

APPENDIX I

APPLIED ENERGY

UNITE GROUP AND TRAVIS PERKINS

11-13 ST PANCRAS WAY, CAMDEN

ENERGY AND SUSTAINABILITY STATEMENT



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1.0 EXECUTIVE SUMMARY

This energy and sustainability assessment has been prepared on behalf of the Unite Group Plc for the proposed development on 11 – 13 St. Pancras Way, London, NW1 0PT. The proposed mixed use development consists of ten storeys with commercial space located at ground floor level with 564 student bedrooms located above in four blocks. The accommodation buildings vary in height from five to nine storeys.

This assessment will demonstrate that the proposed scheme will improve the sustainability and environmental performance of London’s built environment by increasing energy efficiency, reducing CO₂ emissions, generating energy services efficiently and implementing building integrated renewable energy technology.

The table below illustrates the CO₂ emissions reduction for each step taken through the energy design process.

Model	Carbon Dioxide Savings (Tonnes CO ₂ /Annum)		
	Regulated	Unregulated	Total
Building Regulations 2010 Part L Compliant Development	582.78	179.36	762.14
‘Be Lean’ – Energy Efficiency	567.02	179.36	746.38
‘Be Clean’ – CHP	343.14	179.36	522.50
‘Be Green’ - Renewables	343.14	179.36	522.50

Table 1: CO₂ Emissions Savings after each stage of the Energy Hierarchy

The proposed design will aim to exceed Part L 2010 Building Regulations requirements for energy performance by following the London Plan’s Energy Hierarchy. These measures are estimated to result in a 2.71% reduction in CO₂ emissions when compared to the Target Emissions Rate (TER).

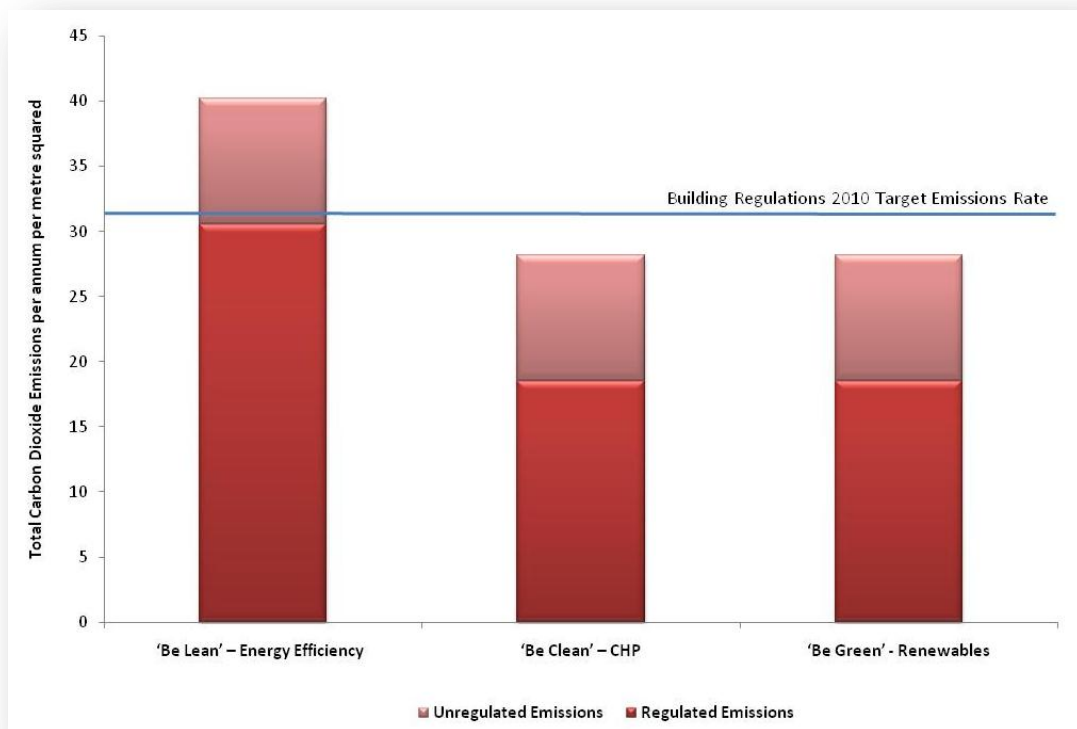
In keeping with the ‘Be Clean’ step of the London Plan guidance it is proposed that the development utilises a Combined Heat and Power unit to generate heating and hot water. By providing this low carbon heat source, it has been calculated that CO₂ emissions can be reduced by a further 39.48%. Investigations were made into connecting to a local district heating network which turned up two schemes near the development; Kings Cross and the Camden Council Euston Road scheme. Although neither scheme was deemed suitable at this time, provisions will be made to allow potential connection in the future.

In order to incorporate renewable energy and ‘Be Green’, investigations for all the potential technologies were undertaken but none were deemed suitable for the project without having an adverse effect on the previous stages of the energy hierarchy.

In total, the proposed scheme would achieve a 41.12% reduction in regulated CO₂ emissions against the 2010 Buildings Regulations Target Emissions Rate.

Model	Carbon Dioxide Savings (Tonnes CO ₂ /Annun)		Carbon Dioxide Savings	
	Regulated	Total	Regulated	Total
'Be Lean' – Energy	15.77	15.77	2.71%	2.07%
'Be Clean' – CHP	223.88	223.88	39.48%	30.00%
'Be Green' - Renewables	0	0	0%	0%
TOTAL CUMULATIVE SAVINGS	239.64	239.64	41.12%	31.44%

Table 2: CO₂ Emissions Savings from each stage of the Energy Hierarchy



Graph 1: The Energy Hierarchy

Initial analysis has shown that both the proposed student accommodation and Travis Perkins commercial unit could achieve a BREEAM Excellent rating.

2.0 INTRODUCTION

2.1 Background

Applied Energy has been commissioned by the Unite Group PLC to prepare an energy and sustainability strategy to accompany the planning submission for the proposed mixed use development on 11 – 13 St. Pancras Way, London. This statement identifies how the proposed development addresses the energy related policies of the London Borough of Camden and the Greater London Authority (GLA) as set out in the draft London Plan, published in October 2009.

Options have been reviewed for reducing CO₂ emissions through energy efficiency measures, heating and cooling hierarchy technologies and renewable energy systems. The local environment and proposed site have been considered throughout.

2.2 Description of the Site

The proposed mixed use development at the Travis Perkins builder's merchants, 11-13 St. Pancras Way is approximately 300m to the northwest of St. Pancras International Train Station. The site is situated within the London Borough of Camden. The building has been designed with a large ground floor area which is to be largely used for commercial space with the student accommodation situated above. The student accommodation consists of four blocks which vary in height up to nine storeys. There are 564 student apartments which consist of a mixture of self contained studio flats which have their own living, sleeping, kitchen and bathroom facilities and cluster flats which have individual sleeping and bathroom facilities and communal kitchen and living areas.

The proposed site is indicated in Figure 1 below.



Figure 1: Proposed Site

2.3 Design Philosophy

This statement has been produced to show what measures are economically feasible and practically viable to increase sustainability for the proposed development. The proposed development will base its design on The Draft London Plan 2009 with guidance taken from The Supplementary Planning Guidance (SPG), Renewable Energy Toolkit, Low Carbon Designer Toolkit, Camden Councils Planning Guidance Documents (specifically no3 – Sustainability) and Replacement Unitary Development Plan (UPD) and the GLA’s guidance document on Energy Assessments (Oct 2010) in order to reduce carbon dioxide emissions.

The mechanical and electrical design of the proposed development will be carefully considered to provide the most efficient balance between requirement, effectiveness, cost and maintainability.

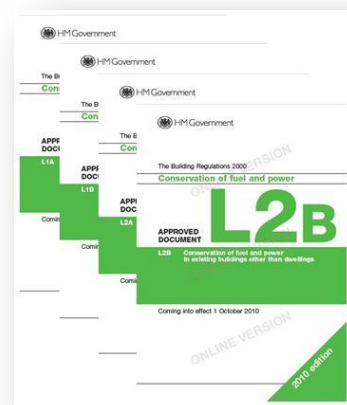
In achieving a sustainable design, it is important that the building is as efficient as possible such that the total base load is minimal. This also helps in reducing the requirement for renewable energy. This report highlights the measures that will be taken to improve energy efficiency and assesses the viability of the renewable technologies available. All assessments within this report have been made using preliminary information and can be subject to development as the project progresses into the detailed design stage.

2.4 Building Regulation

The Government has used Building Regulations Part L, to bring about the efficient use of energy within new and existing buildings. The regulations are split into 4 sections L1(A/B), L2(A/B) with section L1 covering new and existing dwellings and L2 applicable to all new and existing non-domestic buildings, such as offices, hotels and warehouses. Part L aims to limit the maximum energy usage from mechanical and electrical plant and strives for better quality of construction to reduce building air leakage.

The Government set out in its ‘Building a Greener Future’ Policy Statement (July 2007) that non-dwellings are to be net zero carbon by 2019. It is likely that following a 25% step change in 2010 similar changes will follow in 2013 and 2016.

The design of the proposed development will be based on the 2010 version of Building Regulations to increase sustainability and energy efficiency.



3.0 POLICY AND PLANNING CONTEXT

This energy statement is based on The Draft London Plan 2009 with guidance taken from The Supplementary Planning Guidance (SPG), Renewable Energy Toolkit, Low Carbon Designer Toolkit and Camden Council's Planning Guidance 3 (CPG 3) – Sustainability and includes:

1. An energy demand assessment for heating, cooling, electricity and baseline CO₂ emissions
2. A review of the design of the building and the potential for energy efficiency design measures
3. An assessment of the feasibility of low carbon heating and cooling technologies
4. An assessment of renewable energy technologies including details on possible technology/plant sizes and resulting carbon savings
5. A summary identifying the preferred energy strategy and the overall CO₂ emissions reductions achieved over the Building Regulations 2010 compliance baseline

A summary of the relevant policy and guidance documents on which this report are based are listed below:

- Planning for a Sustainable Future – White Paper
- The London Plan 2008 and Draft London Plan 2009: Spatial Development Strategy for Greater London, Consolidated with Alterations
- London Plan Supplementary Planning Guidance on Sustainable Design and Construction
- The Mayor's Energy Strategy: Green Light to Clean Power, Mayor of London
- Camden Council Planning Guidance 3 – Sustainability

3.1 London Plan 2008

The London Plan replaced the previous strategic planning guidance for London. It is a requirement of the Greater London Authority (GLA) Act 1999 that the document deals with matters of strategic importance to Greater London.

Since its original release the document has received further alterations with new policies associated with climate change in Chapter 4A representing the most significant alterations. The latest 2008 version of this document has been used to produce this report.

The former Mayor of London published a document in February 2004 entitled 'Green Light to Clean Power – The Mayor's Energy Strategy'. Its purpose was to reduce London's contribution to climate change, tackle fuel poverty whilst promoting London's economic development through renewable and energy efficient technologies.

The document lays out a coherent Energy Policy for London with emphasis on an Energy Hierarchy based on three key principles: **Be Lean, Be Clean, Be Green**.

3.2 Draft London Plan 2009

The current Mayor has issued a draft revised London Plan (2009) which is out for consultation. This revised document has removed the requirement for a 20% reduction in carbon emissions from renewable energy and instead focuses on the energy

hierarchy and use of decentralised plant. This is seen as guidance for the future policy direction and has been addressed within this report.

The energy assessment has been based on the requirements set out in the London Plan with specific focus on Policies 4A.1 to 4A.7 which focus on climate change impact and mitigation measures which can be adopted, whilst setting out targets for developments to achieve.

In addition to the above, guidance has been taken from the *GLA Energy Team Guidance on Planning Energy Assessments* document which this report is intended to sets out to fulfil.

3.3 Supplementary Planning Guidance – Sustainable Design and Construction

The Supplementary Planning Guidance (SPG) published in May 2006 provides additional information to support the implementation of the London Plan. This document cannot set new policies, but has weight as a formal supplement to the London Plan and is applicable to all building types and associated spaces.

The SPG provides guidance on the way that the seven measures identified in the policy can be implemented to meet the London Plan objectives and therefore the SPG is structured around these seven factors.

3.4 London Renewables Toolkit

In 2004, The London Renewables Toolkit was developed to help support planners, developers, consultants and other interested parties implement Mayoral and related borough planning policies in London which require renewable energy. It was designed to encourage the use of renewable energy technologies in London through new developments and aims to contribute to meeting London's CO₂ reduction and renewable energy targets.

4.0 BREEAM ASSESSMENT

In line with the current Camden Council Supplementary Planning Documents (SPD) the proposed development will aim to achieve a minimum BREEAM rating of 'Very Good' with aspirations for 'Excellent'. A separate assessment will be carried out for the student accommodation and commercial space.

The development will also aim to achieve the following as required by Camden Council:-

- Achieve 60% of the credits available under the Water section of the BREEAM assessment.
- Achieve 60% of the credits available under the Energy section of the BREEAM assessment.
- Achieve 40% of the credits available under the Materials section of the BREEAM assessment.

A pre planning analysis has been undertaken, the results indicate that the development will achieve an Excellent rating for both the multi-residential (student accommodation) and commercial (Travis Perkins) assessments. These assessments are detailed in a separate report.

5.0 BUILDING ENERGY MODELLING

5.1 Building Simulation

The proposed building has been thermally modelled using EDSL TAS dynamic simulation modelling software. This model has been produced to determine the annual energy demand and resultant CO₂ emissions for the different stages of the energy hierarchy.

This software contains the construction database which defines all the construction U-values for each of the building elements. Outputs from the simulation program include hourly kW demands arising from heating and cooling, small power, lighting and fan power. The model was simulated using the CIBSE test reference year (TRY) weather data for London, as required by Part L2A of the building regulations 2010. The outputs from the software allow gas and electrical consumption and related CO₂ emissions to be calculated. The building's performance can therefore be measured against the targeted reduction in CO₂ emissions.

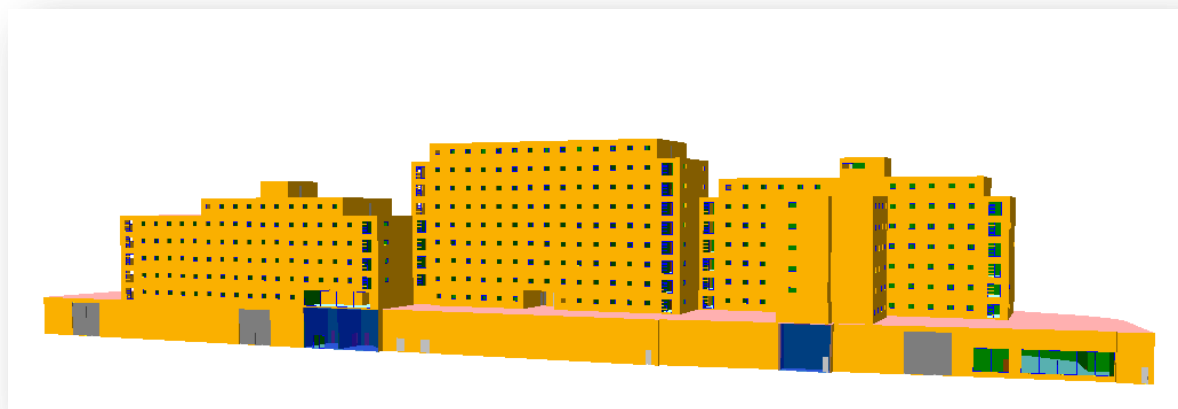


Figure 2: 3-D Model

6.0 DEMAND REDUCTION – ‘BE LEAN’

The aim of the ‘Be Lean’ strategy is to reduce energy usage through the inclusion of energy efficiency measures and good practice sustainable building services, thereby improving the building’s performance over and above the minimum levels stipulated within Part L of the Building Regulations documents.

6.1 Building Fabric Performance

The proposed development will aim to improve on the current Building Regulations Part L2A (2010) area weighted U-values for the opaque building fabrics and glazing elements.

It is a requirement for all new buildings to be pressure tested as detailed within Building Regulations Part L2A (2010). The maximum permissible air leakage rate is set at $10\text{m}^3/(\text{h}\cdot\text{m}^2)$ @ 50 Pa. All endeavours will be taken to improve the air leakage performance of the development over and above the Building Regulations minimum standard.

Based on previous experience of other similar developments the building has been modelled using $7\text{m}^3/(\text{h}\cdot\text{m}^2)$ @ 50 Pa.

6.2 Heating

It is proposed that a wet heating system is provided for the space heating in the student accommodation which will utilise high efficiency gas fired boilers to minimise energy usage.

The heating system efficiency will be improved further by including the following features into the design:

- Plant equipment will be selected with efficiencies exceeding the requirements in the Building Regulations Part L2A (2010).
- Major circulating pumps will be fitted with variable speed drives.
- Heating circuits will be split into zones allowing independent control or set back when zones are not occupied.
- Thermostatic Radiator Valves (TRV) will be provided to all radiators to allow zonal and occupant control
- The main Travis Perkins storage area will not be heated and the showroom will be provided with air source heat pumps to meet the space heating requirements. The details of this system are detailed below.



6.3 Cooling

There is no cooling requirement within the student accommodation bedrooms and public areas.

Efficient air source heat pumps are proposed to be used within the Travis Perkins showroom to meet the calculated cooling loads. The system will be selected with a minimum Energy Efficiency Rating (EER) of 3.5.

6.4 Water Services

With the majority of the development consisting of student accommodation, water usage will play a major role in the sites energy use. To minimise the impact of the proposed development on the existing services infrastructure, the following measures are proposed.

6.4.1 Dual Flush Toilets

The 'Climate Change and The Demand for Water Report 1996' states that the use of water for flushing toilets uses on average 30% of the domestic water demand.

Dual flush cisterns allow users to decide whether to flush only a portion of, or all the water from the cistern.

It is proposed that dual flush cisterns (4 litres/6 litres) are installed to help contribute towards improved water savings.

6.4.2 Low Flow Basin Taps

A standard wash basin mixer tap has a flow rate of around 12 litres per minute which can be reduced through the use of low flow taps. It is proposed that all basin taps will be specified with a flow rate of less than 6 litres per minute.

Percussion taps, or self closing taps as they are otherwise known, have a slow release valve mechanism which, once pressed, allows the flow of water for a predetermined time before the valves closes. By having this level of control, it eliminates human error and the possibility of taps being left on for long periods of time.

It is proposed that percussion and/or sensing taps are provided to all the public and staff toilets to help minimise water wastage.

6.4.3 Shower Flow Restrictors

It is proposed that low flow shower heads are fitted to limit the flow rate to no more than 9 litres per minute.

6.4.4 Urinal Flush Controls

In order to save water usage in public toilets, the installation of urinal flush controllers are proposed. The use of Passive Infrared (PIR) detectors and/or waterless urinals will be investigated to reduce water consumption in these areas.

6.5 Services Distribution

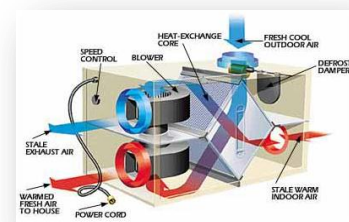
All services pipework, valves, fittings and ductwork will be insulated to minimise unwanted heat loss or heat gain.



6.6 Ventilation

Ventilation rates will be in accordance with Building Regulations Part L2A and CIBSE Guide B2.

Variable speed motors will be provided to modulate the operation of the various ventilation systems from local switches in the kitchen for the extract hoods and via a humidistat's located in the extract ductwork.



Low energy units will be specified that meet with The Code level 5 standards.

Heat recovery will be installed wherever possible with achievable efficiencies of at least 70%.

6.7 Lighting

It is proposed that energy efficient lamps with high frequency ballast and automatic and/or manual switching facilities are provided to assist in keeping the electrical consumption low. The use of photo-electric sensors to control external lighting will be investigated. Consideration will be given to the use of PIR detectors to control lighting in low occupancy back of house and corridor areas.



Lighting shall be designed to achieve illuminance levels for each space in accordance with the 'Unite' Bowen specification (latest revision) and CIBSE 'Codes of Practice'.

6.8 Building Energy Management System

It is proposed that a Building Energy Management System (BEMS) is installed to monitor, control and sequence key mechanical and electrical plant to help drive out energy savings through effective control strategies.

6.9 Summary

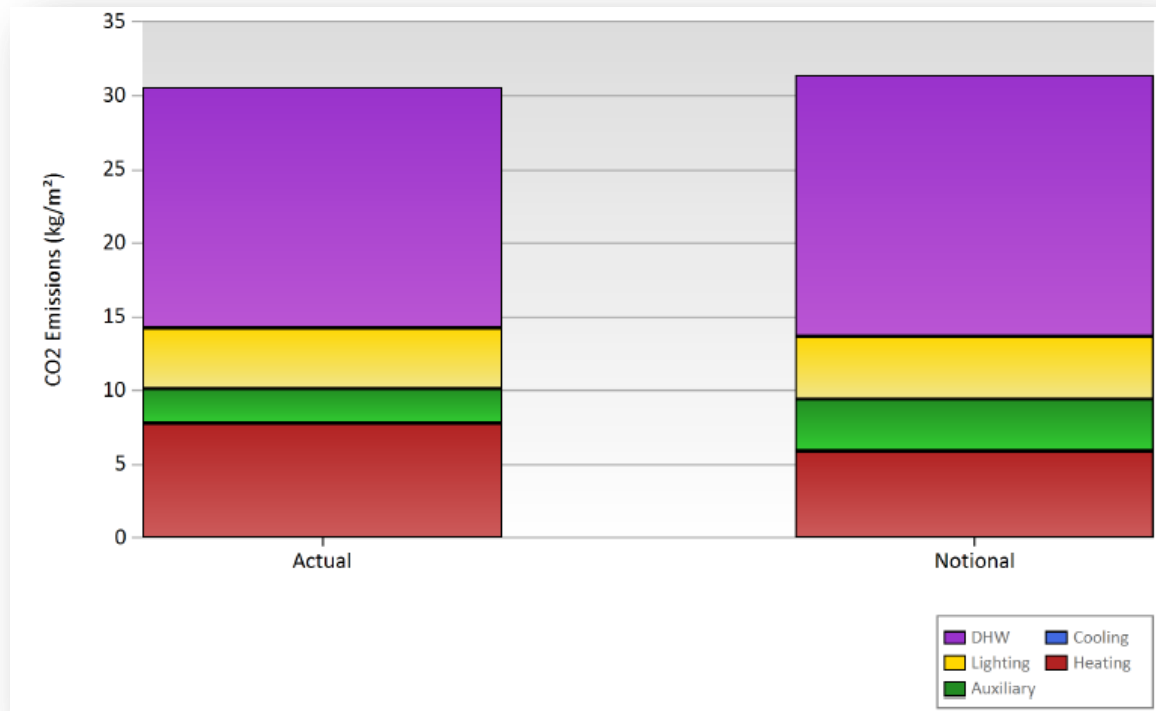
A summary of the above proposed measures and energy efficient figures to be used in the modelling of the development are detailed in Table 3.

<i>Building Services</i>	<i>2010 L2A Values</i>	<i>'Be Lean' Values</i>
<i>Boiler Efficiency</i>	86%	90%
<i>Heat Recovery Efficiency</i>	50%	70%
<i>Electric Heating Efficiency</i>	100%	100%
<i>Cooling System Seasonal Energy Efficiency Ratio (EER)</i>	2.5	2.5
<i>Domestic Hot Water Efficiency</i>	80%	85%
<i>AHU with Heat Recovery Specific Fan Power (W/l/s)</i>	2.2	2.2
<i>Local Fan Specific Fan Power (W/l/s)</i>	0.4	0.4
<i>U-Values (W/m²K)</i>		
<i>Wall</i>	0.35	0.35
<i>Floor</i>	0.25	0.25
<i>Roof</i>	0.25	0.25
<i>Windows</i>	2.2	2.2
<i>High Usage Entrance Doors</i>	3.5	3.5

Table 3: 'Be Lean' Design Criteria

6.10 Be Lean Calculations

TAS simulates the operation of the building for an entire year, calculating the total energy demands for heating, cooling, hot water, lighting and fan power based on specific input data for the development, such as plant efficiencies, room uses and building fabric. From these figures, the resulting CO₂ emissions are obtained and compared against the notional model. The results are detailed below.



Graph 2: CO₂ emission from 'Be Lean' measures

The Building Emissions Rate (BER) achieved a 2.71% reduction in CO₂ against the TER from the inclusion of energy savings measures. The calculated total annual carbon emissions of the development from the 'Be Lean' stage are 567.02 Tonnes CO₂ per year which is a saving of 15.77 Tonnes CO₂ over the TER.

11-13 St. Pancras Way	TER (kgCO ₂ /m ² / annum)	BER (kgCO ₂ /m ² / annum)	Percentage Reduction over TER
Heating	5.95	7.76	-30.42%
Cooling	0.00	0.00	0.00%
Auxiliary	3.48	2.35	32.47%
Lighting	4.21	4.18	0.71%
Domestic Hot Water	17.78	16.27	8.49%
			1
TOTAL	31.42	30.57	2.71%

Table 4: 'Be Lean' SBEM results Breakdown

7.0 ENERGY HIERARCHY – ‘BE CLEAN’

For major commercial and residential developments such as the proposed development, Policy 4A.6 of the London Plan sets out a preferred technology hierarchy in respect to supplying the energy demands for heating, and where necessary, cooling. This is as follows:

- Connection to existing CCHP/CHP distribution networks
- Site-wide CCHP/CHP powered by renewable energy
- Gas-fired CCHP/CHP or hydrogen fuel cells, both accompanied by renewables
- Gas fired communal heating and cooling
- Communal heating and cooling fuelled by renewable sources of energy

7.1 Connection to Existing CCHP/CHP Distribution Networks

The London Heat Map tool has been used to determine if there are any existing or proposed district heating schemes available within the area for the development to utilise. Figure 3 indicates that the development is in close proximity of a proposed district heating network (Euston Road scheme) and in one of the focus areas identified through the heat mapping work undertaken by the London Borough of Camden.

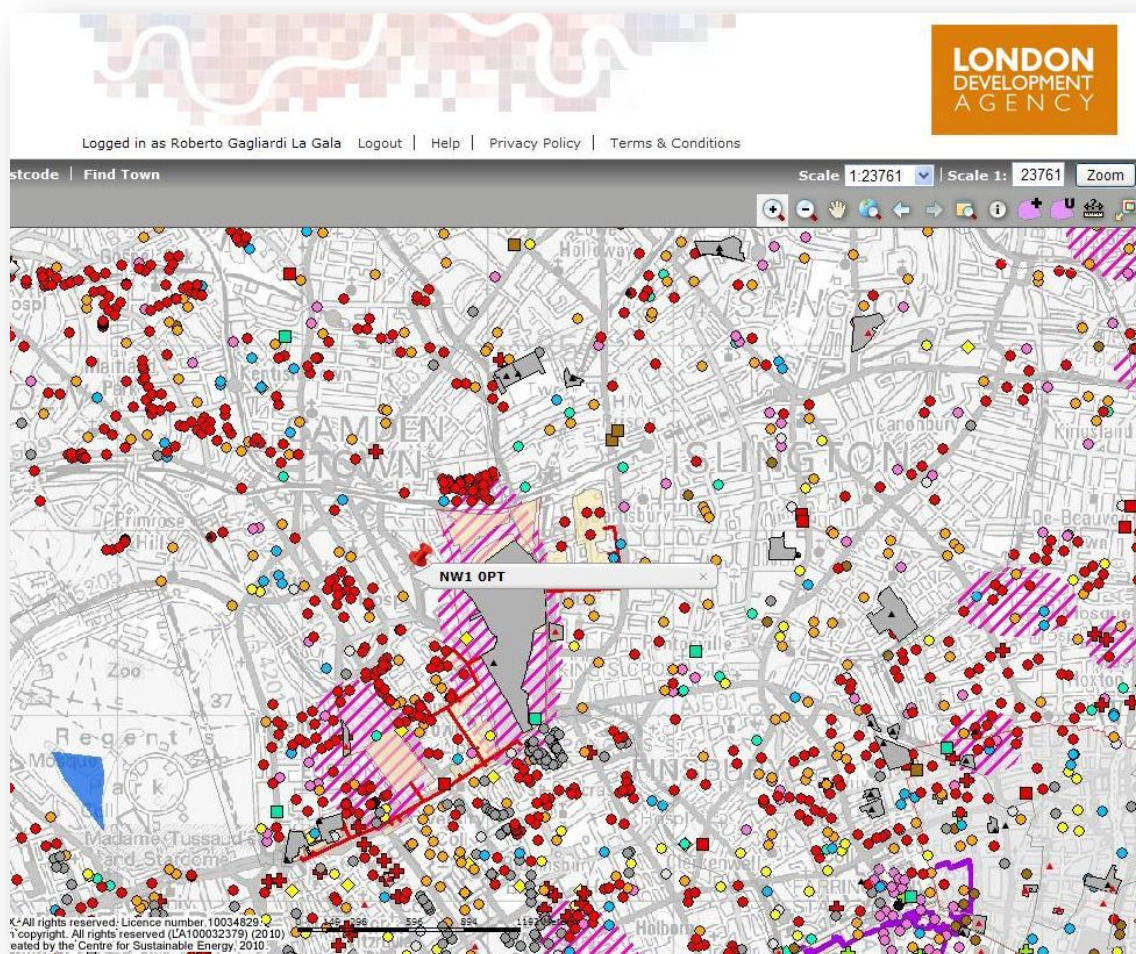


Figure 3: London Heat Map – 11-13 St. Pancras Way

Discussions were undertaken with the Energy Supply Department of the LDA (London Development Agency) whom confirmed that in addition to the Camden Council Euston Road scheme there was also a district CHP heating network at Kings Cross by Argent.

Initial discussions with Peter North of the LDA on Euston Road confirmed that the proposed scheme can potentially accommodate the loads of the development and could therefore connect to the network. However the scheme is not currently available and is at least another 2-3 years from completion.

The Kings Cross heating scheme is already providing heat to nearby buildings and although closer to the development than the Euston Road scheme, the current distribution network lies to the east of the Kings Cross rail network whereas the proposed development lies to the west. This creates a potential issue with regards to connecting the development to the scheme as the distribution pipework would have to cross the railway network. This would be potentially very costly and would require coordinated and detailed discussions with a number of parties in order to finalise a scheme. So although it may be technically viable to connect the development to the Kings Cross network, it may not be financial or practically feasible to do so.

Taking the above into account, it has been deemed unsuitable to connect to either scheme at this time. Given the projected dates for completion of the Euston Road scheme and potential issues with connecting to the Kings Cross network, it is proposed to provide an alternative energy source as part of the *'Be Clean'* process. However provisions will be made to allow connection to a suitable district heating network in the future. These provisions, based on previous experience with district heating networks, will include capped valved connections in the main heating pipework header and allocated space to accommodate future district heating connection plant (e.g. plate heat exchangers).

7.2 Site-wide CCHP/CHP Powered by Renewable Energy

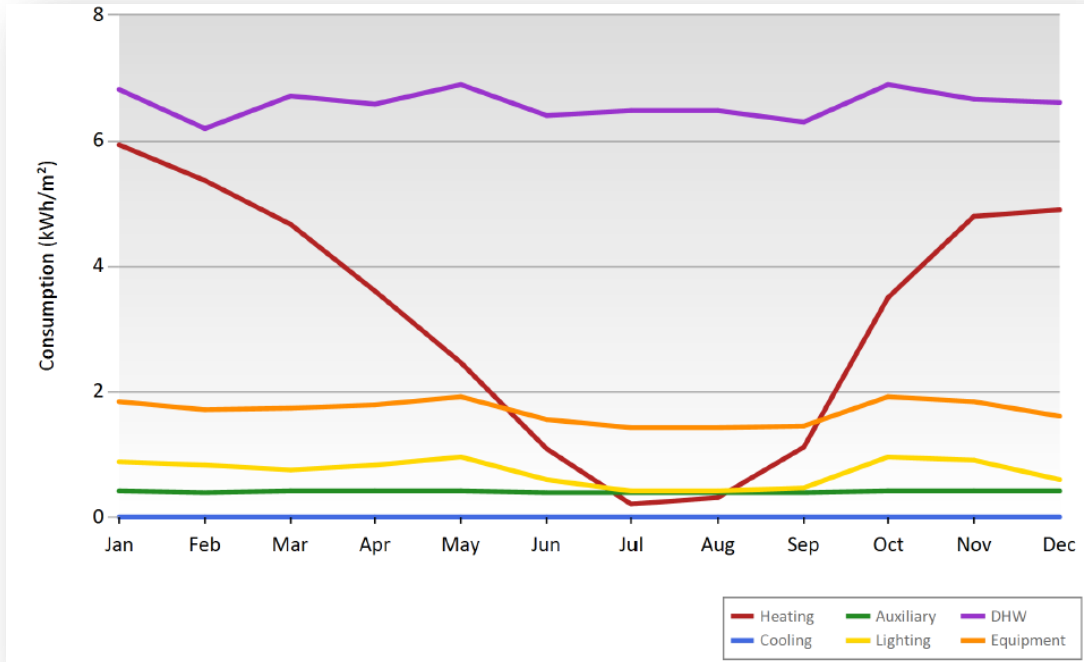
Given the lack of renewable biofuel infrastructure within the locality and the site's location within heart of London, the use of biofuels to power CHP is deemed to not be feasible at this site. Biomass CCHP/CHP is still in the demonstration phase and is therefore not suitable for commercial operation. Bio-diesels have unresolved issues as a fuel for CHP. At present the energy cost of producing bio-fuels are not accurately known therefore the true effect on the sites CO₂ emissions are uncertain. Digester gas involves using the methane produced from anaerobic decomposition of bio-degradable waste as a fuel for the CHP. The bio-digesting plant requires a large amount of space which is not available on this project. It is therefore concluded that CCHP/CHP powered by renewables would not be suitable for this project given the building location.

7.3 Gas-fired CCHP/CHP Accompanied by Renewables

Gas fired CHP (Combined Heat and Power) is a well proven technology when sized correctly and utilised to its full potential. Gas fired CHP will be considered for this development.

The use of CCHP (Combined Cooling Heat and Power) does not suit this development as there is no requirement for cooling in the student accommodation and very minimal cooling demand in Travis Perkins showroom. Therefore the inclusion of CCHP is not a viable option.

As seen in graph 3 below, there are significant heat loads in the winter periods which would benefit from the inclusion of CHP. However the drop in demand in the summer would result in high modulation of the unit which heavily impacts on efficiency. Therefore to maximise performance, the CHP should be sized just above the base summer heat load. Although potential savings in the colder months would be reduced from this method, the overall annual performance of the CHP would be optimised.



Graph 3: Monthly Energy Demands

In addition to the seasonal heat load patterns, there is a constant hot water load present throughout the year which would benefit from the installation of a CHP.

Experience shows that in this type of environment, hot water consumption will have two peak periods a day; one in the early morning and one in the early evening with a small base hot water load provided throughout the remainder of the day. CHP units operate most efficiently with a constant base load and minimal modulation. Providing a standard instantaneous hot water generation system would therefore not suit the provision of a CHP. This can be overcome by using effective water storage techniques to ensure that the CHP runs for the majority of the day. In this instance, the development could benefit further from the installation of a CHP.

The most suitable CHP size that would provide the level of service required whilst maximising efficiency has been determined and discussions have been made with CHP manufacturers and suppliers in order to obtain a proposal.

It is recommended that a 140kWe CHP is installed to provide the development with 203kWth of thermal energy used to meet the base heating and hot water load.

It is proposed that a CHP is installed to provide the developments base heating and hot water load and generate electricity to offset that imported from the grid.

Given the calculated electricity to be generated from the CHP and anticipated site consumption, a percentage of electricity will need to be exported to the National grid and so measures will need to be in place to facilitate this. The proposed system will

comply with G 59 - *Recommendations for the Connection of Embedded Generating Plant to the Regional Electricity Companies' Distribution Systems* and metering facilities will be provided. Once planning approval is given, discussions will take place with the proposed CHP supplier, electricity supplier and electricity distribution network operator to review and agree the exporting arrangement and rates for the site.

7.4 Hydrogen Fuel Cells Accompanied by Renewables

Hydrogen fuel cells are a relatively new technology and would be fed from a natural gas supply given the lack of a hydrogen distribution network at present. The capital cost of such a system is much greater than that of a gas-fired CHP of similar size. With the technology still very embryonic, the use of Hydrogen fuel cells are not recommended for this site.

7.5 Gas fired communal heating and cooling

Analysis has been undertaken with regards to the viability of providing a communal heating and/or cooling system for the development.

As mentioned previously, the student accommodation will be heated via a wet radiator system fed from CHP and gas fired boilers. The only element of the Travis Perkins commercial area that requires heating is the showroom which is normally provided from Air Source Heat Pumps in line with brand standards.

There is a possibility of providing a communal system to serve both uses of the development by however there are problems associated with providing this. Given the distance between the plantroom and showroom, there are potentially high heat losses from the distribution pipework resulting in energy wastage. There are also likely control issues from providing a separate a heating and cooling system which would lead to inefficiencies in the overall system performance. Taking into account the above and comparing against the brand standard Air Source Heat Pumps with high COP's, it is deemed that a communal heating system is not a viable option for this development.

A communal hot water system was also investigated but again due to the pipework heat losses and the minimal hot water load for Travis Perkins in comparison to the rest of the development, it was not deemed viable to provide a communal hot water system.

Cooling is only required for the Travis Perkins showroom and offices and therefore a communal cooling system is not viable.

The requirement for cooling can have a big impact on a sites energy needs. Although the cooling requirements are small in comparison to the rest of the energy needs of the development, measures will be incorporated to minimise the load. These measures will include, but are not limited to, effective solar control, occupant controlled blinds and effective controls.

7.6 Communal heating and cooling fuelled by renewable sources of energy

Given the previous item, these options have been discounted.

7.7 Be Clean Calculations

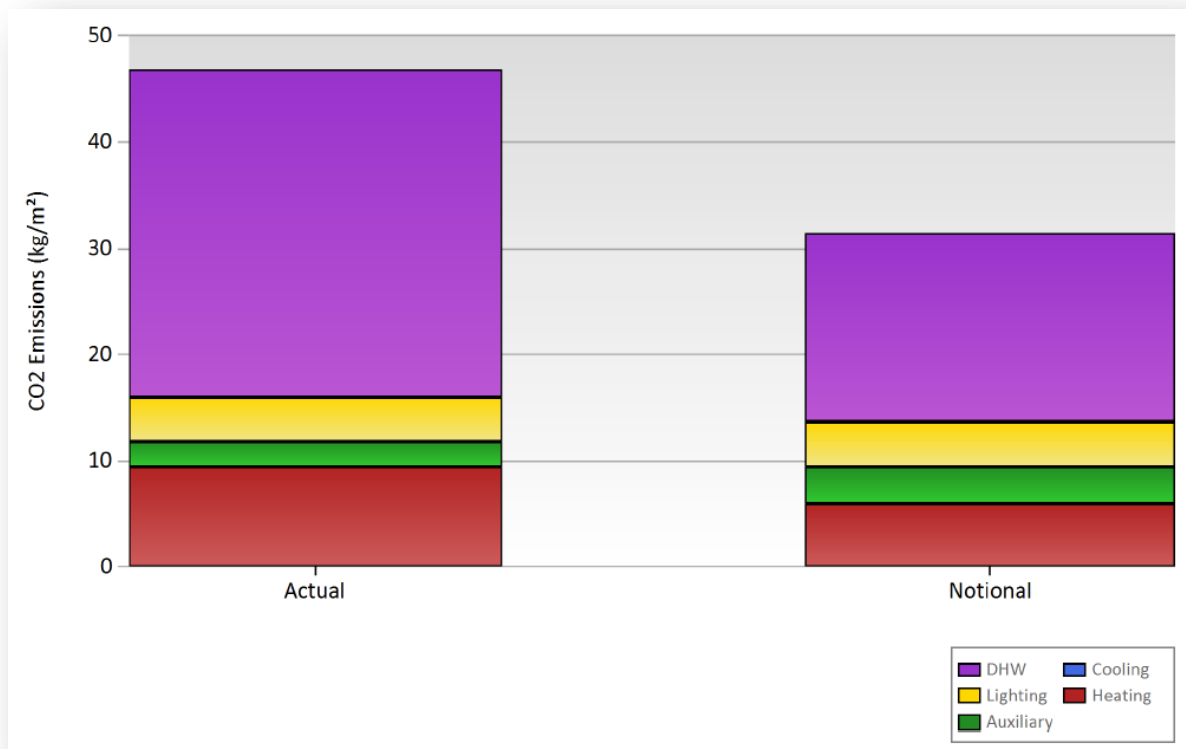
The building has been re-modelled with the inclusion of a gas fired CHP.

The following assumptions have been used in the modelling of the CHP which are based on manufactures data and Building Regulations Part L2A minimum requirements:

- Size Fraction – 0.25
- CHP Efficiency – 78.7%
- Heat to Power Ratio – 1.45

The manufactures technical data for the proposed unit can be found in appendix A of this report.

The resulting annual fuel consumption comparison and CO₂ emissions from the inclusion of the CHP are detailed as follows:



Graph 4: Annual CO₂ emissions from 'Be Clean' Measures (please note that displaced electricity contribution is not shown on this graph)

The BER for the development now achieves a further 39.48% reduction in CO₂ against the 'Be Lean' strategy BER which included energy savings measures only. This combines to give an overall reduction of 41.12% against the 2010 TER. The calculated total carbon emissions of the development from the 'Be Clean' stage are 343.14 Tonnes CO₂ per year which is a saving of 233.88 Tonnes CO₂ over the 'Be Lean' stage.

11-13 St. Pancras Way	TER (kgCO ₂ /m ² / annum)	BER (kgCO ₂ /m ² / annum)	Percentage Reduction over TER
Heating	5.95	9.52	-60.00%
Cooling	0.00	0.00	
Auxiliary	3.48	2.35	32.47%
Lighting	4.21	4.18	0.71%
Domestic Hot Water	17.78	30.77	-73.06%
Displaced Electricity	0.00	-28.32	
TOTAL	31.4	18.5	41.12%

Table 5: 'Be Clean' SBEM Results Breakdown

8.0 RENEWABLE MEASURES – 'BE GREEN'

In accordance with the London Plan Policy A4.7, the Mayor requires major developments to achieve a 20% reduction in CO₂ emissions from on-site renewable energy, except where it can be demonstrated that this is not feasible. This section reviews the potential on-site renewable energy technologies available and assesses their viability in conjunction with the CHP.

- Biomass Boilers
- Ground Source Heat Pumps (GSHP)
- Solar Thermal
- Solar Photovoltaic (PV)
- Wind Turbines
- Air Source Heat Pumps

8.1 Renewable Energy Assessment

From the predicted 'Be Clean' annual CO₂ emissions shown in table 6, it is possible to establish the target renewable CO₂ reduction as shown below.

	CO ₂ Emissions (Tonnes.CO ₂ /annum)
'Be Clean' Strategy	343.14
Target 20% Reduction from Renewable Energy	68.63

Table 6: Renewable Energy CO₂ Emissions Target

8.2 Biomass Boilers

The spatial requirement for biomass plant, equipment and associated fuel storage would be significant and would impact on the current layout of the building.

The site has limited off-street loading facilities for the larger vehicles needed to deliver the biomass fuel. Biomass requires frequent and regular deliveries of fuel which would impact on local transportation and would potentially affect the regular delivery and access requirements of Travis Perkins. Therefore biomass has been deemed not suitable for this development.



There are many discussions at this time with regards to the suitability of biomass within the GLA region due to the Clean Air Act requirements and the viability of clean biomass systems has not yet been proven. An air quality assessment for the development has been undertaken and shows that the annual mean objective for NO₂ is exceeded in some areas of the site and so the inclusion of a biomass system would only worsen the current situation.

Investigations were made into combining the use of CHP and biomass boilers with the former reducing CO₂ emissions and the latter providing a renewable contribution. The modelling showed direct conflicts between the two technologies resulting in loss of efficiency of both systems.

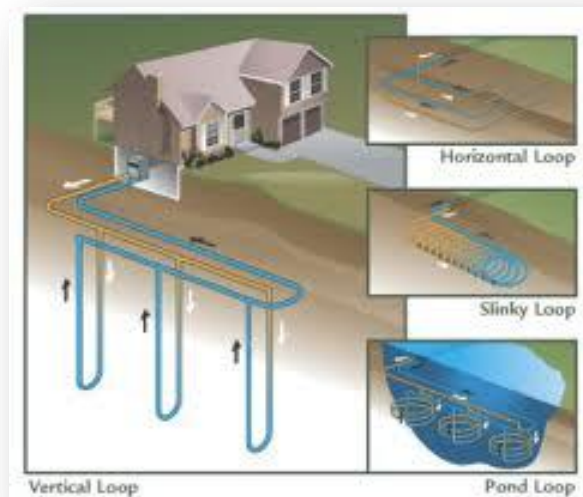
It is therefore believed that the technology is not suitable for this commercial operation in combination with a CHP set.

8.3 Ground Source Heat Pumps

Ground Source Heat Pumps (GSHP) can be used to provide heating and or cooling to the building. Whilst ground source does rely on fossil fuels (indirectly) to provide the energy source, they are considered renewable given their high coefficient of performance and hence reduced fossil fuel reliance.

This can be one of four methods:

- Closed horizontal loops in the strata, generally comprising a number of flow and return horizontal coiled loops often referred to as “slinkies”.
- Closed vertical loops in the strata, generally comprising a number of flow and return vertical loops to approximately 100m.
- Open loop, generally comprising of an abstraction and rejection well
- Abstraction only open loop, comprising of an abstraction well with water rejected to either the local sewer systems or river/water course.



Whilst it is practically viable to incorporate any of the above measures given the sites large footprint, the impact on reducing the energy demand would be limited based on the performance of the system. Ground Source Heat pumps can only provide a

relatively low hot water temperature which although ideal for low temperature heating systems, for example underfloor heating, is not best suited for a radiator system. Additional heat sources would be needed to achieve the desired temperatures for heating and domestic hot water.

Installing a GSHP system would compromise the efficiency and effectiveness of the CHP. Taking into account the potential energy and cost savings and reduced capital expenditure from the CHP in comparison to the GSHP, it is deemed that GSHP are not best suited for this site and have therefore not been considered further.

8.4 Solar Thermal

It is proposed that the development will use a CHP set to provide the contribution to the generation of heating as well as hot water. CHP units operate most efficiently with a constant base heating load, minimising modulation which can reduce the unit's effectiveness. By introducing solar thermal technology to pre-heat the domestic hot water, the base heating load is reduced thereby affecting the performance of the CHP.

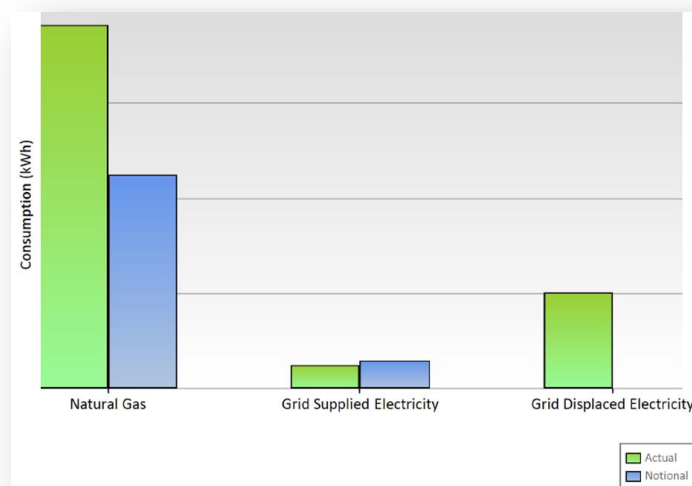
It is deemed that incorporating CHP with solar thermal will not provide an efficient and effective system and therefore has not been considered for this application.



8.5 Solar Photo-Voltaic

The amount of electricity needed to be generated by a solar PV system in order to meet the 20% renewables target is more than 140,000 kWh. This would equate to a solar collector area of just under 1,000m². The proposed useable roof area of the development for PV would be less than half that needed to meet the requirement. The proposed facade treatment to the south and eastern elevations and shadowing from the nearby building would make a PV cladding system unviable, and so the maximum potential amount of PV available at the site would not meet the 20% renewable target.

From the modelling detailed in the previous section of this report, the electricity generated from the CHP offsets electricity taken from the grid which has helped reduced the potential CO₂ emissions of the development.



Graph 4: Annual Fuel Consumptions

The results show that the development would consume around 250,000 kWh of electricity per annum. The CHP would generate approximately 805,000 kWh of electricity per annum, meaning that nearly 555,000 kWh of surplus electricity would be exported to the grid. Even if the consumption from unregulated sources is taken into account, 181,000 kWh of electricity would still be exported to the grid.

Electricity Consumption (kWh/annum)	
Regulated Electricity	249,472
Unregulated Electricity	374,486
Displaced Electricity	-805,120
Electricity Exported to Grid	181,162

Table 7: Anticipated Electricity Consumption

The above is based on an ideal scenario, and does not take into account human error and other variables that would alter this figure in reality.

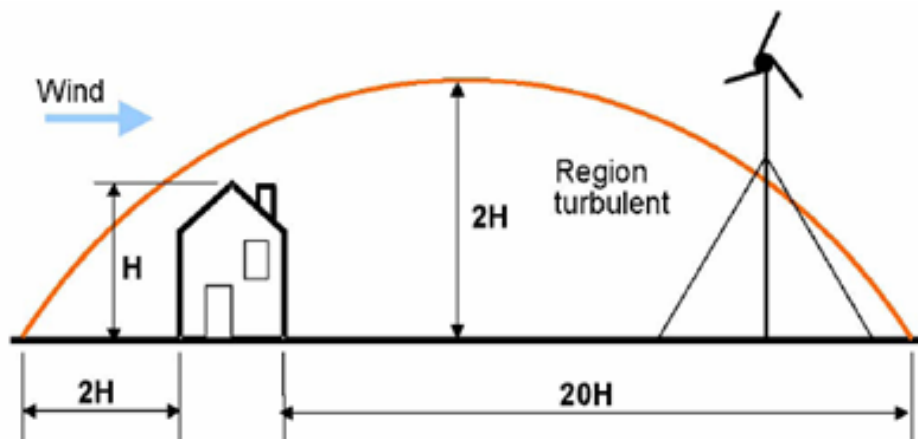
The calculations already show a large percentage of the electricity generated from the CHP being exported to the grid given the sites low electrical consumption, and so any electricity generated from solar PV would be exported directly with no beneficial use for the site. Taking this and the above points into account, the inclusion of solar PV has not deemed suitable for this project.

8.6 Wind Turbine

This section covers both large scale and micro wind solutions.

Large scale wind generation systems have capacities over 100kW and are usually used to power larger developments such as, larger scale housing and industrial estates. These systems cannot be roof mounted due to their size and weight. Due to the restricted site, large scale wind turbine systems are not considered appropriate for this project.

It is difficult to obtain predictable or large amounts of wind energy in city centre locations, as they require non-turbulent, horizontal air streams to be most effective. Surrounding buildings, trees etc can cause significant issues with regards to micro and large scale installations unless the rotors are positioned at a considerable height. An indicative layout is shown below.



Micro wind turbine technology has been found to be extremely difficult to achieve a 20% contribution economically.

Given the massing of the proposed development, changes in height of the tower blocks which are likely to create turbulence and proximity to the surrounding buildings, achieving an acceptable contribution, whilst possible in theory, is unlikely to be achievable in reality. Furthermore, tall buildings give their own specific problems in that the building acts as a spoiler, pushing wind upwards and over the turbine, reducing effectiveness considerably.

Additional considerations with large and micro wind solutions are the potential issues from stroboscopic light, topple distance, noise and impact on wildlife, that are all detrimental given this location.

Based on the above points and those made in the solar PV section, the use of wind power has not been deemed as feasible for this development.

8.7 Air Source Heat Pumps

Due to the Travis Perkins brand requirement, heating and cooling to the showrooms and offices is to be provided by air source heat pumps.

Air source heat pumps (ASHP) extract thermal energy from the surrounding air and can be used to provide heating and/or cooling.

The air source heat pumps require electricity to operate but have a very high coefficient of performance which is why they are now classed as a low/zero carbon technology.

Although a manufacturer hasn't been selected at this stage, the units will be selected to have a SEER and SCOP of no lower than 3.5 to ensure an efficient system is selected.

The outdoor units will be located external adjacent to the offices in a position that minimises their visual impact to the surrounding areas.

Contribution

As the Travis Perkins offices and showroom are the only areas of the development that require cooling and form a small part of the development, the savings from the introduction of energy efficient ground source heat pumps are minuscule in relation to the 20% renewables target. Calculations have shown that this would only account in a CO₂ saving of 650 kg.CO₂ which equates to 0.97% of the renewable target and as a result, the re-modelling of the building has not been undertaken.

The results of the 'Be Clean' stage of the report remain unchanged given the negligible change in CO₂ emissions from the inclusion of ASHP's.

9.0 UNREGULATED EMISSIONS

Unregulated emissions are those which are not covered by the Building Regulations, namely CO₂ emissions from appliances and cooking. To give a true representation of the developments carbon emissions, the estimated contribution from unregulated sources needs to be added to the figures calculated from within the accredited modelling software.

Guidance on how these unregulated consumptions are estimated have been drawn from CIBSE guidelines, ECON and evidence gained from similar previous projects. From these the following assumptions have been made:-

Based on guidelines within CIBSE guide F, office equipment benchmarks for air conditioned offices should use on average 23 kWh/m²/annum as good practice. Using the CO₂ conversion factor of 0.48 kg.CO₂/kWh and applying a 60% treated floor areas factor for the installed IT equipment, this equates to 6.62 kgCO₂/annum/m².

The large storage space for Travis Perkins is purely for storing goods where only lighting is provided. No unregulated emissions are deemed applicable to this area.

For the student accommodation, it is likely that the majority of rooms, if not all, will have a least a TV and a laptop or computer which wouldn't have been accounted for in the part L calculations. Therefore some assumptions have been made on the potential energy consumption of this equipment to give a true representation of the developments total energy demands.

There is no particular reference within CIBSE guide F to benchmarks for unregulated energy consumption for dwellings or apartments as a basis for the student accommodation. However there are benchmarks for business hotels which are not dissimilar to student accommodation with TV's and laptops likely to be used. Therefore a good practice benchmark taken from CIBSE guide F (based on a business hotel) for the student accommodation of 5 kWh/m²/annum will be used. Using the CO₂ conversion factor of 0.48 kg.CO₂/kWh, this equates to 2.4 kgCO₂/annum/m².

Taking account of the two figures above, the sites total carbon emissions rate from unregulated sources would be 9.02 kgCO₂/annum/m²

The latest version of TAS is based upon the 2010 version of Buildings Regulations and now includes emissions from equipment (e.g. non regulated emissions). However these results are not included within the final BER. The figure given from the software for the development is 10.33 kgCO₂/m² as seen in the table below.

	<i>Actual</i>	<i>Notional</i>
Heating (kgCO ₂ /m ²)	7.76	5.95
Cooling (kgCO ₂ /m ²)	0.00	0.00
Auxiliary (kgCO ₂ /m ²)	2.35	3.48
Lighting (kgCO ₂ /m ²)	4.18	4.21
DHW (kgCO ₂ /m ²)	16.27	17.78
Equipment (kgCO₂/m²) *	10.33	10.18
Total (kgCO₂/m²)	30.57	31.42
Total Floor Area (m²)	3576.20	3576.20
<p><i>* Energy used by equipment does not contribute to total value - it is presented here for comparison only</i></p>		

Table 9: SBEM breakdown of results

As the modelling software results do not differ greatly from the figure calculated from CIBSE guide F benchmarks, it can be assumed that these give a realistically representation of the potential emission from unregulated sources. Therefore an average of these two will be used as the basis of this report. The figure used is 9.675 kgCO₂/m².

10.0 SUMMARY, CONCLUSIONS & RECOMMENDATIONS

Many conclusions and recommendations have been made in the previous sections of this report. In this section the main conclusions and recommendations are summarised.

Table 9 summarises the CO₂ emissions for the development for each stage of the assessment:

- 'Be Lean' (Energy Efficiency)
- 'Be Clean' (Community Heating Network)
- 'Be Green' (Renewable Technology)

Model	Carbon Dioxide Savings (Tonnes CO ₂ /Annum)		Carbon Dioxide Savings	
	Regulated	Total	Regulated	Total
'Be Lean' – Energy	15.77	15.77	2.71%	2.07%
'Be Clean' – CHP	223.88	223.88	39.48%	30.00%
'Be Green' - Renewables	0	0	0%	0%
TOTAL CUMULATIVE SAVINGS	239.64	239.64	41.12%	31.44%

Table 9: CO₂ Emissions Savings from each stage of the Energy Hierarchy

The investigation of CO₂ emissions savings involved the analysis and simulation of:

- Energy Efficiency Measures
- Hierarchy of Heating and Cooling Technologies
- Renewable Energy Technologies

It is proposed that the following energy efficiency measures are provided to reduce energy demand for the building before renewable technologies have been considered:

- Improved Heating and Cooling Plant Efficiencies
- Energy Efficient Lighting
- Inclusion of Heat Recovery to Ventilation Systems
- Improved Services Distribution
- Inclusion of Variable Speed Drives to Pumps and Fans
- Installation of a Building Energy Management System to provide active control of the Key Building Services Systems
- Water Saving Technologies

The above energy efficiency measures will provide a 2.71% reduction in CO₂ emissions over the TER.

It is proposed that the development uses a Combined Heat and Power unit to generate a proportion to the sites heating and hot water requirements which will provide a further 39.48% reduction in CO₂ emissions.

From investigations made into local district heating networks, two schemes were found to be in close proximity to the development. Although both had the potential to accommodate the development neither were deemed viable to connect to at this time

due to the proposed completion date of the Euston Road scheme and difficulties connecting to the Kings Cross scheme. However provisions will be made to allow connection to a suitable district heating network at a later date.

Due consideration has been given to incorporating renewable technologies into the development however none were deemed suitable. The inclusion of CHP as part of the 'Be Clean' strategy showed good CO₂ savings over the Building Regulations 2010 compliant scheme. Any introduction of heat generating renewable technology would be in direct conflict with the CHP resulting in reduced efficiencies of both systems and reduced CO₂ savings. The option to not include the CHP to allow the inclusion of renewable technology was reviewed however it was deemed that the provision of CHP provided a better all round solution in terms of carbon savings and site suitability.

It was therefore concluded that a scheme with CHP and no heat generating renewable technology would provide a better technical and sustainable solution to a scheme with CHP and heat generating renewables, or no CHP and some heat generating renewables.

The inclusion of electricity generating renewable technology such as wind and solar PV was also reviewed. However as the calculations already showed that the CHP was already more than enough electricity for the site and so surplus amounts would need to be exported to the grid, it was deemed that the inclusion of such systems would not directly benefit the site.

It is proposed that Air Source Heat Pumps are provided to meet the heating and cooling requirements of the Travis Perkins offices and showrooms. The heating and cooling demand of these areas are small in comparison to the rest of the development and so the savings from the ASHP's are insignificant to the total site emissions. It was calculated that this reduction would contribute less than 1% of the required renewables target. As a result, calculations showing the savings from ASHP's have not been included in the final results.

The proposed Building Services strategy for the development achieves a 41.12% reduction in regulated CO₂ emission over 2010 Building Regulations and a saving including unregulated emission of 31.44%.

Initial analysis has shown that the proposed development would achieve an Excellent BREEAM rating for both the multi-residential and commercial assessments as required by planning.

APPENDIX A - Response to GLA Comments

This report aims to answer the queries raised by the GLA on the planning application for the proposed development at 11-13 St Pancras Way, London. The responses below are in relation to those raised on Sustainability and Climate Change.

Energy – Climate Change Mitigation

Energy Efficient Standards (Item 60) - Section 6.9 of this report details the originally proposed u-values for the main building envelope which are in line with Building Regulations. Since the GLA's comments, the design team have reviewed the building make-up and have indicated that improvements in the u-values can be made which would result in reduced heat gain into the building. At this time, the team have targeted a 10% improvement on all u-values for the main building elements to improve the thermal performance of the development.

The table below shows the previous and proposed new u-values for the development.

<i>Building Services</i>	<i>2010 L2A Values</i>	<i>Existing 'Be Lean' Values</i>	<i>Proposed 'Be Lean' Values</i>
<i>Boiler Efficiency</i>	86%	90%	90%
<i>Heat Recovery Efficiency</i>	50%	70%	70%
<i>Electric Heating Efficiency</i>	100%	100%	100%
<i>Cooling System Seasonal Energy Efficiency Ratio (EER)</i>	2.5	2.5	2.5
<i>Domestic Hot Water Efficiency</i>	80%	85%	85%
<i>AHU with Heat Recovery Specific Fan Power (W/l/s)</i>	2.2	2.2	2.2
<i>Local Fan Specific Fan Power (W/l/s)</i>	0.4	0.4	0.4
<i>U-Values (W/m² K)</i>			
<i>Wall</i>	0.35	0.35	0.315
<i>Floor</i>	0.25	0.25	0.225
<i>Roof</i>	0.25	0.25	0.225
<i>Windows</i>	2.2	2.2	1.98
<i>High Usage Entrance Doors</i>	3.5	3.5	3.15

There are deemed to be no additional energy savings opportunities available for the development that would drastically reduce the energy demands of the development without the need to drastically alter brand standards.

District Heating (Item 55) – Below are the email correspondents with Peter North of the LDA on the Camden Euston Road district heating scheme. These correspondents detail the proposed timing, phasing and scope for the district heating network which as previously detailed do not, at this time, coincide with the programme and location of the

proposed development. However, provisions will be provided for the potential connection to the district heating scheme should the proposed second phase expansion be able to accommodate the development at 11-13 St. Pancras Way. If suitable during the second phase of the development, discussions will be made with the LDA to review the potential connection possibilities.

From: Garner, Harold [mailto:Harold.Garner@Camden.gov.uk]
Sent: 02 June 2011 15:51
To: Stuart Daniels
Cc: Roberto Gagliardi La Gala; Peter North
Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Stuart

There are two phases to the Euston Road project. The first phase is likely to be restricted to Camden housing in Somers Town (just north of the British Library) and will go live in 2012/13. The second phase (2016) will connect to various non-Camden owned buildings in the area. In the first instance this is likely to involve commercial buildings close to the Euston Road.

A connection to St Pancras Way would probably be outside the Phase 1 scope. There is certainly insufficient funding available to extend the network to the location at this stage.

I'll give you a call to discuss in more detail tomorrow.

Regards

Harold

Harold Garner
Sustainability manager (technical projects)
Environment and Transport
Culture and Environment
London Borough of Camden

Telephone: 0207 974 2701
Mobile: 07876 447472
Web: camden.gov.uk

4th floor
Argyle Street
London WC1H 8EQ

Please consider the environment before printing this email.

From: Stuart Daniels [mailto:Stuart.Daniels@appliedenergy.co.uk]
Sent: 02 June 2011 14:10
To: Peter North
Cc: 'Roberto Gagliardi La Gala'; Garner, Harold

Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden
Importance: High

Peter,

Thanks for your previous comments. We have since had a response from the GLA on the scheme and they would like to understand the phasing of the Camden Euston Road scheme to see if in the future, our development could connect to the scheme. Do you have any details or information that could assist me on this?

Your quick response would be appreciated.

Regards,
Stuart

Stuart Daniels
Tel: 07817 893819

From: Peter North [mailto:PeterNorth@LDA.GOV.UK]
Sent: 25 March 2011 14:56
To: Stuart Daniels
Cc: Roberto Gagliardi La Gala; Garner, Harold
Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Stuart

Argent may be able to provide heat now. The Camden scheme would be two to three years away.

Regards

Peter North

Head of Energy Supply - Environment and Capital Projects
020 7593 8344/ peternorth@lda.gov.uk
Mobile 07971 318978

London Development Agency
Palestra
197 Blackfriars Road
London
SE1 8AA

Switchboard: 020 7593 8000

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From: Stuart Daniels [mailto:stuart.daniels@appliedenergy.co.uk]
Sent: 24 March 2011 09:34
To: Peter North
Cc: Roberto Gagliardi La Gala; 'Garner, Harold'
Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Thanks again Peter.

I will speak to Argent re capacity and supply agreements. In terms of going live, when is heat expected to be available from either scheme?

Regards,
Stuart

Stuart Daniels

T: 07817 893 819

From: Peter North [mailto:PeterNorth@LDA.GOV.UK]

Sent: 22 March 2011 17:03

To: Stuart Daniels

Cc: Roberto Gagliardi La Gala; Garner, Harold

Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Stuart

These look feasible heat loads for the Camden scheme. Camden are about to model the energy demands and could include your loads - Harold could confirm this.

I can't speak for Argent, but I would guess they have sufficient capacity to supply your requirements, but you would need to confirm this with them and be prepared to negotiate a heat supply agreement.

Regards

Peter North

Head of Energy Supply - Environment and Capital Projects

020 7593 8344/ peternorth@lda.gov.uk

Mobile 07971 318978

London Development Agency

Palestra

197 Blackfriars Road

London

SE1 8AA

Switchboard: 020 7593 8000

Please consider the environment before printing this e-mail or its attachments.

From: Stuart Daniels [mailto:stuart.daniels@appliedenergy.co.uk]

Sent: 22 March 2011 16:56

To: Peter North

Cc: Roberto Gagliardi La Gala; 'Garner, Harold'

Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Thanks Peter.

The anticipated peak heat load would be in the region of 2.8 MW with an annual consumption of around 3,500 MWh. Subject to planning, these loads would be available in the latter part of 2012. Are these feasible for the proposed capacities of the two schemes you have highlighted?

Regards,
Stuart

Stuart Daniels

T: 07817 893 819

From: Peter North [mailto:PeterNorth@LDA.GOV.UK]
Sent: 22 March 2011 16:34
To: Stuart Daniels
Cc: Roberto Gagliardi La Gala; Garner, Harold
Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Stuart

There are two possible heat network connections that you could consider. The first is the CHPDH scheme being built by Argent at Kings Cross. The contact there is Andre Gibbs. I do not have Andre's contact details.

The second option, and slightly further away is a scheme under development by the London Borough of Camden whose energy centre will be located along Brill Place and would serve Camden housing estates and other heat load in and around Euston Road. It looks like you would be around 800m away from the energy centre and 400m from the planned heat network. The contact there is Harold Garner (cc'd above).

Do you have your forecast heat loads (MWh), peak heat demand (MW) and when the heat loads will appear?

Regards

Peter North

Head of Energy Supply - Environment and Capital Projects
020 7593 8344/ peternorth@lda.gov.uk
Mobile 07971 318978

London Development Agency
Palestra
197 Blackfriars Road
London
SE1 8AA

Switchboard: 020 7593 8000

Please consider the environment before printing this e-mail or its attachments.

From: Roberto Gagliardi La Gala **On Behalf Of** Energy Master Plan
Sent: 22 March 2011 14:39
To: 'Stuart Daniels'
Cc: Peter North; Energy Master Plan
Subject: RE: Decentralised Energy for proposed development on St. Pancras Way, Camden

Dear Stuart

Thanks for your email.

You can view anchor heat loads, energy supply plants, District Heating networks and areas of opportunities for Decentralised Energy schemes simply by zooming in the relevant area of the map at the following link

<http://www.londonheatmap.org.uk/Mapping/>

and switching-on the relevant sub-layer (2.1, 2.2., 2.3 and 2.4) on the left side of the screen.

If you register to the website www.londonheatmap.org.uk and log-in you will also have access to a full range of functionalities of the map.

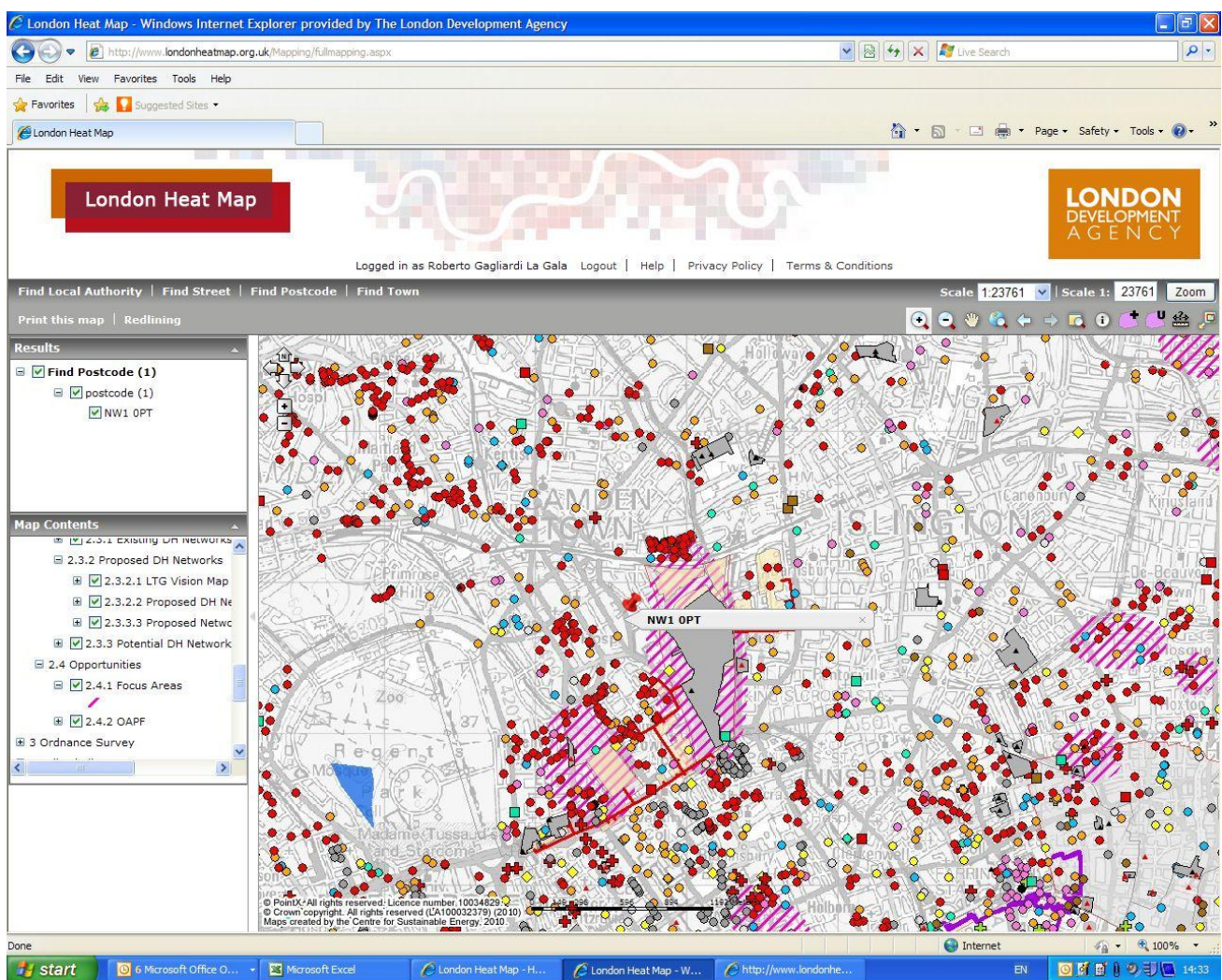
Full guidance & user manual at <http://www.londonheatmap.org.uk/Content/MappingHelp.aspx>

With regards your site (NW1 OPT), if I switch on every sub-layer I can see how the development is in the vicinity of a proposed Districh Heating network (Euston Road) and in one Focus Areas identified through the heat mapping work undertaken by the London Borough of Camden (see below).

My line manager Peter North Head of Energy Supply at the LDA, here in Cc, can provide more information re the proposed Euston Road DH scheme and the potential of connecting additional buildings such as yours.

Regards

Roberto



From: Stuart Daniels [mailto:stuart.daniels@appliedenergy.co.uk]
Sent: 22 March 2011 12:50
To: Energy Master Plan
Subject: Decentralised Energy for proposed development on St. Pancras Way, Camden
Importance: High

Dear Sir/ Madam,

We are involved in a proposed new development at 11-13 St. Pancras Way, London, NW1 0PT. The development is a mix use site consisting of commercial space and student accommodation.

We are trying to determine if there are any existing or proposed decentralised energy networks that the development could use to provide its heating needs? I have been made aware of the proposed Kings Cross Decentralised Energy system by the GLA but can't find any information on if and when it will be available and if the proposed development will be able to use it?

Please could you provide any relevant information on the above to allow us to conclude our planning consultation.

Many thanks in advance.

Regards,
Stuart

Stuart Daniels

T: 07817 893 819

F: 08702 865 954

E: stuart.daniels@appliedenergy.co.uk



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London Development Agency, Palestra, 197 Blackfriars Road, SE1 8AA

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London Development Agency, Palestra, 197 Blackfriars Road, SE1 8AA

<http://www.lda.gov.uk>

Combined Heat and Power (Item 58) – The proposed CHP was selected to provide the base heating load for the development based on results from the SBEM modelling and from previous experience. These figures resulted in the CHP being sized to provide around 25% of the hotels base heating and hot water loads. Although hot water usage for this type of building results in two peak loads (one in the morning and one in the evening) with a small base usage throughout the remainder of the day, there is potential to provide a constant base load for the CHP to improve its efficient. By incorporating large volume storage vessels to heat the water over longer periods of the day (rather than providing instantaneous hot water generation), a constant base heating load will be provided to allow the CHP to run for longer and to minimise modulation hereby improving its effectiveness and gaining greater carbon savings.

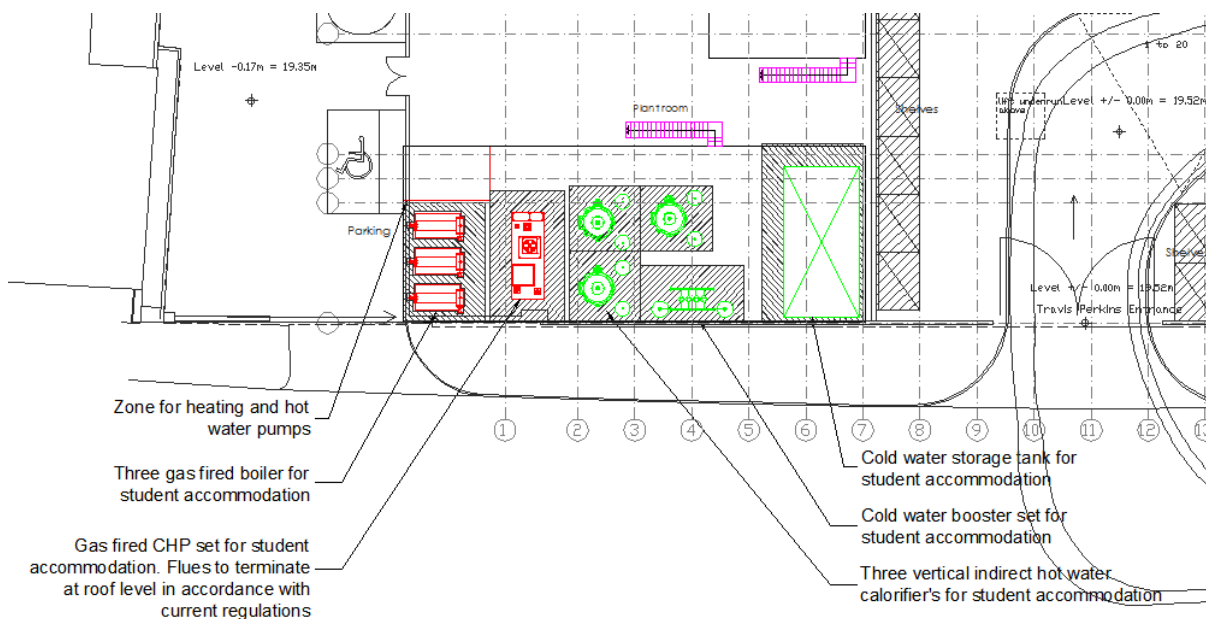
The data for the proposed CHP unit can be found in Appendix B however the key data is detailed below:-

- Overall CHP efficiency – 78.8% @ 100% output and 78.6% @ 75% output.
- Electricity Output – 140kWe

- Heat to Power Ratio (HtP) – 1.45

The savings shown within this report were taken the EDSL TAS dynamic simulation modelling software (DSM) which was the first DSM to be approved for Part L2 and EPC calculations. Tas is also recognised as Building Energy and Environmental Modelling (BEEM) software suitable for calculating building performance and predicting energy usage.

Combined Heat and Power (Item 59) – The proposed CHP is to be located within the mezzanine plantroom within the main plant room situated to the East of the development. A detailed layout of the plantroom can be found in Appendix C however a screen shot is added below. The layout has been designed such that all the main heating, hot water and cold water plant are situated together thereby creating a central Energy Centre for the development.



The CHP unit sizes can be found in Appendix B but have been summarised below:-

- Length – 3,407mm
- Width – 1,347mm
- Height – 2,660mm

Cooling (Item 61) – Measures are proposed to mitigate excessive heat gain into the student accommodation bedrooms and key public areas. These will include the inclusion of solar control glazing to the southern and eastern elevation windows. The glazing on these elevations will be specified with a SHGC (solar heat gain coefficient) of between 0.4 and 0.5 to minimise unwanted heat gain.

The design of the external envelope is such that some shading will be given to a selection of rooms by the introduction of the red mesh panels shown in localised areas. The windows also have a 300mm reveal which will act as a 'Brise soleil' to reduce the amount of heat gain into the rooms by shading the windows during particular times of the day.

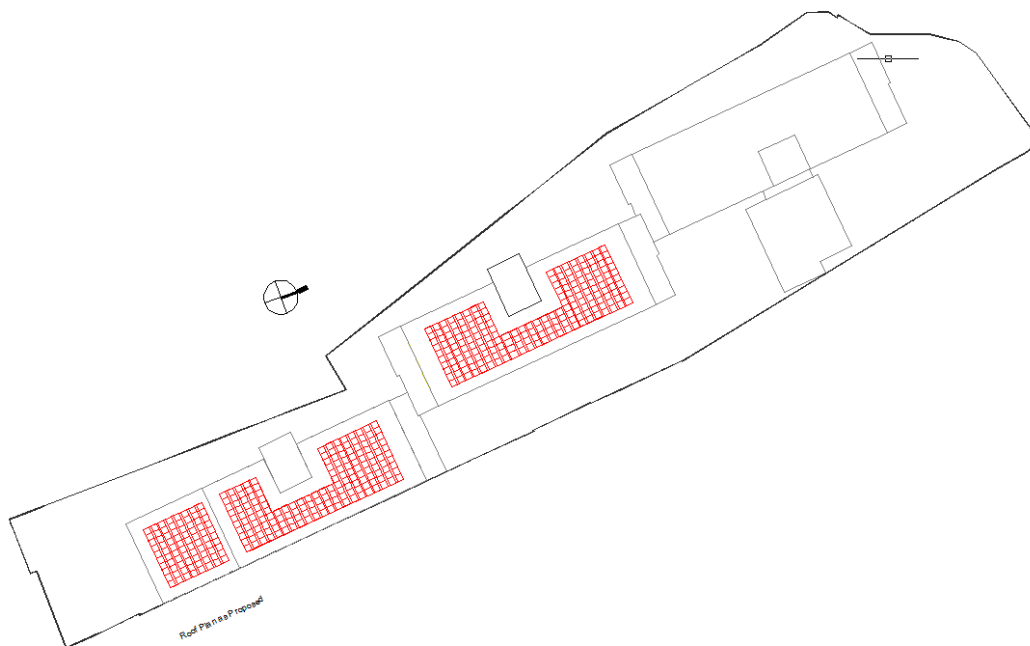
In addition, blinds and curtains are to be provided to each room to provide independent occupant control to further reduce the level of heat gain into the space.

It is believed that the above measures will provide a good level of solar gain control and help prevent the student accommodation rooms from overheating.

Renewable Energy Technologies (Item 65) – Although it is still deemed not financial viable to provide solar PV to the scheme given the proposed amount of electricity already being generated on-site from the CHP, the design team are willing to look further in to the inclusion of PV.

Having reviewed the roof layouts, it is possible to provide solar PV to two of the main blocks of the development. These two roof areas are both south facing and aren't shaded by other parts of the development or nearby buildings. The two roof areas to the right of the development are lower in height than the other two blocks and so the effectiveness of any PV located here would be reduced to due overshadowing. It is therefore not deemed suitable to provide any PV in these locations.

The below drawing shows the potential extent of solar PV that could be provided. Taking into account access routes on the roof for future maintenance and servicing, there is the potential to install 320m² of roof mounted solar PV collectors. The PV area is highlighted in red.



Based on modules mounted at 10° and directly south facing the proposed scheme has the potential to provide a system size of 54.36kWp, generating 44,971kWh of electricity and saving 25,554 kg.CO2. This represents a 7.45% reduction in CO₂ emissions from renewable electricity.

The BER for the development now achieves a further 7.45% reduction in CO₂ against the 'Be Clean' strategy BER from the use of renewable technology. This combines to give an overall reduction of 48.57% against the 2010 TER. The calculated total carbon emissions

of the development from the 'Be Green' stage are 317.58 Tonnes CO₂ per year which is a saving of 25.55 Tonnes CO₂ over the 'Be Clean' stage.

It is therefore deemed that the inclusion of solar PV technology at the development warrants further investigation.

APPENDIX B - CHP Data Sheet

COGENCO DATA SHEET

CGC-0140MA-080-NG-50



Low Temperature Natural Gas

ENERGY BALANCE AND PART LOAD DATA

			100%		75%		50%	
Fuel input (HHV)	(+/-5%)	kW	435	%	346	%	253	%
Electrical output	(+/-3%)	kW	140	32.2%	105	30.3%	70	27.7%
Total usable heat output	(+/-7%)	kW	203	46.7%	167	48.3%	128	50.7%
Total usable energy	(+/-7%)	kW	343	78.8%	272	78.6%	198	78.4%
Heat output from jacket water and oil cooler	(+/-7%)	kW	128	29.4%	108	31.2%	86	34.0%
Heat output from exhaust gases (120°C)	(+/-7%)	kW	75	17.2%	59	17.1%	42	16.6%
Mechanical shaft power	(+/-3%)	kW	150	34.5%	113	32.7%	75	29.7%
Radiated and unaccounted for heat	(+/-7%)	kW	18	4.1%	16	4.6%	14	5.5%
Fuel mass flow		kg/hr	37		29		22	
Fuel volume flow		nm3/hr	44		35		26	
Combustion air mass flow		kg/hr	489		389		285	
Combustion air volume flow		nm3/hr	379		302		221	
Ventilation air volume flow (incl. comb. air)		nm3/hr	5,000		5,000		5,000	
Exhaust gas mass flow (wet)		kg/hr	526		419		306	
Exhaust gas volume flow (wet)		nm3/hr	423		337		246	
Exhaust gas volume flow (wet) @ 120°C		m3/hr	609		484		354	
Jacket water flow		m3/hr	18		18		18	
Intercooler water flow - minimum		m3/hr	N/A					
Secondary water flow - minimum		m3/hr	18		18		18	
Maximum return water inlet temperature		°C	80.0		80.0		80.0	
Secondary water outlet temperature		°C	90.0		88.0		86.0	
Exhaust gas temperature before cooler		°C	590		580		570	

ENGINE DATA

Manufacturer		MAN
Model		E2876 E312
ISO Power	kW	150
Cylinder configuration		In line 6
Exhaust manifold		Water Cooled
Piston Speed	m/s	8.30
Bore	mm	128
Stroke	mm	166
Swept volume	litres	12.82
Mean effective pressure	bar	9.36
Compression ratio		12.0:1
Engine speed	rpm	1500
Engine weight	kg	830
Sump oil content	litres	41
Engine cooling water content	litres	16
Starter motor voltage	v	24
Air fuel ratio		1.00
Oil Consumption	g/kWh	0.2 - 0.5
Gas heating value (HHV)	kJ/nm3	38620
Minimum methane index / content		MI>70
Maximum methane content fluctuation		5%
Fuel Maximum Siloxane content	mg/nm3	n/a
Fuel Maximum Sulphur Compound content	mg/nm3	n/a

GENERATOR DATA

Type (Synchronous)		ECO38-2SN/4 50
Stator configuration		Star
Rating	kVA	200
Frequency	Hz	50
Voltage	V	400
Rating at PF 0.8	kW	160
Current per phase PF 0.8 (@ CHP duty)	A	253
Current per phase PF 1.0 (@ CHP duty)	A	202
Efficiency at PF 1.0	%	95.0
Efficiency at PF 0.8	%	93.0
Power factor lagging		0.8
Generator speed	rpm	1500
Permissible overspeed	rpm	2250
Generator weight	kg	560
Generator moment of inertia	kgm2	1.8799
Radio interference level to VDE 0875		VDE0875K
Protection class		IP21
Insulation class		H
Xd direct axis synchronous reactance	p.u.	2.00
X'd direct axis transient reactance	p.u.	0.11
X''d direct axis sub transient reactance	p.u.	0.059
T'd sub transient reactance time constant	seconds	0.012
T'do open circuit field time constant	seconds	0.9

EXHAUST GAS HEAT EXCHANGER

Capacity	kW	75
Fouling factor		10%
Shell and inlet material		Mild Steel
Tube and outlet material		AISI 316, 304

PLATE HEAT EXCHANGER

Capacity	kW	203
Fouling factor		10%
Materials		AISI 316
Pressure drop (secondary side)	kPa	-

MISCELLANEOUS DATA

Glycol content intercooler circuit and engine circuit		30%
Intercooler circuit max. available head loss	m	n/a
Primary circuit max. available head loss	m	5
Primary pump		FCE 65-125/30-5
Intercooler pump		n/a
Maximum exhaust back pressure at unit	mbar	25
Minimum gas pressure (dynamic)	mbar	20
Maximum gas pressure fluctuation		10%
Ventilation fan available pressure drop	Pa	25
Air fuel ratio control		Kronos 10
Preferred lubrication oil type		Pegasus 710
Spark plug type		Champion
NOx emissions (@ 5% O2)	mg/nm3	5000
CO emissions	mg/nm3	
Catalyst type		None
Ambient test barometric pressure	kPa	100
Ambient test atmospheric temperature	°C	25
Definition of ratings		ISO 3046

CONNECTIONS AND DIMENSIONS**

Gas train diameter	DN/PN	40/screw
Secondary water connections	DN/PN	65/16
Exhaust pipe diameter	DN/PN	100/10
Intercooler connections	DN/PN	-
Condensate drain connection		1" BSP (ABS)
Attenuator connection size	mm	800x800
Weight dry	kg	5,390
Weight wet	kg	5,767
Length - canopy only	mm	3,007
Length - canopy and control panel	mm	3,407
Width	mm	1,347
Height - canopy only	mm	1,960
Height - canopy and 75 dBA attenuators	mm	2,660

MAXIMUM OPERATING PRESSURES

Fuel system	mbar	150
Exhaust system	mbar	25
Primary circuit	bar	3
Secondary circuit	bar	8
Intercooler circuit	bar	n/a

** Check production GA for confirmation

All information provided for guidance only, specifications may change without notice.

Datasheet issue date 11/06/2007

T 0044 (0) 1403 272270

Parsonage Farm Business Park

Data sheet revision PRELIM

F 0044 (0) 1403 272274

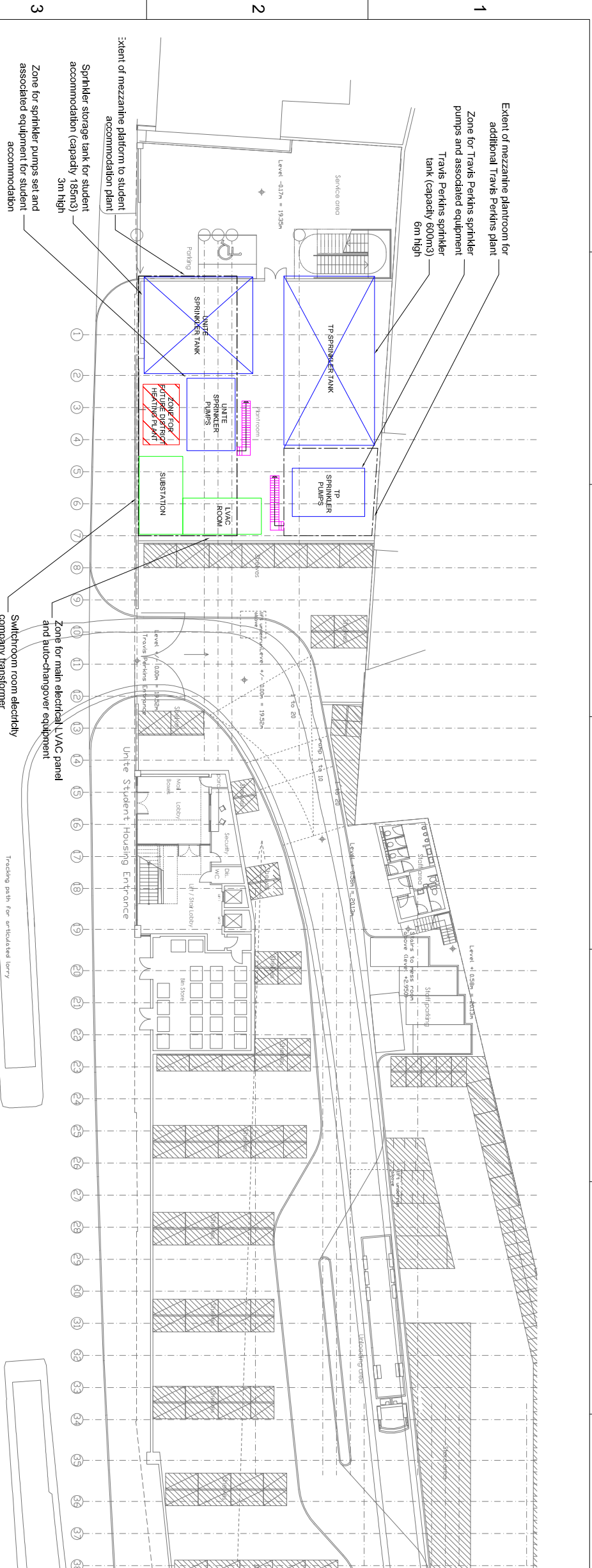
Parsonage Way Horsham

Database revision date 17/11/2008

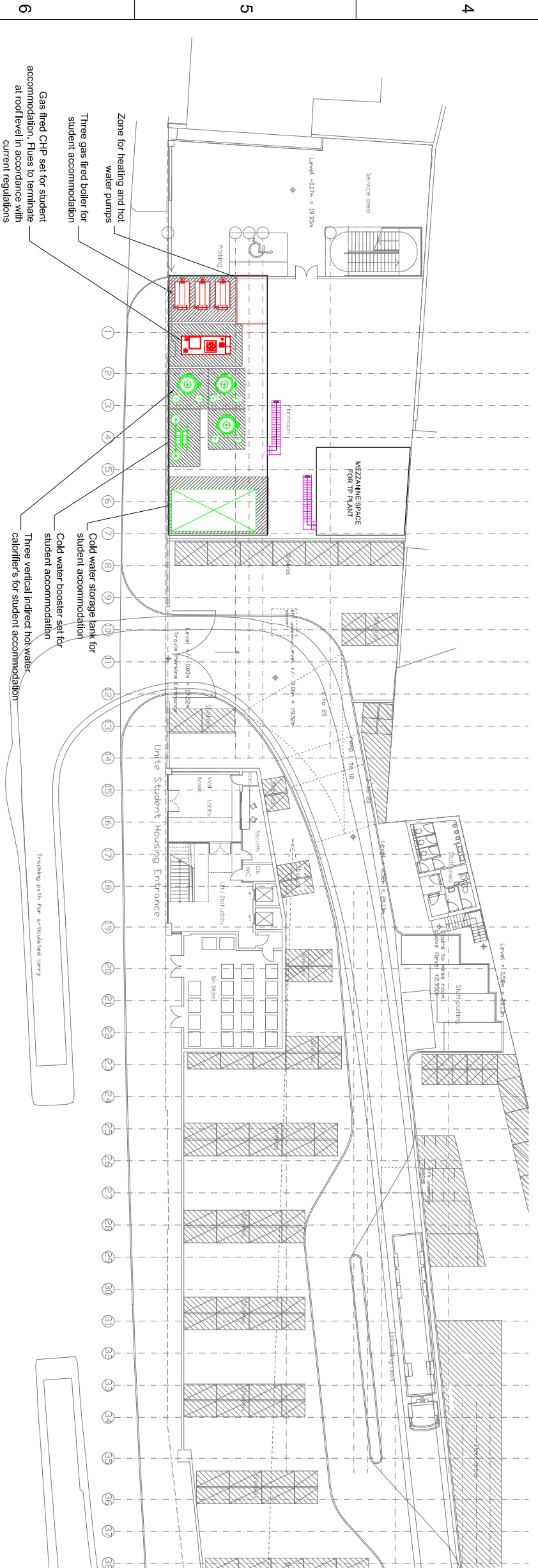
www.cogenco.com

West Sussex RH12 4AL UK

APPENDIX C - Plantroom Layout



GROUND FLOOR PLANTROOM LAYOUT



MEZZANINE PLATFORM PLANTROOM LAYOUT

- NOTES**
- CONTRACTOR TO PREPARE DETAIL WORKING DRAWINGS FOR APPROVAL SUBSEQUENT TO SITE SURVEY.
 - CONTRACTOR TO AGREE FINAL SETTINGS OUT PRIOR TO INSTALLATION.
 - THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL NECESSARY ARCHITECTURAL, STRUCTURAL AND SPECIALIST DRAWINGS, SCOPE OF WORKS AND SPECIFICATIONS.
 - PLANT SIZES GIVEN ARE INDICATIVE AND SUBJECT TO MORE DETAILED DESIGN.
 - SPRINKLER AND ASSOCIATED PLANT REQUIREMENTS TO BE CONFIRMED BY FIRE CONSULTANT AND/OR TRAVIS PERKINS.
 - HATCHED AREAS DEPICT REQUIRED CLEARANCES FOR SERVICING AND MAINTENANCE.
 - SERVICE REQUIREMENTS FOR TRAVIS PERKINS TO BE CONFIRMED.

REV	DESCRIPTION	DATE
B	MINOR CHANGES	05.04.2011
A	MINOR CHANGES	03.02.2011
0	INITIAL RELEASE	09.12.2010

APPLIED ENERGY
 UPPER FARM, BLUE BELL LANE,
 STROKE D'ABERNON, SURREY, KT11 3BW
 TEL: 01932 869880 FAX: 08702 565 954
 EMAIL: info@appliedenergy.co.uk
 www.appliedenergy.co.uk

PROJECT: 11-13 ST PANCRAS WAY

TITLE: GROUND FLOOR PLANTROOM LAYOUT

DRAWING NO.	REV
0106-P-ML-G-HVAC-001	B

SCALE: 1:200@A1

Dimensions shall not be scaled & figured dimensions must be verified on site before work commences

APPENDIX J

Application of Sustainable Urban Drainage Systems (SUDS)

Travis Perkins, 11-13 St Pancras Way

London NW1

3rd June 2011

Prepared For:

THE UNITE GROUP PLC

Approved By: **David Cunnington**

Name: David Cunnington
Department: C&S

Application of Sustainable Urban Drainage Systems (SUDS)

Travis Perkins, 11-13 St Pancras Way

London NW1

Quality Assurance Page

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Issue for Information			
Date	3 rd June 2011			
Prepared by Signature	Miss. B. Gifford			
Checked by Signature	Mr. D.J. Cunnington			
Authorised by Signature	Mr. D. Sharp			
Project number File reference	P1063 P1063/72/DJC/ Application of sustainable urban drainage systems (suds)			

Application of Sustainable Urban Drainage Systems (SUDS)

Travis Perkins, 11-13 St Pancras Way

London NW1

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Application of Sustainable Urban Drainage Systems (SUDS)

Travis Perkins, 11-13 St Pancras Way

London NW1

1. THE DEVELOPMENT

The scheme proposes redevelopment of the site, comprising erection of a

Ten-storey building to contain a Travis Perkins builders merchant with student accommodation facilities above.

The accommodation for Travis Perkins would replace the existing business on the site and comprise 3,877 sq.m. arranged over the lower part of the building fronting St Pancras Way, with a mezzanine shop and office space located at the southern end. A covered one-way vehicle access route would be provided within the building, with dedicated customer pick-up and drive through areas.

Student accommodation, comprising 564 bed spaces arranged in a series of cluster flats (up to 8 bedrooms) and studios, would be located over first to ninth floor level. This would be operated by Unite – the applicant for the scheme, and a provider of purpose-built student accommodation across the United Kingdom.

2. SUSTAINABLE URBAN DRAINAGE RECOMMENDATIONS

Appropriate uses of Sustainable Urban drainage have been considered for this site based on the suitability of each individual element as discussed in section 3, 4 & 5. For this development it is recommended that green roofs and walls be used as extensively as possible. Brown roofs are an alternative but much of the attenuation aspects will be lost. The use of oversized pipes or cellular attenuation is required to attenuate flows behind flow controls, thus reducing water runoffs to acceptable levels. The use of oil interceptors and trapped gullies are required. Rainwater harvesting is an option to be used if volumetric attenuation of the green/ brown roofs is insufficient.

3. SUSTAINABLE URBAN DRAINAGE LEGISLATION AND DESIGN PRINCIPLES

The application of Sustainable Urban Drainage systems is to be applied and set out in accordance with the requirements including the following documents:

- Planning Policy Statement 25 : Development and Flood Risk
- Planning Policy Statement 9 : Biodiversity and Geological Conservation
- Pollution prevention Guidelines PPG3
- The current building regulations
- Current good practice set out in documents such as Ciria C697 The SUDs manual
- Site specific requirements set out by the planners and statutory undertakers.

The application of Sustainable urban drainage systems has the prevention of flood and pollution at its core also has added benefits to the immediate and larger global environment.

Planning Policy Statement 25 : Development and Flood Risk stipulates 'The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development, unless specific off-site arrangements are made and result in the same net effect.

Sustainable Urban drainage Systems are used to achieve to the following as set out in Ciria C697:

- Reducing runoff rates, thus reducing the risk of downstream flooding.
- Reducing the additional runoff volumes and runoff frequencies that tend to be increased as a result of urbanisation, and which can exacerbate flood risk and damage receiving water quality.
- Encouraging natural groundwater recharge (where appropriate) to minimise the impacts on aquifers and river base flows in the receiving catchment
- Reducing pollutant concentrations in storm water, thus protecting the quality of the receiving water body.
- Acting as a buffer for accidental spills by preventing direct discharge of high concentrations of contaminants to the receiving water body

The Unite Group PLC

- Reducing the volume of surface water runoff discharging to combined sewer systems, thus reducing discharges of polluted water to watercourses via Combined Sewer Overflow (CSO) spills
- Contributing to the enhanced amenity and aesthetic value of developed areas
- Providing habitats.

4. SOURCE CONTROL ELEMENTS OF SUSTAINABLE DRAINAGE

In order to achieve a reduction in flow rate and volume for this development a series of SUDs elements can be employed to hold the flows as close to the point of origin as possible ensuring that the peak flow from any event is delayed and the flow rate reduced. The use of rainwater at source for amenity or sanitation as well as possible infiltration to ground will ensure that the volumes of water reaching the downstream network are reduced.

Each of the SUDs elements has characteristics which may make it more or less suitable for this development. The sustainable elements making up a train are discussed in more depth below:

4.1 Ponds

Ponds can be classified into two categories, wet ponds and extended detention basins or dry ponds.

Wet ponds are basins that have a permanent pool of water for water quality treatment. They provide temporary storage for additional storm run-off above the permanent water level. Wet ponds may provide amenity and wildlife benefits.

Extended detention basins are normally dry, though they may have small permanent pools at the inlet and outlet. They are designed to detain a certain volume of runoff as well as providing water quality treatment.

- The use of ponds on this site is not feasible due to the urban nature and the 100% development footprint proposed.

4.2 Swales and ditches

Swales are broad, shallow channels covered by grass or other suitable vegetation. They are designed to convey and/or store runoff, and can infiltrate the water into the ground (if ground conditions allow).

- The use of swales and ditches on this site is not feasible due to the urban nature and the 100% development footprint proposed.

4.3 Soakaway to underlying ground

Rainwater Soakaway to underlying ground can be undertaken in a number of ways. Filter strips are gravel filled trenches used to provide attenuation, treatment and ultimately dispersal to surrounding strata. Permeable manholes connected to upstream drainage networks provide attenuation while dispersion to underlying strata takes place. Infiltration basins are depressions in the surface that are designed to store run-off and infiltrate the water to the ground. They may also be landscaped to provide aesthetic and amenity value.

- The use of infiltration on this site is not feasible due to the urban nature and the 100% development footprint proposed. Furthermore the underlying strata in this general local usually consists of bands of London clay with gravel beds and perched water tables.

4.4 Infiltration surfaces

Infiltration surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water drainage networks.

- The use of infiltration on this site is not feasible due to the urban nature and the 100% development footprint proposed. Furthermore the underlying strata in this general local usually consists of bands of London clay with gravel beds and perched water tables. The use of the hard standing for heavy goods vehicular path and the use as a hardware depot would also preclude infiltration on durability and contamination grounds.

4.5 Rainwater harvesting and collection

This is the direct capture and use of runoff on site. Rainfall runoff can be extracted for domestic use (eg flushing toilets), or irrigation of urban landscapes. The contribution to flood risk management from such systems will be dependent on the scale of the water harvesting system. Designs will need to ensure that storage for runoff control is always available, and that there is an acceptably low risk that the system will be full (and therefore storage bypassed) when a flood occurs.

- The use of rainwater harvesting is suitable for this development subject to space and layout configurations. A rainwater harvesting system can also be utilised for the watering of green roofs. Rainwater harvesting has a high cost associated with the application and requires an additional distribution network separate from the usual system. Harvesting is usually considered only where there is a need for the attenuated water in order to satisfy Breeam or code for sustainable homes purposes. Rainwater harvesting is also usually considered if the volumes of water leaving the site are greater than the predevelopment volumes

4.6 Green (intensive) roofs and walls

Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. Intensive roofs are characterised by their soil strata having a depth greater than 300 – 400mm and the planting of non sedum type vegetation.

Depending on the type and depth of construction, a green roof can provide short to medium term attenuate between 20% and 50% of a storm volume and significantly slow the flows down thus preventing the surge effect. Green roofs provide excellent treatment of rainwater run-off.

For both intensive and brown roofs a significant percentage of attenuated run-off will be permanently lost to evaporation and plant uptake. 10% evaporation is speculated but this figure is thought to be significantly higher on elevated roofs and green walls. Plant uptake varies with the intensity of planting and the type of storage arrangement but is thought to be in the region of 10% to 40%

- The use of green roofs is well suited to this development and can be used over much of the roof to provide amenity, water treatment, attenuation and biodiversity. The use of green roofs will also add a wider benefit of reducing the heat island effect.

4.7 Brown or Sedum roofs

Brown roofs are systems which cover a building's roof with granular medium on which sedums or moss can grow. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. Brown roofs differ from intensive roofs in that their planting medium is usually between 100 and 300 mm deep and comprises a granular medium. The planting on a brown roof may be left bare to be colonised by moss and wild flower or sedum type vegetation.

Brown roofs in contrast to Intensive roofs will only attenuate between 2% and 20% of a peak storm runoff. Flows are slowed down but to a far less extent than intensive roofs. Pollution treatment remains high for this type of roof as the granular medium provides an excellent medium for bacterial colonies.

- The use of brown roofs is well suited to this development and can be used over much of the roof to provide amenity, water treatment, attenuation and biodiversity. The use of green roofs will also go some way to reducing the heat island effect.

4.8 Pollutant removal mechanisms

Trapped road gullies and channels will provide a first line of defences in removing surface spilled pollutants. The use of an oil interceptor will add further water purification by removing fine suspended oils and hydrocarbons. A regular maintenance regime must be set out for these devices to be effective.

- The use of oil interceptors and traps is highly recommended to prevent contaminated water entering the downstream system. Depending on the receiving body of water a class 1 or class 2 device will be recommended.

4.9 Flow control devices

Flow control devices, whilst not being a SUDS train item, are essential to limit the flow to the downstream network.

- The use of flow control devices is essential to limit the flow rate of discharge to a quantity acceptable to the planners and statutory undertakers.

4.10 Attenuation devices

Attenuation devices can take several forms from a simple manhole to preformed cellular storage units or oversized pipes. The purposes of attenuation devices are to provide space underground to store excess water being held behind a flow control unit. Very little water quality treatment takes place within these units unless specifically designed to do so.

- The use of underground attenuation is well suited to this site. The size volume and material selection will depend on the discharge rate and will be significantly reduced by employing green roofs and rainwater harvesting.

5. ASSOCIATED BENEFITS OF SUSTAINABLE URBAN DRAINAGE SYSTEMS

5.1 Water quality

By using green roofs and employing hydrocarbon traps the runoff quality will be significantly improved.

5.2 Air quality

Surrounding air quality will significantly benefit from the use of a green roof as these roofs act as a trap for fine particulate matter and also trap heavy metals.

5.3 Temperature environment

The local temperature environment will benefit from green roofs as these are proven to reduce the heat island effect.

5.4 Biodiversity

Biodiversity will benefit locally if green roofs are employed but also in the wider environment as the water quality improvement will benefit receiving watercourses.

P1063/72/Application of Sustainable Urban Drainage Systems (SUDs)
Travis Perkins, 11-13 St Pancras Way, London NW1



The Unite Group PLC



Meinhardt (UK) Ltd
New Penderel House
283-288 High Holborn
London
WC1V 7HP
T: +44 (0) 20 7831 7969 F: +44 (0) 20 7404 7872

www.meinhardtgroup.com