



Sustainability and Energy Statement

On behalf of:
Derwent Holdings Ltd

In respect of:
Edge Lane Retail Park
Edge Lane Central
Liverpool

Date:
September 2010

Reference:
MB/SS/1003708/RetailPark/R008m



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1.0 Executive Summary

- 1.1 The application seeks outline planning permission with all matters reserved at this stage. This Sustainability and Energy Statement assesses the proposals against relevant Development Plan policy relating to sustainable development and energy efficiency.
- 1.2 The report identifies how the proposals result in the redevelopment of the existing retail units to be replaced by up to 47 new retail units, new leisure uses, restaurants, car parking, and new areas of landscaping forming part of the comprehensive regeneration of Edge Lane Central.
- 1.3 One of the principle objectives of the Edge Lane Central masterplan is to create a high quality new urban environment with a new retail park connected to leisure uses, residential areas, and a new community park by a corridor of greenspace. This seeks to promote pedestrian permeability through the area, removing vacant and underused land and buildings.
- 1.4 The proposals will promote energy and resource efficiency and it is intended that some of the following measures could be included:
 - Energy efficient luminaires that maximise the available light;
 - Fluorescent T5 lamps (bulbs) to maximise the lighting efficiency;
 - External Passive Infra Red (PIR) sensors;
 - Low energy light emitting diode (LED) lighting;
 - Roof lights to the sales floor allows an influx of additional daylight and reduces the need for artificial lighting;
 - Mixed mode ventilation system to increase the flow of air through the building whilst reducing the reliance on the mechanical system;
 - Energy monitoring & metering systems will help to optimise energy use;
- 1.5 An assessment of renewable and low carbon technologies identified energy generated by on-site CHP is the proposed solution for this project. There are three units proposed; 2 units each $228_e / 358_{th}$, with a third unit of $210_e / 358_{th}$. A net reduction of 969,300kgs/CO₂ saving across the development; this will equate to a

reduction of 12.3%. It is recognised that 4 units are shown on the submission plans, and this is to allow for the potential for the energy demands to alter as the development becomes fully specified.

- 1.6 The assessment demonstrates that by incorporating some of the identified energy efficiency measures alongside a CHP unit will generate a total carbon saving of 25% above present Building Regulations.

	Savings kWh/yr	Savings kgCO ₂ /yr
Site Baseline	29,764,205	9,269,748
Energy Efficiency	4,464,631	1,390,462
CHP	3,805,094	969,300
Total Carbon Savings		25%

- 1.7 The site is easily accessible by public transport, with frequent bus and train timetables within close distance of the site. The site will also interact with the existing network of cycling routes that link the city centre to other main areas of interest. The application site also benefits from being within walking distance to the Old Swan District Centre to the north which offers a range of services and functions, reducing the need for staff or visitors to make additional car journeys to other centres.
- 1.8 Consideration of water efficiency has also been had in the landscape masterplan with new native species chosen which are easily maintained without the need for large water demands in this otherwise urban location.

2.0 Introduction

- 2.1 This statement is submitted on behalf of Derwent Holdings Limited ('DHL') in support of a full planning application for the redevelopment of Edge Lane Retail Park and associated works. The proposals involve the redevelopment of the existing retail units to be replaced by up to 47 new retail units (Class A1), new leisure uses (Class D2), car parking, and new areas of landscaping forming part of the comprehensive regeneration of Edge Lane Central.
- 2.2 The statement has been developed to reflect a good practice approach to sustainability assessment. The content of the assessment seeks to provide a consistent and complementary analysis when taken into account with the planning application and should be read alongside the accompanying plans and reports.
- 2.3 The report also includes an assessment of the proposed retail and leisure uses to establish the baseline energy demands, demonstrating how bespoke design features as part of these modern new units reduce energy and maximise efficiency through design.

Application Site and Surroundings

- 2.4 The application site consists of the existing Edge Lane Retail Park, bounded to the north by Binns Road, and to the south by Edge Lane. The retail park is arranged in a U-shape around an internal car park accessed from Edge Lane. The uses on the retail park are a mix of traditional and bulky goods retailers such as B&Q and Comet. Several of the units are now dated and are vacant. Three smaller restaurant (Class A3) units are located within the car park but only the MacDonald's restaurant remains open.
- 2.5 The application site also takes in the existing Rathbone Road Recreation Ground. This area of underused green space is to be relocated as part of the holistic regeneration of the area, replaced by a new high quality community park with dedicated playspace located off Mill Lane.
- 2.6 The wider Edge Lane area is defined as one of Liverpool's Strategic Investment Areas

(SIA's) where the emphasis is on supporting new businesses and economic development along one of the city's key transport corridors. Within the Eastern Approaches SIA the application site also falls within the Edge Lane Central Development Framework boundary.

Development Proposals

- 2.7 Given the scale of the proposals a full description of development is provided in the accompany Planning and Retail Assessment. The following is a summary for the purpose of this assessment.
- 2.8 The proposals involve the complete redevelopment of the existing retail and leisure park with a site area of approximately 21.5ha. The existing retail and leisure buildings will be replaced with approximately 55,588m² of gross retail floorspace across 47 new units. In addition to this 18,585m² of new leisure uses will be provided for, along with 4 ancillary food and drink uses totalling 960m². The new development will be served by 1795 new car parking spaces at grade and basement level.
- 2.9 One of the principle design features of the retail park is to improve the urban environment of Edge Lane by removing vacant and derelict land and buildings and creating a new pedestrian green corridor linking new retail and leisure uses and a new park situated off Mill Lane.

3.0 Relevant Planning Policy

National Guidance

- 3.1 **PPS1 – Delivering Sustainable Communities** sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system. The national guidance seeks to facilitate and promote sustainable and inclusive patterns of development.
- 3.2 **PPS1 Supplement – Planning and Climate Change** sets out how planning should contribute to reducing emissions and stabilising climate change (through mitigation) and address its unavoidable consequences (through adaptation). Designing for environmental performance is highlighted as important in the design of new development.
- 3.3 **PPS4 - Planning for Sustainable Economic Growth Policy EC10.2** requires all planning applications for economic development to consider whether the proposal limits carbon dioxide and minimises vulnerability to climate change.
- 3.4 The UK government's **Climate Change Act** (2008) has established legally binding targets for an 80% reduction in carbon dioxide CO₂ emissions by 2050, with a 34% reduction by 2020. To support these targets and to meet with European Union requirements, the UK Renewable Energy Strategy was launched in July 2009 to provide 15% of energy from renewable sources. Incumbent in both documents is the need for increased levels of energy efficiency and the development of low carbon and renewable energy technologies.
- 3.5 The Government has already established targets for 10% of all UK electricity to be generated from renewables by 2010 and 20% by 2020. **PPS22**, published in 2004 encourages local authorities to include renewable targets for new developments.
- 3.6 **PPS10 – Planning for Sustainable Waste Management (1999)** aims to deliver a planning strategy and framework whereby waste is considered as a resource, with disposal seen as the last option. Although the guidance provides a framework for

industrial and municipal waste management, issues of design are also addressed; promoting recycling and integration of waste management facilities without adverse impact on the street scene.

Local Planning Policy

Liverpool Unitary Development Plan (UDP)

- 3.7 UDP **Policy GEN1** seeks to reverse economic decline by promoting investment and economic development in the Strategic Investment Areas (SIA's). The application site falls within the Eastern Approaches SIA.
- 3.8 Edge Lane is designated under **Policy OE15** as an Environmental Improvement Corridor. The focus of this policy is to improve the appearance and environment of some of the city's key gateways and transport corridors.
- 3.9 **Policy EP1** promotes and encourages the reclamation of derelict and neglected land and buildings, with particular attention given to development which meets the aims of urban regeneration; one of the fundamental objectives of the plan.
- 3.10 With regard to the protection of the environment **Policy EP11** restricts development that has the potential to create unacceptable air, water, noise or other pollution in construction and operation. **Policy EP13** deals with flooding and restricts development unless appropriate alleviation or mitigation measures are carried out.
- 3.11 **Policy OE6** seeks to protect nature conservation, encouraging developers to undertake landscaping in a sensitive manner where appropriate. In accordance with **Policy T12** all new development which generates a demand for car parking will be required to make provision for parking on site to meet the minimum operational requirements of the development.

Local Development Framework

- 3.12 The Core Strategy Preferred Options were published for consultation in March 2008.

However, in view of the changes made to the planning system, the Growth Points bid, and representations made by the Government Office for the North West the Council are undertaking a further round of consultation to reflect these changes.

- 3.13 In view of the progress of the Core Strategy little weight has been given to this in the assessment of this development.

Edge Lane Central Development Framework

- 3.14 The Development Framework for Edge Lane Central was endorsed by the Council's Executive Board on the 15th January 2010. The Development Framework advocates a strategic development framework for the regeneration of Edge Lane Central. The area covered by the guidance extends to 28.2 hectares and incorporates key sites in prominent positions such as Edge Lane Retail Park, the Rathbone Road Recreation Ground and the former Ian Skelly Car Showroom.
- 3.15 Through the implementation of the document Derwent Holdings Ltd, Liverpool City Council, and Liverpool Vision hope to deliver a holistic approach to guiding development, contributing to a new, high quality, sustainable mix of uses focused around improved public realm and open space. The principles set out in the document are intended to provide a clear guidance for stakeholders in the development process, ensuring that Edge Lane Central will generate a positive new image for Liverpool, utilising the strategic location as a primary gateway whilst offering opportunities for new and improved employment, retail, leisure, open space and residential development.
- 3.16 Whilst the document does not form part of the LDF process, it is a non-statutory planning guide intended to shape the regeneration of Edge Lane Central. It also provides information on the approach taken in terms of application strategy.

4.0 Environmental, Social and Economic Assessment

- 4.1 National guidance in PPS1 (para. 4) sets out the importance of environmental, social, and economic considerations which underpin sustainability. The following demonstrates how the development proposal accords with this approach and the associated relevant Liverpool UDP policies.

Environmental

- 4.2 At the local level UDP **Policy OE15** seeks to promote and improve the environmental quality of the Edge Lane corridor as part of the strategic regeneration of the area. **Policy EP1** specifically promotes and encourages the recycling of vacant and underused land and buildings, reflecting national guidance in **PPS1**.
- 4.3 The environmental quality of the application site at present is poor. Given the strategic nature of Edge Lane the urban environment is dominated by vehicles with poor quality pedestrian environment and no linkages from the retail park to neighbouring residential areas or other land uses. The existing retail units are dated and several remain vacant, as do former food and drink units within the park.
- 4.4 The Rathbone Road Recreation Ground, which forms part of the application site is underused and in need of significant investment.
- 4.5 The Edge Lane Central Development Framework recognised the poor urban environment as a barrier to investment and the strategic regeneration of the area. One of the principle objectives of the Edge Lane Central masterplan is therefore to create a high quality new urban environment with a new retail park connected to leisure uses, residential areas, and a new community park by a corridor of greenspace. This seeks to promote pedestrian permeability through the area, removing vacant and underused land and buildings.
- 4.6 Specific details of how this will be achieved are found in the accompanying Landscape Masterplan.

- 4.7 This is also achieved by the relocation and consolidation of industrial uses. As part of the masterplan new high quality industrial units are proposed on land to the south of Edge Lane, consolidating retail and leisure units within the retail park, with industrial units on the adjacent side of the road. This will be delivered through a separate planning application.
- 4.8 This approach to significantly addressing the environmental quality of the Eastern Approaches is entirely consistent with **Policy OE15**, **Policy EP1** and the objectives of **PPS1** which encourage local authorities to improve the environment through development management. By improving the environment the proposals will contribute to the regeneration of the corridor whilst acting as a catalyst for continued investment in the SIA.

Social

- 4.9 PPS1 seeks to promote social inclusion and reduce social inequalities through development proposals whilst working towards safe, liveable, and inclusive communities.
- 4.10 To date, the majority of consultation on this application has been undertaken as part of the lengthy discussions in respect of the broader Edge Lane Central Development Framework. This has been subject to extensive negotiation and dialogue with officers of the Council and their advisers, partner organisations such as Liverpool Vision, and dialogue with elected members.
- 4.11 In addition to this numerous community meetings and consultation events have been held with the Edge Lane Steering Group. The Steering Group have taken an active role in shaping the form of the scheme and the consultation approach undertaken. Specifically, the Steering Group has advised in terms of the programme and detail of wider public consultation which will be carried out alongside the submission of this planning application.
- 4.12 Consultation has also been carried out with CABE's 'Places Matter' panel which has specifically looked at design matters such as the layout and orientation of units, and the detailed public realm improvements. The accompanying Design and Access

Statement demonstrates how the proposal has evolved throughout the several stages of consultation with key stakeholders.

- 4.13 The accompanying Statement of Community Involvement also provides further details and demonstrates the proposal's commitment to social inclusion and community consultation in accordance with PPS1.

Economic

- 4.14 The focus of **PPS1** and UDP **Policy GEN1** in promoting sustainable economic development has been supplemented by the adoption of **PPS4** in December 2009.
- 4.15 The accompanying Planning and Retail Statement looks more closely at this and provides an assessment of the proposals for compliance with PPS4, in particular looking at the scale of retail development proposed and impact on Liverpool City Centre.

5.0 Energy Efficiency and Carbon Reduction

- 5.1 The Edge Lane Retail Park site has a CO₂ emissions level of 9,270 tonnes.
- 5.2 Improvements in the energy efficiency of the buildings through design and construction measures are expected to reduce CO₂ emissions to 7,879 tonnes.
- 5.3 The low carbon and renewable technologies options review identified as technically viable are:
- Solar Hot Water
 - Photovoltaic panels (PV)
 - Gas Combined Heat and Power
 - Biomass heating and
 - Heat Pumps
- 5.4 The heat pumps, solar hot water and PV are not capable of meeting sufficient demand for the site, but could be combined with other suitable technologies.
- 5.5 The biomass boiler option needs careful consideration of possible NO_x emissions and access requirements for the feedstock deliveries. In addition it will need to be sited carefully to meet the most efficient use of the technology.
- 5.6 Energy generated by on-site CHP is the proposed solution for this project. As there are three assumed units at this stage it is expected that there will be 2 units each 228_e/358_{th}, with a third unit of 210_e/358_{th}. A net reduction of 969,300kgs/CO₂ saving across the development; this will equate to a reduction of 12.3%. CHPs are capable of providing both heat and power to the development and in addition can export excess electricity to the grid.
- 5.7 The actual number of units will need to be defined as the specification of the site progresses. The application drawings include for four CHP's within the development to allow for the potential for the energy demands to alter as the development becomes fully specified.

- 5.8 In order to adequately meet this load it is recommended that a number of smaller CHP engines are located across the site, and installed at different stages. In this way best efficiency will be gained from the technology. Details of the units can be found in the appendix 1 section 5.
- 5.9 The table below summarises the carbon savings for the site from the viable technology options.

	Savings kWh/yr Energy	Savings kg/CO ₂ /yr Carbon
Site Baseline	29,764,205	9,269,748
Energy Efficiency	4,464,631	1,390,462
CHP	3,805,094	969,300
Total Carbon Savings		25%

6.0 Transport

- 6.1 The underlying principles of PPS1 and PPG13 seek to reduce the need to travel, especially by private car. The proposed layout plan illustrates a total of 1795 car parking spaces, 101 dedicated disabled and/or Parent Child spaces, and dedicated motorcycle (134) and cycle (254) racks, of which 106 are dedicated to employees. This provides the minimum operational requirements for the development for compliance with UDP **Policy T12**, whilst remaining within the maximum targets set out in the Ensuring a Choice of Travel SPD (2008).
- 6.2 The site is easily accessible by public transport, with frequent bus and train timetables within close distance of the site. The site will also interact with the existing network of cycling routes that link the city centre to other main areas of interest.
- 6.3 The application site is also ideally placed to benefit from excellent accessibility to the Old Swan District Centre to the north; one of Liverpool's primary shopping areas. The District Centre is within walking distance and offers a range of services and functions, reducing the need for staff or visitors to make additional car journeys to other centres.
- 6.4 The accompanying Travel Plan goes into more detail as to how more sustainable travel will be promoted by the development. The objectives of the Travel Plan are to;
- To minimise single occupancy vehicle trips created by the site; and
 - To encourage staff to travel by sustainable modes.
- 6.5 The Travel Plan seeks to achieve these objectives by;
- Promoting car sharing;
 - Reducing the need to travel to work;
 - Promoting different forms of transport; and
 - Promoting use of public transport given the excellent accessibility to rail and bus services.
- 6.6 Also included with the Travel Plan are details regarding the ongoing monitoring and

review to ensure objectives are reached.

7.0 Pollution and Ecology

- 7.1 Regarding land use and contamination UDP **Policy EP1** seeks to support the redevelopment and remediation of vacant and underused previously developed land. **Policy EP11** seeks to restrict development where this would have an unacceptable impact on pollution. **Policy OE6** seeks to protect ecological assets and requires developers to incorporate landscaping where appropriate in all new development proposals.
- 7.2 Submitted with this application are supporting documents which deal specifically with the impact of the proposal on land contamination and pollutants, air quality, noise, and ecology.
- 7.3 Due to the size of the application site the land contamination report is split into four sections. The first, Site 4a covers the existing recreation ground and concludes that risk to end users is low given the historically undeveloped nature of the site. Site 4b fronts onto Edge Lane and comprises vacant retail/commercial uses. Although there is evidence of fly-tipping and Japanese Knotweed the site poses no risk to human health from any previous uses.
- 7.4 Sites 4c and 4d have the potential for some level of contaminants due to the proximity to industrial uses. The reports recommend that further intrusive studies are required to determine the likely threat which may be posed to end users. This can be controlled and enforced through the use of planning conditions and ensures that the development will not result in any risk to future occupiers of the site. The development proposals will therefore offer the opportunity to remediate any ongoing contamination in the area in accordance with UDP **Policy EP1**.
- 7.5 With regard to pollution the accompanying Air Quality Assessment evaluates the impact during both the construction and operational phases. The report concludes that whilst the size of the proposed development presents a high risk to air quality during the construction phase site specific mitigation measures will ensure there is only a low risk to end users. This approach accords with UDP **Policy EP11** in

reducing pollution.

- 7.6 With regard to the operational phase the report concludes that the impact on air quality will be “insignificant” given the characteristics of Edge Lane Central and use of this route as a major arterial route into the City and Strategic Investment Area with focus on employment generating uses.
- 7.7 With regard to noise pollution the accompanying report concludes that given the existing background noise levels along Edge Lane, dominated by vehicle movements along this strategic network, combined with other industrial uses the impact on any residents will be minimal. Where noise sensitive residential properties are located close to the site, such as to the south of the existing recreation ground acoustic fencing is proposed to ensure there is no loss of amenity which can be controlled by planning condition. This approach is consistent with **Policy EP11**.
- 7.8 The ecological survey and evaluation shows that the application site contains no significant ecological or biodiversity constraints. Redevelopment will have no adverse effects on protected species or on important biodiversity within the area or in the surrounding area, provided that there is mitigation for protected bat species.
- 7.9 In summary, the accompanying suite of documents demonstrates that the existing application site is dominated by existing retail park uses which have no ecological value or history of contamination. Given the nature of the site, located within a SIA on an arterial route out of the City there will be insignificant impact in terms of noise or air pollution. The proposal is therefore in accordance with the objectives of UDP **Policy EP1, EP11, and OE6** and will have no detrimental impact in terms of pollution.

8.0 Water and Flood Risk

- 8.1 Designing for environmental performance is also highlighted as important in the design of new development in **PPS1 Supplement**. This includes securing sustainable urban drainage systems, paying attention to the potential contribution to be gained to water harvesting from impermeable surfaces and encourage layouts that accommodate waste water recycling.
- 8.2 Consideration of water efficiency has also been had in the landscape masterplan with new native species chosen which are easily maintained without the need for large water demands in this otherwise urban location.
- 8.3 With regard to flooding the site lies outside of any defined area of flood risk based on the Environment Agency Flood Risk mapping. As a site over 1ha a Flood Risk Assessment has been prepared and accompanies this application in accordance with PPS25. The report concludes that as an existing development containing buildings and hardstanding in an urban area the proposals will not have any adverse impact or result in localised flooding – with surface run-off proposed as existing into the current drainage arrangements.
- 8.4 Sustainable urban drainage is also included in the form of rainwater harvesting and extensive landscaping. The collection of rainwater improves water efficiency by reducing the run-off from the site and allowing for water to be reused as part of landscaping. The use of landscaping will break up hard surfaces to reduce surface water runoff further.
- 8.5 This approach to water efficiency is consistent with guidance contained in **PPS1 Supplement**.

9.0 Sustainable Waste and Resource Management

- 9.1 **PPS10** seeks to reduce waste in all forms of development from the construction and operational phases.
- 9.2 The proposed reuse of the existing land and buildings is synonymous with the approach of PPS1. With regard to construction it is intended that the developer would sign up to the Considerate Constructors scheme and where possible source all materials used in the construction of new units from accredited suppliers of responsibly sourced materials.
- 9.3 The developer also intends to prepare a Site Waste Management Plan (SWMP) prior to the commencement of development, to minimise the extent of waste material to be taken off site during construction. The SWMP will seek to incorporate final reporting of waste management performance (with respect to recycled and secondary materials, waste reduction, segregation, recovery and disposal) and cost savings identified. As the new units will be constructed from primarily a brick built base with cladding and panelling above the SWMP will also identify opportunities for recycling construction materials from the demolition of the existing buildings.
- 9.4 Specific details along with the implementation of the SWMP can be controlled and enforced by the Council through use of an appropriately worded pre-commencement planning condition. This approach to maximising the reuse of materials in both the construction and operational phases of development is consistent with the objectives of PPS10.

10.0 Conclusion

- 10.1 The principle of development is synonymous with **PPS1** which seeks to promote the efficient reuse of land and buildings. The development proposal seeks to redevelop the existing retail park, and vacant land and buildings as part of a new high quality retail and leisure park at the heart of Edge Lane Central's regeneration. The site forms part of a comprehensive masterplan which will connect new retail, leisure, housing, employment and open space by new high quality public realm and pedestrian infrastructure, securing sustainable future investment in the SIA.
- 10.2 The application site is ideally placed to benefit from excellent accessibility to bus services along Edge Lane, and rail services from the neighbouring Wavertree Technology Park station. The implementation of a Travel Plan will further promote staff and visitors to take advantage of these opportunities and reduce private car use, promoting linked trips to Edge Lane Central and the neighbouring Old Swan district centre.
- 10.3 With regard to energy efficiency the assessment provided in the Appendix demonstrates that the new retail park reduces carbon emissions by 25%.
- 10.4 The total energy saving can be summarised as follows:

	Savings kWh/yr Energy	Savings kg/CO ₂ /yr Carbon
Site Baseline	29,764,205	9,269,748
Energy Efficiency	4,464,631	1,390,462
CHP	3,805,094	969,300
Total Carbon Savings		25%

Appendix 1: Carbon Reduction

1.0 Carbon Strategy

- 1.1 The national focus for reducing energy and maximising efficiency in new buildings is set out in **PPS1** and adopted **PPS1 Supplement**. This has also been reinforced by the proposed changes to **Building Regulations Part L** in October 2010.
- 1.2 The following energy assessment demonstrates the likely baseline energy demand for the new retail park, and how carbon emissions and overall energy will be significantly reduced through the inclusion of design features.
- 1.3 The overarching strategy to implement carbon reduction at Edge Lane Central is based upon:
 - Reducing energy consumption where possible through effective building design including maximising natural daylighting and improving air tightness;
 - Incorporating efficient low carbon technologies where applicable and viable;
 - Enabling additional technologies to be retrofitted to the scheme.

2.0 Energy Baseline

- 2.1 The likely annual energy consumption and associated CO₂ emissions from the proposed development is based on industry benchmarks for energy use obtained from CIBSE Guide F. Since the majority of end users are unknown the bulk of the floorspace used in this assessment has been determined based upon use class.
- 2.2 The following table provides a breakdown of the gross internal floorspaces used in the calculations to follow.

Use	Floorspace Gross Internal m ²
Retail	55,588
Leisure	18,585
Food & Drink	960
Total Energy Consumption Floor Area	75,133
Car Park	25,252

- 2.3 The data sets in CIBSE Guide F are becoming out of date due to the changing building regulation requirements. The Merton Rule policy guidelines suggest that benchmark figures should be reduced by 8% to compensate for the reductions.
- 2.4 The energy consumption and CO₂ emissions for the development can be seen in the table below.

	Energy (kWh/yr)	Emissions (kgCO ₂ /yr)
Site Baseline	29,764,205	9,269,748

3.0 Energy Efficiency Measures

3.1 The following design features are included which seek to significantly improve energy efficiency and reduce the overall energy consumption of the site. It is anticipated the following measures will achieve up to 17% energy efficiency savings.

Lighting

- Energy efficient luminaires that maximise the available light will be implemented in the project. The control of the lighting allows for light to be provided in areas where it is most needed and accurately directed to reduce glare. In this way the frequency of the fixings can be reduced to maximise efficiency.
- Fluorescent T5 lamps (bulbs) inserted into luminaires will maximise the lighting efficiency by converting electricity efficiency. By having ballasts which work at a higher frequency, T5 bulbs have increased efficacy by up to 20% with reduced power losses and a lower optimum performance temperature.
- External Passive Infra Red (PIR) sensors will operate in areas where occupancy is less constant. In this way unnecessary lighting will be on only when required thus reducing energy loads.
- Integration of time switch controls for areas with low usage so that lights are only used when physically required.
- Low energy light emitting diode (LED) lighting will be incorporated into many sections of the retail units. LED lights consume less energy in operation, and have a longer lifespan. LED lighting will also be installed in external car parking areas.
- Roof lights to the sales floor are to be adopted for some units within the site. This solution allows an influx of additional daylight and reduces the need for artificial lighting. The proposed rooflights are gel filled units which reduce solar gain. This additional heat can make it necessary in the summer months to increase the cooling demand. Installing the rooflights reduces the

likelihood of this occurring.

Ventilation

- Increasing the flow of air through the building whilst reducing the reliance on the mechanical system will be achieved through the mixed mode ventilation system. This includes mono draught roof ventilation systems which provide natural ventilation without the need for a mechanical and electrical requirement.

Monitoring

- The installation of energy monitoring & metering systems will help to optimise energy use. Through regular checking of energy use, everyday consumption levels can be scrutinized and changes made to onsite procedures as they occur.
- Management of the power loads within the site through electronic systems allows for the minimisation of overall power demands.

3.2 The tables below show these savings in against the baseline emissions and highlights total carbon and energy savings.

	Energy (kWh/yr)	Emissions (kgCO ₂ /yr)
Site Baseline	29,764,205	9,269,748
Energy Efficiency Saving	4,464,631	1,390,462
Adjusted Baseline	25,299,574	7,879,286

Baseline building

Building type	Use	Class	Gas (kWh/m ² /yr)	Electricity (kWh/m ² /yr)	M ²	Total Gas (kWh/yr)	Total Electricity (kWh/yr)	Total Energy (kWh/yr)	Gas CO ₂ (kg/CO ₂)	Elec CO ₂ (kg/CO ₂)	Total CO ₂ (kg/CO ₂)
Clothes shops	Retail	A1	99	264	13,430	1,334,405	3,546,057	4,880,462	258,875	1,496,436	1,755,311
Department stores	Retail	A1	228	270	14,048	3,205,192	3,799,703	7,004,895	621,807	1,603,475	2,225,282
Electrical goods	Retail	A1	-	339	3,643	-	1,233,374	1,233,374	-	520,484	520,484
Catalogue stores	Retail	A1	63	93	1,489	94,522	138,358	232,880	18,337	58,387	76,724
DIY stores	Retail	A1	177	147	17,876	3,157,617	2,631,347	5,788,964	612,578	1,110,429	1,723,006
Fast food Restaurant	Catering	A3	616	819	960	591,744	786,048	1,377,792	114,798	331,712	446,511
High street agencies	Retail	A2	212	69	874	184,938	60,306	245,244	35,878	25,449	61,327
Book stores	Retail	A1	-	235	4,229	-	992,123	992,123	-	418,676	418,676
Dry sports centre	Sports	D2	316	97	18,585	5,864,683	1,795,311	7,659,994	1,137,748	757,621	1,895,370
Car park		X	-	14	25,252	-	348,478	348,478	-	147,058	147,058
TOTAL					100,386	14,433,100	15,331,105	29,764,205	2,800,021	6,469,726	9,269,748

Adjusted baseline with Energy Efficiency savings (15%)

Building type	Use	Class	Gas (kWh/m2/yr)	Electricity (kWh/m ² /yr)	M ²	Total Gas (kWh/yr)	Total Electricity (kWh/yr)	Total Energy (kWh/yr)	Gas CO ₂ (kg/CO ₂)	Elec CO ₂ (kg/CO ₂)	Total CO ₂ (kg/CO ₂)
Clothes shops	Retail	A1	84	224	13,430	1,134,244	3,014,149	4,148,393	220,043	1,271,971	1,492,014
Department stores	Retail	A1	194	230	14,048	2,724,413	3,229,748	5,954,161	528,536	1,362,953	1,891,490
Electrical goods	Retail	A1	-	288	3,643	-	1,048,368	1,048,368	-	442,411	442,411
Catalogue stores	Retail	A1	54	79	1,489	80,343	117,604	197,948	15,587	49,629	65,216
DIY stores	Retail	A1	150	125	17,876	2,683,974	2,236,645	4,920,619	520,691	943,864	1,464,555
Fast food Restaurant	Catering	A3	524	696	960	502,982	668,141	1,171,123	97,579	281,955	379,534
High street agencies	Retail	A2	180	59	874	157,198	51,260	208,458	30,496	21,632	52,128
Book stores	Retail	A1	-	199	4,229	-	843,305	843,305	-	355,875	355,875
Dry sports centre	Sports	D2	268	82	18,585	4,984,980	1,526,014	6,510,995	967,086	643,978	1,611,064
Car park		X	-	12	25,252	-	296,206	296,206	-	124,999	124,999
TOTAL					100,386	12,268,135	13,031,440	25,299,574	2,380,018	5,499,268	7,879,286

4.0 Renewable / Low and Zero Carbon Technology Options

4.1 Consistent with the approach of PPS1, the following provides an assessment of available renewable and low/zero carbon technologies to determine which are viable and feasible to achieve to include as part of the scheme. The viability of each technology to be used at the store is scored against a traffic light system to focus attention on where greatest benefits can be gained:

- Red – not viable
- Amber – not currently viable but potentially in the future
- Green - viable.

		Applicability Assessment				
Renewable Technology	Description	Design Constraints	Application	Indicative costs	Emission Reduction Potential	Viability at Edge Lane
Small Scale Wind Turbines	Produce electricity by using the natural power of the wind to drive a generator capable of 6kW to 50kW	Small scale turbines require clear access to wind flow and wind speeds need to be at least 6m/s. Urban areas are not ideal.	Can be installed on the development site. Wind speeds at the development will be variable	Medium capital costs with long paybacks.	Average – offsets electricity which has a high CO ₂ content. Wind speeds may not produce large amount of electricity.	Small scale turbines are not appropriate for site. Low level (10 m agl) wind speeds at the site are 4.8 m/s, so wind would be unviable
Large scale wind turbines	Produce electricity by using the natural power of the wind to drive a generator capable of 250kW to 5MW	Large structures up to 100m in height and need to be away from housing and in areas of high average	Constrained site adjacent to residential properties.	High – wind turbines can cost significantly	High – potentially a large producer of electricity	Would require a number of turbines with a hub height of 30-40m. There is no suitable free-

		Applicability Assessment				
Renewable Technology	Description	Design Constraints	Application	Indicative costs	Emission Reduction Potential	Viability at Edge Lane
		wind speeds.				standing location
Photovoltaics (PVs)	Modules of semi conductor cells that convert daylight into electricity. Generates approximately 850kWh/yr for a 1kW System	Southerly orientation necessary for optimum performance.	Can form part of the roof or wall structure – requires over 7000m ²	High – efficiencies and costs have fallen but still very expensive.	High – potentially a large producer of electricity	Would require over significant roof space.
Solar water heating	Energy from the sun heats fluid in roof mounted heat collector. Fluid then heats water which is stored in building. Flat plate collectors generate on average 500kWh/m ² /yr and evacuated tube 600kWh/m ² /yr	Southerly orientation necessary for optimum performance and a good hot water demand.	Can form part of the roof structure.	Low – additional equipment required minimal and can be easily installed	Limited to the amount of hot water stored, Limited CO ₂ reductions as offsetting gas, will reduce gas demands in the summer	Insufficient demand for hot water to provide a substantial provision.
Biomass heating	Utilises energy from boilers or a local district scheme run on biofuels.	Connection to existing grid network to access a district heating scheme	Biomass boilers can be used commercially for district heating	Medium – removes the need for a gas supply in some cases. Cost to connect to the grid can be expensive	High – low carbon fuel used	Potential to utilise energy for heating and hot water on site. Compact site will not have sufficient space for fuel storage
Gas Combined Heat and Power	CHP generates electric and thermal energy in a single system, satisfying two energy demands. Gas CHP converts natural gas into usable energy (e.g., steam and electricity).	Needs to serve a high electrical and heat demand all year round. Running hours of over 6,000 are desirable.	Scope for CHP to be incorporated into ancillary services /storage areas	Medium – cost savings can be considerable if the system operates for most of the year.	High – using natural gas as the fuel input results in large amounts of electricity and heat produced and high emission savings	Most suitable when electrical and gas loads are approximately 1:1 and buildings have high usage patterns

		Applicability Assessment				
Renewable Technology	Description	Design Constraints	Application	Indicative costs	Emission Reduction Potential	Viability at Edge Lane
Biomass CHP	CHP generates electric and thermal energy in a single system, satisfying two energy demands. Biomass CHP converts organic matter either directly from plants or indirectly from industrial, commercial, domestic or agricultural products	Needs to serve a high electrical and heat demand all year round. Running hours of over 6,000 are desirable. Storage space limited.	Can be applied to district heating schemes on a commercial level	High – biomass CHP is relatively new and based on large systems. Fuel supply is more complex	High – fuel input is normally low carbon and produces heat and electricity efficiently	Technology is not used widely. Potential impacts on residential amenity by NOx emissions
Ground source heat pump	Ground source heat pumps (GSHP) transfer heat from the ground into a building to provide space heating and, in some cases, to pre-heat hot water.	Either requires vertical boreholes or a large horizontal area. Can only serve under floor heating. Ground conditions may affect viability.	Can serve the site providing winter heating	Medium – ground works can be costly and savings determined by unit prices. High electricity prices affect payback.	Medium to High – requires electricity to run the heat pump but does produce emission savings. Electricity supply could be renewable.	Use limited for space heating. Will meet less than 1% of demand
Air Source Heat Pump	Air source heat pumps (ASHP) recover heat from the air and provides water and/or space heating. Some units are also designed to utilise both exhaust air and ambient air.	ASHP's are less efficient than gshp, and likely to be more variable because air temperatures fluctuate both daily and seasonally	Can serve the site providing heating and/or ventilation	Medium/Low – Requires large area within constrained site. High electricity prices affect payback.	Medium to High – requires electricity to run the heat pump.	Large area would be required for heat pumps. Will meet less than 1% of demand
Geothermal heat, hot rocks	Use of heat, steam or hot water generated from geothermal reservoirs to provide electricity through generators. Can produce 2mW in conjunction with CHP	Needs a specific source. Only a few locations in the UK	Can provide district heating	Fuel source is free but the infrastructure required is relatively high	Good – displaces the need for large amounts of gas	No source in the development

5.0 Technology Review

- 5.1 This section provides a detailed review on the application of viable technologies in the development.

Solar Hot Water (SHW)

- 5.2 Solar hot water heating is most appropriate for buildings where there is a constant annual demand for hot water. They are capable of reliably meeting up to 60% of the hot water demand per year and cost in the region of £3,000 per 4m² of collector installed.
- 5.3 Solar hot water systems use the sun's heat to warm water all year round and it is not necessary to have direct sunlight for the system to be effective. A conventional immersion heater or boiler can be used to top up the temperature of the water when necessary.
- 5.4 Solar collectors can be sited at an optimum pitch of 30-35° as in the case of photovoltaic or can be more versatile and can be installed either vertically or horizontally under the correct conditions.
- 5.5 The site heating and hot water demand is approximately 12,268,135kWh/yr, equivalent to a total of 2,380,018kg/CO₂/yr.
- 5.6 The leisure centres and part of the retail units are primary users of hot water on site and would be suitable recipients for the technology, however the low overall demand of the site for hot water, makes this technology unfeasible for the project as a single technology solution.

Technology	Size/output	Approximate Capital Cost	Renewable Energy (kWh/yr)	Carbon Savings (kg/CO ₂ /yr)
SHW	3,078	£2,308,640	1,693,003	328,443

Photovoltaic Panels (PV)

- 5.7 PV produces electricity through the conversion of the heat from the sun. As with solar water collectors there does not need to be direct sunlight for the conversion process to occur. PV panels can provide electricity for the lighting and appliances for all the elements of the development.
- 5.8 Energy generated but not used can be stored in batteries for use at a later time or exported to the national grid to provide a revenue stream.
- 5.9 PV panels cost in the region of £5,000 per kilowatt peak (kWp) and generate 850kW. Whilst restrictions on the availability of appropriately orientated roofspace exist, there are areas where PV can be installed. PV panels totalling approximately 850kWp and requiring 2,197m² of available space is feasible and would cost in the region of £10,983,114 installed.
- 5.10 Such a large amount of PV would need to be carefully sited to provide appropriate energy resources for the major users on site.
- 5.11 The table below describes the total savings that can be achieved from an appropriately sized PV array.

Technology	Size/output	Approximate Capital Cost	Renewable Energy (kWh/yr)	Carbon Savings (kg/CO ₂ /yr)
PV	2,197	£10,983,114	1,867,129	787,929

Combined Heat and Power (CHP)

- 5.12 A combined heat and power energy centre provides both space heating and electricity to the retail park site, with the potential to export excess electricity to the grid for revenue.
- 5.13 The CHP is able to provide hot water, heating and electricity to the site, typically

provided by fossil fuel. The total gas demand is 12,268,135kWh/yr, which equates to 2,380,018kgs/CO₂. In addition the electricity generated will further displace carbon emissions.

- 5.14 Given the size of the development and its build out in phases, a series of CHP units are suggested designed for the relevant phase they operate to. Each of the CHP units need to be designed to operate for more than 6,000 hours per annum to benefit from efficiencies. Each will also require an anchor heat load to operate from to support this demand.
- 5.15 It is recommended that CHP units are provided for each phase; the first phase will involve units 11 to 13, units 21 to 32, units 38 to 41 and the restaurants.
- 5.16 Two CHP units can be installed in phase 1, the first to support the units 11 to 13 and the restaurants, and the second to support the units 21 to 32. It is recommended that the CHP units be sited closest to the larger units where both demand will be highest and space more available.
- 5.17 For phase 2 a third unit should be sited close to the proposed leisure centre where the likely high demands for both heat and power will reduce system losses.
- 5.18 Gas backup boilers may need to be provided in addition for downtime and maintenance to ensure a reliable supply to the site.
- 5.19 It is further recommended that as the development specifications come forwards a more detailed assessment of the energy demands is carried out and the unit outputs amended accordingly.
- 5.20 The table below describes the savings that can be achieved from the appropriately sized units available. As there are three assumed units at this stage it is expected that there will be 2 units each 228_e/358_{th}, with a third unit of 210_e/358_{th}.
- 5.21 A net reduction of 969,300kgs/CO₂ saving across the development; this will equate to a reduction of 12.3%.

ENER-G Unit size	230 (2 units of this size)	210
Fuel Input (kW)	718	692
Electrical Output (kW)	228	210
Heat Output (kW)	358	345
Annual running hours	7,300	7,300
Annual Electrical Output (kW)	1,664,309	1,532,916
Annual Heat Output (kW)	2,613,257	2,518,362
Efficiency (%)	90%	89%
Operational CO ₂ emissions (kg)	1,016,776	979,957
CHP CO ₂ savings (kg)	1,360,534	1,261,741
Net CO ₂ savings (kg)	343,758	281,784

Biomass Boiler

- 5.22 Biomass boilers replace gas rather than electricity and so have a lower emissions savings than electrical technologies. A biomass boiler system of approximately 3000kW is feasible to support the heat demand. Fully installed such a system connected to an auger and storage hopper and including installation and commissioning would cost in the region of £1,500,000
- 5.23 A set of cascading boilers would allow for essential servicing and downtime to be carried out and negate the need for alternative more carbon intensive traditional gas boilers as a backup system.
- 5.24 Boilers capable of using pellets, wood chip and cereals are optimal for efficiency and will reduce the potential effects of wood pellet price fluctuations. In addition they are likely to be fully automated including de-ashing and self cleaning thus reducing ongoing maintenance costs to a minimum.
- 5.25 The boilers can be suited to provide heat and hot water to either a single unit or more units if the delivery system is designed to extend across the site.
- 5.26 Biomass fuels have increased NO_x emissions over natural gas, and need to ensure they burn smokeless fuels and have a suitable flue for extract. Further consideration of such features along with storage and delivery options will need to be considered if

biomass is part of the final strategy solution for the site.

5.27 The table below outlines the key factors for biomass boilers at the site:

Technology	Size/output	Apprioximate Capital Cost	Renewable Energy (kWh/yr)	Carbon Savings (kg/CO ₂ /yr)
Biomass	3,000	£1,500,000	4,061,487	787,929

Heat Pumps

5.28 Heat Pumps are capable of working with a range of heat sources that include the ground, air and water. In each case they transfer heat from the natural source into a building to provide space heating and, in some cases, to pre-heat to hot water supplies.

5.29 The site is too constrained to adequately install a ground source heat pump horizontal or vertical heat coils, and as a result this technology has been discounted from further investigation.

5.30 As there is no suitable watercourse within an appropriate distance, water source heat pumps are also unviable and discounted from further investigation.

5.31 The installation of an air source heat pump (ASHP) system into the development could raise installation space issues due to the large area required to achieve a satisfying energy output and unacceptable levels of noise pollution within the neighbouring developments.

5.32 Heat pumps provide low grade heat and as such are often used more efficiently at providing heating rather than hot water. This is because as domestic hot water requires an increase in the water temperature over that required for a space heating system so the length of time needed for the pump to run will increase.

5.33 Air source heat pumps have associated noise emissions (70db similar to a loud radio

or vacuum cleaner¹) and will need to be sited well away from any bedrooms. In addition snow or ice blocking the units will need to be cleared to maintain optimum efficiency.

- 5.34 A full backup natural gas or electrically based system will need to be installed to ensure continuity of service across the year and should be factored into the capital cost of the technology.
- 5.35 Appropriately sized heat pumps could provide carbon savings of approximately 787,929kg/CO₂/yr and meet 7% of the site energy.

Technology	Size / Output	Estimated Capital Cost	Renewable Energy (kWh/yr)	Carbon Savings (kg/CO ₂ /yr)
ASHP	2,489,507	£8,713,275	1,867,130	787,929

¹ <http://www.hse.gov.uk/pubns/indg362.pdf>