



Energy and Carbon Statement.

**Erection of 194 No. dwellings - comprising 52 No. 2 storey
houses, 18 No. 3 storey houses and 124 No. apartments
Site at Crabtree Lane, Openshaw**

Ref: PBS/25/3419

Client: Keepmoat Homes
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0.0 EXECUTIVE SUMMARY

This Sustainability Report has been prepared by PB Sustainability Limited, an energy performance and sustainability consultancy. The report and its associated Appendices describe the suggested sustainable design and construction measures which may be included in the proposals for the development of the site to exceed the targets set by current (2021) Building Regulations

The site occupies a plot of land off Crabtree Lane, Openshaw, Manchester. The surrounding environment is typically low-rise suburban mixed residential and commercial.

Development proposals comprise the erection of 194 No. dwellings comprises 52 No. 2 storey houses, 18 No. 3 storey houses and 124 No. apartments, together with associated hard and soft landscaping.

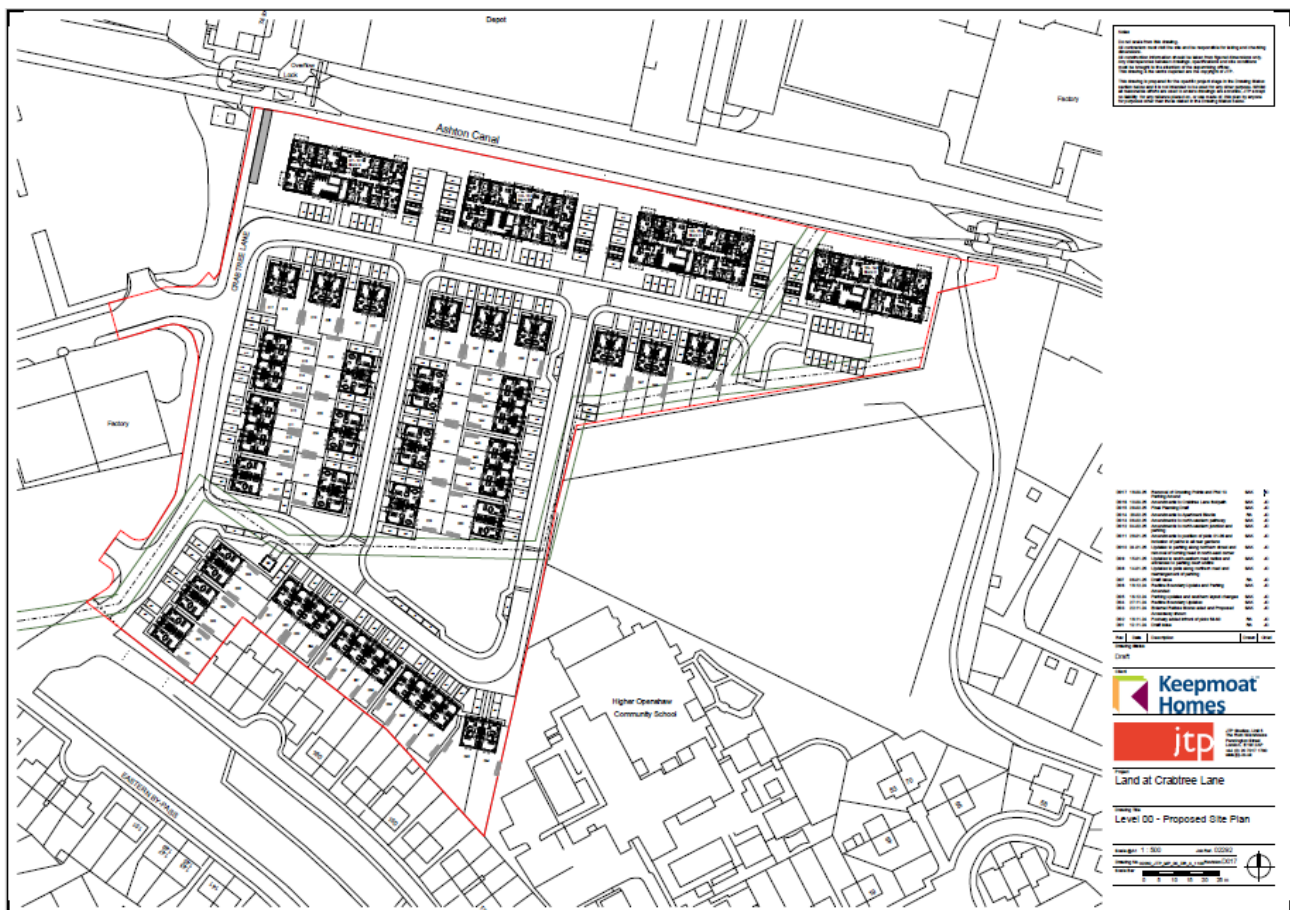


Figure 2.1 – Proposed site plan

PB Sustainability Limited have been engaged by Keepmoat Homes to review the sustainability performance of the proposed residential development at Crabtree Lane, Openshaw. The purpose of



this statement is to summarise the relevant policy background and requirements of Manchester City Council and demonstrate the ways in which the developer has addressed these aims through their proposals, ensuring all practicable measures have been taken in order to deliver a sustainable development at this site.

Details of the design attributes, specifications and characteristics of the scheme are appraised in order to demonstrate how the proposals contribute to sustainable development in Manchester and seek to mitigate the environmental impacts of the scheme.

Due to the lack of a nearby existing or proposed district heating network the intention is to make use of Microgeneration Technologies where required to achieve the target.

SAP 10.2 and Building Regulations 2021 represents a 31% reduction in CO₂ emissions when compared with 2010 Building Regulations requirements. This report demonstrates through SAP 10.2 calculations that the proposed specification reduces key parameters of current Building Regulations as follows:

- Primary Energy Rate – 1.8% reduction resulting in a net saving of 13,608 kWh of energy per year,
- Emission Rate – 3.1% reduction resulting in a net saving of 4,437 Kg of carbon dioxide per year,
- Fabric Energy Efficiency – 3.2% reduction resulting in a net saving of 9,573 kWh of energy per year.

Thermal elements will be significantly improved beyond than the requirements of Building Regulations and sustainable measures are proposed that are in line with the National Planning Policy Framework 2019, which emphasises sustainable development, energy efficiency and reduction in carbon emissions.

The internal water consumption within each unit is to be limited to not more than 110 litres/person.day by the use of water efficient sanitary ware and flow control devices. This is in line with the recommendation of the former Code for Sustainable Homes (level 4).



1.0 BUILDING FABRIC AND VENTILATION

Details of the proposed energy strategy for this development, which includes an enhanced 'fabric led' approach to dwelling emission rate reduction combined with efficient mechanical and electrical servicing is reviewed below.

1.1 Energy Efficiency Measures

The broad energy strategy for the proposed development is to produce a design that will positively influence the overall predicted energy supply and demand. The aim is to create dwellings which use less energy and for the energy supply to be clean and efficient.

1.2 Natural daylight & energy efficient glazing

The units offer all habitable rooms with windows in order to provide natural light. The windows will allow a degree of passive solar gain on the principle elevations. 'A' rated windows will also be specified to provide a net energy input into each dwelling. These glazing characteristics will help to reduce the lighting and heating load and therefore electricity and heating fuel consumption.

1.3 Building fabric

Fundamental to energy efficiency best practice is a 'fabric first' approach. This is underpinned by the notion that it is much better to ensure less energy is needed in the first place so that, regardless of how energy is generated and supplied, a building requires less of it. This approach is deemed better than to simply rely on 'bolt-on' technology which may generate energy for a certain period but may be decommissioned or not replaced after reaching the end of its serviceable life.

The windows are to be high specification and will have an overall U-value of 1.3 Wm²K combined for the frame and glass. This will provide a balance between maximising solar gain and light levels into the internal spaces whilst keeping heat loss down. The selected windows are to be 'A' rated by the BFRC. External doors will achieve a U value of 1.1 Wm²K.

Insulation U-values are to be specified as better than current Building Regulations (2021). The Table 5.1 below sets out the proposed fabric standards in the context of the current building regulations standards. Comparative building fabric specification.



	Proposed	B Regs 2021 Requirement	Percentage Improvement
Roof	0.10	0.16	37.5
External Wall	0.19	0.26	27.0
Ground Floor	0.17	0.18	5.5
Party Wall	0.00	0.20	100.0
Windows	1.30	1.60	18.7
Solid Doors	1.20	1.60	25.0

Table 5.1 – U value comparison

Recent research has demonstrated that heat loss through cavity party walls is a much more significant issue than previously thought and was not accounted for in previous versions of SAP. It is now incorporated in the revised methodology of SAP 10.2 and as such all party walls are to be specified as fully filled and edge sealed to avoid the loss of heat.

A Design Air Permeability (DAP) of $4.5\text{m}^3/\text{m}^2.\text{hr}$ has been assumed, which is 43.7% lower than the Building Regulations requirement of $8.0\text{m}^3/\text{m}^2.\text{hr}$, but without being so low as to create unfavourable conditions with the potential for mould growth and implications for respiratory health. Sufficient background ventilation will be provided in accordance with Part F of the Building Regulations to avoid the need for mechanical ventilation systems which are a further source of energy demand and use electricity (which has the worst attributed emissions of the primary heating fuels).

Analysis of heat loss goes further than basic elemental insulation and U values - consideration will also be given to limiting the effects of thermal bridging. This is where heat loss occurs through 'junctions' in the construction which bridge the insulation layer. Standardised junction details known as 'Recognised Construction Details' have been adopted in order to limit thermal bridging and aid air tightness.

1.4 Internal lighting

The proposed residential development will make use of low energy lighting in line with BRE best practice – 100% of the lighting is to be comprised of energy efficient fittings with a minimum lamp luminous efficacy of 80 lumens per circuit watt. This will apply to both internal and external lighting. Any security lighting will have appropriate wattage, sensors and controls to ensure efficient operation.



1.5 Ventilation

Each proposed dwelling will utilise natural ventilation comprising openable windows for rapid ventilation and trickle vents for background ventilation. A decentralised mechanical extract ventilation system (dMEV) will be utilised to extract from kitchens, bathrooms and other wet rooms. Simple user controls of these systems will allow occupants to easily maintain the necessary number of air changes to meet general habitability requirements.



2.0 ENERGY EFFICIENCY

Data analysis using SAP 10.2 is the methodology adopted within this Energy Statement as it reflects current approach to determine compliance with Building Regulations and represents the most accurate standardised way of assessing comparable energy consumption.

SAP considers various parameters to calculate the energy performance of a dwelling, including but not limited to:

- Location
- Orientation and exposure
- Size
- Building fabric construction
- Thermal bridging
- Solar gain
- Ventilation and air leakage
- Building services energy demand and heat gains
- Space and water heating design
- Lighting

SAP software calculates the regulated energy demand of the dwellings and associated carbon dioxide emissions, in accordance with the requirements of Building Regulation, Part L- Volume 1 (2021) that this development will be constructed in compliance with.

Representative SAP models have been calculated for each house and apartment type to provide a complete data set for all one hundred and ninety four residential units within the proposed scheme. The following units have been selected for assessment as they are representative of the entire development in terms of their size, layout, location and orientation:



Table 2.1 – SAP 10.2 Primary Energy Requirement results

Type	Form	DPER	TPER	% DPER/TPER	Floor Area (m2)	Number	Saving (kWh/yr)
Apartments	1B2P Apartment (Mid Floor)	55.3	56.19	1.59	50.1	30	1337.67
Apartments	1B2P Apartment (Top Floor)	64.13	65.22	1.67	50.1	16	873.74
Apartments	1B2P Apartment (Ground Floor)	65.94	66.45	0.76	50.1	17	434.37
Apartments	2B3P Apartment (Mid Floor)	49.73	50.76	2.03	62.8	34	2199.26
Apartments	2B3P Apartment (Top Floor)	52.5	52.66	0.31	62.8	16	160.77
Apartments	2B3P Apartment (Ground Floor)	52.53	53.16	1.18	62.8	11	435.20
Ashburton	Ashburton (End Terrace)	62.99	64.83	2.84	71.2	8	1048.06
Ashburton	Ashburton (Mid Terrace)	57.02	57.47	0.78	71.2	8	256.32
Devoke	Devoke (Semi Detached)	52.84	53.97	2.09	122.7	18	2495.72
Fewston	Fewston (Semi Detached)	57.59	59.4	3.05	85.2	10	1542.12
Holgate	Holgate (Semi Detached)	53.19	53.93	1.38	94.6	2	140.01
Longford	Longford (Semi Detached)	51.57	52.28	1.36	107	12	911.64
Seacourt	Seacourt (End Terrace)	56.56	57.99	2.47	85.2	6	731.02
Seacourt	Seacourt (Mid Terrace)	49.4	51.44	3.97	85.2	6	1042.85
TOTAL						194	13608.74

Calculations show a 1.8% reduction in 2021 requirements resulting in a net saving of 13,608 kWh of energy per year.

Table 2.2 – SAP 10.2 Emission Rate results

Type	Form	DER	TER	% DER/TER	Total Floor Area	Number	Saving (kgCO2/yr)
Apartments	1B2P Apartment (Mid Floor)	10.25	10.65	3.76	50.1	30	601.20
Apartments	1B2P Apartment (Top Floor)	11.89	12.33	3.57	50.1	16	352.70
Apartments	1B2P Apartment (Ground Floor)	12.19	12.56	2.95	50.1	17	315.13
Apartments	2B3P Apartment (Mid Floor)	9.35	9.68	3.41	62.8	34	704.62
Apartments	2B3P Apartment (Top Floor)	9.83	10.03	1.99	62.8	16	200.96
Apartments	2B3P Apartment (Ground Floor)	9.84	10.13	2.86	62.8	11	200.33
Ashburton	Ashburton (End Terrace)	11.89	12.38	3.96	71.2	8	279.10
Ashburton	Ashburton (Mid Terrace)	10.77	11.01	2.18	71.2	8	136.70
Devoke	Devoke (Semi Detached)	10.05	10.32	2.62	122.7	18	596.32
Fewston	Fewston (Semi Detached)	10.95	11.37	3.69	85.2	10	357.84
Holgate	Holgate (Semi Detached)	10.13	10.34	2.03	94.6	2	39.73
Longford	Longford (Semi Detached)	9.84	10.03	1.89	107	12	243.96
Seacourt	Seacourt (End Terrace)	10.76	11.1	3.06	85.2	6	173.81
Seacourt	Seacourt (Mid Terrace)	9.44	9.9	4.65	85.2	6	235.15
TOTAL						194	4437.56

Calculations show a 3.1% reduction in 2021 requirements resulting in a net saving of 4,437 Kg of carbon dioxide per year.



Table 2.3 – SAP 10.2 Fabric Energy Efficiency results

Type	Form	DFEE	TFEE	% DFEE/TFEE	Total Floor Area	Number	Saving (kWh/yr)
Apartments	1B2P Apartment (Mid Floor)	14	13.75	-1.79	50.1	30	-375.75
Apartments	1B2P Apartment (Top Floor)	21.06	21.51	2.09	50.1	16	360.72
Apartments	1B2P Apartment (Ground Floor)	21.98	22.82	3.66	50.1	17	715.43
Apartments	2B3P Apartment (Mid Floor)	15.04	15.29	1.63	62.8	34	533.80
Apartments	2B3P Apartment (Top Floor)	16.47	16.96	2.84	62.8	16	492.35
Apartments	2B3P Apartment (Ground Floor)	16.93	17.5	3.26	62.8	11	393.76
Ashburton	Ashburton (End Terrace)	34.98	36.43	3.99	71.2	8	825.92
Ashburton	Ashburton (Mid Terrace)	29.13	30.05	3.06	71.2	8	524.03
Devoke	Devoke (Semi Detached)	33.5	34.34	2.45	122.7	18	1855.22
Fewston	Fewston (Semi Detached)	34.31	35.66	3.77	85.2	10	1150.20
Holgate	Holgate (Semi Detached)	31.92	33.18	3.79	94.6	2	238.39
Longford	Longford (Semi Detached)	33.88	35.04	3.32	107	12	1489.44
Seacourt	Seacourt (End Terrace)	33.35	34.64	3.74	85.2	6	659.45
Seacourt	Seacourt (Mid Terrace)	27.88	29.27	4.76	85.2	6	710.57
TOTAL						194	9573.53

Calculations show a 3.2% reduction in 2021 requirements resulting in a net saving of 9,573 kWh of energy per year.

These indicative SAP calculations demonstrate that the Dwelling Primary Energy Rate (DPER), Dwelling Emission Rate (DER) and Dwelling Fabric Energy Efficiency (DFEE) for the Crabtree Lane scheme will provide an improvement over Part L- Volume 1 (2021) compliance standards as a consequence of the enhanced fabric specifications and efficient mechanical and electrical systems.

Energy Efficient equipment

- White goods are graded on a scale from G (the least efficient) up to A++ (the most efficient) under the EU energy efficiency labelling scheme. There will be the provision of A and A+ rated white goods (where applicable);
- Provision of EU energy efficiency labelling scheme details to assist in the purchasing of energy efficient white goods;
- Space and equipment provided for drying of clothes;
- 100% low energy and/or LED internal lighting;
- All external space lighting to be provided by dedicated energy efficient fittings and controls.



3.0 RENEWABLE ENERGY

3.1 Energy Hierarchy

The scheme will incorporate an enhanced material specification along with high quality design and construction standards in order to improve energy efficiency through a 'fabric led' energy strategy. The construction, design and specification proposed for this scheme will deliver buildings that are inherently efficient and cost-effective during occupation.

The Energy Hierarchy provides a framework to guide energy policy and decision making to achieve practical and cost-effective carbon emission reduction strategies. The hierarchy prioritises demand-side activities to reduce wastage and improve efficiency (see Figure 5.1).

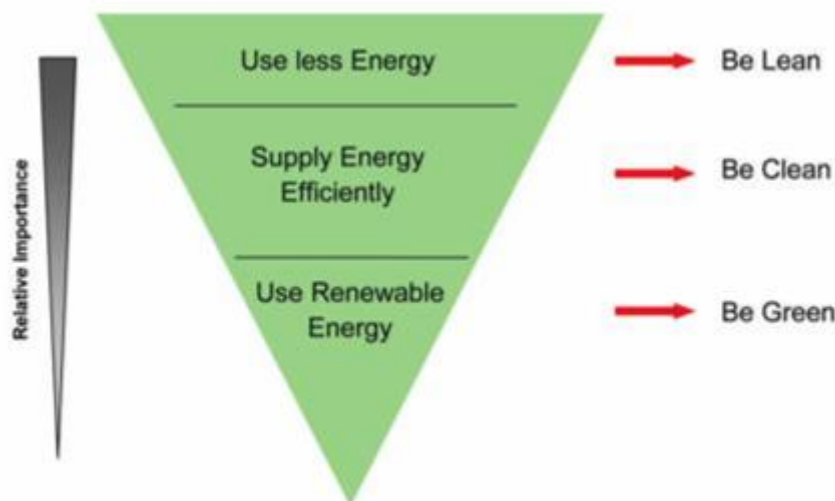


Figure 5.1 – The Energy Hierarchy

Be Lean

The following efficiency measures are designed to reduce heat losses and minimise energy demand:

- The buildings will be constructed with a material and design specification which exceeds minimum Building Regulation standards and includes numerous efficiency measures designed to reduce heat losses and minimise energy demand, including very good levels of insulation and low u values;
- The design air permeability target for all units is 4.5m³/hm² (@50Pa.). This low air permeability target will minimise any uncontrolled ventilation and assist to limit heat loss through the structure of the build; and,



- The g value of the glazing will be optimised to control solar gain in the summer months and allow beneficial gains in the winter season so as to minimise the overheating risk and limit the heating energy demand within the properties.

This 'fabric led' approach to minimising energy demand and associated carbon dioxide emissions is aligned with the first principle of the energy hierarchy which states that reduction in energy demand should be achieved initially by energy efficiency.

Be Clean

Combined heat and power technology is not proposed as part of this energy strategy. As per the second principle of the Energy Hierarchy:

- Sophisticated control systems for the space and water heating will ensure that energy consumed by the dwellings is used efficiently;
- The dwellings will be designed to not require active cooling.

Be Green

- Space and water heating requirements within all dwellings are to be delivered using high efficiency Low NOx gas combination boilers
- Solar photovoltaic panels will be installed in order to mitigate energy consumption with each dwelling

The preceding calculation results assume the installation of photovoltaic panels with a direct connection to each dwelling. The total size of the relevant array per dwelling (in kWp) is outlined below



Table 3.1 – Photovoltaic panel allocation

Type	Form	PV (kWp)	Number	Total (kWp)	Energy Reduction (kWh)
Apartments	1B2P Apartment (Mid Floor)	0.9	30	27.0	-23317.8
Apartments	1B2P Apartment (Top Floor)	0.9	16	14.4	-12436.2
Apartments	1B2P Apartment (Ground Floor)	0.8	17	13.6	-11745.3
Apartments	2B3P Apartment (Mid Floor)	1.2	34	40.8	-35235.6
Apartments	2B3P Apartment (Top Floor)	1.1	16	17.6	-15199.7
Apartments	2B3P Apartment (Ground Floor)	1.1	11	12.1	-10449.8
Ashburton	Ashburton (End Terrace)	2.5	8	20.0	-14525.7
Ashburton	Ashburton (Mid Terrace)	2.3	8	18.4	-13363.6
Devoke	Devoke (Semi Detached)	3.0	18	54.0	-39219.3
Fewston	Fewston (Semi Detached)	2.5	10	25.0	-21590.5
Holgate	Holgate (Semi Detached)	2.7	2	5.4	-4663.5
Longford	Longford (Semi Detached)	3.0	12	36.0	-31090.3
Seacourt	Seacourt (End Terrace)	2.5	6	15.0	-12954.3
Seacourt	Seacourt (Mid Terrace)	2.5	6	15.0	-12954.3
TOTAL			194	314.3	-258745.8

Calculations show installation of photovoltaic (PV) roof panels to each plot will result in a net provision of 258,745 kWh of energy per year



4.0 LOW CARBON HEATING

4.1 Heating & hot water systems

High efficiency low NOx gas combi boilers will be utilised to provide space and water heating within each dwelling. These units operate at an efficiency of 93%, thereby minimising operational energy use.

Installation of air source heat pumps to each dwelling would render the scheme economically unviable. THE developer seeks exemption from the requirements for low carbon heating in this case.

4.2 Ventilation

Each proposed dwelling will utilise natural ventilation comprising openable windows for rapid ventilation and trickle vents for background ventilation. A decentralised mechanical extract ventilation system (dMEV) will be utilised to extract from kitchens, bathrooms and other wet rooms. Simple user controls of these systems will allow occupants to easily maintain the necessary number of air changes to meet general habitability requirements as well as the functional requirements of Building Regulations Part O.



5.0 OVERHEATING RISK

While no specific overheating assessment has been undertaken for this development the clients experience of similar house types on other elevations indicated the use of mechanical cooling systems will not be necessary in order to achieve the requirements of Building Regulations Part O.

Each proposed dwelling will utilise natural ventilation comprising openable windows for rapid ventilation and trickle vents for background ventilation. A decentralised mechanical extract ventilation system (dMEV) will be utilised to extract from kitchens, bathrooms and other wet rooms. Simple user controls of these systems will allow occupants to easily maintain the necessary number of air changes to meet general habitability requirements.



6.0 MATERIALS

6.1 Minimising embodied carbon

The choice of construction materials affects the level of embodied energy being used by the development and has a wide impact on the environment. Embodied energy is the energy consumed in the processes associated with the construction of the building. Where practicable the following practices should be adopted to assist in reducing levels of embodied energy being used.

- Where feasible, the development will use materials that are locally sourced. In doing this the project will be supporting the local economy and will be minimising transportation of materials to the Application Site;
- Where feasible materials will be selected which are from sustainable sources. The Building Research Establishment (BRE) has created a Guide which rates construction materials according to sustainability criteria and where possible materials will have the highest sustainability rating, 'A+' or 'A'. Such materials have lower environmental impacts compared with 'B' and 'C' rated materials. Where an A+ or A rated material is not feasible the next level of B should be selected;
- The use of recycled materials should be carefully considered from a sustainability perspective and where they can be incorporated in the development, this should be determined at the detailed design stage.
- All insulation materials specified should have an Ozone Depleting Potential (ODP) of Zero and Global Warming Potential (GWP) of less than 5.

6.2 Water

Use of potable water use by the occupants will be minimised through the specification of water saving sanitary features achieving not more than the 110 litres per person per day requirement as required under level 4 of the former Code for Sustainable Homes. The following devices will be incorporated within each dwelling to assist in achieving this requirement:

- Water efficient taps determined through the use of water restrictors;
- Water efficient and dual flush toilets;
- Shower flow rates between 6 to 8 litres/minute;



Information on ways to reduce water use will be included as part of the Home User Guide which all residents will be given on occupation of their dwelling.

6.3 Surface water run-off

The development site benefits from being located in a Low Flood Risk Zone. Data provided on the Environment Agency website confirms the development has a low probability of flooding and lies within Zone 1 (see Figure 4.1).

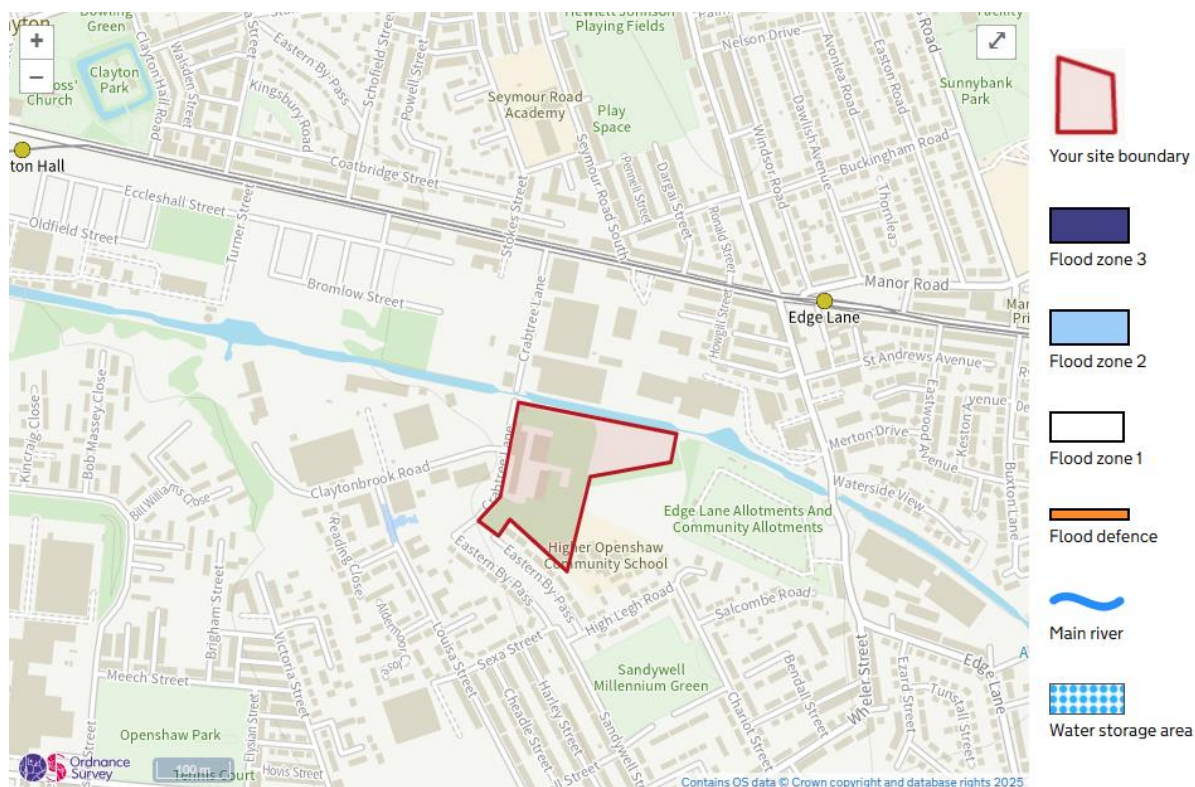


Figure 6.1 – Flood risk map

To minimise the risk and impact of localised flooding on and off-site, watercourse pollution and other environmental damage, the surface water drainage strategy will be designed ensuring the peak rate and volume of surface water run-off will be no greater post-development than pre-development run-off rates.

The landscaped areas and newly planted trees will serve to increase the short-term water storage within the development footprint and attenuate the rate and volume of surface water movements off site, thereby relieving potential for flash flood risk and pollution within the water catchment.



6.4 Waste minimisation and recycling

Construction Waste

Construction operations generate waste materials as a result of general handling losses and surpluses. These wastes can be reduced through the appropriate selection of construction methods, good site waste management practices and spotting opportunities to avoid creating unnecessary waste. In accordance with regulatory requirements the Developer will need to prepare a Site Waste Management Plan (SWMP) at the appropriate stage of development. Implementing the SWMP could result in various benefits for the development, which include:

- Better control of risks relating to the materials and waste on the site, 'Good housekeeping' of waste improves site safety;
- Demonstrating compliance with the legislative framework;
- Demonstrating to clients how waste is managed and minimised and how associated costs are controlled.

The Developer should also initiate the proposed scheme in accordance with the principles of Considerate Constructors Scheme. Part of this accreditation includes waste management measures and re use of materials and recycling.

In addition the following good practice techniques should be considered as appropriate:

- Development and implementation of a Site Waste Management Plan;
- Toolbox talks to staff to raise awareness of waste and to provide training on waste management practices;
- Waste segregation (space permitting);
- Segregation of all inert waste materials and concrete for reuse on site;
- Segregation of metals and timber for off-site reprocessing;
- Packaging waste targeted at the fit out phase (when amount increases);
- Segregation of timber during the structural phase if there is local recycling infrastructure;
- Identifying local waste companies/ processors that may offer a rebate for segregated skips;
- Minimising the number of waste streams in the mixed waste skip;
- Appointing a waste management contractor(s) committed to recovering a broad range of materials.



Domestic Waste

The buildings will provide infrastructure and facilities that meet the need of the residents and building users for segregated waste storage, thereby optimising the ability to recycle waste:

- Recycling bin storage provisions will enable residents to make full use of Local Authority recycling services; and,
- A waste management strategy will be developed, ensuring adequately sized bin storage areas for the retail units and each residential dwelling, access for collection personnel and vehicles, and other aspects of waste management will be designed into the development at an early stage of the design. The strategy will allow for storage of general waste, recyclable materials, and food waste, in order to optimise the recycling rates achieved by Manchester City Council.



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