122 OLD HALL STREET

SUSTAINABILITY STATEMENT

NOVEMBER, 2016

WSP | PARSONS BRINCKERHOFF

122 OLD HALL STREET

SUSTAINABILITY REPORT

Project no: 70023367
Report no: WSP-3367-SUST-st2
Date: 11th November, 2016

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DISCLAIMER

The purpose of this report is to record the development of the design through to the end of Stage 2, identifying assumptions, recording key design decisions and providing a platform for the on-going development of the 122 Old Hall Street design.

This is a targeted report covering 122 Old Hall only, including basement, overview of retail and amenity areas, and apartments. Please contact the authors for further information.

The findings and opinions expressed are based on the conditions encountered and/or information reasonably available at the date of issue of this document and will be applicable only to the circumstances envisaged herein.

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1

EXECUTIVE SUMMARY

Considering the principles of sustainability early in the design and planning process is a positive step to ensuring that the new development is sustainable in terms of construction, operation, the local community, the environment and its future occupation.

This Sustainability Report has been produced to demonstrate how the design of 122 Old Hall Street (the Proposed Development) addresses the various issues that contribute to sustainable development and is submitted in support of the planning application. A review of national, regional and local planning policies was undertaken, with particular emphasis on the 2012 National Planning Policy Framework (NPPF), the Liverpool Unitary Development Plan, Liverpool's Climate Change Strategic Framework, and the Commercial Quarter SPD.

A new Liverpool Local Plan is currently under review and has not yet been implemented as a planning requirement. In anticipation of the issues the new local plan will address, the proposed development responds to the following issue raised in the various current policy documents:

POLICY ITEM	SUMMARY
Climate Change Adaptation and Mitigation	The proposed development has been carefully designed to take the likely impacts of climate change into account. Proposed measures will promote flexible living accommodation and help to reduce internal and external overheating, and provide benefits in terms of balancing the microclimate.
Energy & CO_2	The proposed Energy Assessment seeks to meet the requirements of Building Regulations Part L 2013. The project has adopted a fabric first approach by relying on an effective thermal envelope and efficient lighting to minimise loads on active systems. Two system options that meet or exceed Part L have been outlined.
Effective Use of Land	The proposed development reuses previously developed land and improves utilisation of the available plot of land. Its occupancy will bring socio-economic benefits to the local area while aiming to minimise its environmental impacts as much as possible.
Materials	Though no specific materials focused requirements are outlined in the Liverpool Unitary Development Plan, several issues have been identified as topics for further assessment in Stage 3. The project will seek to adopt a sustainable approach to material selection wherever practicable.
Water Management	The proposed development will be designed to minimise water use and impact on urban drainage. Measures include the use of water saving fixtures and fittings, optimised water management through metering and leak detection. A sustainable approach to site drainage and flood risk mitigation have been described in two separate documents: the Drainage Strategy Report and the Flood Risk Statement.
Pollution and Local Impacts	The construction and operation of the proposed development will ensure that pollution to land, air and water are minimised by implementing best practice construction policies and design in terms of spillages and excessive emissions during construction, noise pollution and light pollution at night.
Waste Management	The proposed development will incorporate good practice waste reduction measures to reduce, reuse, and recycle wherever practicable. Strategies will be developed to, manage the effects of both construction waste and operational waste by minimising its generation and maximising reuse or recycling.
Health and Wellbeing	The proposed design includes a variety of initiatives aimed at providing a healthy and safe environment to residents such as ensuring ventilation provision meets the regulatory requirements, good practice lighting design including good access to natural light. Where practicable, materials will be used that minimise volatile organic compounds (VOC) or other chemical components; good practice acoustic design; creation of a development which offers minimum risk for crime and anti-social behaviour.
Biodiversity	The site largely comprises of hard standing, steel fencing and brick walls with a small area of bare ground covered with scattered scrub located in the south-eastern corner of the site. No impacts upon statutory designated sites within 10ikm or non-statutory sites within 2km are expected from the proposed development due to the ecological context of these sites and their distance from the site. Ecological enhancements have been recommended in the Ecological Appraisal report. These recommendations have been made to improve the biodiversity value where possible and appropriate, including the planting of native trees and shrubs.
Transportation and Accessibility	The site has good public transport connections including the Pierhead Ferry Terminal, Moorfields Railway Station (0.5 mile walk), Lime Street Railway Station (less than 1 mile walk). As part of the project, improved pedestrian access routes will be provided and cycle routes will be considered throughout the design of the public realm areas. The project also provide provision of secure bicycle storage.

2 APPROACH TO SUSTAINABILITY

2.1 SUSTAINABILITY STRATEGY

WSP UK was commissioned by 122 Old Hall Street Ltd. to develop a Sustainability Strategy for the 122 Old Hall Street development (the Proposed Development) in the Commercial Quarter of Liverpool, to identify the most appropriate design solutions that meet the relevant planning and Building Regulations targets which apply to the development.

The appraisal identifies key legislative drivers, local planning policy and client targets in regards to sustainable development and establishes how these objectives are met by the design.

2.2 DEVELOPMENT DESCRIPTION

EXISTING SITE

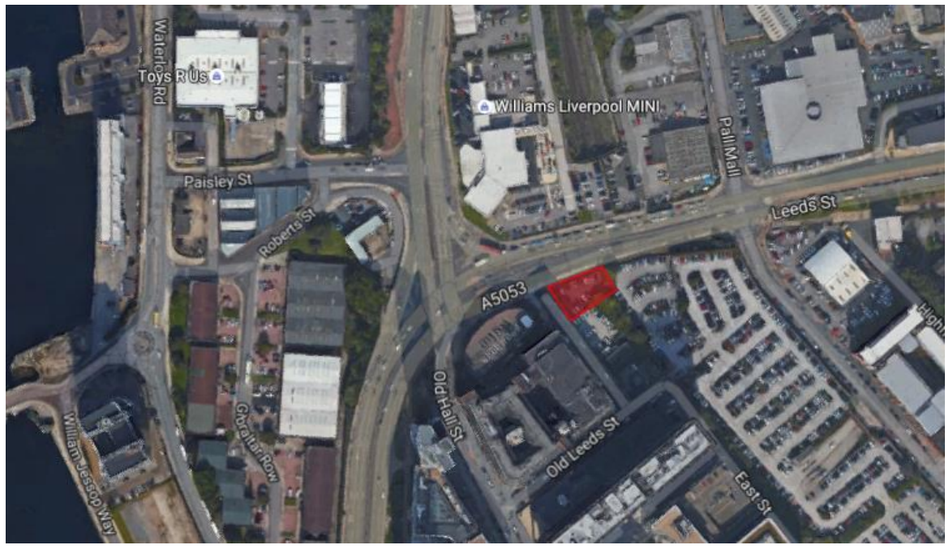
The site is a car park on the corner of Leeds Street and Back Leeds Street. A map of the site, with the location of the new development is shown in red in Figure 2-1

PROPOSED DEVELOPMENT

The 122 Old Hall Street development consists of the erection of one residential tower of 31No. stories, which currently consists of:

- Levels 01-22, each containing 7No. apartment in a mixture of 1 and 2 bed sizes
- Level 24 & 24, each containing 4No. 3 bed apartments on each level
- Levels 25 & 26, containing a total of 6No. duplex penthouse apartments
- Ground floor residential lobby and lounge
- Mezzanine level
- Transfer level
- 2No.Basement plant room levels (potentially being reduced to one level depending on the chosen building mechanical system – See the energy and carbon statement)

Figure 2-1 Site Location Map for the Proposed Development



3 POLICY CONTEXT

3.1 OVERVIEW

Liverpool City Council is currently undergoing a review of the new Liverpool Local Plan. Until this document is adopted, it is understood that the following documents need to be reviewed:

- The Liverpool Unitary Development Plan (Adopted November 2002)
- The Joint Merseyside and Halton Waste Local Plan (2013)

In addition to National and City requirements, the Commercial Quarter of Liverpool has its own Supplementary Planning Document.

3.2 NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework (NPPF) replaced the suite of Planning Policy Statements and Guidance in 2012. At the heart of the NPPF is a "presumption in favour of sustainable development", which should be seen as a "golden thread" running through both plan-making and decision-taking.

The NPPF identifies three dimensions to sustainable development - economic, social and environmental – which should be applied jointly and simultaneously:

- **Economic role** – contributing to building a strong, responsive and competitive economy, by identifying and coordinating development requirements, including the provision of infrastructure;
- **Social role** – supporting strong, vibrant and healthy communities, by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being;
- **Environmental role** – contributing to protecting and enhancing our natural, built and historic environment. This includes helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change.

The NPPF promotes the pursuit of sustainable development by seeking positive improvements to the built and natural environment, and to people's quality of life. This will include:

- Improving the conditions in which people live, work, travel and take leisure
- Widening the choice of high quality homes

3.3 REGIONAL POLICY – LIVERPOOL CITY COUNCIL

The sustainability strategy for 122 Old Hall Street has been designed to fully align with the objectives and aspirations of the Liverpool Unitary Development Plan, and the Joint Merseyside and Halton Waste Local Plan. Together these documents set out a range of policies to underpin Liverpool's response to local and national sustainability issues. An overview of the key requirements is provided in Table 3-1 below:

Table 3-1 Summary of Liverpool City Council's development policies

POLICY	SUMMARY
Energy & CO_2	Meet the requirements of Building Regulations Part L 2013.
Water Management	Address urban drainage issues, protect surface and ground water. If the site is at risk of flooding, provide appropriate mitigation. Ensure the development does not have an adverse effect on flood risk.
Pollution	Ensure that there is no potential to create unacceptable air, water, noise or other pollution or nuisance. Minimise risk to human health and the environment.
Waste Management	Include measures to protect watercourses, floodplains and groundwater. Ensure development does not pose an unacceptable risk to the current supply of water. Where necessary, provide appropriate alleviation or mitigation measures to minimise flood risk
Transportation	Ensure secure cycle parking facilities are provided. Improve access and mobility for all pedestrians. Ensure that routes for pedestrians are pleasant and direct as well as safe.

3.4 LOCAL POLICY – LIVERPOOL COMMERCIAL QUARTER

COMMERCIAL QUARTER SUPPLEMENTARY PLANNING DOCUMENT

The sustainability appraisal involves assessment of the predicted effect of a number of development options for the Quarter against a range of economic, social and environmental criteria. Developments should be both sustainable and flexible, addressing the following issues:

- Attain at least a "good" rating on the Building Research Establishment's Environmental Assessment Method (BREEAM).
- Residential developments should follow the principles set out in the Building Research Establishment's EcoHomes rating.
- Construction materials should be durable and robust, so that they can be easily maintained and cleaned, minimising the need for replacement.
- Use of recycled materials and material from renewable sources is encouraged.
- Provision for recycling of waste generated by the development.

4 ENVIRONMENTAL RATING METHODS

4.1 CODE FOR SUSTAINABLE HOMES

There are currently no requirements for environmental ratings of residential buildings in Liverpool's Unitary Development Plan. A separate document, the City of Liverpool Climate Change Strategic Framework: A prospectus for Action (September 2009)1, references that the Liverpool First Partnership for Housing will prepare a detailed action plan to include continued implementation of national Code for Sustainable Homes (CfSH). It is understood that this is not currently a requirement to be submitted as part of the planning application. As CfSH no longer a requirement, a Code pre-assessment has not been provided with this planning submission.

4.2 BRE ECO HOMES

The Liverpool Commercial Quarter SPD2 has a requirement to follow the principles set out in the Building Research Establishment's Eco Homes Rating. This standard was a precursor to the Code for Sustainable Homes. During design, 122 Old Hall Street will follow the principles set out in these rating systems where.

4.3 BREEAM

BREEAM is a market-focused tool aimed at encouraging significant improvements in the performance of buildings through the recognition and demonstration of improvements made to those buildings.

The Liverpool Commercial Quarter SPD has a requirement to achieve a BREEAM GOOD rating. This is only relevant to non-residential buildings, and therefore not currently relevant to this project. If future additions to the development contain non-residential components, to address this requirement, a BREEAM pre-assessment will be carried out as required.

[1] https://liverpool.gov.uk/media/9142/liverpool_climate_change_implementation_programme_sept2009.pdf

[2] https://liverpool.gov.uk/media/9376/commercial-quarter-spd.pdf

5 CLIMATE CHANGE ADAPTION AND MITIGATION

The effects of climate change can already be seen in UK weather patterns and it is prudent to consider the likely impact of changes on new developments. Taking action to mitigate the effects will help future proof the new buildings, providing longevity and flexibility to the development and making it an attractive place to live, regardless of the climate.

Climate change adaptation measures will improve the resilience to changing climate. Their benefits include reduced carbon dioxide emissions and improved water and energy security. Furthermore they can assist with tackling social inequality and boost the 'green' economy.

Taking action to mitigate the effects of climate change will help future proof buildings and infrastructure, providing longevity and flexibility to the development and making it an attractive place to work, regardless of the climate. It is important that the buildings and spaces built today are suitable for occupation and use for their anticipated lifetime.

Particularly relevant for Liverpool is the urban heat island effect. This is the term given to the observed higher temperatures in cities and towns in comparison to rural areas. The predicted impact of climate change is to make the world warmer, particularly summers, which would exacerbate the urban heat island effect in Liverpool.

The UK Climate Projections 20093 data for Northwest England are presented in Table 5-1 below, showing predicted increased temperatures.

The climate change data also show that along with warmer summers, rainfall patterns are likely to change. This means new developments should consider how they manage rainfall and use water carefully.

Table 5-1 – Climate Change Impacts for Northwest England (UKCP09)

	2020	2050	2080
Summer Mean Temperature	+1.5°C	+2.6°C	+2.8°C
Summer Mean Daily Max. Temperature	+1.9°C	+3.3°C	+3.6°C
Winter Mean Precipitation	+6%	+13%	+15%
Summer Mean Precipitation	-8%	-16%	22%

UKCP09 suggests that Liverpool could:

- By the 2020s, see an increase in summer mean temperature of 1.5°C, a decrease in mean summer rainfall of 8% and an increase in mean winter rainfall of 6%, all from a 1961 – 1990 baseline.
- By 2050s, see an increase in mean summer temperature of 2.6°c, an increase in mean winter rainfall of 13% and a decrease in mean summer rainfall of 18%
- By the 2080s, see an increase in mean summer temperature of 2.8°C, an increase of 16% in mean winter rainfall and a decrease in mean summer rainfall of 22%

[3] http://ukclimateprojections.defra.gov.uk/

The climate change data also show that along with warmer summers, rainfalls patterns are likely to change. This means that new developments should consider how they manage rainfall and use water carefully.

5.1 REQUIREMENTS AND TARGETS

The City of Liverpool Climate Change Strategic Framework: A prospectus for Action (September 2009)4 references that the City Council is currently preparing its Core Strategy, the key planning policy document within its local framework. It is anticipated that the new Local Plan will require that the new buildings will address the following issues related to climate change:

- Buildings provide for flexibility of uses during their projected operational lives.
- Buildings adapted to and mitigate for the effects of the urban heat island and the expected increases in hot dry summers and wet mild winters.

5.2 DESIGN APPRAISAL

The development has been carefully designed to take the likely impacts of climate change into account:

OVERHEATING IN DWELLINGS

The strategy for minimising the need for active cooling for the proposed development is as follows:

- Passive design:
  - 100% low energy lighting will be provided to reduce internal heat gains within the apartments.
  - A highly efficient unitised curtain walling systems is proposed to minimise heat loss and manage solar gains.
- Passive and natural ventilation techniques:
  - All apartments will benefit from opening windows in regularly occupied spaces to allow the apartments to be cooled by natural ventilation for the majority of time throughout the year.
- Apartments that have higher proportions of glazing will be provided with high efficiency comfort cooling systems to ensure comfortable internal temperatures are maintained.
- Typical apartments on the South and South West facades were assessed against the SAP Appendix P overheating criteria and Part L1A Criterion 3. According to the results of the preliminary SAP calculations, all apartments modelled comply with the overheating criteria with the building fabric specifications described within this document and with the assumption that apartments benefit from internal curtains as specified in SAP guidance. Overheating studies will be continued in detail during Stage 3.

OVERHEATING IN CORRIDORS

In addition, it is recognised that market feedback on internal heat networks (particularly within multi storey residential buildings) in recent years has highlighted a common, significant failing; the overheating of internal corridor spaces particularly in summer. Solutions adopted to mitigate this problem include:

[4] https://liverpool.gov.uk/media/9142/liverpool_climate_change_implementation_programme_sept2009.pdf

- Low energy lighting to reduce heat gains within the corridors.
- PIR sensors on lighting systems to turn off lights when not required.
- Use of pre insulated pipework and robust attention to insulation detailing at values and equipment.
- Enhanced ventilation in corridors (supplying tempered fresh air through the smoke shafts).

DEVELOPMENT FLEXIBILITY

The proposed development incorporates a number of measures and approaches to promote flexible living and working accommodation, as far as practicable.

EASE OF PLANT MAINTENANCE AND REPLACEMENT

Replacement of major items of plant at basement, ground and roof levels should not be required during the normally anticipated life expectancy of the plant. However, as the anticipated life of the building is in excess of the life of the plant (typically 20-25 years) consideration has been given as to how these services can be replaced without significant impact on the building structure. This strategy also accommodates for any major plant failure prior to the expected 20-25 years plant life.

Major items of plant are located at basement and roof levels. The plant replacement strategy is such that normal periodic plant maintenance activities and minor equipment replacement can be carried out using normal access routes such as lifts and staircases. A grille to the south of the site provides a large opening to access the basement if needed.

SUSTAINABLE URBAN DRAINAGE

Drier summers and periods of prolonged drought will put pressure on the availability of mains water which will simultaneously be subjected to increased demand to supply new development. Conversely, increases in winter precipitation and the frequency of unpredictable, intense rainfall events will lead to a greater risk of flash flooding in from surface water run-off, exacerbated by increased urbanisation.

The development will include measures for water conservation and managing surface water runoff. These measures are discussed in the Drainage Strategy report.

FLOOD RISK

The site’s drainage strategy considers both a 20% and 40% increase in peak rainfall due to climate change. Attenuation storage is sized to accommodate the 1 in 100 year storm with a 40% allowance for climate change. Therefore, it is considered that the design of the strategy has a reasonable consideration for increased surface water flows due to climate change.

Further details can be found in the Flood Risk Statement.

6 ENERGY AND CARBON STATEMENT

When considered at the planning stage, the design of new developments and the choice of energy sources must ensure that energy will be used efficiently and sustainably.

6.1 REQUIREMENTS AND TARGETS

The requirement for planning in terms of energy and carbon is to meet or exceed Part L of the Building Regulations.

Part L1A of the Building Regulations - Conservation of fuel and power in new dwellings sets a Target Emissions Rate (TER) based on CO2 emissions for dwellings. Part L1A also sets a fabric energy efficiency standard (FEES) which determines the dwellings maximum heating and cooling demand. It is measured as the amount of energy which would normally be needed to maintain comfortable internal temperatures in a home and is measured in kWh/m^2/yr.

The targets use a “notional” dwelling design and set “improvement factors” for the developer to demonstrate that their designs are within the targets. The TER is set approximately 6% lower across the build mix than the previous regulations in 2010. This means that new homes must be designed to emit 6% less CO2 using a variety of means, including improving both the building fabric and the efficiency of building services. FEES is a new standard introduced in Part L1A 2013.

Under the Building Regulations residential accommodation is assessed using the Standard Assessment Procedure (SAP). SAP calculations are a Building Regulations requirement for all new houses, conversions and some extensions. The SAP is a measure of the energy consumption of a property and is used to compare the energy and environmental performance of dwellings.

SAP quantifies a dwelling’s performance in terms of energy use per unit floor area, a fuel-cost-based energy efficiency rating (the SAP Rating) and emissions of CO2 (the Environmental Impact Rating). These indicators of performance are based on estimates of annual energy consumption for the provision of space heating, domestic hot water, lighting and ventilation. Other SAP outputs include an estimate of appliance energy use, the potential for overheating in summer and the resultant cooling load.

At this stage typical TER and FEES should be used based on Part L1A 2013 compliant dwellings. This initial evaluation is primarily to ascertain the likely energy consumption and the requisite contribution of the most appropriate Low or Zero Carbon Technology to meet as a minimum the planning obligations.

6.2 DESIGN APPRAISAL

PASSIVE DESIGN

122 Old Hall Street is taking a fabric first approach to meeting the energy targets. An efficient building fabric is proposed to reduce heat loss in winter heating months and also to minimise overheating risk in the summer months.

Particular consideration has been given to the passive performance of the apartments, and specifically the need to minimise the risk of overheating while and achieving good daylighting levels within the apartments.

One of the key drivers in the form of the building was to reduce the façade area to floor area ratio. A building of this form inherently has significantly lower heat loss than a rectangular structure due to reduced skin area.

One of the design options that meets Part L is focussing on the use of triple glazing and highly insulated spandrel panels to minimise heat loss, while allowing excellent access to natural light.

Dwellings will include low energy lighting, reducing both electrical energy use and internal heat gain, allowing most of the apartments to be cooled passively through use of operable windows.

ELECTRIC HEATING SYSTEM

The potential use of a wet heating system was investigated, and options that would meet Part L were developed; however, the preferred system for 122 Old Hall Street is an all-electric solution.

The space heating will be provided using electric heating panels and ventilation will be delivered using mechanical heat recovery ventilators (MVHRs). Domestic Hot Water (DHW) will be provided using electric water heaters with highly insulated tanks.

The advantages of an electric heating system (compared to a wet-heating system) are:

- An all-electric solution takes up considerably less floor space than a wet heating system, and uses significantly less material.
- The all-electric solution requires very little plant space, and only requires one basement floor. The all-electric system therefore requires significantly less excavation than the wet system, which would require two basement floors.
- Though electric heating is, in principle, a higher carbon heating source than natural gas, the optimised use of space and reduced cost of the system allow money to be spent on additional energy saving measures that can allow equivalent or better performance in terms of annual emissions.
- By 2050 the UK is committed to reducing greenhouse gas emissions by at least 80% compared with 1990 levels. Decarbonisation of the grid will play a major role in this process. The use of electric heating allows the project to take advantage of the decarbonisation of the grid.

PRELIMINARY ENERGY ANALYSIS

A preliminary SAP assessment was carried out on representative apartments within the building. A conservative approach was taken in selecting which apartments were selected for analysis. The typical apartment is represented by a south/west facing apartment in Floor 22. The duplex apartments were represented by the south/west facing duplex apartment.

Several system types and façade combinations were analysed to determine which options met the energy target, and which options met with the architectural aspirations and the required budget.

PRELIMINARY ENERGY CALCULATIONS – TYPICAL FLOOR (LEVEL 22)

Accredited Design SAP software was used to determine the performance of the current design against Part L of the Building Regulations. The analysis focussed on the worst-case apartments (i.e. the south-west facing apartments with the largest façade to floor area ratio. The top floor apartments were analysed as well as a typical floor, because the current design intent is to include comfort cooling on the top-floor, duplex apartments.

The table below summarises the inputs and results for the worst case apartment that is not on the top floor (Note that curtain wall and glazing U-values include thermal bridging):

SUMMARY:

- → The preferred system is: Electric heating system
  - Requires MVHRs
  - Requires triple glazing
  - Requires highly insulated electric hot water cylinders (150kWh/24hr heat loss)
  - Requires ~340 m^2 of roof-mounted PV
  - Note – if the glazing area is reduced, it may be possible to change to double-glazing and/or reduce the PV area required. This may be investigated in Stage 3.

Table 6-1 – SAP Analysis Summary for Critical Apartment on Level 22

70023367 - 122 Old Hall Street, Liverpool																										Rev 1
Sample apartment - Level 22 - Orientation - South / West-Facing																										
Iteration Revision	Design Criteria																			Dwelling Fabric Energy Efficiency ($kgCO_2/m^2$)		% Improvement on TFEE	Dwelling Emission Rate ($kgCO_2/m^2$)		% Improvement on TER	Comments
	Building Air perm.	Fabric U-values						Glazing Specification			Heating		Cooling	Mechanical Ventilation (W/l/s)			Low Energy Lighting (L.E.L)			LZC						
	$m^3/h.m^2$ at 50Pa.	Ground	Curtain Wall	Party Walls	Roof	Doors	Glazing	G-value	Lt	Internal Blinds	LTHW	DHW	Energy Class	Extract only	PIV	MVHR	Total number of light fittings	Percentage L.E.L	Electricity Tariff	Technology	TFEE	DFEE		TER	DER		
Rev 01	3.0	0.13	1.40	0.00	0.13	1.00	1.40	0.56	71%	Yes - to non vent windows only	Communal gas 90% HIU	Communal gas 90% HIU	-	✓	-	-	15	15	Standard	-	36.73	**45.80**	**-24.77%**	16.02	**18.24**	**-13.87%**	Double glazed curtain walling - average weighted U-value 1.4
Rev 02	3.0	0.13	1.00	0.00	0.13	1.00	1.00	0.56	70%	Yes - to non vent windows only	Communal gas 90% HIU	Communal gas 90% HIU	-	✓	-	-	15	15	Standard	-	36.66	**35.61**	**2.88%**	16.00	**15.59**	**2.59%**	Triple glazed curtain walling - average weighted U-value 1.0
Rev 03	3.0	0.13	1.00	0.00	0.13	1.00	1.00	0.56	70%	Yes - to non vent windows only	Communal gas 90% HIU	Communal gas 90% HIU	-	✓	-	-	15	15	Standard	CHP	36.66	**35.61**	**2.88%**	16.00	**12.73**	**20.46%**	Triple glazed curtain walling - average weighted U-value 1.0 CHP - 30% heat demand, 1.28 heat power ratio
Rev 04	3.0	0.13	1.00	0.00	0.13	1.00	1.10	0.56	70%	Yes - to non vent windows only	Electric panel heaters	250l Electric cylinder - Insulated loss 1.50kWh / 24hr	-	-	-	✓ sfp 0.6 W/l/s	15	15	Standard	-	36.66	35.74	2.52%	23.66	24.37	2.98%	Curtain Walling - 28% Opaque, 72% Glazing Electric Heating & DHW, No PV, MVHR approved installation with insulated ducts
Rev 05	3.0	0.13	1.00	0.00	0.13	1.00	1.10	0.56	70%	Yes - to non vent windows only	Electric panel heaters	250l Electric cylinder - Insulated loss 1.50kWh / 24hr	-	-	-	✓ sfp 0.6 W/l/s	15	15	Standard	PV	36.66	35.74	2.52%	23.66	22.57	4.62%	Curtain Walling - 28% Opaque, 72% Glazing Electric Heating & DHW, 340m^2 PV Site wide (2m^2 apportioned per apt), MVHR approved installation with insulated ducts
Rev 06	3.0	0.13	0.84	0.00	0.13	1.00	1.10	0.56	70%	Yes - to non vent windows only	Electric panel heaters	250l Electric cylinder - Insulated loss 1.50kWh / 24hr	-	-	-	✓ sfp 0.6 W/l/s	15	15	Standard	-	36.66	32.00	12.63%	23.65	23.29	1.52%	Curtain Walling - 40% Opaque, 60% Glazing Electric Heating & DHW, No PV, MVHR approved installation with insulated ducts

PRELIMINARY ENERGY CALCULATIONS – DUPLEX FLOOR (LEVEL 25)

Accredited Design SAP software was used to determine the performance of the current design against Part L of the Building Regulations. The analysis focussed on the worst-case apartments (i.e. the south-west facing apartments with the largest façade to floor area ratio. The top floor apartments were analysed as well as a typical floor, because the current design intent is to include comfort cooling on the top-floor, duplex apartments.

The table below summarises the inputs and results for the worst case, top floor (duplex) apartment (Note that curtain wall and glazing U-values include thermal bridging):

SUMMARY:

→ Rev 04 Meets energy and overheating requirements:

- Requires use of electric air source heat pumps to provide:
  - Space heating
  - Space cooling (to meet overheating requirements)
  - Requires triple glazing (with current glazing area)
  - Requires highly insulated electric hot water cylinders (150kWh/24hr heat loss)
  - Requires MVHRs

Table 6-2 – SAP Analysis Summary for Critical Apartment on Level 25 (Duplex)

70023367 - 122 Old Hall Street, Liverpool																								Rev 1
Sample duplex apartment - Level 25 - Orientation - South / West-Facing																								
Iteration Revision	Design Criteria																		Dwelling Fabric Energy Efficiency ($kgCO_2/m^2$)		% Improvement on TFEE	Dwelling Emission Rate ($kgCO_2/m^2$)		% Improvement on TER	Comments
	Building Air perm.	Fabric U-values						Glazing Specification			Heating		Cooling	Mechanical Ventilation (W/l/s)			Low Energy Lighting (L.E.L)			LZC				
	$m^3/h.m^2$ at 50Pa.	Ground	Curtain Wall	Party Walls	Roof	Doors	Glazing	G-value	Lt	Internal Blinds	LTHW	DHW	Energy Class	Extract only	PIV	MVHR	Total number of light fittings	Percentage L.E.L	Electricity Tariff	Technology	TFEE	DFEE		TER	DER		
Rev 01	3.0	0.13	1.00	0.00	0.13	1.00	1.00	0.56	70%	Yes - to non vent windows only	90%	90%	A	✓	-	-	30	30	Standard	-	41.74	**39.29**	**5.86%**	13.76	**12.90**	**6.22%**	Triple glazed curtain walling - average weighted U-value 1.0. Enery class A cooling to Living area only (approx 30% of unit).
Rev 02	3.0	0.13	1.00	0.00	0.13	1.00	1.00	0.56	70%	Yes - to non vent windows only	90%	90%	A	✓	-	-	30	30	Standard	-	41.74	**39.29**	**5.86%**	13.76	**13.63**	**0.92%**	Triple glazed curtain walling - average weighted U-value 1.0. Enery class A cooling to Living and bedrooms (approx 74% of unit).
Rev 03	3.0	0.13	1.00	0.00	0.13	1.00	1.00	0.56	70%	Yes - to non vent windows only	90%	90%	A	✓	-	-	30	30	Standard	CHP	41.74	**39.29**	**5.86%**	13.76	**10.99**	**20.11%**	Triple glazed curtain walling - average weighted U-value 1.0. Enery class A cooling to Living and bedrooms (approx 74% of unit). CHP - 30% heat demand, 1.28 heat power ratio
Rev 04	3.0	0.13	1.00	0.00	0.13	1.00	1.00	0.56	70%	Yes - to non vent windows only	Electric Heat Pump	250l Electric cylinder - Insulated loss 1.50kWh / 24hr	A	✓	-	-	30	30	Standard	-	41.74	**39.41**	**5.58%**	20.31	**18.20**	**10.40%**	Curtain Walling - 20% Opaque, 80% Glazing Heat pump & Electric DHW, No PV, MVHR approved installation with insulated ducts

7

MATERIALS

Current resource use in developed counties such as the UK is unsustainable. Each new development needs to be designed so that more sustainable materials can be used and resources are used in the most sustainable way possible, for example by reusing any materials from demolition.

The depletion of certain material resources along with the environmental impact of the materials extraction, processing and manufacturing puts a huge burden on our planet. In the UK it is estimated that 7 tonnes of construction materials are used per person each year.

To address these issues, there is now an increased focus on 'embodied impacts' due to material use, a drive to use materials in a more efficient way and to select materials based on their environmental, health and ethical credentials. The careful choice and application of building materials does not only have a positive impact on the environment and the building occupants, it can also reduce costs over the lifetime of the building.

The design of the Proposed Development will broadly follow the materials hierarchy displayed in Figure 7-1.

7.1 REQUIREMENTS AND TARGETS

The Liverpool Unitary Development Plan doesn't have specific requirements dedicated to materials. However, to address this important issue, the project will follow the following principles where practicable (each to be verified in Stage3):

- Avoid insulation materials containing substances known to contribute to stratospheric ozone depletion and global warming
- Aggregate Resource Depletion - Minimise use of new aggregates.
- Minimise Natural Resource Depletion - No peat or natural weathered limestone used in buildings or landscaping.
- Preference should be given to materials derived from recycled and reused content in products and materials selected.
- Specification of locally sourced materials wherever practicable.

7.2 DESIGN APPRAISAL

The materials specification for 122 Old Hall Street will be developed during Stage 3, and will address each of the following categories in terms of balancing the requirements of the design brief with the requirements for a building with low environmental impact.

ENVIRONMENTAL IMPACT

LOW IMPACT

The environmental impact of the proposed materials palette will, where practicable, have regard for selecting components that score well under The Green Guide to Specification[5].

[5] www.thegreenguide.org.uk

EXTERNAL MATERIALS WITH LOW ALBEDO AND HIGH CONDUCTIVITY

Where practicable, the proposed development will make use of externally used materials with a low albedo and high conductivity (like grass or concrete). These will be advantageous to a building's climate resilience since they store heat energy which is then re-radiated at night when it is cooler.

VOLATILE ORGANIC COMPOUNDS (VOCS)

Where practicable, prioritisation will be given to materials which contain no harmful substances and preservatives with minimum toxicity.

LOW GLOBAL WARMING POTENTIAL (GWP)

Where practicable, prioritisation will be given to insulation materials with low/zero GWP.

Figure 7-1 – Materials Design Hierarchy

RECYCLED CONTENT

Demolition materials will be utilised on site if and where practicable, e.g. the use of crushed bricks and concrete for uses such as blinding concrete, piling mats and mass concrete fill.

The building's new concrete structural elements will contain recycled material where feasible such as cement replacement with fly ash or ground granulated blast furnace slag (GGBS) as well as secondary aggregates.

8 WATER MANAGEMENT

Water consumption is an important issue to address as not only does it carry a financial cost and large carbon footprint but climate change predictions also forecast irregular rainfall patterns, leading to either too much water in winter, increasing flood risk, or insufficient in summer. In terms of the environmental impact of water consumption, Water-wise produced figures which show that the production of potable water requires chemicals and energy in large amounts and creates a carbon footprint for water of almost 300kgCO2/1000 m3.

A responsible and prudent use of water should therefore reduce pressure on the environment both in terms of water scarcity, waste water quantities and CO2 emissions related to water treatment and distribution.

8.1 REQUIREMENTS AND TARGETS

The Liverpool Unitary Development Plan sets out the following requirements regarding water management for new developments:

- Incorporate measures to protect water courses, floodplains and groundwater
- Do not adversely affect the quality or supply of surface water or ground water
- No local abstraction of surface or ground water which would:
  - Increase requirements for water (unless adequate supply already exists)
  - Pose an unacceptable risk to the current supply of water users
- Unless appropriate alleviation or mitigation measures are carried out, the development must not:
  - Be at direct unacceptable risk of flooding
  - Be likely to increase the risk of flooding elsewhere
  - Cause loss of access to watercourses for future maintenance
  - Result in an adverse impact on the water environment due to additional surface water run off
  - Have adverse effects upon the integrity of tidal and fluvial defences

8.2 DESIGN APPRAISAL

The Proposed Development will be designed to minimise water use and impact on urban drainage.

WATER CONSERVATION AND REUSE

The Proposed Development employs best practice design in regards to water conservation and will have a reduced mains water demand over typical building performance. Proposed water saving features include:

WATER EFFICIENT SANITARY WARE

Water efficient sanitary fittings such as low flush WCs and low flow taps and showers with flow regulators will be installed in the dwellings.

All sanitary appliances shall be fitted with a flow limiting valve to automatically limit the flow of hot and cold water in accordance with the BS8558 and Approved Document Part G, whichever is the more stringent.

WATER USE DURING CONSTRUCTION

Water consumption targets will be set for the construction site and usage will be monitored.

MANAGING WATER USE

To ensure ongoing sustainability performance during building operation, water use must be appropriately and effectively managed.

Proposed features include:

- Water meters: Water metering will enable monitoring and evaluation of water usage by residential occupants and building management team.
- Leak detection and prevention: Systems will be specified to detect a major water leak on the mains supply.

8.3 SUSTAINABLE DRAINAGE

SURFACE WATER DRAINAGE STRATEGY

Following the hierarchy for surface water disposal, since discharge by infiltration or to a watercourse are not feasible the surface water will discharge to the public combined water sewer which runs through the site.

The proposed discharge rate from the site will be restricted to 10 l/s in accordance with the United Utilities consultation response.

Attenuation storage will accommodate flows for up to the 1 in 100 year storm including a 40 % allowance for climate change.

Owing to the limited external space which is highly congested with underground services, the attenuation storage is currently proposed in the basement of the building. Surface water will be pumped from this storage tank in order to connect to the combined water sewer running through the site. However, the routing of the surface water network and location and arrangement of the attenuation storage will be confirmed following internal and external coordination at the detailed design stage.

Further details can be found in the Drainage Strategy report.

FLOOD RISK STRATEGY

The site's drainage strategy considers both a 20% and 40% increase in peak rainfall due to climate change. Attenuation storage is sized to accommodate the 1 in 100 year storm with a 40% allowance for climate change. Therefore, it is considered that the design of the strategy has a reasonable consideration for increased surface water flows due to climate change.

Further details can be found in the Flood Risk Statement.

9 POLLUTION AND LOCAL IMPACTS

Historically pollution was controlled after it was created. Treating wastewater, filtering air emissions, and creating landfills for solid waste are all methods of controlling pollution after it has been created. Pollution prevention means avoiding pollution at the source rather than trying to control it afterwards. Projects should always try to reduce pollution first. This approach can benefit the environment and save money. During the construction and the operation of the building, there are many sources of pollution that should be addressed and minimised, such as:

- Air pollution: CO2 emissions, particulates, dust, volatile organic compounds (VOC) etc.
- Land pollution: spills and improper waste disposal
- Water pollution: spills accessing local water ways and the aquifer
- Light pollution
- Noise pollution

9.1 REQUIREMENTS AND TARGETS

The Liverpool Unitary Development Plan sets out the following requirements regarding pollution management for new developments:

- Ensure that there is no potential to create unacceptable air, water, noise or other pollution or nuisance.
- Minimise risk to human health and the environment, and encourage and apply the most advanced technical solutions.

9.2 DESIGN APPRAISAL

AIR POLLUTION

The proposed design minimises air pollution in the following ways:

- Low CO2 emissions during operation (see Energy Strategy)
- Use of high efficiency boilers and CHP engines so that the low dry NOx emissions
- Dust and other air pollution will be minimised during construction, enforced through the Considerate Constructors Scheme (CCS) requirements that will be specified

LAND AND WATER POLLUTION

The proposed design minimises pollution to land and water in the following ways:

- Best practice procedures will be applied on site in regards to dealing with spillage and site waste management, enforced through the requirements specified in the Liverpool UDP.
- Good practice construction methods include a baseline conditions appraisal before work commences to ensure no unacceptable impacts from construction.

NOISE POLLUTION

During the period of construction the requirements defined in the CCS scheme limit the impacts allowed by construction activities. This will require that noisy construction activities are restricted and appropriate to the area and time of day.

LIGHT POLLUTION

As a residential (and therefore 24h) development, due cognisance has been given to the impact on light pollution. The proposed design minimises light spillage to the night sky in the following ways:

- The external lighting design will be in compliance with the guidance in the Institution of Lighting Engineers (ILE) Guidance notes for the reduction of obtrusive light, 2005.
- All external space lighting, including lighting in common areas, is provided by dedicated energy efficient fittings with appropriate control systems such as passive infrared (PIR),‘dusk to dawn’ daylight sensors and time switches.

MICROCLIMATE

A pedestrian comfort analysis has been undertaken to address the impact the project has on the local wind speeds.

10 WASTE

The UK construction industry is responsible for the consumption of 400 million tonnes of resources every year and produces 120 million tonnes of waste (source: WRAP). This is a very large amount of largely finite, natural resources being consumed and of which, a third is thrown away. This is clearly not financially or environmentally responsible and organisations like Waste Recycle Action Plan (WRAP) are promoting a more sustainable approach to using natural resources.

10.1 REQUIREMENTS AND TARGETS

Various standards are referenced in the Waste Management Strategy:

- National Planning Policy Framework (2012)
- National Planning Policy for Waste (2014)
- Waste Management Plan for England (2013)
- Joint Merseyside and Halton Waste Local Plan6
- The Joint Waste Recycling and Waste Management Strategy for Merseyside: Resources Merseyside 2011-2041
- Liverpool Core Strategy Submission Draft (2012)

Section 3.7 of the Waste Management Strategy report outlines targets and objectives that need to be set during design, including:

- Ensure there is an effective system of waste minimisation, reuse and recycling of waste in place that focuses on:
  - Quantifying raw material wastage
  - Quantifying the generation of each waste stream
  - Improvements in current working practices
  - Methods by which waste streams are being handled and stored
  - The available waste disposal routes used, e.g. landfill, waste transfer stations, etc.

10.2 DESIGN APPRAISAL

CONSTRUCTION WASTE

Based on standard construction operations in the UK, it is estimated that approximately 1,500 tonnes of waste may arise from the proposed development, this figure can be lowered through good waste management practice.

CONSIDERATE CONSTRUCTORS SCHEME

The Principal Contractor will register with the “Considerate Constructors Scheme”. Sites that register with the Scheme sign up and are monitored against a Code of Considerate Practice, designed to encourage best practice beyond statutory requirements.

- How waste is avoided, reduced, reused and/or recycled
- Whether there is a waste management plan/ strategy and how this is monitored
- The type of feedback received (if any) as to how much waste on-site is diverted to landfill

SITE PREPARATION AND EARTHWORKS

- Clean excavated material that cannot be reused onsite would be removed by licensed waste carriers and sent for reuse at another development site or sent for disposal at appropriately licenced facilities
- Contaminated material that would require removal from the site will be collected by suitable waste carriers and sent for disposal at appropriately licenced hazardous waste facilities.

OPERATIONAL WASTE

Refuse collection from the buildings will incorporate facilities to allow the segregation of recyclable waste to be in line with European Directives, Liverpool’s waste recycling strategy and the principles of sustainability.

The design of the apartments will follow best practice guidance and will include:

- The ability to store segregated waste streams externally as well as space for general waste
- Incorporate adequate space internally for recycling
- It is proposed that a waste storage area is located in close proximity to the service core (see section 4 of the Waste Management Strategey report for details)

[6] http://www.knowsley.gov.uk/pdf/jointmerseyside-and-haltonwastelocalplan2013.pdf

11 HEALTH AND WELLBEING

Humans spend as much as 90% of their time inside buildings. It is therefore vital that new developments are designed with human health in mind. Internal spaces should have adequate levels of space and natural light whilst external areas provide pleasant areas of public realm, which are safe and easily accessible for all. The main areas for consideration are:

Internal Environmental Quality - limiting volatile organic compounds (VOCs) emitted from materials, flexible ventilation and heating strategies to adjust to each occupant's requirements and adequate external views and natural daylight.

Externally, consider the access to buildings, how public realm can be used to the benefit of users and also designed to ensure it is safe for people to use at all times of day, by having adequate lighting and being overlooked.

11.1 REQUIREMENTS AND TARGETS

There is no specific section of the Liverpool Unitary Development Plan that sets out requirements regarding health and wellbeing in new developments. Several sections within the Plan touch on the following issues:

- Incorporate measures which reflect the need to make proper provision for personal safety and crime prevention.
- Access to goods, services and facilities.

11.2 DESIGN APPRAISAL

The proposed design addresses the requirements in the UDP, while also providing an excellent level of comfort for the occupants (indoor environmental quality). Measures will include:

INDOOR COMFORT AND CONTROL

- Good thermal comfort levels will be provided, informed during design by thermal modelling of the building and enabled during operation by the use of optimised controls
- Good access to natural light is a key design criteria, informed by daylighting studies

INDOOR AIR QUALITY

All dwellings will have operable windows to provide both passive cooling and ventilation, openings have been sized for purge ventilation.

SECURITY

- Architectural interior and external layout and design provides safe and comfortable environments;
- Close working with relevant authorities will create a development which offers minimum risk for crime and anti-social behaviour.

INCLUSIVE DESIGN

Design proposals have taken into consideration external and internal accessibility requirements for all elements of the building, as well as for cyclists using the internal cycle parking area.

SOUND INSULATION

Good practice acoustic separation of neighbouring dwellings enables an improvement in sound insulation levels over the limits set by Building Regulations Part E. Appropriate design detailing is advised by an acoustic consultant.

ACCESS TO GOODS, SERVICES AND FACILITIES

As highlighted in the Transportation and accessibility section, the wide variety of amenities available in Liverpool City Centre are a short walk away from the 122 Old Hall Street Development.

12 TRANSPORTATION AND ACCESSIBILITY

Road transport in Liverpool accounts for 18% of total emissions of carbon dioxide (CO2) – a major contributor to climate change. The EU has agreements with motor manufacturers that aim to reduce average CO2 emissions from new cars. However, as traffic levels are predicted to increase, road transport will continue to be a significant contributor to greenhouse gas emissions.

Air pollutants from transport include nitrogen oxides (NOx), particulates, carbon monoxide and hydrocarbons. All have a damaging impact on the health of people, animals and vegetation locally. Air quality in the UK is slowly improving, but many areas still fail to meet the health based national air quality objectives and European limit values – especially for particulates and NOx. The result is that vehicles are responsible for most local pollution.

Road traffic also creates noise pollution and vehicle use can affect local quality of life as busy roads are dangerous and intimidating, dividing communities and making street life unpleasant. Sustainable transport means addressing these problems by facilitating alternatives for travelling to the site, using less damaging means of travel. The main alternatives are:

- Car sharing - reducing the number of single occupant journeys can have a huge impact on pollution and congestion
- Green travel plans - When businesses create a travel plan, they can make a real difference to the transport choice their employees and visitors make
- Cycling – Traffic free cycle routes can promote cycle use which not only reduces transport emissions but promotes a healthy lifestyle

12.1 REQUIREMENTS AND TARGETS

The Liverpool Unitary Development Plan sets out the following goals regarding transportation and accessibility relevant to new building developments:

- Ensure secure cycle parking facilities are provided
- Improve access and mobility for all pedestrians. Ensure that routes for pedestrians are pleasant and direct as well as safe.
- Remove obstacles to movement such as obstructing planting boxes

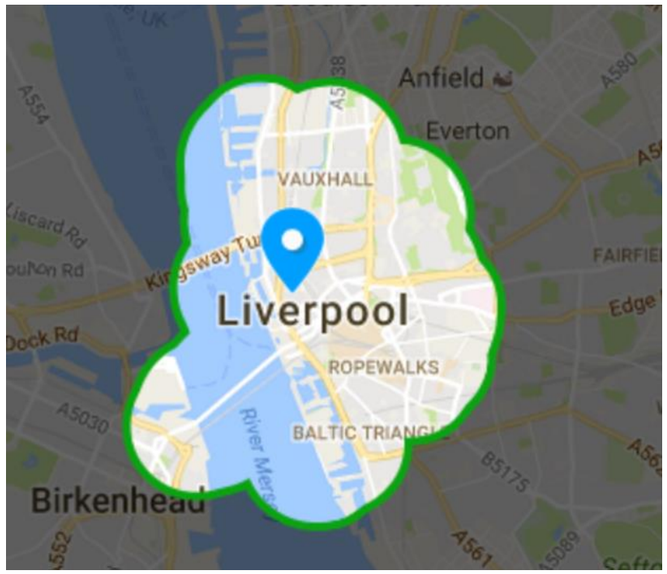
12.2 DESIGN APPRAISAL

The site has good public transport connections including the Pierhead Ferry Terminal, Moorfields Railway Station (0.5 mile walk), Lime Street Railway Station (less than 1 mile walk). As part of the project, improved pedestrian access routes will be provided and cycle routes will be considered throughout the design of the public realm areas. The project also provide provision of secure bicycle storage.

Further details are included within the Transport Statement.

Figure 12-1 – Local plan showing the distance that can be travelled in a 10 minute walk

Figure 12-2 – Local plan showing the distance that can be travelled in a 10 minute bike ride:



13 CONCLUSION

Considering the principles of sustainability early in the design and planning process is a positive step to ensuring that the new development is sustainable in terms of construction, operation, the local community, the environment and its future occupation.

This Sustainability Report has been produced to demonstrate how the design of the Proposed Development addresses the various issues that contribute to sustainable development. A review of national, regional and local planning policies was undertaken, with particular emphasis on the 2012 National Planning Policy Framework (NPPF), the Liverpool Unitary Development Plan, Liverpool's Climate Change Strategic Framework, and the Commercial Quarter SPD.

The development responds to the issues raised in the policy documents in the following areas:

13.1 CLIMATE CHANGE ADAPTATION AND MITIGATION

The proposed development has been carefully designed to take the likely impacts of climate change into account. Proposed measures will help to reduce internal and external overheating and provide benefits in terms of balancing the microclimate.

13.2 ENERGY AND CARBON

The proposed Energy Assessment seeks to comply with Building Regulations Part L 2013 of the Building Regulations. Preliminary SAP calculations have been performed to confirm the building fabric and building systems will comply with all the requirements of Part L.

Several approaches, have been investigated. The preferred approach is an all-electric solution with photovoltaic panels on the roof.

13.3 EFFECTIVE USE OF LAND

The Proposed Development reuses previously developed land and improves utilisation of the available plot of land. Its occupancy will bring socio-economic benefits to the local area while aiming to minimise its environmental impacts as much as possible.

13.4 WATER MANAGEMENT

To ensure ongoing sustainability performance during building operation, water will be appropriately and effectively managed through the use of water meters and leak detection.

Following the hierarchy for surface water disposal, since discharge by infiltration or to a watercourse are not feasible the surface water will discharge to the public combined water sewer which runs through the site. The proposed discharge rate from the site will be restricted to 10 l/s in accordance with the United Utilities consultation response. Attenuation storage will accommodate flows for up to the 1 in 100 year storm including a 40% allowance for climate change.

The site's drainage strategy considers both a 20% and 40% increase in peak rainfall due to climate change. Attenuation storage is sized to accommodate the 1 in 100 year storm with a 40% allowance for climate change. Therefore, it is considered that the design of the strategy has a reasonable consideration for increased surface water flows due to climate change

13.5 MATERIALS

The materials specification for 122 Old Hall Street will follow principles of lean design and use of environmentally friendly and sustainably sourced materials. Robust and durable materials for facades and landscaping will be used as well as materials with high recycled content.

A sustainable procurement plan will be developed at a later design stage which will prioritise the use of locally sourced materials and the use of products from suppliers who implement an Environmental Management System.

13.6 POLLUTION AND LOCAL IMPACTS

The construction and operation of the Proposed Development will ensure that pollution to land, air and water are minimised by implementing best practice construction policies and design in terms of spillages and excessive emissions during construction, noise pollution and light pollution at night.

13.7 WASTE

The proposed development will incorporate good practice waste reduction measures to reduce, reuse, and recycle wherever practicable. Strategies will be developed to, manage the effects of both construction waste and operational waste by minimising its generation and maximising reuse or recycling.

13.8 HEALTH AND WELLBEING

The proposed design includes a variety of initiatives aimed at providing a healthy and safe environment to residents and people working on the premises alike such as increased ventilation provision over and above the regulatory requirements; best practice lighting design including good access to natural light; choice of materials with low VOCs or other chemical components; good practice acoustic design; creation of a development which offers minimum risk for crime and anti-social behaviour.

13.9 BIODIVERSITY

The site largely comprises of hard standing, steel fencing and brick walls with a small area of bare ground covered with scattered scrub located in the south-eastern corner of the site. No impacts upon statutory designated sites within 10ikm or non-statutory sites within 2km are expected from the proposed development due to the ecological context of these sites and their distance from the site. Ecological enhancements have been recommended in the Ecological Appraisal report. These recommendations have been made to improve the biodiversity value where possible and appropriate, including the planting of native trees and shrubs.

13.10 TRANSPORTATION AND ACCESSIBILITY

The site has good public transport connections including the Pierhead Ferry Terminal, Moorfields Railway Station (0.5 mile walk), Lime Street Railway Station (less than 1 mile walk). As part of the project, improved pedestrian access routes will be provided and cycle routes will be considered throughout the design of the public realm areas. The project also provide provision of secure bicycle storage.

13.11 SUMMARY

Overall, the Proposed Development has adopted an approach for sustainable development that encompasses environmental, social and economic aspects and delivers a long-lasting healthy and comfortable atmosphere for the future residents and users.