factors, although it is expected that they will be much lower in reality. Therefore this report should be used to indicate the potential carbon reductions of the development and provides a worst-case scenario in terms of carbon emissions.

Table 3.3: SAP2012 and SAP10 carbon factors.

Fuel Type	SAP2012 carbon factor	SAP10 carbon factor
Gas	0.216	0.210
Electricity	0.519	0.233

Modelling has been undertaken to determine the reduction in CO₂ emissions as a result of the incorporation of the proposed energy-efficient design and the installation of the ASHP.

There are six semi-detached properties. All properties are the same size and therefore CO₂ emissions and reductions are identical for all of them. Modelling has been done to estimate the decrease in CO₂ emissions brought on by implementing the suggested energy-efficient design and installing the ASHP. All 6 houses were modelled, and the total Target Emission Rate (TER) and Dwelling Emission Rate (DER) were calculated for the entire development. The results are summarised in Table 3.4.

Table 3.4: The Total Emission rate and percentage reduction in CO₂ emissions compared to Building Regulations compliant design.

Total Target Emission Rate (kgCO ₂ /m ²)	Total Dwelling Emission Rate (kgCO ₂ /m ²)
145.08	90.72
Total Percentage reduction	37.47%

The carbon emissions for the entire development have been predicted using the emission rates for each dwelling. It is estimated that the development will result in approximately 10.43 tonnes of CO₂ per year when using SAP2012 carbon factors. As previously mentioned, this is assumed to be a worst-case scenario.

Table 3.6: Overall CO₂ emissions as a result of energy-efficient design and ASHP.

Total Targetted CO ₂ Emissions (tonnesCO ₂ /year)	Total CO ₂ Emissions (tonnesCO ₂ /year)	Percentage Reduction (%)
16.68	10.43	37.5%

An overall reduction of 37.5 % in CO₂ emissions can be achieved by the proposed development by ensuring an energy-efficient design, and a sustainable heating system. Planning policy states that 'Target 3 Micro-generation areas' should achieve a reduction of 15% against the Building Regulations. The proposed development is expected to exceed the requirements of the planning policy by following the energy strategy highlighted in this report.

It should be noted that these values are based on each individual properties. This is a result of the small number of properties. By analysing each property, we discovered that the readings were consistent, which meant that the CO₂ emissions and reductions would also be consistent. But owing to outside influences, there will inevitably be modest variations in the future. The possible carbon emission savings linked to the planned development are, nevertheless, indicated in this report.

4. Conclusion

This report summarises the proposed energy strategy for the proposed development at Land on Brendon Avenue, Moston, M40 9DN.

Both energy-saving techniques and renewable and low-carbon technology have both been taken into consideration, along with appropriate policies. The methods in which the planned development would adhere to the Energy Hierarchy are outlined in this report.

Priority has been placed initially on improving the air permeability and building fabric. Air Source Heat Pumps were the most practical low carbon technology to for the proposed development in order to achieve further decrease. A low-carbon heating and hot water system will be offered by ASHP.

Through the combination of these measures, a total reduction of 37.5 percent beyond Building Regulations is anticipated. When SAP10 carbon factors are implemented, carbon emissions are expected to be lower than those reported in this report. However, it should be noted that any modification to the design with respect to this energy strategy may cause a change in CO₂ emissions.

Therefore, it can be said that the planned development would not be in violation of any national, regional, or municipal planning regulation with regard to carbon emissions or energy use if the actions recommended in this report were implemented.