Report Prepared By

Ben Wells

Arcus Consulting LLP
Corner House,
177 Cross Street,
Sale, M33 7JQ

T 0161 905 3222
F 0161 905 3111

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WORLDWIDE HOUSE ENERGY STATEMENT

CONTENTS

1.0 EXECUTIVE SUMMARY

Arcus Consulting have been commissioned to compile an Energy Centre for the proposed 3rd Floor extension at Worldwide House, Bayham Street, London. This report has been compiled to identify strategies to meet the requirement to achieve 20% reduction in CO_2 through the installation of low or zero carbon technologies.

A benchmarking exercise has been undertaken to establish anticipated energy demand and how the implementation of low and zero carbon technologies can contribute to reducing the CO_2 emissions by 20%, in doing so, meeting the requirements of the Local Planning Authority.

The tables below show an overview of the energy modelling results. The use of photovoltaic panels or air source heating has been demonstrated to be sufficient to achieve the 20% reduction in CO_2 target.

During detailed design, full calculations will be undertaken as part of a costing exercise in order to specify the most appropriate solution in terms of cost whilst achieving the 20% reduction.

Technology	Total CO2 (kg/m2)	Carbon Saving
Base Model	45.06	NA
PV	36.10	20%
ASHP	24.03	47%

Table 1: Modelled Carbon Savings

Technology	Generation Proportion
PV	24%
ASHP	38%

Table 2: Modelled LZC Energy Generation

A BREEAM Pre-Assessment report has also been undertaken and this can be found in the Appendix of this report. The assessment details how the extension of the building will meet the BREEAM Very Good standard.

2.0 INTRODUCTION

Arcus Consulting have been commissioned to compile an Energy Centre for the proposed 3rd Floor extension at Worldwide House, Bayham Street, London. This report has been compiled to identify strategies to meet the requirement to achieve 20% reduction in CO_2 emissions through the installation of low or zero carbon technologies.

This report will detail the various methods of achieving the percentage reduction as required by the Local Authority. The requirements for compiling Energy Statements can be found in both: *Energy Planning: GLA Guidance on preparing energy assessments;* and *Camden Planning Guidance, Sustainability.* A review of this documentation can also be found in the main body of the report.

In addition to the Energy Statement, we have also undertaken a BREEAM Pre-Assessment to accompany the application. This document can be found in the Appendix of this report and it demonstrates that a BREEAM Very Good rating is targeted in line with the Planning Authority's requirements.

3.0 THE SITE

The site on Bayham Street in the London Borough of Camden currently consists of a three storey block of commercial offices. The planned extension will comprise a fourth storey across the entire footplate of the existing building. As a result of the extension, the existing plant on the roof will need to be relocated to the roof of the new extension.

4.0 PLANNING POLICY CONTEXT

NATIONAL

On the basis of the information from the Government's Sustainable Development Strategy, 'Securing the Future' (2005), priorities for the UK can be summarised as:

- Sustainable Consumption and Production;
- Climate Change and Energy;
- Natural Resource Protection and Environmental Enhancement;
- Sustainable Communities.

The construction of new buildings provides a real opportunity to reduce the carbon emissions associated with the built environment. New techniques and innovative technologies are allowing new build projects to achieve ever increasing levels environmental performance.

REGIONAL

'The London Plan: Spatial Development Strategy for Greater London' outlines the broad commitment to minimising the impacts of climate change through the achievement of a Carbon reduction target. By 2025, the Mayor will seek to achieve a 60% reduction in Carbon over 1990 levels.

The built environment is considered the largest contributor to the Carbon emissions within Greater London and as such, stringent targets have been set for new developments. Not only have targets been outlined in the document but also the methodology for achieving the target. The energy hierarchy must be considered in all cases. Below is an extract from The London Plan detailing how this hierarchy should be considered.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

The target for non-domestic buildings in 2013 is a 25% reduction in CO_2 emissions. Given the application referred to in this Energy Statement is not yet at detailed design stage, a benchmarking exercise has been undertaken using the standard benchmarks in CIBSE TM:46.

'Energy Planning: GLA Guidance on preparing energy assessments' details the requirements for the compilation of Energy Statements to accompany Planning Applications within London.

Using the principles of the Energy Hierarchy, this document outlines the requirements for the production of Energy Statements for new developments within Greater London.

This document states that Energy Strategy documents should include the following:

- A target for regulated CO_2 reductions.
- A target for regulated CO_2 emissions savings through energy demand.
- Reduction measures.
- Commitment to communal heating infrastructure, if appropriate for the development, and evidence of investigation into the existence of any wider district networks that the development could be connected to.
- Investigations of the feasibility and, where viable, commit to the installation of CHP In the proposed development.
- Large-scale developments should provide a feasibility assessment to ensure that CHP is sized to minimise CO2 emissions.
- Identification of measures to minimise unregulated emissions.
- Where appropriate we will expect an initial feasibility test for renewable energy technologies to be undertaken with a resulting commitment to further reduce CO_2 emissions through the use of onsite renewable energy generation.
- Where the required improvement on a development's Target Emission Rate is not met a commitment to ensure the shortfall is met off-site using the provision established by the borough.

LOCAL

As with the planning documents outlined above, the Camden Core Strategy 2010 – 2025, Adoption version 2010, places an emphasis on the energy hierarchy for reducing the Carbon emissions of the borough as a whole. It goes on to say that assessment methodologies such as BREEAM should be used to demonstrate the environmental performance of the built environment.

Once the energy use of the building is reduced, The Core Strategy encourages the use of energy efficient and renewable technologies to meet the reduced demand. The target that has been set in The Core Strategy is for developments to achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy generation.

Camden Planning Guidance 3: Sustainability (CPG 3), provides further confirmation of what must be included within an Energy Statement. The following from CPG 3 indicates the headings that should be used:

- Baseline energy demand and carbon dioxide emissions
- Reduce the demand for energy
- Supply energy efficiently
- Conclusion

Again, referring back to the energy hierarchy, CPG 3 highlights how the hierarchy should be considered within an energy statement. Section 6 mirrors the London Plan and Core Strategy documents outlining the 20% reduction in CO_2 through the use of renewable technologies. For clarity, the technologies outlined in CPG 3 as being 'renewable, are as follows:

- Solar/Thermal Hot Water Panels
- Photovoltaic (PVs)
- Ground Source Heat Pumps (GSHP) or geothermal
- Air source heat pumps (ASHP)
- Biomass heating and power
- Wind turbines

This Energy Statement will consider the use of the above, in addition to energy efficiency, and demonstrate options for compliance with the target of a 20% reduction in CO_2.

5.0 ENERGY STATEMENT

This Energy Statement is compiled in order to demonstrate how the savings in carbon, outlined as targets within the Core Strategy, can be achieved on the Worldwide House 3rd floor extension.

The Energy Statement must demonstrate compliance with the targets set out in the Core Strategy as outlined in the previous sections. The focus of this report is the following requirement:

- A 20% reduction in Carbon emissions must be achieved through the use of renewable and low carbon technologies.

Energy Hierarchy

Energy and Carbon reduction should be considered as part of any development in the following order starting with the action at the top:

- Energy conservation - Changing wasteful behaviour to reduce demand.
- Energy efficiency - Using technology to reduce demand and eliminate waste.
- Exploitation of renewable, sustainable resources.
- Exploitation of low-carbon technologies.
- Exploitation of conventional resources.

Government guidance for carbon performance suggests a hierarchy of good practice in low carbon design. The figure illustrates this hierarchy.

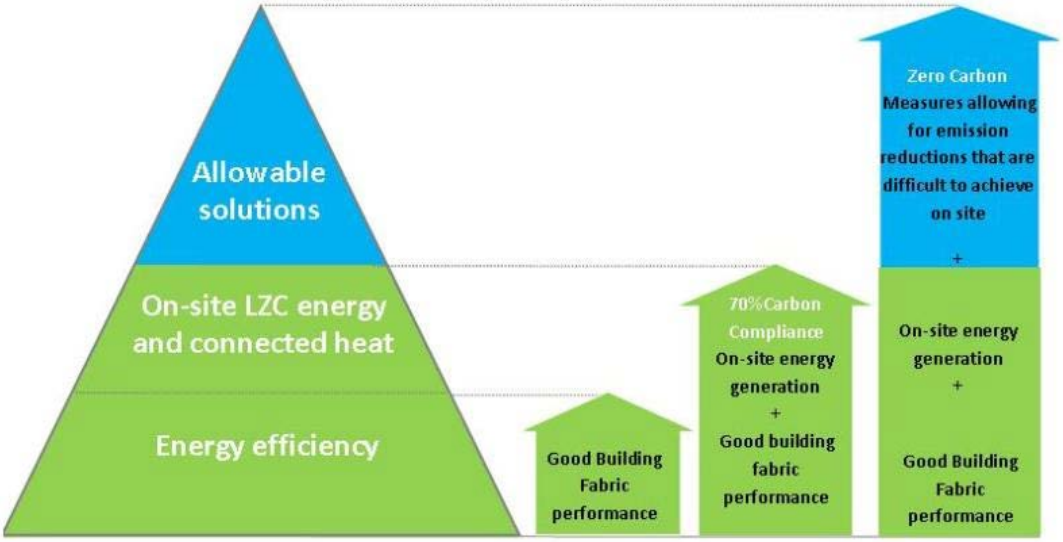


Fig 1 - Low Carbon Design Hierarchy

Whilst the building envelope is contrained to some degree by the nature of the developemnt as an extension of an existing building, consideration has been given to the integration of any proposed low and zero carbon energy sources with fixed services such as heating and hot water.

The last element of the hierarchy is the use of renewable energy solutions to generate the energy used on site. Ideally, these renewable energy sources should be installed locally.

Methodology

Given the development is an extension of an existing building and detailed design calculations using SBEM would be premature, we have undertaken a benchmarking exercise using CIBSE TM:46. Using these benchmarks we have set a baseline using the function areas in TM:46. Whilst Part L compliance cannot be derived using these benchmarks, they represent a similar energy demand to that of the notional building in the NCM.

Benchmarks are based on the rationalisation of a variety of value from different sources. The system consists of 237 building types split into 29 benchmark categories. Benchmarks are set for each category for electricity and/or fuel use annually assuming standard hours of use.

As part of this energy statement we have set the benchmarks typical for this type of office space. We have then used this data to calculate the percentage reduction in CO_2 resulting from the installation of renewable technologies. Given the building will be built to Part L of the Building Regulations, we have assumed that this will be achieved without the need for renewable technologies. This ensures compliance with the energy hierarchy as detailed in the relevant planning documentation outlined above.

Given the likely solutions for meeting the 20% reduction target, we will also demonstrate that the ‘providing energy efficiently’ part of the hierarchy, as well as the ‘renewable energy’ element will be covered using the same technology.

Overall this document provides confirmation that the developer is aware of their responsibilities with respect to energy reduction, prior to the demonstration of this through detailed design and full Part L design calculations.

Overview of Low & Zero Carbon Technologies

There are a number of technologies available for the development of the scheme which are discussed below:

HIGH EFFICIENCY/CONDENSING BOILERS

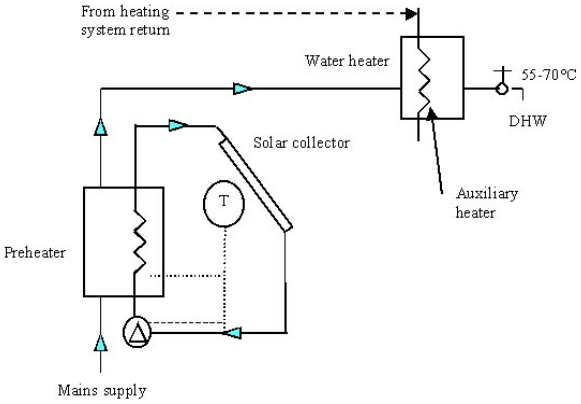
A high efficiency condensing boiler works on the principle of recovering as much as possible of the waste heat which is normally rejected to the atmosphere from the flue of a conventional (non-condensing) boiler.

This is accomplished by using two heat exchangers within the boiler which maximises heat transfer from the burner as well as recovering useful heat which would normally be lost with the flue gases. When in condensing mode (condensing boilers do not condense all of the time) the flue gases give up their 'latent heat' which is then recovered by the heat exchanger within the boiler. As a result the temperature of the gases exiting the flue of a condensing boiler is typically 50-60°C compared with 120-180°C in a non-condensing boiler. At the same time an amount of water or 'condensate' is produced.

The result of recovering heat from the exhaust flue gas means less primary gas demand. This subsequently reduces CO_2 emissions.

SOLAR COLLECTORS

Solar collectors collect both direct and diffuse solar radiation. Heat is transferred to the circulating liquid via heat exchange pipes that run through the solar collector. The circulating fluid in the solar collector is a mixture of water and glycol (antifreeze). This is to enable operation in winter and maximises efficiency similar to run around coils in a ventilation system, which use the same water and antifreeze mix. The water and antifreeze mixture is used to extract heat from the panels, so increasing the temperature of the water/circulating fluid. The water is then used to pre-heat the building domestic hot water as shown in the diagram above. The preheated water is then heated through a condensing boiler prior to delivery to the building at the desired temperature.



The domestic hot water can be provided for the building via a central plant room. The primary heat source for this hot water can be provided via a solar collector system. Hot water requirements could be served via evacuated-tube solar collectors on the roof of the building. The evacuated tube solar collector consists of a series of metal rods contained inside glass tubes, which are heated by the sun, and conduct their heat to water passing through a header at the ends of the rods. The hot water is then circulated into the building and utilised.

GROUND & WATER SOURCE HEAT PUMP (GSHP)

There are a multitude of GSHP's available in the construction industry, each GSHP is installed differently and subsequently perform differently, however the principle of operation is fundamentally the same.

A GSHP removes heat from the earth or ground water in cold weather and transfers it to the building through an underground piping system. For this particular development, it may be possible to utilise the water from Lake Windermere given the proximity of the development to the shore of the lake. It is important to note that there is likely to be an encourchment fee to South Lakeland District Council for using the lake in this way.

Whether ground or water is used as the source, the process remains the same and reverses in warm weather as heat is transferred to the ground. GSHP's work by circulating water or a water/antifreeze solution, generally

through a closed loop of pipe that is buried in the ground or set beneath water. The refrigerant cycle within a GSHP system comprises a two phase process, operating in the vapour and liquid phases. A GSHP can be categorised as having closed or open loops and these loops can be installed in three ways:

- horizontally,
- vertically,
- in a river / pond or lake.

The selection process for a GSHP depends on the area of the site / land, soil and rock type at the project. These factors will help determine the most economical choice for installation of the ground loop.

CLOSED LOOP SYSTEM

In closed loop systems, water or antifreeze solution is circulated through pipes buried beneath the earth's surface. During the winter, the fluid collects heat from the earth and carries it through the system and into the building. During the summer, the system can reverse itself to cool the building by pulling heat from the building, carrying it through the system and placing it in the ground. This process creates free hot water in the summer and delivers substantial hot water savings in the winter.

Horizontal loops or 'slinky systems' are the most common configuration of closed loop systems. A trench is dug on the site and high density, fusible, polyethylene pipe is laid and appropriately spaced in the bottom of the trench, then buried in a continuous or parallel loop (depending on size of unit). There are various depths the pipes can be installed, however, the most common depth is to bury a loop at least 300mm below the frost level. It is possible to layer more than two pipes in each trench, this can reduce the cost of digging / installation. If a double layer of pipe is used in a single trench, then the trench must be deep enough to allow for thermal separation. It is important to backfill the trench properly, to avoid air pockets that can reduce the transfer of heat, and to ensure that the pipe is not damaged by large sharp rocks.

OPEN LOOP SYSTEM

Open loop systems are less common but operate on the same principle as closed loop system. The open loop system circulates a constant source of ground water and disperses the water back to its origin, such as a stream, well, or pond. Benefits similar to the closed loop system are obtained, but environmental concerns regarding the water source can mean they are not an acceptable solution.

AIR SOURCE HEAT PUMP (ASHP)

Air source heat pump (ASHP) systems operate in a similar manner to GSHP systems, only they extract heat energy from the air, rather than the ground. They offer a simpler and cheaper alternative to GSHP's in that, generally, they offer much greater flexibility with regards to their installation and do not require the prior geological work needed by GSHP's.

With a typical SAP rated efficiency of 250%, they are not quite as efficient as GSHP's which are 320% efficient. They do, however, offer a renewable energy source to provide low grade hot water for suitable for domestic hot water or under floor heating installations.

When utilised with radiator systems it must be understood that most existing wet heating systems are sized for a water temperature of 80°C. A heat pump can usually achieve a maximum heating water flow temperature of around 45°C. This is ideally suited to under-floor heating systems, where low surface temperatures are required, but does not lend itself well to existing radiator installations without a commitment to reduce building heat losses through fabric improvement.

For this reason, radiators for a heat pump system may need to be significantly larger than those for a system served by a conventional boiler. The flow temperature of an ASHP system can be raised by the use of an electric top-up heater.

BIOMASS BOILERS

Biomass constitutes all non-fossil organic materials that have intrinsic chemical energy content. This includes all water and land-based vegetation and trees or virgin biomass, such as log wood or thinning from local forests, prunings from roadsides or parks, grasses and energy crops and in some countries residues from agriculture or food processing e.g. nutshells or olive pits, wood chips, recycled untreated wood or palletising residues from wood processing. Also all waste biomass such as municipal solid waste, municipal bio solids (sewage) and animal wastes (manures), forestry and agricultural residues, and certain types of industrial wastes are classified as biomass. Through using these resources a possible disposal problem can be turned into a high quality fuel and local suppliers of wood fuels will gain extra income and enhance local economic turnover.

Biomass can be used on a domestic or industrial scale. For a large scale biomass power plant, the chipped, shredded and dried fuel is fed into a boiler or gasifier, from where the gas is collected and used.

Boilers providing heat to the site could operate via biofuel. Biofuel is any fuel that derives from biomass - recently living organisms or their metabolic byproducts, such as manure from cows. It is a renewable energy, unlike other natural resources such as petroleum, coal and nuclear fuels. The carbon in biofuels was recently extracted from atmospheric carbon dioxide by growing plants, so burning it does not result in a net increase of carbon dioxide in the Earth's atmosphere.

The use of biofuel would mean the requirement for biofuel storage and regular deliveries. A hard standing is therefore required for a delivery truck or hopper, along with suitable protection from the elements. A trade-off between frequency of fuel deliveries and storage space is usually sought.

Maintenance of biomass boilers is considerably more onerous than for a conventional boiler. Ash residues mean that the plant must be shut down for cleaning on a regular basis.

BIOGAS BOILERS

Biogasses are produced when organic matter is broken down by microbes. A common gas amongst the many emitted during this process is methane. If this methane can be contained as it is given off, it can then be combusted in a boiler (similar to a conventional gas fired boiler) to produce heat.

This process can be undertaken using anaerobic digestion, where organic waste (human or animal effluent, food waste, garden waste etc) is broken down in a sealed container to allow gasses to be captured. The resultnat slurry can also be collected and used as fertiliser.

When determining the effectiveness of biogas generation systems, consideration must be given to the type and quantity of organic waste available. The conditions under which these are digested, as well as the time over which this is allowed to occur, all have an effect on the quantity and quality of combustible gas which can be generated.

WIND TURBINES

Wind turbines generate electricity from natural wind power via the rotation of their rotors. Turbines are classified as either ‘small scale’ (6kW to 50kW capacity), ‘medium scale (between 50kW and 250kW output) or ‘large scale’ (250kW to 5MW output).

Large scale turbines are unlikely to be awarded planning permission in urban areas due to aesthetic and safety constraints. All turbines require clear access to wind speeds which achieve 6m/s or greater on a regular basis. The presence of buildings or variation in the local landscape can all affect the feasibility of a turbine installation.

In order to fully assess the viability of a turbine installation, local weather data at the proposed installation site should be collected for a minimum of 6 months, but ideally for 12 months, to allow accurate generation estimations to be made. This data would be collected via an anemometer on a mast to the height of the proposed turbine. This installation would also normally require planning permission.

PHOTOVOLTAIC (PV) PANELS

PV panels collect direct and diffuse solar energy and convert this into electricity which can be used on site or exported to the national electrical grid. Arrays of PV panels can be of almost any size and are normally installed on roof tops to ensure that they are cleared of any potential obstructions or shades.

The introduction of the Government's Feed-In Tariff (FIT) scheme has meant that PV is now a mainstream technology, used widely in domestic and commercial applications. As such, the cost of this technology has reduced dramatically over the last few years.

PV panels are available in monocrystalline, polycrystalline or amorphous thin-film types, which vary in efficiency and cost (monocrystalline being the more expensive and most efficient).

Energy Use

The energy use of the devlopment has been calculated through a benchmarking exercise based on the standard benchmarks in CIBSE TM46:2008, Energy Benchmarks. Once an M&E consultant has been appointed we would look to work alongside them to finalise the percentage contributions for each of the feasible technologies.

The table below highlights the key figures from this benchmarking exercise for the existing floors and the proposed new extension.

		Heating & Hot Water		Cooling		Fans, Pumps, Controls		Lighting		Total	
Zone	Area (m2)	$kgCO_2/m^2$	$kgCO_2$	$kgCO_2/m^2$	$kgCO_2$	$kgCO_2/m^2$	$kgCO_2$	$kgCO_2/m^2$	$kgCO_2$	$kgCO_2/m^2$	$kgCO_2$
New 3rd Floor	412	30.0	12376	1.9	774	1.9	774	11.3	4641	45.1	18565
Existing 2nd Floor	412	30.0	12376	1.9	774	1.9	774	11.3	4641	45.1	18565
Existing 1st Floor	412	30.0	12376	1.9	774	1.9	774	11.3	4641	45.1	18565
Existing Ground	412	30.0	12376	1.9	774	1.9	774	11.3	4641	45.1	18565
TOTAL	**1648**	**30.0**	**49506**	**1.9**	**3094**	**1.9**	**3094.1**	**11.3**	**18565**	**45.1**	**74259**

Table 3: Whole Building Carbon Benchmark Data

As the requirement for low and zero carbon energy generation applies to the new extension only, this will be considered in isolation to the other floors.

Feasibility Assessments

The table below provides an initial overview of the feasibility of the various technologies discussed in the previous section. A traffic light system has been adopted to represent the anticipated feasibility of these measures prior to undertaking modelling of the site.

The traffic light system should be interpreted as follows:

Red – Technology not suitable.

Amber – Technology may be suitable depending on building energy demands.

Green – Technology likely to be suitable given appropriate payback and operational constraints are met.

LZC Technology	Feasibility Comment	Feasible	>20% reduction in CO2
Wind Turbines	Given the location of the site it is likely that local planning conditions and landscape features may render a turbine unviable. This should be considered as a high level assessment of feasibility only, as local site conditions and recorded wind data should be considered prior to full rejection of this proposal.	No	Yes
Photovoltaic Panels	PV panels are likely to be suitable given the facility to incorporate these into the design of the new 3rd floor roof. The effects of any shading caused by surrounding buildings would need to be considered, but it is not anticipated that	Yes	Yes

	this would render PV non-viable. We would propose full output modelling of the system in situ to confirm the effectiveness of this technology and confirm how much PV would be required to meet the 20% target.		
High Efficiency/ Condensing Boilers	If conventional gas fired heating is adopted then this should be via high efficiency or condensing boilers. This could operate via a district heating system for each zone or a separate unit for each building. The status of existing gas infrastructure on the site will need to be fully examined to ensure the feasibility of this option. It is likely that the installation of this technology would be required as a minimum to achieve Building Regulation Part L compliance, therefore, it is unlikely to provide the 20% reduction.	Yes	No
Solar Collectors	Solar hot water panels are likely to be unsuitable given the low hot water demand of the building. As hot water is only required for WCs and pantries it is unlikely that sufficient energy consumption would occur to provide a reasonable payback on the equipment or to generate 20% of the development's energy usage.	No	No
CHP	CHP is unlikely to be viable as the site will not have the consistent base loads required to support the significant financial outlay for this type of technology. CHP operates most effectively if it can operate at a constant load continuously. If there is insufficient heat demand then excess heat has to be purged to the atmosphere as waste. Clearly this is not advisable. A full financial assessment of the viability of CHP is a complex and detailed procedure and, as such, it is beyond the scope of this report.	No	No
ASHP	Air source heating could be used to serve the heating and hot water demands, given sufficient space for external plant compounds where current plant for the other floors is being relocated. ASHPs must also be supported by the use of further energy saving measures such as a higher performing fabric, due to the low output temperatures produced by the heat pumps.	Yes	Yes
GSHP	Ground source heating and cooling could be used to serve heating, cooling and DHW demands for the site, given sufficient space and suitable ground conditions to accommodate the required slinky system or bore holes. Given the nature and location of the site it is unlikely that the required ground loops or bore holes could be created to serve such a system.	No	No
Biomass Boilers	Biomass boilers are likely to be able to provide a significant carbon saving over gas fired or electrically driven cooling. However, the operational risks, high maintenance demands and fuel storage requirements are likely to result in this being non-viable given the nature and location of the site.	No	Yes

6.0 SITE ENERGY MODELS

Overview

A benchmarking exercise has been undertaken to establish anticipated energy demand and how this can be minimised via the use of sustainable measures. As mentioned in the previous section, we have assumed Part L compliance will be achieved without the need for renewable technologies. This helps ensure a high performance building envelope and efficient services are installed prior to the selection of renewable technologies.

The models included within this report have been constructed using CIBSE and DECC approved benchmark data. As noted earlier in this statement, it is not appropriate at this stage to undertake full design calculations given the level of detail we have on the proposed extension.

The base model represents an extension without the inclusion of any low or zero carbon technologies. The models within this report aim to demonstrate that the application of renewable energy generation can provide a 20% carbon saving over the base model.

Low & Zero Carbon Technologies

The use of low and zero carbon technologies to generate energy has been modelled to assess the potential suitability of the different technologies.

Following an initial feasibility assessment, the following technologies were identified for further analysis:

- Photovoltaic (PV) Generation
- Air Source (ASHP) Heating

Photovoltaic Panels

An allowance has been made for 80m^2 of PV panels.

		Heating & Hot Water		Cooling		Fans, Pumps, Controls		Lighting		Total	
Zone	Area (m2)	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2
New 3rd Floor	412	30.0	12376	1.9	774	1.9	774	11.3	4641	36.1	14860
									SAVING	20%	

Table 4: Photovoltaic Panel Energy Model

80m^2 of PV panels provides a 20% carbon saving over the base line building. We would calculate that this would generate around 8,800 kWh per annum, equivalent to 24.9% of the extension's energy consumption.

Air Source Heating

The model assumes all heating and hot water generation would be provided by the ASHP.

		Heating & Hot Water		Cooling		Fans, Pumps, Controls		Lighting		Total	
Zone	Area (m2)	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2	kgCO2/m2	kgCO2
New 3rd Floor	412	9.0	3713	1.9	774	1.9	774	11.3	4641	24.0	9901
									SAVING	46.7%	

Table 5: Air Source Heat Pump Energy Model

The air source heat pump would provide a carbon saving of 46.7% over the base model. With all heating and hot water provided by a low and zero carbon energy source, this equates to 37.5% renewable energy generation.

Technology	Total CO2 (kg/m2)	Carbon Saving	Generation Proportion
Base Model	45.06	NA	NA
PV	36.10	20%	24%
ASHP	24.03	47%	38%

Table 6: Summary Table

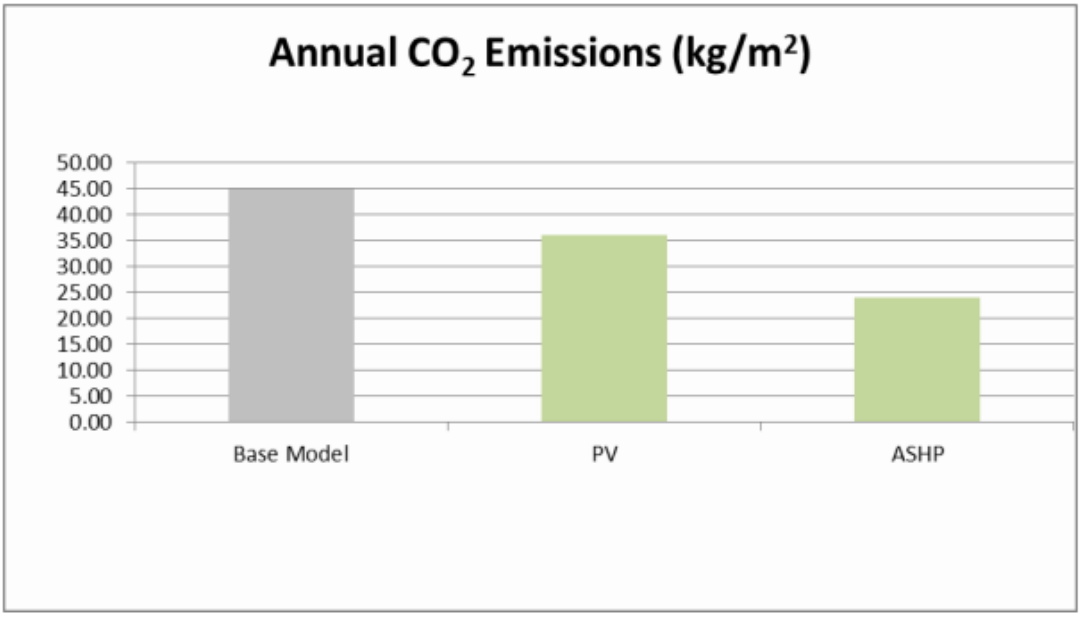


Figure 1: Annual CO_2 Savings

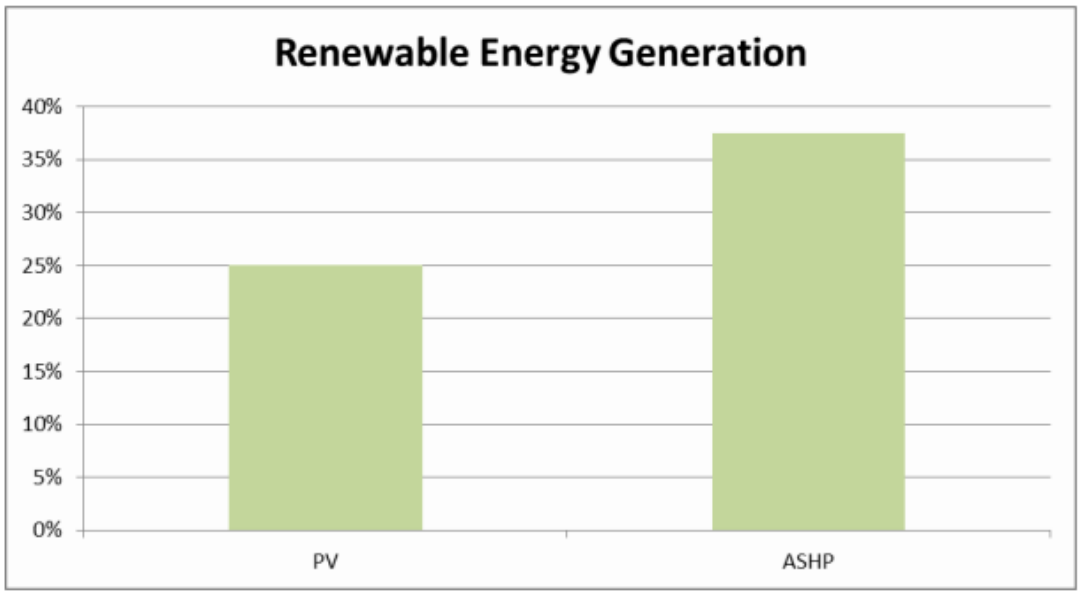


Figure 2: Proportions of LZC Energy Generation

7.0 BREEAM

Arcus Consulting have been commissioned by Rivercrest to undertake a BREEAM NC 2011 Pre-Assessment for the extension of the third floor of the building known as Worldwise House in Camden, London.

A BREEAM NC 2011 Pre-Assessment Estimator tele-conference was undertaken in order to ascertain the likely rating of the property. The London Borough of Camden Planning Department have expressed that a BREEAM rating of 'Very Good' must be achieved on a Post Construction Review Assessment of the development.

We have undertaken a full BREEAM Pre-Assessment, however, the building may be categorised as a 'Simple Building' and therefore eligible for registration under this scheme rather than the full criteria. The BRE have not released the Pre-Assessment tool for this scheme which is why we have undertaken a full assessment.

Based on the information provided by the project team and the commitments made by them, the proposed development has a predicted BREEAM score of 61.3% and a rating of 'Very Good'. The minimum requirement for 'Very Good' is 55%. A detailed summary of credits targeted is outlined in the Appendix.

BREEAM Methodology

The Building Research Establishment (BRE) has developed a voluntary, standard environmental assessment method (known as BREEAM), by which the environmental impact of a building is assessed against a range of issues, and credits are awarded where the building achieves a benchmark performance. BREEAM seeks to bring about reductions in the environmental impact of buildings through recognition of the business benefits that can be achieved.

The method addresses the impacts of a building on the global, local and indoor environments across a range of issues, grouped under the headings of:

- Management;
- Health and Wellbeing;
- Energy;
- Transport;
- Water;
- Materials;
- Waste;
- Land Use and Ecology;
- Pollution; and
- Innovation.

The credits scored are shown as a weighted percentage score, which itself corresponds to an overall rating of Pass, Good, Very Good, Excellent or Outstanding.

A Pre-Assessment Estimator provides a quick evaluation of the BREEAM rating likely to be achieved under a Design Stage assessment. The results can be used to feed into the design process in order to maximise the score achieved. Its completion is a means of monitoring the sustainability performance of the development against this established, independent benchmark. It should be noted that, as the Pre-Assessment Estimator is a simplified version of the full method, it only provides an estimate of the BREEAM rating. As a consequence, the final rating may vary following a Design Stage assessment.

8.0 CONCLUSIONS

As has been calculated through the use of a benchmarking exercise, there are two options for the installation of renewable energy solutions sufficient to meet the 20% reduction in CO2 emissions set by the Local Authority.

Either ASHPs or Photovoltaic panels would be sufficient to meet this target. ASHPs would provide a 46.7% reduction in CO2 emissions, despite running on CO2 intensive electricity. The seasonal efficiency of heat pumps is improving as new technologies are developed and the high percentage reduction is mainly due to the fact that the technology would be providing both heating and domestic hot water for the proposed development.

ASHPs are also likely to be the least expensive of the two technologies although hot water storage tanks would also need to be provided. It is likely that underfloor heating would be the most appropriate distribution system and costs for this would have to be taken into account.

Photovoltaic panels on the other hand would require very little in the way ancillary equipment. An inverter would be required and the developer would need to ensure that the roof was structurally sound enough to take the additional weight and uplift. The PV array is likely cost considerably more than the ASHP but the developer would be eligible for the Feed in Tariff and electricity savings. The calculations in the main body of the report do not consider unregulated energy use. That is, energy from appliances and other small power equipment. Given the use as an office, greater lifecycle savings could be seen through the PV as opposed to the ASHP option.

To sum up, both these technologies would be suitable for installation at this development pending further detailed design and Part L calculations. Consideration would need to be given to the ancillary equipment for each technology and the lifecycle payback periods for the developer. Other stakeholders would include the future tenants of the office space and the developer may wish to consider ongoing running costs when making a decision on which technology to install.

With regard to the BREEAM Pre-Assessment undertaken, a score of 61.3% (Very Good) has been achieved at this stage. Full design and post construction stage assessments will be required in order ascertain certification under the scheme. A full breakdown of where credits will be targeted can be found in the appendix.

9.0 APPENDIX

BREEAM®

BREEAM 2011 New Construction Pre-Assessment Estimator

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a buildings potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

Building name	Worldwide House (Extension)
Indicative building score (%)	61.30%
Indicative BREEAM rating	Pre-Assessment result indicates potential for BREEAM Very Good rating
Indicative minimum standards level achieved	Pre-Assessment result indicates the minimum standards for Very Good level

MANAGEMENT — Section Weighting 12.00% — Indicative Section Score 9.27%

Man01 Sustainable Procurement

No. of BREEAM credits available	8	Available contribution to overall score	4.36%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will roles, responsibilities and a training schedule be defined in accordance with BREEAM?	Yes	1	1
Will a BREEAM AP be appointed at RIBA stage A/B and performance targets contractually agreed?	Yes	1	1
Will a BREEAM AP be appointed to monitor and report progress during RIBA stage B-E ?	Yes	1	1
Willa BREEAM AP be appointed to monitor and report progress during RIBA stage F-L?	Yes	1	1
Will a thermographic survey be conducted and any defects uncovered remedied?	Yes	1	1
Will compliant commissioning of building services be carried out?	Yes	1	1
Will compliant seasonal commissioning of building services be carried out?	Yes	1	1
Will water/energy consumption data be recorded and aftercare support provided for 12 months?	Yes	1	1
Will water/energy consumption be recorded/reported for 3 years post construction?	Yes	1	1

Total indicative BREEAM credits achieved	8
Total indicative contribution to overall building score	4.36%
Total indicative BREEAM innovation credits achieved	1
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Man02 Responsible Construction Practices

No. of BREEAM credits available	2	Available contribution to overall score	1.09%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Pre-Assessment question/criteria

Which considerate construction scheme will be used or required to be used by the principal contractor?	Considerate Constructors Scheme
For the required scheme, what will be the target performance level set for the site/contractor?	A CCS score between 32 and 35.5.

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	1.09%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Man03 Construction Site Impacts

No. of BREEAM credits available	5	Available contribution to overall score	2.73%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will site energy consumption be metered/monitored?	Yes	1	1
Will site water consumption be metered/monitored?	Yes	1	1
Will the transport of construction materials and waste to/from site be measured/monitored?	Yes	1	1
Will timber be sourced in accordance with the Government's Timber Procurement Policy?	Yes	1	1
Will/does the principal contractor operate a compliant Environmental Management System?	No	1	0
Will the principal contractor adopt best practice pollution prevention policies & procedures?	Yes		

Total indicative BREEAM credits achieved	4
Total indicative contribution to overall building score	2.18%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Man04 Stakeholder Participation

No. of BREEAM credits available	4	Available contribution to overall score	2.18%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will an appropriate level of consultation activities be undertaken?	No	1	0
Will an access statement be developed and appropriate building user facilities provided?	Yes	1	1
Will building user guides and relevant user information be provided?	Yes	1	1
Will a post occupancy evaluation assessment be undertaken and information disseminated?	Yes	1	1

Total indicative BREEAM credits achieved	3
Total indicative contribution to overall building score	1.64%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Man05 Life cycle cost and service life planning

No. of BREEAM credits available	3	Available contribution to overall score	1.64%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will a feasibility stage Life Cycle Cost (LCC) analysis be commissioned and completed?	No	1	0
Will a strategic and system level LCC be commissioned and completed?	No	1	0
Will a technical design LCC to be commissioned and completed?	No	1	0

Total indicative BREEAM credits achieved	0
Total indicative contribution to overall building score	0.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

HEALTH & WELLBEING	Section Weighting	15.00%	Indicative Section Score	10.71%

Hea01 Visual Comfort

No. of BREEAM credits available	3	Available contribution to overall score	3.21%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will all fluorescent lamps be fitted with high frequency ballasts?	Yes	N/A	N/A
Will all relevant building areas be designed to achieve the appropriate daylight factor(s)?	Yes	1	1
Will the design provide adequate glare control and view out for building users?	Yes	1	1
Will internal/external lighting be specified in accordance with the relevant CIBSE Guides/British Standards?	Yes	1	1
Will all relevant building areas be designed to achieve exemplary level daylight factor(s)?		1	0

Total indicative BREEAM credits achieved	3
Total indicative contribution to overall building score	3.21%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Hea02 Indoor Air Quality

No. of BREEAM credits available	4	Available contribution to overall score	4.29%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will an air quality plan be produced?	Yes	1	1
Will the building be designed to minimise sources of internal air pollution?	Yes		
Will the relevant products be specified to meet the VOC testing and emission levels required?	No	1	0
Will formaldehyde and total VOC levels be measured post construction?	No	1	0
Will the building be designed to, or have the potential to provide, natural ventilation?	No	1	0

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.07%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Hea03 Thermal Comfort

No. of BREEAM credits available	2	Available contribution to overall score	2.14%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will thermal modelling of the design be carried out?	Yes	1	1
Will the modelling inform the development of a thermal zoning and control strategy?	Yes	1	1

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.14%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Hea04 Water Quality

No. of BREEAM credits available	1	Available contribution to overall score	1.07%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will all water systems be designed to comply with the relevant HSE Approved Code of Practice and Guidance?	Yes	1	1
Where humidification is to be provided, will a failsafe humidification system be specified?	Yes		
Will a wholesome supply of accessible, clean and fresh drinking water be supplied for building users?	Yes		

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.07%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Hea05 Acoustic Performance

No. of BREEAM credits available	2	Available contribution to overall score	2.14%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will/has a suitably qualified acoustician be appointed to provide appropriate design advice?	Yes		
Will the building meet the relevant acoustic performance standards and testing requirements?	Yes	2	2

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.14%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Hea06 Safety and Security

No. of BREEAM credits available	2	Available contribution to overall score	2.14%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Where external site areas are present, will safe access be designed for pedestrians and cyclists?	No	1	0
Will a suitably qualified security consultant be appointed and security considerations accounted for?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.07%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

ENERGY	Section Weighting	19.00%	Indicative Section Score	9.12%

Ene01 Reduction of CO_2 Emissions

No. of BREEAM credits available	15	Available contribution to overall score	11.40%
No. of BREEAM innovation credits available	5	Minimum standards applicable	Yes

How do you wish to assess the number of BREEAM credits achieved for this issue?	Define a target number of BREEAM credits achieved		
Select the target number of BREEAM credits for the Ene01 issue	4	BREEAM Innovation credits	

BREEAM 2011 New Construction Pre-Assessment Estimator

Total indicative BREEAM credits achieved	4
Total indicative contribution to overall building score	3.04%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Very Good level

Comments/notes:

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene02 Energy Monitoring

No. of BREEAM credits available	2	Available contribution to overall score	1.52%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will a BMS or sub-meters be specified to monitor energy use from major building services systems?	Yes	1	1
Will a BMS or sub-meters be specified to monitor energy use by tenant/building function areas?	Yes	1	1

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	1.52%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene03 External Lighting

No. of BREEAM credits available	1	Available contribution to overall score	0.76%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will external light fittings and controls be specified in accordance with the BREEAM criteria?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	0.76%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene04 Low and Zero Carbon Technology

No. of BREEAM credits available	5	Available contribution to overall score	3.80%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Compliant LZC feasibility study to be undertaken	Yes	2	1
What will be the intended scope of the feasibility study?	Operational stage carbon savings/emissions		
Target percentage net reduction in operational stage CO2 emissions	20.00%	2	2
Please confirm the intended energy source of the Low and/or zero carbon system?	Aerothermal		
Please select	No	1	0

Total indicative BREEAM credits achieved	3
Total indicative contribution to overall building score	2.28%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene05 Energy Efficient Cold Storage

Assessment Issue Not Applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved

Total indicative BREEAM credits achieved	N/A
Total indicative contribution to overall building score	N/A
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene06 Energy Efficient Transportation Systems

Assessment Issue Not Applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved

Total indicative BREEAM credits achieved	N/A
Total indicative contribution to overall building score	N/A
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene07 Energy Efficient Laboratory Systems

Assessment Issue Not Applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved

Total indicative BREEAM credits achieved	N/A
Total indicative contribution to overall building score	N/A
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene08 Energy Efficient Equipment

No. of BREEAM credits available	2	Available contribution to overall score	1.52%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Present	Significant majority contributor
Which of the following will be present and likely to be a/the major contributor to 'unregulated' energy use:		
Small power/plug in equipment?	Yes	No
Swimming pool?	No	
Communal laundry?	No	
Data centre?	No	
IT-intensive operation areas?	No	
Residential areas?	No	
Healthcare?	No	
Kitchen and catering facilities?	No	

	Indicative compliance?	Credits available	Indicative credits achieved	
Will the significant majority contributor(s) to 'unregulated' energy use (above) meet the BREEAM criteria?	Yes	2	2	N/A

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	1.52%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Ene09 Drying Space

Assessment Issue Not Applicable

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved

Total indicative BREEAM credits achieved	N/A
Total indicative contribution to overall building score	N/A
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

TRANSPORT	Section Weighting	8.00%	Indicative Section Score	6.22%

Tra01 Public Transport Accessibility

No. of BREEAM credits available	3	Available contribution to overall score	2.67%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria

What is the building type category (for the purpose of Tra01 issue assessment)?	Business (office/industrial)
What is the degree of public transport provision for the building's location?	Excellent provision of public transport, i.e. large urban/metropolitan city centre
Building's indicative Accessibility Index	18
Does the building have a dedicated bus service?	

Total indicative BREEAM credits achieved	3
Total indicative contribution to overall building score	2.67%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Tra02 Proximity to Amenities

No. of BREEAM credits available	1	Available contribution to overall score	0.89%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will the building be in close proximity of and accessible to applicable amenities?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	0.89%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Tra03 Cyclist facilities

No. of BREEAM credits available	2	Available contribution to overall score	1.78%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

What is the building type category (for the purpose of Tra03 issue assessment)?	Business - offices, Industrial

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will cycle storage spaces be provided?		2	0
Will cyclist facilities be provided?			

Total indicative BREEAM credits achieved	0
Total indicative contribution to overall building score	0.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Tra04 Maximum Car Parking Capacity

No. of BREEAM credits available	2	Available contribution to overall score	1.78%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Building type category (for the purpose of Tra04 issue)?	Business - offices, Industrial
Buildings indicative Accessibility Index (sourced from issue Tra01)	18

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will the building meet BREEAM's maximum parking capacity criteria for this building type/Accessibility Index?	Yes	2	2

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	1.78%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Tra05 Travel Plan

No. of BREEAM credits available	1	Available contribution to overall score	0.89%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will a transport plan based on site specific travel survey/assessment be developed?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	0.89%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

WATER	Section Weighting	6.00%	Indicative Section Score	2.25%

Wat01 Water Consumption

No. of BREEAM credits available	5	Available contribution to overall score	3.75%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Select the level that corresponds closely to the target or likely water component specification?	Level 2 - Two credits

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	1.50%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Wat02 Water Monitoring

No. of BREEAM credits available	1	Available contribution to overall score	0.75%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will there be a water meter on the mains water supply to the building(s)?	Yes	1	1
Will metering/monitoring equipment be specified on the water supply to any relevant plant/building areas?	Yes		
Will all specified water meters have a pulsed output?	Yes		
If the site/building has an existing BMS connection, will all pulsed meters be connected to the BMS?	N/A		

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	0.75%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Wat03 Water Leak Detection and Prevention

No. of BREEAM credits available	2	Available contribution to overall score	1.50%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will a mains water leak detection system be installed on the building's mains water supply?	No	1	0
Will flow control devices be installed in each sanitary area/facility?	No	1	0

Total indicative BREEAM credits achieved	0
Total indicative contribution to overall building score	0.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Wat04 Water Efficient Equipment — **Assessment Issue Not Applicable**

No. of BREEAM credits available	N/A	Available contribution to overall score	N/A
No. of BREEAM innovation credits available	N/A	Minimum standards applicable	N/A

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved

Total indicative BREEAM credits achieved	N/A
Total indicative contribution to overall building score	N/A
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

MATERIALS	Section Weighting	12.50%	Indicative Section Score	7.29%

Mat01 Life Cycle Impacts

No. of BREEAM credits available	5	Available contribution to overall score	5.21%
No. of BREEAM innovation credits available	1	Minimum standards applicable	No

Pre-Assessment question/criteria

How do you wish to assess the number of BREEAM credits achieved for this issue?	Define a target number of BREEAM credits to be achieved		
Select the number of BREEAM credits being targeted for the Mat01 issue	2	BREEAM Innovation credits	

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.08%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Mat02 Hard Landscaping and Boundary Protection

No. of BREEAM credits available	1	Available contribution to overall score	1.04%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will ≥80% of all external hard landscaping and boundary protection achieve a Green Guide A or A+ rating?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.04%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Mat03 Responsible Sourcing

No. of BREEAM credits available	3	Available contribution to overall score	3.13%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Pre-Assessment question/criteria

How do you wish to assess the number of BREEAM credits achieved for this issue?	Define a target number of BREEAM credits		
Select the number of BREEAM credits being targeted for the Mat03 issue	1	BREEAM Innovation credits	
Will all timber used on the project be sourced in accordance with the UK Govt's Timber Procurement Policy?	Yes		

BREEAM 2011 New Construction Pre-Assessment Estimator	
Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.04%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Mat04 Insulation

No. of BREEAM credits available	2	Available contribution to overall score	2.08%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Is the building targeting an insulating index of 2 or more?	Yes	1	1
Will the building's insulating materials be responsibly sourced?	Yes	1	1

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.08%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Mat05 Designing for Robustness

No. of BREEAM credits available	1	Available contribution to overall score	1.04%
No. of BREEAM innovation credits available	0	Minimum standards applicable	N/A

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will suitable durability/protection measures be specified and installed to vulnerable areas of the building?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.04%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

WASTE	Section Weighting	7.50%	Indicative Section Score	5.36%

Wst01 Construction Waste Management

No. of BREEAM credits available	4	Available contribution to overall score	4.29%
No. of BREEAM innovation credits available	1	Minimum standards applicable	Yes

Pre-Assessment question/criteria

How do you wish to assess the number of BREEAM credits achieved for this issue?	Define a target number of BREEAM credits to be achieved		
Select the number of BREEAM credits being targeted for the Wst01 issue	2	BREEAM Innovation credits	

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.14%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Wst02 Recycled Aggregates

No. of BREEAM credits available	1	Available contribution to overall score	1.07%
No. of BREEAM innovation credits available	1	Minimum standards applicable	No

Pre-Assessment question/criteria

How do you wish to assess the number of BREEAM credits achieved for this issue?	Define a target number of BREEAM credits to be achieved		
Select the number of BREEAM credits being targeted for the Wst02 issue	1	BREEAM Innovation credits	

BREEAM 2011 New Construction Pre-Assessment Estimator	
Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.07%
Total indicative BREEAM innovation credits achieved	0
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Wst03 Operational Waste

No. of BREEAM credits available	1	Available contribution to overall score	1.07%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will appropriate facilities for the storage of operational recyclable waste volumes be provided?	Yes	1	1
If relevant, will a static waste compactor(s) or baler(s) be specified/installed?	N/A		
If relevant, will a vessel for composting suitable organic waste be specified/installed?	N/A		

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.07%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

Wst04 Speculative Floor and Ceiling Finishes

No. of BREEAM credits available	1	Available contribution to overall score	1.07%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Speculative floor and ceiling finishes will be installed in a show area only	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.07%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

LAND USE & ECOLOGY	Section Weighting	10.00%	Indicative Section Score	7.00%

LE01 Site Selection

No. of BREEAM credits available	2	Available contribution to overall score	2.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will at least 75% of the proposed development's footprint be located on previously been developed land?	Yes	1	1
Is the site deemed to be significantly contaminated?	No	1	0

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

LE02 Ecological Value of Site and Protection of Ecological Features

No. of BREEAM credits available	1	Available contribution to overall score	1.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Can the land within the construction zone be defined as 'land of low ecological value'?	Yes	1	1
Will all features of ecological value surrounding the construction zone/site boundary be protected?	Yes		

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

LE03 Mitigating Ecological Impact

No. of BREEAM credits available	2	Available contribution to overall score	2.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	Yes

Pre-Assessment question/criteria

What is the likely change in ecological value (plant species richness) as a result of the sites development?	No negative change or improvement in plant species richness

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	Pre-Assessment result indicates the minimum standards for Outstanding level

BREEAM 2011 New Construction Pre-Assessment Estimator

LE04 Enhancing Site Ecology

No. of BREEAM credits available	3	Available contribution to overall score	3.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will a suitably qualified ecologist be appointed to report on enhancing and protecting site ecology?	Yes	3	2
Will the suitably qualified ecologists general recommendations be implemented?	Yes		
What is the targeted/intended improvement in ecological value as a result of enhancement actions?	Small improvement in plant species richness		

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	2.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

LE05 Long Term Impact on Biodiversity

No. of BREEAM credits available	2	Available contribution to overall score	2.00%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will the building meet BREEAM's mandatory criteria for this BREEAM issue?	Yes	2	1
Will a Biodiversity Champion be appointed to monitor/minimise impacts of site activities on biodiversity?	Yes		
Will the contractor provide training for the site workforce on how to protect ecology during the project?	Yes		
Will the contractor record actions to protect biodiversity and monitor their effectiveness during construction?	Yes		
Will a new ecologically valuable habitat, appropriate to the local area, be created?	No		
Where flora/fauna habitats exist on site, will the contractor programme site works to minimise disturbance?	N/A		

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

POLLUTION	Section Weighting	10.00%	Indicative Section Score	3.08%

Pol01 Impact of Refrigerants

No. of BREEAM credits available	3	Available contribution to overall score	2.31%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will refrigerant containing systems be installed in the assessed building?	Yes	2	0
Is the Global Warming Potential of the specified refrigerant(s) likely to be 10 or less?	No		
What is the target range Direct Effect Life Cycle CO_2eq. emissions for the system?	>1000	kgCO2eq/kW coolth capacity	
Will a refrigerant leak detection and containment system be specified/installed?	No	1	0

Total indicative BREEAM credits achieved	0
Total indicative contribution to overall building score	0.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Pol02 NO_x Emissions

No. of BREEAM credits available	3	Available contribution to overall score	2.31%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	
Please enter the target/maximum NO_x emission level for space heating system	150.00	mg/kWh

Total indicative BREEAM credits achieved	0
Total indicative contribution to overall building score	0.00%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Pol03 Surface Water Run off

No. of BREEAM credits available	5	Available contribution to overall score	3.85%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
What is the actual/likely annual probability of flooding for the assessed site?	Low	2	2
Will a compliant Flood Risk Assessment be undertaken?	Yes		
Will the site meet the BREEAM criteria for peak rate surface water run off?	No	1	0
Will the site meet the criteria for surface water run off volume, attenuation and/or limiting discharge?	No	1	0
Will the site be designed to minimise watercourse pollution in accordance with the BREEAM criteria?	No	1	0

Total indicative BREEAM credits achieved	2
Total indicative contribution to overall building score	1.54%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Pol04 Reduction of Night Time Light Pollution

No. of BREEAM credits available	1	Available contribution to overall score	0.77%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will the external lighting be designed to reduce light pollution?	Yes	1	1

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	0.77%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

Pol05 Noise Attenuation

No. of BREEAM credits available	1	Available contribution to overall score	0.77%
No. of BREEAM innovation credits available	0	Minimum standards applicable	No

Pre-Assessment question/criteria	Response	Credits available	Indicative credits achieved
Will there be, or is there noise-sensitive areas/buildings within 800m radius of the development?	Yes	1	1
Will a noise impact assessment be completed and, if applicable, noise attenuation measures specified?	Yes		

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	0.77%
Total indicative BREEAM innovation credits achieved	N/A
Indicative minimum standard(s) level	N/A

BREEAM 2011 New Construction Pre-Assessment Estimator

INNOVATION	Section Weighting	10.00%	Indicative Section Score	1.00%

Inn01 Innovation

No. of BREEAM innovation credits available	10	Available contribution to overall score	10.00%
		Minimum standards applicable	No

Pre-Assessment question/criteria	Exemplary level achieved	Credits available	Indicative credits achieved
Man01 Sustainable Procurement	Yes	1	1
Man02 Responsible Construction Practices	No	1	0
Hea01 Visual Comfort	No	1	0
Ene01 Reduction of CO2 Emissions	No	5	0
Ene04 Low and Zero Carbon Technology	No	1	0
Ene05 Energy Efficient Cold Storage	N/A	N/A	N/A
Wat01 Water Consumption	No	1	0
Mat01 Life Cycle Impacts	No	1	0
Mat03 Responsible Sourcing of Materials	No	1	0
Wst01 Construction Waste Management	No	1	0
Wst02 Recycled Aggregates	No	1	0

Total indicative BREEAM credits achieved	1
Total indicative contribution to overall building score	1.00%
Indicative minimum standard(s) level	N/A