Sustainability Statement

The Bull and Last PH, 168 Highgate Rd, London NW5

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Executive Summary

This Sustainability Statement considers the sustainability and energy issues relating to the development at The Bull and Last, 168 Highgate Road, London NW5.

The site currently accommodates a public house and the proposal includes the refurbishment of the upper levels to provide bed and breakfast accommodation ancillary to the public house below including conversion of the roof space. In addition it is proposed to reconfigure the back of house accommodation to allow a side extension to be constructed (with basement) to create two new apartments.

The Statement also contains an energy demand assessment showing how selected energy efficiency measures have been incorporated into the development design and considers those renewable technologies, which may be appropriate.

SAP calculations have been prepared for each of the two new apartments using the planning drawings and an agreed construction specification and these have been used to test a number of design scenarios to ensure the apartments meet the emissions reductions target required by the planning policy.

	Total	% Reduction
	kg CO_2/year	
Total TER emissions to the new apartments	**2,803**	**-**
Total DER emissions after energy efficiency & PV	**2,224**	**-**
Reductions in emissions	**579**	**20.66%**

It is proposed to install 5, 300W photovoltaic panels onto the flat roof of the upper apartment. These will be gently inclined on racks to the flat roof and will not be visible from ground level. They will be installed with the green roof proposed.

The Code for Sustainable Homes has recently been withdrawn by the Government and whilst the new apartments will achieve the energy, emissions and water reductions targets previously required by Code Level 4 it is not proposed that the apartments will achieve FULL Code Certification.

1.0 Introduction

Bluesky Unlimited has been commissioned by WMG Studio to prepare a Sustainability Statement in support of the refurbishment and extension of The Bull and Last at 168 Highgate Road, London NW5. The Statement demonstrates how the works meet the requirements of national, regional and local planning policy and guidance in relation to sustainability and provides evidence to confirm compliance or where the works exceed the required standards.

The site will be designed and constructed to reduce energy demand and carbon dioxide emissions. The objective is to reduce the energy demand to an economic minimum by making investment in the parts of the building that have the greatest impact on energy demand and are the most difficult and costly to change in the future, namely the building fabric. Once a cost effective structure has been designed, renewable technologies will be considered for installation to provide heat and/or electricity.

The following hierarchy will be followed:

- Lean — reduce demand and consumption
- Clean — increase energy efficiency
- Green — provide low carbon renewable energy sources

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants, licensed BREEAM Domestic Refurbishment, Code for Sustainable Homes and EcoHomes Assessors.

Study Area

The Bull and Last public house is a historic building, which is on the corner of Highgate Road and Woodsome Road. Whilst the building is a positive contributor within the Dartmouth Park Conservation Area it is not listed.

The building currently accommodates a bar and dining area on ground and first floors with staff accommodation provided on the second floor and ancillary accommodation provided in the basement.

2.0 Planning Policy Context

National Policy

The UK Government published its sustainable development strategy in 1999 entitled "A better quality of life: A strategy for sustainable development in the UK". This sets out four main objectives for sustainable development in the UK:

- Social progress that recognises the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources.
- Maintenance of high stable levels of economic growth and employment.

Sustainable Communities: Building for the Future, known colloquially as the Communities Plan was published in 2003. The Plan sets out a long-term programme of action for delivering sustainable communities in both urban and rural areas. It aims to tackle housing supply issues in parts of the country, low demand in other parts and the quality of our public spaces. The Communities Plan describes sustainable communities as: Active, inclusive and safe, well run, environmentally sensitive, well designed and built, well connected, thriving, well served and fair for everyone.

The most relevant national planning policy guidance on sustainability is set out in:

- National Planning Policy Framework - 2012

NPPF Core Planning Principle 17 states;

"support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, and encourage the use of renewable resources (for example, by the development of renewable energy)"

Regional and Local Policies

London Plan, adopted July 2011

Within this Statement the following Policies have been addressed:

Policy 5.2 – Minimising carbon dioxide emissions

A) Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

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

D) As a minimum, energy assessments should include the following details:

a calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy
b proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services
d proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

Policy 5.3 - Sustainable design and construction

B) Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

London Borough of Camden

The Camden Core Strategy 2010-2015 and Camden Development Policies document (adopted 2010) provide the policy framework.

The following policies are specifically relevant to this topic area and have been edited for clarity and relevance.

CS13 – Tackling climate change through promoting higher environmental standards

Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

a) ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;

b) promoting the efficient use of land and buildings;

c) minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:

1. ensuring developments use less energy,

3. generating renewable energy on-site; and

d) ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions

Development Policies DP22 – Promoting sustainable design and construction

The Council will require development to incorporate sustainable design and construction measures.

Schemes must:

a) demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below (this states that the Council will have regard to costs and feasibility), have been incorporated into the design and proposed implementation; and

b) incorporate green or brown roofs and green walls wherever suitable.

The Council will promote and measure sustainable design and construction by:

*c) expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016.**

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

f) summer shading and planting;

g) limiting run-off;

h) reducing water consumption;

i) reducing air pollution; and

j) not locating vulnerable uses in basements in flood-prone areas.

* The Ministerial Statement made by the Government on 27th March announced the withdraw of the Code for Sustainable Homes and has stated that Local Authorities should not impose specific Code requirements on new applications with immediate effect.

In addition the Government has set a maximum carbon dioxide emissions reduction target to the equivalent of Code Level 4, i.e. 19% of Building Regulations maximum (Part L – 2013).

Therefore whilst many of the commitments and initiatives contained within this Statement form part of a Code Assessment it is not proposed to provide FULL Code Certification to the new apartments.

3.0 Assessment Methodology

In assessing this proposal we have been informed by the following guidance:

- **London Sustainability Checklist**
- **BRE Green Guide to Specification**

Emission Factors

The CO_2 emission factors, where applicable, used throughout this report have been taken from the Building Regulation Approved Document L.

Fuel	Kg CO_2/kWh
Natural Gas	0.216
Grid supplied electricity	0.519
Displaced electricity	0.519

4.0 Proposal

The proposal is for the extension and refurbishment of the existing public house and to extend the basement area with an extension over to provide two new apartments.

The floor area of the new apartments is as follows;

Unit Type	No.	Area
		m^2
2-Bedroom apartment (basement and first)	1	88.95
2-Bedroom apartment (first and second)	1	68.00
Total	**2**	**153.75**

5.0 Energy Efficiency

5.1 Demand Reduction (Be Lean and Be Clean)

Design

The energy performance of a building is affected by its design, construction and use and whilst occupant behaviour is beyond the remit of this statement, better design and construction methods can significantly reduce the life cycle emissions of a building and assist the occupant to reduce consumption.

It is possible to exceed Building Regulations requirements (Part L) through demand reduction measures alone, which typically include a combination of passive design measures (e.g. building design and efficient building fabric) and active design measures (e.g. variable speed motors).

Passive Design Measures

The passive design measures proposed include;

Passive Solar Gain and Daylighting

The proposal is for the extension and refurbishment of an existing building and the location, size and orientation of the openings on the elevations is constrained within the context of the arrangement of the existing building. However, bedrooms within the existing building have been designed to provide natural daylighting to all.

The layout of the two new apartments has required an imaginative approach and a glazed courtyard at basement level and void at ground level provides natural daylighting to the bedrooms within the basement apartment.

Natural Ventilation

The apartments will have operable windows to allow for natural ventilation. Mechanical extract ventilation will be provided to appropriate rooms.

Efficient Building Fabric

Building Envelope

U-values of the building envelope must meet Building Regulations Part L standards; further improvements to U-values will reduce the development heating requirements, favourably impacting in reducing energy demand.

The selection of high thermal density materials can help to stabilise temperature fluctuations in a building, reducing maximum demands on building services.

The building is constructed in traditional materials with high thermal mass. On those floors where major refurbishment works are to be carried out it is proposed to upgrade the existing U-values, which will meet those required by the Building Regulations.

The new elements within the two new apartments will be insulated to best practice standards. The follow table sets out the elemental U-values target for the refurbished and new construction:

Element	Part L Limiting U-values	Proposed U-values Refurbished Elements	Proposed U-values New Elements
	W/m^2K	W/m^2K	W/m^2K
External Walls	**0.30**	**0.25**	**0.17**
Flat Roof	**0.20**	**-**	**0.12**
Sloping Roof	**0.20**	**0.16**	**-**
Floor	**0.25**	**0.11**	**0.11**
Windows	**2.00**	**2.00**	**1.50**

Air Leakage

Large amounts of heat are lost in winter through air leakage from a building (also referred to as infiltration or air permeability) often through poor sealing of joints and openings in the building

The Building Regulations set a minimum standard for air permeability of 10 m^3 of air per hour per m^2 of envelope area, at 50Pa for new construction. It is assumed this standard can be improved upon and for the purposes of this assessment an air tightness of 5 m^3 per hour per m^2 is targeted for the two new apartments.

Ventilation

As a result of increasing thermal efficiency and air tightness, Building Regulations Approved Document F18 was also revised in 2006 to address the possibility of overheating and poor air quality. Mechanical ventilation will be used in appropriate rooms to control air quality although maximum use will be made of natural ventilation for summer night-time cooling.

Active Design Measures will include;

Efficient Lighting and Controls

Throughout the scheme natural lighting will be optimised.

Approved Document L requires three in four light fittings (75%) to be dedicated low energy fittings. The development will exceed this and all light fittings will be of a dedicated energy efficient type.

Any common area lighting will be fitted with time controls and light sensors to ensure illumination is restricted to required times.

External lighting will be fitted with time controls and light sensors to ensure illumination is restricted to required times. External lighting will be limited to a maximum fitting output of 150w.

5.2 Establishing Carbon Dioxide Emissions

SAP Calculations

Detailed working drawing design has not yet been carried out and SAP calculation has been prepared based upon the detailed planning drawings and an assumed specification.

Whilst the Code for Sustainable Homes has been withdrawn the policy requires new development to achieve the energy efficiency standard equivalent to Code Level 4, i.e. a 19% reduction in emissions compared to Building Regulations.

A SAP calculation has been prepared for each of the new apartments with the benefit of photovoltaic panels. The following tables summarises the CO_2 emissions:

2-Bed Apartment (basement & ground-floor) 96.3 m^2 - with 1.2 kW of PV	**CO_2 TER**	**CO_2 DER**
	kg/m^2/yr	kg/m^2/yr
Space heating	7.74	11.21
Water heating	5.99	4.97
Electricity for lighting, pumps and fans	2.62	2.62
Electricity generated from photovoltaic panels	-	(6.05)
Total	**16.34**	**12.76**

2-Bed Apartment (first-floor & second-floor) 68.0 m^2 - with 0.3 kW of PV	**CO_2 TER**	**CO_2 DER**
	kg/m^2/yr	kg/m^2/yr
Space heating	9.70	8.86
Water heating	7.23	6.29
Electricity for lighting, pumps and fans	2.93	2.93
Electricity generated from photovoltaic panels	-	(2.08)
Total	**19.86**	**16.02**

Total Carbon Dioxide Emissions

Using the above information the total emissions from the two apartments following the energy efficiency measures detailed can be calculated as follows:

Unit Type	Area	CO_2 Target Emissions	CO_2 Dwelling/ Building Emissions
	m^2	kg CO_2/yr	kg CO_2/yr
2-bed apartment (basement & ground)	88.95	1,453	1,135
2-bed apartment (first & second)	68.0	1,350	1,089
Totals	**156.95**	**2,803**	**2,224**

The total site emissions from the apartments based on the TER are assessed as:

- **2,803 kg CO_2 per year**

The total site emissions from the apartments based on the DER are assessed as:

- **2,224 kg CO_2 per year**

The reduction in site CO_2 emissions as a result of the energy efficiency measures and 1.5 kW of photovoltaic panels is assessed as;

- **579 kg CO_2 per year, which equates to a reduction of 20.66%**

5.3 Renewable Technologies (Be Green)

The energy demand established above has been used to test the viability of various renewable and low carbon technologies as follows.

This section determines the appropriateness of each renewable technology and considers the ability of each technology to comply with the planning requirements as set out above in Section 2.0.

The Government's Renewable Obligation defines renewable energy in the UK. The identified technologies are;

- Small hydro-electric
- Landfill and sewage gas
- Onshore and offshore wind
- Biomass
- Tidal and wave power
- Geothermal power
- Solar

The use of landfill or sewage gas, offshore wind or any form of hydroelectric power is not suitable for the site due to its location. The remaining technologies are considered below;

Wind

Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.

The Government wind speed database predicts local wind speeds at Highgate Road to be 5.1 m/s at 10m above ground level and 5.9 m/s at 25m above ground level. This is below the level generally required for commercial investment in large wind turbines and in addition the land take, potential for noise and signal interference make a large wind turbine unsuitable for this development.

Combined Heat and Power and Community Heating

Combined heat and power (CHP) also called co-generation is a de-centralised method of producing electricity from a fuel and 'capturing' the heat generated for us in buildings. The plant is essentially a small-scale electrical power station. The production and transportation of electricity via the National Grid is very inefficient with over 65% of the energy produced at the power station being lost to the atmosphere and through transportation.

Consequently CHP can demonstrate significant CO_2 savings and although not necessary classed as renewable energy (depending on the fuel used) the technology is low carbon.

For a CHP plant to be economic it needs to operate for as much of the time as possible (usually deemed to be in excess of 14 hours per day) and therefore the size of the unit are usually based upon the hot water load of the buildings with additional boilers meeting the peak space heating demand.

Community heating schemes are similarly communal systems but seek to supply heat only without the electricity production. Therefore, unless using a biomass or biofuel a community heating system will not demonstrate CO_2 reductions

In order to optimise a combined heat and power or communal heating system, whether fuelled by biomass or a fossil fuel the site needs to be relatively dense with buildings close together and preferable multi storey in order to minimise infrastructure pipe work.

There is insufficient heat demand to warrant a communal heating system or CHP and these systems are not proposed.

Ground Source Heat Pumps

Sub soil temperatures are reasonable constant and predictable in the UK, providing a store of the sun's energy throughout the year. Below London the groundwater in the lower London aquifer is at a fairly constant temperature of 12^{o} C.

Ground source heat pumps (GSHP) extract this low-grade heat and convert it to usable heat for space heating.

GSHP operates on a similar principle to refrigerators, transferring heat from a cool place to a warmer place. They operate most efficiently when providing space heating at a low temperature, typically via under floor heating or with low temperature radiators.

The pumps require electricity for their operation and the resultant reduction in CO_2 is not as significant as with other renewables.

There are generally two types of installation being a bore-hole (open loop) and a closed loop system. Open loop bore holes extract energy from ground water located deep below the surface and discharge the water back to the ground reservoir whereas closed loop systems circulate a fluid around a series of boreholes or horizontal 'slinky' and extract heat from the ground.

There is insufficient ground area to accommodate a horizontal 'slinky' or compact collector system for each of the apartments and a bore-hole system would need to be installed through the ground floor accommodation.

This is impractical and therefore this technology is not proposed.

Solar

(i) Solar Water Heating

Solar hot water panels use the suns energy to directly heat water circulating through panels or pipes. The technology is simple and easily understood by purchasers.

Solar hot water heating panels are based generally around two types, which are available being 'flat plate collectors' and 'evacuated tubes'.

Flat plate collectors can achieve and output of up to 1,124 kWh/annum* and evacuated tubes can achieve outputs up to 1,365 kWh/annum **

Panels are traditionally roof mounted and for highest efficiencies should be mounted plus or minus 30 degrees of due south.

Evacuated tubes can be laid horizontally on flat roofs but flat plate collectors need to be installed at an incline of circa 30 degrees.

Solar hot water panels are considered an appropriate technology and the flat roof over the upper apartment allows an evacuated tube panel to be installed to each apartment.

Solar hot water panels could be used.

(ii) Photovoltaics

Photovoltaic panels (PV) provide clean silent electricity. They generate electricity during most daylight conditions although they are most efficient when exposed to direct sunlight or are orientated to face plus or minus 30 degrees of due south.

PV panels can be integrated into many different aspects of a development including roofs, walls, shading devices or architectural panels.

The planning policy requires emissions to be reduced by 19% compared to Building Regulations (Part L – 2013) and the SAP calculations have incorporated the use of photovoltaic panels to achieve this target. It is proposed to install a total of 1.5 kW of PV, which will be dispersed as 1.2 kW for the lower apartment and 0.3 kW for the upper apartment.

This will be provided through an installation of five, 300W panels. These will be installed, inclined on racks at an angle of circa 20 degrees on the flat roof over the upper apartment.

Air Source Heat Pumps (ASHP)

Air sourced heat pumps operate using the same reverse refrigeration cycle as ground source heat pumps, however the initial heat energy is extracted from the external air rather than the ground. These heat pumps can be reversed to provide cooling to an area although this reduces the coefficient of performance of the pumps.

ASHP tend to have a lower coefficient of performance (CoP) than GSHP and with the emissions factor for electricity being 2.61 times that of gas (emissions factor is the weight of CO_2 emitted per kWh) installations with CoPs of less than this figure show little real saving in CO_2 emissions.

The efficiency of ASHPs can be significantly reduced where there is a high hot water demand compared to the total demand. They are therefore not appropriate for the apartments.

Other Technologies

New technologies are becoming available, which do not 'fit' into one of the above categories but which need to be considered. One such system is flue gas heat recovery units. These devices are used in conjunction with gas-fired boilers and recover the heat exhausted through the boiler flue.

6.0 Climate change adaption and Water resources

Sustainable Drainage Systems (SUDS)

The Environment Agency Flood Maps show the site is located within Flood Zone 1.

The existing site is covered with buildings or hard surfaces and therefore the incorporation of some areas of 'green roof' will increase the storage capacity of the site. The surface water system will not be altered from the existing disposal system.

Surface Water Management

Consideration has been given to the use of grey water recycling. However, this will require tanks to be install into the apartments. This will lead to excessive costs and when coupled with customer's resistance to the appearance of the recycled water does not currently make them a viable option. They have therefore not been included in the proposals.

Water efficiency measures

In excess of 20% of the UK's water is used domestically with over 50% of this used for flushing WCs and washing (source: Environment Agency). The majority of this comes from drinking quality standard or potable water.

The water efficiency measures included in this development will ensure that the water use target of 105 litres per person per day is achieved using the measures described below.

Water efficient devices will be fully evaluated, and installed, wherever possible. The specification of such devices will be considered at detailed design stage and each will be subject to an evaluation based on technical performance, cost and market appeal, together with compliance with the water use regulations.

The following devices will be incorporated within each apartment:

- Water efficient taps.
- Water efficient toilets.
- Low output showers.
- Flow restrictors to manage water pressures to achieve optimum levels.
- Water meters to all premises with guidance on water consumption and savings.

Water consumption calculations have been carried out using the Water Efficiency Calculator provided by the BRE. Although not perfect this calculator gives a good indication of the probable water use in the dwelling, although this is largely dependent on the way on which occupants use their homes.

Below is a typical specification, which would achieve the 105 Litres per person per year target.

Schedule of Appliance Water Consumption		
Appliance	Flow rate or capacity	Total Litres
WC	4/2.6 litres dual flush	14.72
Basin	1.7 litres/min.	5.98
Shower	8 litres/min	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
Washing Machine	Default used	16.66
Dishwasher	Default used	3.90
		104.99

7.0 Materials and Waste

The BRE Green Guide to Specification is a simple guide for design professionals. The guide provides environmental impact, cost and replacement interval information for a wide range of commonly used building specifications over a notional 60-year building life. The proposal involves the extension and refurbishment of an existing building. For new materials the construction specification will prioritise materials within ratings A+, A or B.

Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy. A full evaluation of these suppliers will be undertaken at the next stage of design.

In addition, timber would be sourced, where practical, certified by PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials will have a zero ozone depleting potential

Construction waste

A Site Waste Management Plan will be prepared which will monitor and report on waste generated on site into defined waste groups in compliance with the SWMP regulations 2008.

The Plan will indicate the setting of targets to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA.

The overarching principle of waste management is that waste should be treated or disposed of within the region where it is produced.

Construction operations generate waste materials as a result of general handling losses and surpluses. These wastes can be reduced through appropriate selection of the construction method, good site management practices and spotting opportunities to avoid creating unnecessary waste.

The Construction Strategy will explore these issues, some of which are set out below:

- Proper handling and storage of all materials to avoid damage.
- Efficient purchasing arrangements to minimise over ordering.
- Segregation of construction waste to maximise potential for reuse/recycling.
- Suppliers who collect and reuse/recycle packaging materials

Construction waste is a key element to be considered in achieving a reduction in all waste – it is estimated that some 40% of all waste is construction related.

Domestic Waste and Recycling

Domestic waste has been considered in the proposed development in the following way:

- External space is provided for storing recyclable materials, for collection by the Authority, within the boundary of the site.
- The external space for recyclable material is of sufficient size to accord with Local Authority procedures.
- Internal storage for recyclables is provided at a capacity in excess of 30 litres.
- The Home Owners Guide will be provided to residents giving information about the location of the nearest recycling bank.

8.0 Construction Process and Site Management

Where best practice guidance is available dealing with construction methods and standards these will be adopted.

Considerate Constructors

The site will be registered with the Considerate Constructors Scheme, which addresses both limiting the effect on the community and the effects on the environment. The applicant is committed to demonstrate best site management practices, and if practical to go beyond this. The CC scheme monitors the contractor's performance against the eight point Code for Considerate Practice.

Construction Site Impacts

To ensure good relations with the local community, the developers will ensure that they keep local people informed of works, which might affect them, and provide a method for comments, complaints and required remedial action to be communicated to the developer.

Site management procedures will be put in place to monitor water consumption and CO_2 emissions arising from site activities.