New Homes on Regent's Park Estate

SD8 Energy and Sustainability Statement

May 2015

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HS2 REPLACEMENT HOUSING, REGENTS PARK ESTATE, LONDON

ENERGY & SUSTAINABILITY STATEMENT

Prepared by AM/MF, issued 15th May 2015

FREEDOM OF INFORMATION ACT EXEMPT

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1.0 INTRODUCTION

TGA has been commissioned as part of Tibbalds Multi-disciplinary team to provide professional services associated with the energy, sustainability, mechanical, electrical and public health engineering services design associated with the Regents Park development.

The project is for the provision of 116 new dwellings plus community and commercial space to rehouse existing residents who will be displaced following the demolition of existing 1960s blocks as a result of the HS2 development.

Multiple plots have been identified across the Regents Park Estate to ensure that existing residents displaced by the planned high speed rail link from London to Birmingham (HS2) are rehoused on the estate.

Although not part of the planning submission, potential for the creation of a further 5 dwellings exists upon refurbishment of the upper floors above the Camden Peoples Theatre (CPT), located off Drummond Street to the South East of the Estate. Since the energy strategy addresses carbon reduction as an estate-wide approach, the CPT has been included within assessments to ensure adequate provision is made to meet carbon targets.

1.1 Existing estate

Bound by Regents Park to the West and Euston Station railway lines to the East, the Regents Park Estate is a post-war council estate, comprising predominantly residential buildings. A number of existing community facilities, green spaces and shops also exist as well as three market squares: Clarence Gardens, Munster Square and Cumberland Market.

Existing blocks generally date to the 1960s and are constructed in the manner of that time. Thermal performance of building envelopes is significantly below current standards.

Thermal energy within existing blocks on the estate is typically generated by local gas fired boilers serving individual units. A limited number of communal systems are provided to blocks and there is no thermal energy network currently serving the estate.

1.2 Proposals

Proposals include construction of mixed development across a nine sites as shown in figure 1.1 and set out in the following table.

Table 1.1 – Summary of proposals

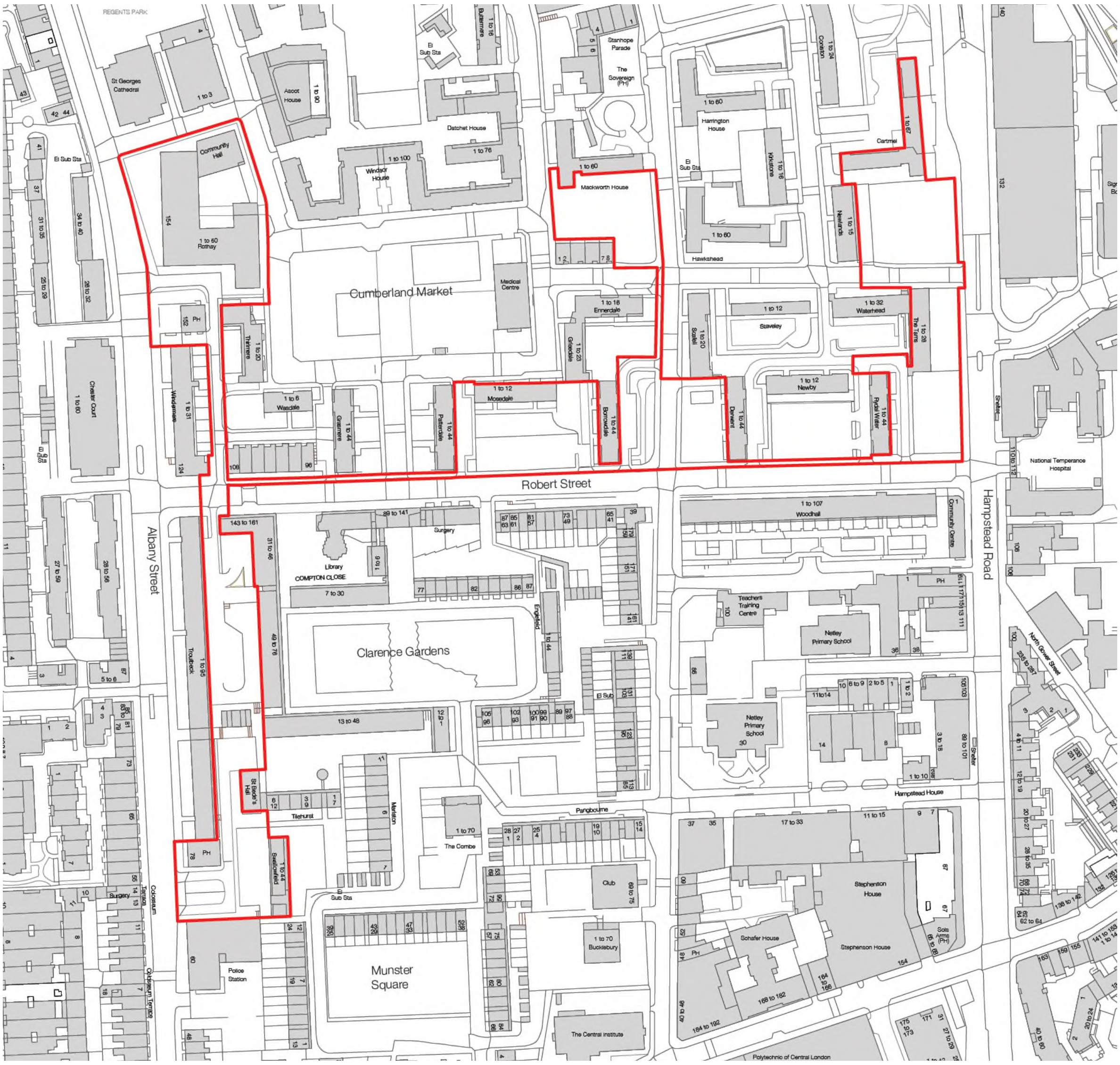
Site	Proposal	1 B	2 B	3 B	4 B	5 B	Total	Community/ Commercial
Cape of Good Hope	Demolish & rebuild	5	2	8	0	0	15	-
St Bede's mews	New build	1	0	2	0	0	3	-
Former One Stop Shop	New build	15	7	2	0	0	24	162 m^2
Newlands plot	New build	9	14	3	6	0	32	95 m^2
The Victory pub	Demolish & rebuild	2	4	3	1	0	10	185 m^2
Robert Street car park	New build	1	5	6	1	0	13	334 m^2
Varndell Street Corner	New build	0	1	5	1	1	8	-
Dick Collins Hall	Demolish & rebuild	2	1	6	0	2	11	-
CPT	Refurbish	4	1	0	0	0	5	-

1.3 Aims and objectives

This report has been prepared to record the development of the thermal envelope and engineering services design proposals and to respond planning requirements associated with energy generation and use. The report will:

- Follow the guiding principles of the energy hierarchy
- Consider the design and passive means to reduce energy consumption
- Consider and develop an appropriate energy strategy for the development
- Consider the energy performance of the development
- Set out the rationale for carbon reduction, confirming compliance with appropriate standards
- Discuss energy calculations required to define the energy and carbon performance of the development

Figure 1.1 Site plan showing development sites



2.0 LEGISLATIVE REQUIREMENTS

2.1 Policy

All new building developments in the London Borough of Camden are required to meet minimum standards relating to sustainability, energy efficiency and carbon reduction.

Sustainability, energy efficiency and carbon reduction all feature in the planning process. Planning guidance on these matters is set out in the Local Development Framework and in particular, within the following inter-related policy documents:

- CS13 - Tackling Climate Change Through Promoting Higher Environmental Standards
- DP22 - Promoting Sustainable Design and Construction
- DP23 - Water
- CS16 - Improving Camden's Health and Wellbeing
- DP32 - Air Quality & Camden's Clear Zone
- CPG3 - Sustainability

2.2 The London Plan

The London Plan[1] sets out a progressive improvement in carbon performance over the 2010 versions of Approved Document L[2].

2.2.1 Residential buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013:	25 per cent
2013 – 2016:	40 per cent
2016 – 2031:	Zero carbon

2.2.2 Non-domestic buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013:	25 per cent
2013 – 2016:	40 per cent
2016 – 2019:	As per building regulations requirements
2019 – 2031:	Zero carbon

2.3 Summary of requirements

A summary of the requirements of the aforementioned documents is included within the table overleaf.

[1] The London Plan, The Spatial Development Plan for London, Consolidated with Alterations Since 2011, Greater London Autority, March 2015

[2] Building Regulations 2000, Part L, Conservation of Fuel and Power in Buildings, 2010 Edition

Table 2.1 – Summary of carbon targets within policy documents

Document	Author	Publish date	Section	Target
The London Plan	GLA	March 2015	Policy 5.2	Emission rate to improve by 40% (2013 - 2016) over ADL1 2010
Energy Planning	GLA	April 2014	Structure and content of Energy Assessments	Emission rate to improve by 35% over ADL1 2013
Camden Core strategy 2010	London Borough of Camden	November 2010	Section 3 - CS13, 13.11	Carbon reduction of 20% from on-site renewable energy generation
CPG3 - Sustainability	London Borough of Camden	September 2013	3.20	Follows London Plan - emission rate to improve by 40% (2013 - 2016) over ADL1 2010
CPG3 - Sustainability	London Borough of Camden	September 2013	Section 9.0	Compliance with Code Level 4. 25% improvement over ADL1 2010 and 19% improvement over ADL1 2013

Although the current London Plan document (March 2015) states as an improvement over the 2010 version of Building Regulations Part L, much of the assessment undertaken to date references the guidance on Energy Planning[3] published in April 2014 by the GLA, which states that a reduction in carbon emissions of **35% beyond that required by ADL 2013 shall be achieved for all new residential developments**. This is understood to be comparable to 40% over the 2010 version of Part L.

2.4 The Energy Hierarchy

It is customary to consider energy supply and energy efficiency in buildings in a three step process known as an Energy Hierarchy, defined in the London Borough of Camden (LBC) Guidance CPG3 Sustainability[4] as follows:

1. Be Lean – *Design and construct a new building to reduce energy demand*
2. Be Clean – *Deliver and consume energy efficiently*
3. Be Green – *Deliver some or all of the required energy from renewable sources.*

The importance of the 'Energy Hierarchy' is it's drive to ensure that buildings are designed and constructed to consume only the minimum amount of energy in the first instance. After this first objective in the hierarchy has been defined, the design of the energy generation and delivery systems can be considered. The final step in the process is to identify how much of the buildings energy needs can be met from renewable energy sources.

Application of the energy hierarchy is covered in the following sections.

[3] Energy Planning, GLA/Mayor of London, April 2014
[4] Camden Planning Guidance, Sustainability, CPG3, The London Borough of Camden, September 2013

3.0 'BE LEAN' – REDUCE THE DEMAND FOR ENERGY

3.1 General design approach

Sustainable design has been considered as an integral part of the architectural form, structure and building services proposals across all sites at the Regents Park Estate.

London in general has invested heavily in low carbon energy generation across the city. The proposals for the Regents Park Estate will connect to the existing power and gas infrastructure. The design shall benefit from the use of passive and active technologies directly applied to the building to reduce reliance on the existing infrastructure.

Moving forward through to detailed design development the design team shall ensure that the building fabric, its support systems and subsequent operation of the building will respond to environmental expectations of a modern residential development.

Energy and carbon management through appropriate benchmarking, monitoring and targeting will become an integral part of the building management process.

A summary of measures considered during the design development to control and/or reduce thermal and electrical energy demand and improve occupant comfort are set out in the following table.

Table 3.1 – Summary of design approach

Design aspect	Strategy
Solar shading	Reduction of solar gain through analysing the building orientation and through careful selection of solar control glazing and external shading devices.
Thermal insulation standards	Improved thermal insulation of new building elements beyond the current requirements of Building Regulations Part L 2010.
Optimising Daylight	Ensuring appropriate artificial lighting controls are provided.
Optimising Natural Ventilation	Reducing the requirement for mechanical ventilation and cooling through the use of opening windows and/or trickle vents.
Heat Recovery	Utilisation of high efficiency heat recovery devices on supply and extract ventilation systems where applicable. Also heat recovery from heating appliance flue gases.
Free Cooling	Use of the ambient air temperature to directly cool the internal spaces when the ambient air is cooler than the internal air temperature through the use of opening windows and/or trickle vents.
Night cooling	Allowing direct contact of outdoor air with the structure during the evening to cool the structure resulting in a delayed heat gain to the space and consequently a slower rise in internal temperature during the daytime occupied period.

Design aspect	Strategy
Water Conservation	Carefully selected sanitary fittings to reduce water consumption.
Green materials	Select wherever practicable materials listed as 'A' rating in the BRE Green guide codes.

3.2 Building Fabric

Performance of the building fabric will directly affect the required peak load plant capacities, plant capital costs, annual energy demand and running costs of the building services systems.

London Borough of Camden has set standards for improving a building's fabric above and beyond the current Building Regulations. The table below relates to the minimum U-values to be achieved by residential developments as detailed in CPG3.

Table 3.2 – LBC target fabric standards

Element	U value (W/m^2K)
External wall	0.20
Floor	0.13
Roof	0.13
Glazing	1.50
Air tightness (m^3/hm^2)	3

To meet the required carbon reduction fabric performance must be greater than the required minimum standards.

Passivhaus standards were considered for the building envelope but the improvements in performance were marginal in comparison to increased cost and buidlability issues associated with that approach. A high performance envelope is currently proposed, as follows.

Table 3.3 – Target fabric standards for Regents Park Estate

Element	U value (W/m^2K)
External wall	0.10
Floor	0.11
Roof	0.11
Glazing	1.50 (double)
Air tightness (m^3/hm^2)	3

3.3 Thermal bridging

Thermal (or cold) bridging is also a factor that is taken into consideration when setting standards for the thermal envelope. A thermal bridge (or cold bridge) is an area of the building fabric which has a higher thermal transmission than the surrounding parts of the fabric, resulting in a reduction in the overall thermal insulation of the structure.

The occurrence of thermal bridges can be attributable to:

- Issues associated with the design of the thermal envelope;
- Buildability and construction issues; or as is often the case,
- A combination of both of the above points.

3.3.1 Linear thermal transmittance, psi (ψ) value

The linear thermal transmittance or psi (ψ) value is the rate of heat flow per degree temperature difference per unit length of a thermal bridge. The psi (ψ) value has units of W/mK, where m is the linear metres of the thermal bridge. To calculate the heat loss through a particular thermal bridge, the length of the thermal bridge in metres must be multiplied by its respective psi value.

3.3.2 y-value

The y-value is a proxy for the heat loss through the non-repeating thermal bridging areas of a building. To calculate the y-value of a building, the length of each thermal bridge is measured and multiplied by the respective psi value. Results are then aggregated to determine the transmission heat transfer coefficient or H_{TB} value (W/K), which is divided by the total external heat loss area of the building to determine the y-value (W/m^{2}K).

Approved document L1 2013 refers to Appendix R in the SAP 2012 guidance[5] for an acceptable y-value. Whilst thermal bridging must be minimised to enable buildings to perform well in terms of energy conservation, consideration must also be given to the buildability issues in achieving target parameters in practice.

For the new buildings proposed across the Regents Park Estate, a y-value of 0.08 W/m^2 is to be adopted.

3.4 Overheating

Whist high performing insulative characteristics and low air permeability increases efficiency from a heating perspective, it also increases the potential for overheating. To mitigate this, the chosen ventilation approach will need to be carefully considered, ensuring systems deliver consistent air change rates to ensure that background ventilation rates are maintained. Background ventilation will be used in conjunction with natural purge ventilation, predominantly via openable windows to limit overheating risk.

It must be accepted with any natural ventilation strategy that internal conditions will reflect external conditions as outdoor air is being used for conditioning purposes.

Dynamic thermal simulation of selected units has been undertaken to gauge potential performance. Results are discussed later in this report.

3.5 Daylighting

Daylighting of occupied spaces shall be maximized wherever possible. To achieve this, areas and thermal performance of glazed elements will be maximised and the building orientation will be configured for best passive solar design.

3.6 Baseline energy demand and carbon emissions

In accordance with CPG3, baseline carbon emissions have been calculated for energy use for individual dwellings prior to the application of any carbon reduction measures. The calculation has

[5] SAP 2012, The Government's Standard Assessment Procedure for Energy Rating of Dwellings, 2012 edition, Published on behalf of DECC by BRE, 2014

been performed using the Standard Assessment Procedure (SAP); a government approved methodology for calculating the energy performance of major developments. Full details of the baseline energy demand and subsequent assessments of different scenarios are provided later in this document (section 6.0).

4.0 'BE CLEAN' – DELIVER AND CONSUME ENERGY EFFICIENTLY

4.1 Energy efficient design

Wherever possible electrical engineering services installations will be designed and installed to consume less energy. This will principally relate to the specification and installation of low energy lighting with LED technology and the use of control systems.

4.2 Thermal energy

A detailed review of available options for energy generation has been undertaken and summary information is included within Appendix A. The approach considered the range of generation options available and compared these against specific criteria.

Electricity based systems were discounted due to their limited operating range and relative carbon intensity and thus a fossil fuel based approach was considered most appropriate. A review of central or local options was examined in more detail and a summary of the key criteria associated with each approach is set out in table 4.1. The dispersed nature of the development and scale of development sites suggests local installations are most appropriate but all opportunities are examined.

Table 4.1 – Summary of considerations for central and local approaches

Element	Central	Local
Space	Central energy generator requires larger dedicated plant space in an accessible location. Loss of residential floor space	Local installations are self-contained within area served.
Incoming Services	A single, larger incoming service to a single accessible point.	Multiple incoming service connections. Dedicated space for meters. Multiple utility pipelines through building. Greater risk.
Billing	Heat metering. Contra charging. Financial risk, management burden.	Direct to consumer no further action.
Distribution	Primary service routes through building to units. Central flues required to roof. Common pipelines.	Multiple utility services. Pipelines to roof for solar thermal energy systems
Terminal Devices	Heat interface units/exchangers (boiler size) pre-fabrication options. Flexible locations. Intuitive heat metering.	Local boilers flues from each unit. Limited location options. Plant on roof. Cylinders required.
Maintenance	More complex installations. Specialist input. More expensive repairs. Single point of failure (subject to resilience)	Simple installations. Annual inspections. Access/failure issues multiple call outs. Inexpensive repairs, but more frequent.
Carbon	CHP option. Local electricity generator. Maximises diversity. Constant operation.	Gas/solar option. Full capacity installations, no diversity. Intermittent operation. Reduced seasonal efficiency.
Lifecycle	20 – 25 year installation.	10 – 15 year installation.

4.3 Connection to decentralised energy networks

LBC sustainability polices promote the use of district heating installations and requires an assessment of the opportunities to develop new or connect to existing district heating installations during the planning stages of major development.

A review of opportunities has been undertaken and this has identified three areas for consideration:

- The Euston Area Plan adopted in January 2015
- Netley Estate communal heating installation
- Regents Park Estate itself

All of the above options have been referred to in the recent Decentralised Energy Programme Delivery Unit (DEPDU) report into the Euston area district heating installation and whilst this report did not consider the provision of a district heating installation to the Regents Park Estate as viable, it did suggest that this is reviewed alongside any major redevelopment work.

4.4 Existing heat networks

Figure 4.1 shows an extract from the London Heat Map covering the Regents Park Estate.

The Eastern part of the estate is identified as an area for a potential decentralised energy network.

To assess the viability of the sites a number of factors must first be considered:

- Size of the development: the sites themselves are relatively small, with low thermal requirements, expected to better suited to self-contained central or local systems
- Distance to existing network pipes: though in the general vicinity of a proposed network, the distance to the sites would impact on system efficiency and increased heat losses from extensive district heating pipework
- Physical barriers, e.g. roads or railways: cost and disruption of installing new underground mains in the adjacent Hampstead Road is considered to have a detrimental impact on the development

Within the Euston Area Plan (EAP)[6], there is reference to a likely energy centre adjacent the new Euston Station building, with a potential district heating mains extending North to South along Hampstead Road. An extract from the EAP is shown in Figure 4.2.

4.5 Sites for energy centres

Regents Park Estate project is associated with the re-provision of homes that will be lost as a result of the HS2 development. A number of potential development sites were identified by Tibbalds Planning and Urban Design in its Regents Park Estate Architectural Feasibility Study submitted in December 2013.Most suitable sites have been selected for future development and now form part of the current scope.

Pressure on land for housing development is such that there is no space available to site a large scale energy centre. The mix of building heights and adjacency of both low and mid-rise buildings would complicate flueing of the plant installations and potentially increase localised air pollution.

Options for the provision of basements have been ruled out on cost and programme grounds in order to de-risk the construction activities to align the construction programme with the demolition of existing blocks by HS2.

[6] Euston Area Plan – a new plan for the Euston area, Proposed submission draft, GLA, January 2014

Figure 4.1 – London Heat Map, showing decentralised energy potential adjacent the estate

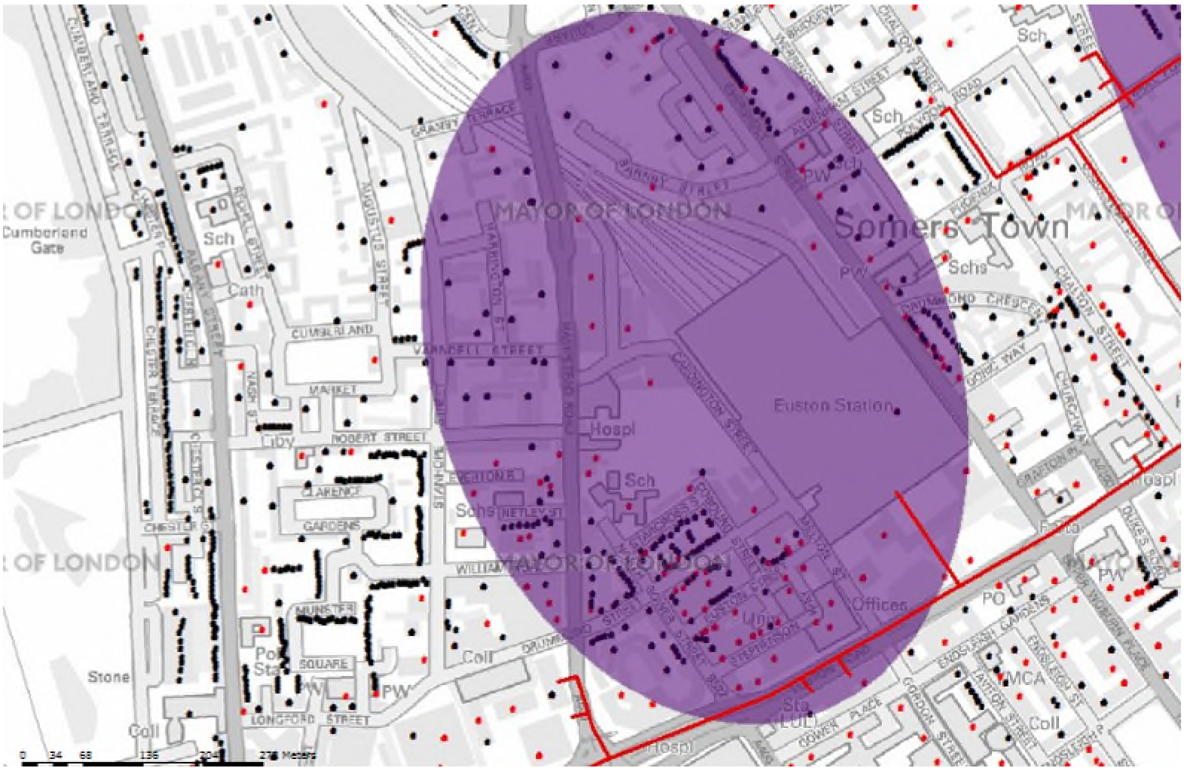
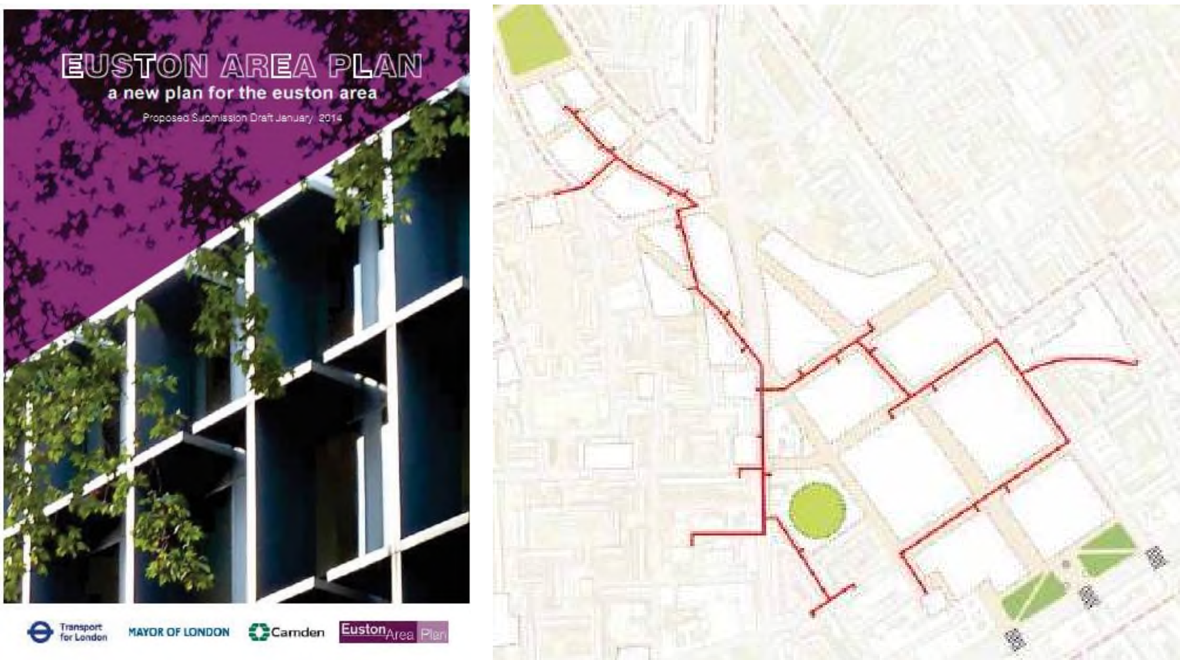


Figure 4.2 – Euston Area Plan, showing potential decentralised energy network



4.5.1 Netley Estate

Netley estate is a recently completed project that incorporates a communal heating installation that serves a mixture of residential and education premises. The 70 private residential properties are still in construction so current performance levels are not fully understood. Projected maintenance costs for existing residential properties in Woodhall suggested the on-going maintenance cost is in excess of expectations.

Plant and distribution installations are understood to have been designed for the current connected load as well as new residential units at the Surma development and the Victorian School building.

If connection is possible, potential benefits with the increased connected load should be increased efficiency of the installation and proportionally reduced operational costs. However, the network will extend considerably further than it currently does to potential development sites at Former One Stop Shop, Newlands plot, Varndell Street Corner and Robert Street Car Park. Terminal heat metering will be required and the additional distribution losses and circulation energy will need to be apportioned across the whole system demand.

A major part of the interconnection would be the routing of new distribution mains between the existing energy centre and the new Regents Park Development sites. This would need to cross and traverse Robert Street. HS2 will be diverting a 42" water main along Roberts Street and this will inevitably cause disruption to any new heating mains.

The programme to deliver these replacement housing units ahead of HS2 demolition of the three red blocks makes the introduction of a new or expanded system difficult as any system would require extensive consultation; require works to internal flats as well as external works on the estate. All adding to delay in delivery replacement housing scheme

4.5.2 Regents Park Estate

Challenges in identifying or releasing proposed development sites are significant. Sites under consideration here are located across the site with little or no adjacency to one another.

To operate most effectively communal heating installations require high heat demand with high density of distribution. With a fabric first approach building envelopes have been optimised for maximum thermal benefit with buildable and affordable construction elements that far exceed current building regulations standards.

A reduced heat demand and low density of load fail to satisfy the precursors of a heat distribution system. Energy from a new sitewide installation could not be delivered efficiently to the new development sites.

Consideration of other potential connections is required to increase viability. Existing buildings typically have local gas fired installations of varying age and condition. There are currently no capital plans for the replacement of these installations or their conversion from a local to a central or local strategy.

A detailed feasibility study would be required to ascertain the viability of a full scale change but that is considered beyond the scope of this project.

Per building an assessment has been undertaken on the viability of using central or local installations for thermal energy generation. In broad terms central plant is potentially viable where a block has fifteen or more separate dwellings. Two of the buildings fall into this category and these are Newlands and Former One Stop Shop.

These sites are also located on the Hampstead Road side of the site and are most feasible for connection into a likely heat network that may emanate from the area around Euston Station.

4.6 Opportunities for integration with other buildings

LBC Sustainability department and GLA has requested consideration of connection to other buildings on the estate for the purposes of thermal energy distribution.

Where connection into an existing system is considered it will be necessary to:

- Review the plant capacity to ensure it can support the additional load;
- Consider the age and condition of existing plant and determine whether it offers sufficient resilience to support new installations;
- Consider whether plant should be replaced and buildings connected to common plant;
- Consider where plant should be located, i.e. within the new or existing buildings;
- Consider the carbon penalty or trade off arising from the connection;
- Review the carbon reduction potential to existing developments as a result of this change;
- Determine if it is feasible

A review of opportunities for interconnection to buildings adjacent development sites that have central plant has been undertaken and this has identified the following:

- Netley Development
- Newlands (existing)
- Rothay House
- Camden Peoples Theatre

4.6.1 Netley

The development's space heating and hot water demand is met by a centralised energy centre located in the basement of the Netley School building. Heat is generated by a combination of combined heat and power (CHP) units and traditional gas-fired boilers. The installation serves:

- Netley School
- Block A Apartments
- Block B Apartments
- Everton Buildings
- Woodhall Flats

Connections are reported to have been included for the future connection of the Surma Centre but the capacity and sizing of these mains is unknown.

Woodhall Flats are served by a separate circuit from the plant installation. This circuit runs through a basement tunnel to the Woodhall plant room. Mains have been sized for the Woodhall building only and do not appear to offer any further capacity.

There is no additional plant space available within the Woodhall plant room as this houses new plate heat exchangers and domestic hot water cylinders.

The installed capacity within the Netley system seems to closely match the connected load with an allowance for redundancy and preheat. Load monitoring would be required through the heating season to determine whether there is any space capacity in practice. This is however unlikely

Further, challenges will no doubt be significant when accommodating new pipework and circulation equipment within the plant room and when routing the pipelines from the basement plant room and a strategy for doing so has not yet been considered.

4.6.2 Newlands and Former One Stop Shop:

Existing Newlands building has a small gas fired boiler installation within a roof level plant room which serves the fifteen dwellings within it. This plant is in excess of 20 years old.

On the upper level of the building there is a room whose only function is as an access to a roof access hatch. The space is around $21m^2$ and it could be used for the installation of replacement plant, or as a plant interface point for connection into a new installation.

An option to consider here is the possible interconnection between existing Newlands and new Newlands buildings. This would offer a substantial carbon reduction to the existing building and improve the system resilience for the benefit of the occupants within it.

Current proposals include for a central installation within the new Newlands building. The adjacent Former One Stop Shop site will also benefit from a central installation but interconnection of these building has not currently been adopted due to the complexity of service diversions (as part of HS2) and routing between the two sites. It is however discussed further later.

Estimated cost premium for interconnection is £85,000.00 for pipelines, pumped circuit and plate heat exchanger for old Newlands.

Estimated carbon reduction potential from plant replacement is approximately 25% of the existing emissions from Newlands.

4.6.3 Rothay

Plant serving Rothay was replaced in 2005 and comprises two Broag Remeha RP300 boilers. Space is available in the existing plant room to provide a new LPHW circuit to serve the new Dick Collins Hall building. Existing plant capacity is in the order of 600 kW and it currently serves 50 properties.

Practically the Rothay plant could be extended to serve the new Dick Collins Hall building. A connection could be taken from an extended header to a plate heat exchanger within the Rothay plant room or within the new block. However the capacity of the plant is of concern at this stage. Whilst diversity would clearly be a factor, there seems to be limited redundancy in the plant and it may not be able to serve the additional 11 units proposed.

Further, plant is around ten years old and LBC should consider whether the longevity of this plant is satisfactory for the new development and the associated charges that would be levied at the time of replacement.

Existing plant efficiency is below current standards and further enhancements would be required elsewhere to meet the carbon reduction requirements of the new development.

Interconnection with Rothay therefore presents a carbon penalty and leasehold issues that may impose undue burden on London Borough of Camden, existing occupants and new occupants. It has therefore been discounted.

4.6.4 Camden Peoples Theatre

Plant within the CPT basement has been replaced. The installation is known as Tolmer Square. This plant could be extended to serve the new CPT properties with a new circuit from the existing installation. Having been replaced in 2012 with completion in 2014 the plant is of modern standards and the new development would not be penalised from the adoption of inefficient plant. Other carbon reduction opportunities would need to be explored to achieve compliance.

Existing plant is rated at 760 kW and it serves 69 properties. Plant capacity appears to have been rationalised with limited redundancy but the inclusion of a further five units should not pose a problem. Adequate space is available in the existing plant room to provide a new dedicated LPHW circuit for the new CPT dwellings. Further design development is required at the appropriate time.

4.7 Impact of interconnection

An assessment of the potential impact of heat network extensions has been undertaken. This has considered the heat loss from pipelines under normal operation on the basis of an average rate of heat loss at 16 W/m.

Whilst return temperatures would be as low as possible this is absolutely dependent upon on domestic hot water demand. Flow temperature must be maintained at a sufficiently high value to deliver both heating and hot water in the tertiary installations. A summary of circulation losses is set out below.

Table 4.2 Summary of delivery losses

Site		Distance (m)		Demand per unit (kW)		Total demand (kWh) *	Efficiency after			
Receiver	*Source*	*Direct*	*Assumed route*	*Rate @ 16W/m*	*Annual*	*From SAP @ 10,718 kWh per dwelling*	*Circulation*	*Generation @ 90% ** *	*Transfer @10%*	*Delivery*
Roberts Street	Netley	138	200	6.4	56,064	139,334	60%	15,482	13933	39%
Newlands	Former One Stop Shop	90	135	4.3	37,843	353,694	89%	39,299	35369	68%
Former One Stop Shop	Netley	175	300	9.6	84,096	257,232	67%	28,581	25723	46%

** As energy demand has been reduced as far as possible the significance of losses, however small, becomes greater. In the examples above the SAP output has been doubled to reflect likely energy demand (due to SAP being a theoretical analysis tool) but even still the potential losses are a substantial element of this.*

*** Generation losses would be present in any system and are not exclusive to these options*

Electrical energy consumed by circulation equipment must also be considered. Variable volume installations would be used to reduce circulation energy under periods of low demand. Return temperature would be as low as possible to maximise the temperature differential and reduce circulation volume. Typical annual consumption is presented in table 4.3, adjacent. Energy will of course vary depending upon the circuit size.

A simple cost comparison has been undertaken to demonstrate the increase in capital cost associated with the interconnection of buildings, this is shown in table 4.4, overleaf. Costs are base construction with no allowances for statutory permissions and the like. Costs are considered to be those over and above the servicing strategies proposed.

Table 4.3 Typical annual circulation energy requirement (Newlands @ 258kW)

Temperature (°C)			Energy content	% full load	Proportion of year	Volume	P1/P2 (kW)	Hours run	Annual consumption	Cost (£)
Flow	Return	Diff.								
								8760		*0.08*
90	70	20	83.6	20%	10%	3.09	1	876	876	70.08
90	60	30	125.4	40%	20%	2.06	0.23	1,752	402.96	32.23
90	50	40	167.2	60%	40%	1.54	0.13	3,504	455.52	36.44
90	40	50	209	80%	20%	1.23	0.13	1,752	227.76	18.22
90	30	60	250.8	100%	10%	1.03	0.03	876	26.28	2.10
Sub-total								**8,760**	**1988.52**	**£159.08**

Table 4.4 Typical capital cost

Item	Unit	Rate	Extension	Details
Plant upgrade	1	0	£ -	Assumes no plant upgrade provided, principle of diversity assumed.
Interconnection within source plant room	25	500	£ 12,500.00	Allowance for header modifications and associated pipework
Circulation equipment	2	7,500	£ 15,000.00	Allowance for two variable speed pumpsets
Buried mains (Roberts Street used in this example)	200	400	£ 80,000.00	Uses assumed route from heat loss analysis for flow and return pipelines.
Plant room exit	1	12,500	£ 12,500.00	Nominal allowance for builders work and pipeline interface
Building entry	1	12,500	£ 12,500.00	Nominal allowance for builders work and pipeline interface
Building interface	1	45,000	£ 45,000.00	Assumes a plate heat exchanger in a common plant room
Controls upgrade	1	10,000	£ 10,000.00	Allowance for upgrade to panel and software.
Sub-total			**£ 187,500.00**	

4.8 Summary

Whilst the use of multiple building communal heating installations is a preferred strategy, analysis undertaken here has indicated that their use could attract both capital cost and carbon penalties.

From the potential opportunities discussed above the preferred course of action is:

- Netley – Interconnection with adjacent sites not considered feasible but Roberts street car park, Newlands and the Former One Stop Shop will be considered during further design development;
- Newlands and Former One Stop Shop – Interconnection not considered feasible due to major planned utilities works, but will be considered further during design development nonetheless;
- Rothay – Connection discounted on the basis of plant efficiency, longevity and building tenancy;
- Camden Peoples Theatre – Connection of new units into existing installations considered viable and is proposed.

5.0 'BE GREEN' – DELIVERING ENERGY BY RENEWABLE SOURCES

A number of Low or Zero Carbon (LZC) technologies have been evaluated in terms of their overall suitability for implementation at the Regents Park Estate. These were as follows:

- Biomass
- Air Source Heat Pump (ASHP)
- Wind power
- Ground source heating and cooling
- Solar water heating
- Solar photovoltaic (PV) system
- Combined Heat and Power (CHP)

A commentary for a number of available technologies is presented in table 5.1, overleaf.

Figure 5.1 –LZC technologies (from top left clockwise, GSHP, wind, CHP, solar thermal)

Further, table 3.10 overleaf identifies a number of both central and local thermal energy generation strategies deemed appropriate for sites within the Regents Park Estate. Amongst the options presented, strategies employ both conventional and LZC modes for generating thermal energy.

Of those options considered the opportunities for integration are limited to micro combined heat and power plant and solar photovoltaics. Potential application of these technologies is considered later.

Table 5.1 – LZC Comparison matrix

Technology	Category	Description	Comments
Biomass	Considered renewable as the carbon released is equivalent to that absorbed during the fuels lifetime.	Thermal energy provided by burning wood chips, pellets or other biofuels.	▪ Biomass boilers are not generally suitable for low temperature applications as the return temperature must be greater than 62.5°C for safe operation. ▪ Fuel deliveries and fuel storage create logistical problems that need to be managed. ▪ Backup plant is normally provided for urban applications. ▪ Air quality issues and flueing are particular problems associated with plant installation.
Air source heat pump	Low carbon due to energy release from vapour compression cycle	Thermal energy (heating or cooling) provided through the conversion of electrical input.	▪ Systems use refrigerant for the vapour compression cycle. ▪ Efficiencies of up to 350% are achievable. ▪ To maintain efficiency only low grade heat is produced which limits application for hot water generation.
Wind power	Renewable energy	Electrical energy is produced by the stator windings within the turbine.	▪ Average wind speeds of 7m/s are generally considered necessary. ▪ Issues associated with shadow flicker and rotation noise cause nuisance issues to adjacent residents. ▪ The site does not have a suitable location for the installation of turbines.
Solar water heating	Renewable energy	DHWS by capturing the suns energy to heat solar fluid which is circulated through a vessel	▪ Solar water heating is a very useful and effective technology. ▪ In the case of this development the demand will be sporadic from a low base level to high peak at particular times. It would be inefficient to collect and store the volumes of water that would be required for application here. ▪ The technology also competes against other thermal generation technologies that require a base load, such as CHP.

Technology	Category	Description	Comments
Ground source heating and cooling	Renewable energy in principle	Thermal energy provided by using the ground as a source or sink	▪ Can be used to pre-cool supply air in the form of earth tubes as an open loop system. ▪ Can be used in closed loop format to provide heating and cooling via. a heat pump. ▪ Heat pump based systems generally provide low grade heat which is not suitable for hot water generation, a key component of the site demand.
Solar PV	Renewable energy	Electrical energy through the conversion of the suns energy into DC current, inverters are required to convert this to AC	▪ Solar PV systems have been expensive, but with rising electricity prices and falling material prices, they are increasingly being installed onto buildings to produce zero carbon electricity and feed the National Grid during times of surplus production. ▪ PV has a poor embodied energy value. ▪ PV is a relatively inefficient method of production at around 15% for better performing systems. ▪ This technology is an extremely useful bolt on to reduce overall carbon emissions of a development and could be deployed widely on the development due to the large expanse of flat roof.
CHP	Low carbon	Electrical and thermal energy	▪ CHP plant provides simultaneous generation of thermal and electrical energy. ▪ It is not possible to use CHP as a sole source provider so additional plant is required. ▪ CHP only saves CO_2 and money when operating and so needs a constant base load to be viable. ▪ When the above conditions can be satisfied CHP is a viable option that provides useful thermal energy for use in all applications required here.

6.0 CARBON EMISSION ASSESSMENT OF PROPOSED OPTIONS

CPG3 requires that the energy consumption and associated carbon emissions are calculated for typical dwellings to demonstrate the energy performance and associated carbon emissions of selected energy generation strategies.

6.1 Standard Assessment Procedure

The Standard Assessment Procedure (SAP) is adopted by Government as the UK methodology for calculating the energy performance of major developments, such as the proposals for the Regents Park Estate.

A SAP calculation assesses how much energy a dwelling will consume when delivering a defined level of comfort and service provision. The assessment is based on standardised assumptions for occupancy and behaviour, enabling a like-for-like comparison of dwelling performance. Associated carbon emissions are also determined from the assessment.

6.1.1 Input information

The following building specific information is inputted into the calculation, all of which contribute to energy efficiency and carbon emissions:

- materials used for construction of the dwelling
- thermal insulation of the building fabric
- air leakage ventilation characteristics of the dwelling, and ventilation equipment
- efficiency and control of the heating system(s)
- solar gains through openings of the dwelling
- the fuel used to provide space and water heating, ventilation and lighting
- energy for space cooling, if applicable
- renewable energy technologies

6.1.2 Output

SAP quantifies the performance of a dwelling in terms of energy use per unit floor area, a fuel-cost-based energy efficiency rating (the SAP Rating) and CO_2 emissions (the Environmental Impact Rating). These indicators of performance are based on estimates of annual energy consumption for the provision of space heating, domestic hot water, lighting and ventilation.

Carbon emissions calculated by SAP are expressed as a Dwelling Emission Rate (DER) and a Target Emission Rate (TER), expressed as $kgCO_2$ per m^2. The TER is generated by the software, based on a notional dwelling of the same type, size and heating fuel as the one proposed. The DER is that of the actual dwelling, referencing actual inputted data. The DER must meet or exceed the TER in order for the dwelling to demonstrate compliance with the building regulations.

SAP calculations allow comparison to be made of the energy running costs of dwellings anywhere in the UK. This is achieved because the calculations are predominantly location independent and are based upon a notional standard occupancy that overcomes variations associated with physical location and the differing ways in which people utilise their homes.

The software tool used to perform the SAP analysis is IES Virtual Environment with JPA Designer plugin using SAP Version 9.92, the most recent version of the tool, published to support the 2013 amendment to Part L of the Building Regulations for England.

6.1.3 Performance standards

As detailed in the earlier section of this document, to satisfy the requirements of CPG3, the target set out in the London Plan for new residential developments must be achieved. This target requires new dwellings to demonstrate a reduction in carbon emissions of 35% beyond that required by ADL 2013.

6.2 Typical dwelling

A sample upper level 2 bed, and 3 persons dwelling with exposed walls has been used as the basis for calculations. A pro rata basis of the sample flat results has been used to predict the overall energy demand and CO_2 emissions of each of the dwellings.

6.3 Baseline emissions - Standard case base model

6.3.1 Baseline model parameters

The standard case model against which other heat generation technologies are measured represents a common scenario where a gas boiler is installed in a typical flat with limiting fabric parameters. This is to allow a fair comparison of other heat generation technologies and methods, regardless of the carbon intensity of the actual heating fuel specified. The standard case scenario applied to each flat is summarised in the following table:

Table 6.1 Summary of standard case base model parameters

Item	Element or System	Value
1	Main heating fuel (space and water)	Mains gas
2	Main heating system	Boiler and radiators, fully pumped circulation, water pump in heated space
3	Heating system controls	Programmer, room thermostats, TRV's, boiler interlock
4	Secondary heating fuel	None
5	Secondary heating system	None
6	Hot water system	Stored hot water, heated by boiler only, separate time control for space and water heating
7	Hot water storage	150litre cylinder insulated with 35mm of factory applied foam
8	Primary water heating losses	Primary pipework insulated, cylinder temperature controlled by thermostat

6.3.1 Non-regulated carbon emissions

Carbon emissions calculated using SAP are based on regulated energy consumption, e.g. fixed lighting, heating and hot water systems, ventilation/cooling etc. It does not account for non-regulated energy sources from 'plug-in' sources, e.g. cooking, electrical appliances and IT and communications equipment.

Non-regulated emissions for the estate have been calculated from benchmark data provided in the BSRIA Rules of Thumb[7], which states 3,300kWh per dwelling as an appropriate indicator. Using this

[7] BSRIA Rules of Thumb, 5th Edition, published 2011

methodology the estimated energy used from non-regulated sources for each of the proposed developments at the Regents Park Estate have been calculated.

6.3.2 Base model energy prediction

Each heat generation technology is measured against a base energy demand and the corresponding estimated CO_2 emissions.

The predicted energy consumption and CO_2 emissions of the standard case scenario for the typical 2 bed, 3 person dwelling is provided in table 6.2 below.

The following conversion factors were used to determine the CO_2 emission of each fuel

- Natural Gas = 0.216 $kgCO_2/kWh$
- Grid Supplied Electricity = 0.519 $kgCO_2/kWh$

Table 6.2 Predicated typical monthly energy demand associated with SAP base model

	Date	Space Heating (kWh)	Water Heating (kWh)	Total Thermal Energy (kWh)	CO_2 Emission ($kgCO_2$)
Gas	*January*	*484*	*281*	*765*	*165*
	February	*403*	*249*	*652*	*141*
	March	*370*	*265*	*635*	*137*
	April	*252*	*243*	*495*	*107*
	May	*163*	*243*	*406*	*88*
	June	*0*	*231*	*231*	*50*
	July	*0*	*226*	*226*	*49*
	August	*0*	*243*	*243*	*52*
	September	*0*	*241*	*241*	*52*
	October	*237*	*252*	*489*	*106*
	November	*357*	*260*	*617*	*133*
	December	*481*	*275*	*756*	*163*
	Annual	2,747	3,009	5,756	1,243
Electricity	Description			Electrical Demand (kWh/year)	CO_2 Emission ($kgCO_2$/year)
	Electrical energy for pumps and fans			*323*	*168*
	Electrical energy for lighting			*349*	*181*
	Total regulated electrical energy			672	349
Baseline Total:-					**3,185**
Baseline Total (including non-regulated emissions):-					**4,898**

6.4 Fabric performance

New construction elements will target the fabric performance as detailed in section 3, previously, summarised in the table overleaf:

Table 6.3 – LBC target and improved fabric standards for new buildings

Element	LBC target U value (W/m^2K)	Improved target U value (W/m^2K)
External wall	0.20	0.10
Floor	0.13	0.11
Roof	0.13	0.11
Glazing	1.50	1.50

Air tightness, $3m^3/hm^2$, Thermal bridging target: y-value of 0.08

6.5 Building services systems

As detailed in section 4, local systems shall comprise high efficiency gas fired combination boilers to deliver heating and hot water and central systems shall comprise a central gas fired boiler, connected to individual HIUs. Such central systems as the one proposed offer and opportunity for CHP to be utilised to further improve carbon performance.

With regards to the mode of ventilation for dwellings with local systems, there are a number of factors to consider. In terms of suitability and energy efficiency, the options considered most appropriate in this application are heat recovery systems or intermittent extract only.

6.6 Scenarios for assessment

In order to demonstrate the energy and carbon performance of the proposed thermal energy generation strategies deemed appropriate for the dwellings across the Regents Park Estate, a SAP assessment of different scenarios has been undertaken.

calculations have been undertaken to demonstrate both local and central options for the new build elements of the estate as follows:

- **Scenario 1, Combination of local and central systems, each dwelling with intermittent extract ventilation**

  Dwellings served by local systems (combination boiler) and central systems (central gas fired boilers) across the estate. Each dwelling assessed with intermittent extract ventilation system. Target fabric beyond LBC standard (as per table 4.1)

- **Scenario 2**: **Combination of local and central systems including CHP, each dwelling with intermittent extract** ventilation

  Dwellings served by local systems (combination boiler) and central systems (central gas fired boilers led by CHP) across the estate. Each dwelling assessed with intermittent extract ventilation system. Target fabric beyond LBC standard (as per table 4.1)

- **Scenario 3, Combination of local and central systems, each dwelling with mechanical whole house heat recovery ventilation**

  Dwellings served by local systems (combination boiler) and central systems (central gas fired boilers) across the estate. Each dwelling assessed with whole house heat recovery ventilation system. Target fabric beyond LBC standard (as per table 4.1)

- **Scenario 4, Combination of local and central systems including CHP, each dwelling with mechanical whole house heat recovery ventilation**

  Dwellings served by local systems (combination boiler) and central systems (central gas fired boilers led by CHP) across the estate. Each dwelling assessed with whole house heat recovery ventilation system. Target fabric beyond LBC standard (as per table 4.1)

Within scenarios 2 and 4 above, a suitable CHP unit, approximately sized such that in practice it will operate to its optimum performance, has been assessed. The portion of the annual thermal energy provided by the CHP plant is referred to as it's 'heat fraction', of which is in the order of 35% for this assessment.

For each scenario, supplementary PV systems will be required in order to demonstrate the required 25% and 35% improvement of the DER over the TER to meet the targets set out in CfSH and the London Plan respectively.

Particular buildings have insufficient roof space to accommodate the total amount of PV required to comply with the energy target. Following detailed discussions with the CfSH Assessor and relevant personnel within the LBC Sustainability Department, it has been agreed that any surplus arrays can be positioned on those roofs within the estate that do have available space.

6.7 Results

The table overleaf presents the estimated estate wide PV requirements associated with each of the above scenarios to meet both a 25% and 35% reduction in carbon emissions. The shortfall in PV coverage achieved has been presented separately.

Table 6.4 – Anticipated estate wide PV coverage requirements

Scenario	System	Roof space available for PV	PV req to achieve 25%	25% Shortfall	PV req to achieve 35%	35% Shortfall
		m^2	m^2	m^2	m^2	m^2
1	Local extract ventilation (local & central)	670.7	981.2	310.5	1475.4	804.7
2	Local extract ventilation (local & central inc. CHP)	670.7	708.4	37.7	1202.5	531.8
3	Heat Recovery ventilation (local & central)	670.7	954.7	284.0	1440.7	770.0
4	Heat Recovery ventilation (local & central inc. CHP)	670.7	724.7	54.0	1210.7	540.0

6.8 Discussion

The purpose of the modelling exercise is to ensure that an appropriate engineering services and fabric strategy can be established. This needs to meet the requirements for the development in use, client energy and carbon reduction aspirations and the requirements of planning.

An assessment of the available roof area for the installation of PV has been undertaken and in conjunction with the architectural team proposed layout drawings showing potential PV arrays have been developed. This drawing forms part of the overall planning submission.

Given the nature of the sites and proposed building design it is not possible provide sufficient PV in the new buildings to meet the 25% or 35% carbon reduction.

As an alternative to meeting the 35% target, and in discussion with LBC's Sustainability Department, opportunities for carbon offsetting were explored, which is where provision of measures elsewhere in the borough or a financial contribution is made which is used to secure delivery of carbon reduction measures elsewhere.

In a collective effort to assess where financial contribution would be most suitably assigned LBC's Sustainability Department have developed a report to set out the potential carbon reduction through fabric enhancements.

A copy of this report is included in Appendix C. Further, those buildings that may be afforded fabric enhancement have all been identified on the energy strategy drawing, included in Appendix D. This drawing also shows opportunities for the installation of PV on other buildings across the estate.

The project has committed to work with the Sustainability Department and will make the necessary financial contribution to ensure the 35% carbon reduction target associated with the Regents Park Estate development is achieved.

Calculations to determine the extent of financial contribution to achieve the carbon offset are included later in this document.

7.0 PROPOSALS

7.1 How are the aims of the wider policies being addressed?

7.1.1 Identification of a location for an energy centre

There are no feasible locations on the estate for a central energy centre primarily due to programming, flueing and spatial constraints.

7.1.2 Regents Park Estate site wide system

Existing accommodation generally utilises local boiler installations and the likelihood of a phased changeover to a new communal installation is unlikely given the associated reengineering, leaseholder issues and disruption.

7.1.3 Communal installations serving multiple buildings

Viability of interconnection of existing buildings cannot be demonstrated due to the circulation energy losses and capital expenditure required for such installations.

7.1.4 Thresholds for central systems

Where feasible (notionally 15 units or more) central installations have been selected. It is sub-economic from both capital and operational perspectives to consider central installations lower than this quantum.

7.1.5 Maximising opportunities

Those developments closest to the likely network locations on Hampstead Road are proposed to have central plant with future connection possibilities.

Other sites are being designed with flexibility for future adaption, but with local installations with a ten year life expectancy to provide alignment with the bulk of the estate.

7.2 Proposed strategy

Foregoing sections discussed the application of the energy hierarchy to inform the development of an environmentally conscious design.

A fabric first approach has resulted in reduced energy demand through increased envelope performance.

Consideration of all factors associated with thermal energy generation identified two candidates for deployment on the estate and those were gas fired central and local options for the generation of low pressure hot water.

Where local systems are used these will comprise a local gas fired combination boiler and associated distribution installation.

Central installations will comprise high efficiency gas fired condensing boilers, thermal storage and interconnecting pipelines to heat interface units within dwellings for the instantaneous generation of heating and hot water.

Further carbon reduction measures are required through the application of the ‘be green’ element and solar photovoltaics are the preferred method. Determination of PV requirements for the selected approach is discussed in the following section.

Table 7.1 – Summary of proposals for the estate

Site	New dwellings	Central / Local	Strategy
Cape of Good Hope	15	Local	Gas fired combination boilers
St Bede's mews	3	Local	Gas fired combination boilers
Former One Stop Shop	24	Central	Gas fired central boilers
Newlands plot	32	Central	Gas fired central boilers
The Victory pub	10	Local	Gas fired combination boilers
Robert Street car park	13	Local	Gas fired combination boilers
Varndell Street Corner	8	Local	Gas fired combination boilers
Dick Collins Hall	11	Local	Gas fired combination boilers
Camden People's Theatre	5	Connect to existing	Connect into existing central system

7.2.1 Combined Heat and Power

Central systems offer the opportunity to use Combined Heat and Power (CHP)

Also known as co-generation, this is the name applied to processes which from a single stream of fuel simultaneously generate heat and power (usually electricity).

A typical CHP plant consists of a reciprocating internal combustion engine directly driving a generator to produce electrical power. The excess heat liberated in combustion is recovered via heat exchangers as usable heat, rather than being rejected to atmosphere. It is the ability to recover this heat, yielding efficiency gains together with the differential in fuel price between raw fuels and processed electricity, which makes CHP schemes an attractive proposal.

CHP plant works well in conjunction with central boiler plant when it is configured such that the CHP is the priority mode of thermal energy generation, supported by modular boilers. This enables the maximum electrical energy to be generated by the CHP plant, which would be expended across the site where required, thus offsetting electricity demand from the grid and subsequently reducing CO_2 emissions.

Analysis of the potential contribution to carbon reduction from micro CHP has been assessed and this could provide some benefit.

However, from a capital and maintenance perspective the use of micro CHP is not considered viable and it has thus been discounted.

7.2.2 Decentralised energy network compatibility

Newlands plot and Former One Stop Shop are in close proximity to the possible new Euston Station. The EAP proposes a new decentralised network with primary pipelines routed along Hampstead Road.

At the current stage, provision will be made for a hydraulic interface to allow future connection to such a system.

7.3 PV requirements and further carbon mitigation

As previously discussed, in order to achieve the 35% reduction in carbon emissions, a contribution will be made to support proposed improvements of existing building envelope performance elsewhere on the estate.

Table 7.2 below set out the estimated PV requirements to meet both a 25% and 35% reduction in carbon emissions for each block when assessed under the proposed energy strategy. Where values are denoted with a minus (-) sign, this indicates a shortfall. Values in green denote where the roof space available is sufficient to accommodate the required PV to meet the 25% reduction in carbon emissions.

Table 7.2 – Anticipated PV coverage requirements for each building

Site	Roof space available for PV	PV req to achieve 25%	25% Shortfall	PV req to achieve 35%	35% Shortfall
	m^2	m^2	m^2	m^2	m^2
Cape of Good Hope	67.4	102.3	-34.9	161.7	-94.3
St Bede's mews	30	21.7	8.3	34.3	-4.3
Former One Stop Shop	114.8	147	-32.2	210	-95.2
Newlands plot	128	294	-166	420	-292
The Victory pub	89	71.3	17.7	112.7	-23.7
Robert Street car park	113.5	102.3	11.2	161.7	-48.2
Varndell Street Corner	41	80.6	-39.6	127.4	-86.4
Dick Collins Hall	87	99.2	-12.2	156.8	-69.8
Camden People's Theatre	tbc	18.6	-18.6	29.4	-29.4
Total	**670.7**	**937**	**-266.3**	**1414**	**-743.3**

Carbon deficits for each building are set out in table 7.3 below. These identify the resultant carbon reduction to achieve the 35% target after the application of the proposed strategy

Table 7.3 – Associated carbon emissions for each building

Site	Total carbon (25%)	Total carbon (35%)	Carbon deficit
	tCO_2	tCO_2	tCO_2
Cape of Good Hope	18.743	16.177	2.567
St Bede's mews	3.976	3.431	0.544
Former One Stop Shop	19.187	16.494	2.692
Newlands plot	38.373	32.989	5.384
The Victory pub	13.063	11.275	1.789
Robert Street car park	18.743	16.177	2.567
Varndell Street Corner	14.767	12.745	2.022
Dick Collins Hall	18.175	15.686	2.489
Camden People's Theatre	3.408	2.941	0.467
Total	**148.436**	**127.915**	**20.521**

7.4 Discussion

After application of a fabric first approach and generation of energy through the most appropriate means it was not possible to achieve a 35% carbon reduction beyond the requirements of Part L 2013.

Analysis considered opportunities for central installations and these have been used where feasible. Interconnection of buildings or connection into existing networks is not considered viable in this instance although future connections will be facilitated.

Solar photovoltaic panels were the preferred renewable energy technology for further carbon reduction. As it would not be possible to accommodate the required PV area on the proposed developments it was necessary to identify surrogate buildings for this purpose.

In conjunction with LBC sustainability an exercise to identify candidate buildings was undertaken. This also considered the benefits of improving envelope performance of other buildings on the estate. The outcome was a viable proposal that would include a mixture of both opportunities to reduce carbon emissions.

8.0 OVERHEATING ASSESSMENT

8.1 Introduction

At the request of GLA, a thermal modelling assessment was performed on a number of the proposed dwellings to assess the risk of overheating. In order to obtain a fair representation of the dwellings across the estate, a sample set were chosen, each of varying size, selected from different buildings.

The dwellings assessed are as follows:

- 1B2P dwelling at Former One Stop Shop (6th floor)
- 2B3P dwelling at Varndell Street Corner (Ground & 1st floor – maisonette)
- 3B5P dwelling at Roberts Street (3rd & 4th floor - maisonette)

Dwellings considered to be worst affected by overheating, such as those with a greater extent of exposed surfaces and those with glazing on a Southerly aspect were targeted as to provide the most useful information.

8.2 Benchmarks

CIBSE Guide A[8] sets out benchmarks for overheating criteria in dwellings, which have been summarised as follows:

Table 8.1 Performance benchmarks for overheating

Habitable room type	Benchmark peak temperature (°C)	Overheating criterion
Living areas	28	1% annual occupied hours over operative temp. of 28°C
Bedrooms	26	1% annual occupied hours over operative temp. of 26°C

8.3 Methodology

Although guidance does acknowledge that the occupied hours can vary on a day to day basis for non-residential buildings such as offices and schools, it does not provide any suggested occupation profiles for dwellings. This is something that cannot be accurately predicted therefore for the purpose of this assessment it has been assumed that the dwellings will be occupied daily for the following periods:

- Living areas: 09:00 – 22:00 (13 hours daily, 4,745 hours annually)
- Bedrooms: 23:00 – 08:00 (9 hours daily, 3,285 hours annually)

Although dwellings will be provided with mechanical whole house heat recovery ventilation systems to maintain background rates; openable windows will be the primary mode of regulating indoor temperatures during the summer.

In order to demonstrate the effects of opening the windows to reduce the risk of overheating, a number of scenarios were modelled for each dwelling, initially with all windows closed, then with windows open to 10% and 25% of the openable area.

[8] CIBSE Guide A, Environmental Design, Issue 2, 2007

It has been assumed that all windows are openable at this stage. As the architectural design develops then it is intended that the results from this assessment will inform the number of, and extent of the openable windows.

8.4 Results

The performance of each dwelling is presented Table 8.2 below, where cells highlighted in yellow indicate those rooms in compliance with benchmark criterion and cells highlighted in red indicating those that do not:

Table 8.2 Indicative performance – all windows closed

Dwelling type	Room	Peak temperature	> 26deg (bedrooms)		> 28deg (living rooms)	
		°C	Hours	%	Hours	%
1B2P	Bedroom 1	29.1	13	0.4%	-	-
	Living area	33.1	-	-	347	7.3%
2B3P	Bedroom 1	33.9	395	12.0%	-	-
	Bedroom 2	28.1	78	2.4%	-	-
	Living area	30.8	-	-	184	3.9%
3B5P	Bedroom 1	27.85	11	0.3%	-	-
	Bedroom 2	28.5	86	2.6%	-	-
	Bedroom 3	34.2	473	14.4%	-	-
	Living area	32.3	-	-	446	9.4%

Table 8.3 Indicative performance – windows open to 10%

Dwelling type	Room	Peak temperature	> 26deg (bedrooms)		> 28deg (living rooms)	
		°C	Hours	%	Hours	%
1B2P	Bedroom 1	28.81	4	0.1%	-	-
	Living area	30.68	-	-	65	1.4%
2B3P	Bedroom 1	29.68	28	0.9%	-	-
	Bedroom 2	26.92	6	0.2%	-	-
	Living area	29.81	-	-	28	0.6%
3B5P	Bedroom 1	27.86	2	0.1%	-	-
	Bedroom 2	28.08	12	0.4%	-	-
	Bedroom 3	31.29	40	1.2%	-	-
	Living area	30.56	-	-	131	2.8%

Table 8.4 Indicative performance – windows open to 25%

Dwelling type	Room	Peak temperature	> 26deg (bedrooms)		> 28deg (living rooms)	
		°C	Hours	%		
1B2P	Bedroom 1	28.74	2	0.1%	-	-
	Living area	30.74	-	-	44	0.9%
2B3P	Bedroom 1	30.12	9	0.3%	-	-
	Bedroom 2	27.34	2	0.1%	-	-
	Living area	29.59	-	-	26	0.5%
3B5P	Bedroom 1	28.16	1	0.0%	-	-
	Bedroom 2	28.27	3	0.1%	-	-
	Bedroom 3	30.98	12	0.4%	-	-
	Living area	30.63	-	-	31	0.7%

8.5 Discussion

When the windows are modelled as closed, the majority of the habitable rooms assessed demonstrate a significant extent of overheating, with some bedrooms well in exceedance of the 1% threshold. In reality, since the facility for openable windows will be provided, this can be overcome by users.

With all windows set to open to 10% of their openable area, internal conditions are improved considerably, with the percentage of occupied hours reducing close to 1% for most areas. By increasing the extent of the window openings further, to 25% of the openable area, then all habitable rooms demonstrate temperatures within the acceptable limits set out by CIBSE Guide A.

9.0 SUSTAINBILITY STATEMENT

9.1 Introduction

The utilities information contained within this report is based on correspondence received from the respective utility companies and also on a visual walk around inspection of the Regents Park existing site.

This section forms the sustainability statement supporting the planning consent for the proposed development of the Regents Park Estate that have been made in addition to the energy and carbon saving commitments that were outlined in the energy statement.

It covers the following topics:

- Water efficiency
- Living roofs
- Flooding
- Materials
- Adaptation to climate change

9.2 Environmental assessment tools

Environmental assessment tools have been utilised for the dwellings at the Regents Park Estate in order to rate and certify the performance of both new and refurbished dwellings.

9.2.1 The Code for Sustainable Homes

The Code for Sustainable Homes (CfSH) is an environmental impact rating system for new housing. It sets standards for energy efficiency and sustainability, aiming to limit the environmental impact of housing.

Time period	Minimum rating	Min. standard for categories (%un-weighted credits)
2010-2012:	Level 3	Energy 50%, Water 50%, Materials 50%
2013 -2015:	Level 4	Energy 50%, Water 50%, Materials 50%
2016+:	Level 6	'zero carbon', Energy 50%, Water 50%, Materials 50%

A pre-assessment for the dwellings at the Regents Park Estate has been undertaken by the sustainability sub-consultant, Consult FES.

In conjunction with relevant members of the design team, anticipated credits have been allocated for each of the various environmental attributes. Each of the credits is weighted in terms of its environmental impact, then totalled to provide an overall score which equates to the level achieved.

The pre-assessment is included within Appendix E of this document. In summary, with the commitments received to date from the team the dwellings would each achieve a predicted CfSH score of 73.74 – 75.08 (for the different dwelling types), which translates into a provisional Code for Sustainable Homes rating of 'Level 4'.

9.2.2 BREEAM Domestic Refurbishment

Formerly, LBC required that the sustainability of existing housing where refurbishment, conversion or a change of use of a residential development (of 5 dwellings or more) be assessed by Ecohomes.

The Ecohomes scheme has since been replaced by the BREEAM Domestic Refurbishment (BDR) scheme, of which LBC have confirmed the following standards should be targeted:

Time period	Minimum rating	Min. standard for categories (%un-weighted credits)
2010-2012:	'very good'	Energy 60%, Water 60%, Materials 40%
2013+:	'excellent'	Energy 60%, Water 60%, Materials 40%

Those dwellings created as part of the refurbishment of existing buildings, such as those at the Camden People's Theatre site, will be designed to achieve BREEAM 'excellent'.

A BDR pre-assessment for the refurbishment dwellings at the Regents Park Estate has also been undertaken by the sustainability sub-consultant, Consult FES.

The BDR assessment follows a similar approach to the CfSH assessment, whereby relevant members of the design team collaborate with the assessor to allocate credits to the various environmental attributes.

An overall score of 71.93 is achieved, equating to a BDR 'excellent' rating.

The full report is included within Appendix F of this document.

9.3 Water Efficiency

Water saving features will be incorporated for both consumption and discharge of wastewater. A maximum internal water use figure of 105 litres/person/day will be achieved through the specification of low-flow fittings and efficient water use appliances.

To compliment low water use fittings, additional electronic controls will be considered to both avoid unnecessary consumption and prevent excessive consumption.

Other water saving devices which will also be considered during the design process are to include low flush WCs, spray taps, spray showers and shallow baths all as recommended within CfSH and BDR.

Surface water run off generated as a result of the proposed development will be managed in a number of ways as part of a surface water management strategy using Sustainable Drainage Systems (SUDS).

An attenuation/infiltration system is also envisaged in the form of below ground geo-cellular storage proposed to moderate and filter run off. This system will also provide the added benefit of reducing contaminants in water run-off.

9.4 Living roofs

Living roofs comprise a multi-layered system that covers the roof of a building or podium structures with vegetation cover/landscaping over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run off and attenuating peak flows.

There are three main categories of living roofs:

1. Intensive – Provide accessible amenity space e.g. rooftop gardens and food growing areas, and often require higher levels of design and maintenance.
2. Semi-intensive – Can provide different degrees of access and ecological habitat.
3. Extensive - Generally demand less maintenance, extensive roofs can be either a Sedum roof, a type of low-growing plant with shallow roots; or a biodiverse living roof – designed to optimise wildlife value, these are sparsely sown with wildflowers or re-colonised naturally.

4. Biodiverse roofs can be ‘brown’ (substrate of brownfield habitat) or ‘green’ (nutrient poor soil), or a combination of both. The Environment Agency state that around 75% of living roofs should be designed for biodiverse green or brown roofs and 25% should be intensive/semi-intensive.

   LBC’s Development Policy DP22 requires schemes to incorporate green and brown roofs unless it is demonstrated that it is not possible or appropriate to do so. This is supported by Camden Planning Guidance 3: Sustainability (CPG3).

   The design team have ensured the LBC requirements have been met during the development of the design. A combination of green and brown roofs has been proposed for buildings across the estate and will be installed alongside proposed PV installations, which will provide shaded areas, enhancing the biodiversity value of a roof.

9.5 Flooding

A Flood Risk Assessment (FRA) has been carried out to support the planning application for the proposed development. The FRA has been prepared in accordance with the NPPF (National Planning Policy Framework) and takes into account the LBC Core Strategy Policies.

For development plots situated in the estate, both developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

9.6 Materials

Embodied energy is the energy that has gone into the manufacture, processing and transportation of materials to site. Where possible materials with a low embodied energy will be specified and, where high embodied energy materials are selected, their volume is to be minimised.

The construction elements for the development at the Regents Park Estate are to be assessed using the 2008 Green Guide for specification. It is expected that at least 3 of the 5 following building elements will achieve a Green Guide rating of D to A+:

- Roof
- External walls
- Internal walls
- Upper and ground floors
- Windows

In addition to this the design team have made a commitment that a significant proportion of the materials used in finishing the basic building elements will be responsibly sourced.

All timber or timber products will be FSC/PEFC/CSA certified (internal doors, skirting, panelling, kitchen units, fitted furniture, bath panels, fascias, frames, boarding, or other significant use).

All UPVC products will be ISO14001/EMAS/ BES6001 certified for the key & supply chain processes.

9.7 Adapting to climate change

The engineering services have been developed in conjunction with the building design to minimise the reliance on energy for space conditioning.

Continuous mechanical heat recovery ventilation systems have been considered to comply with building regulations and to improve occupant comfort.

The surface water drainage management strategy takes into account future allowances for climate change for a predicted increase of 30% in rainfall intensities in accordance with the NPPF.

10.0 CONCLUDING REMARKS

Both planning policies set out by LBC and the requirements of the London Plan require that a logical approach to carbon reduction is adopted. This has been applied to this development through the application of the energy hierarchy.

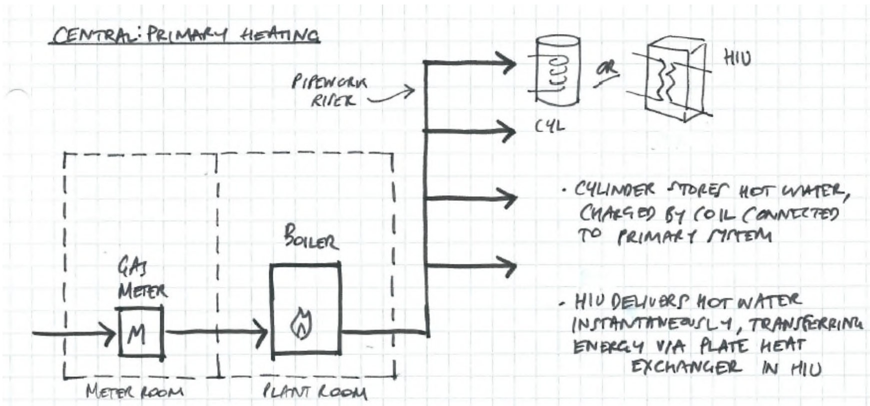
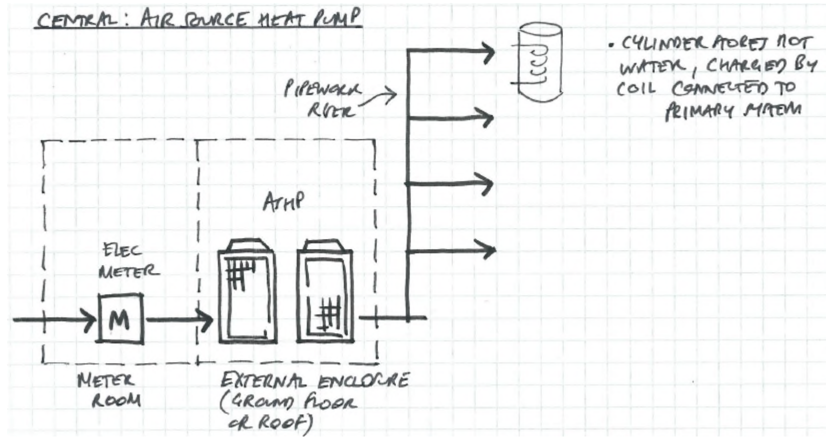
A fabric first approach has been adopted to ensure the energy demand is minimised from the onset of development of any energy generation approaches.

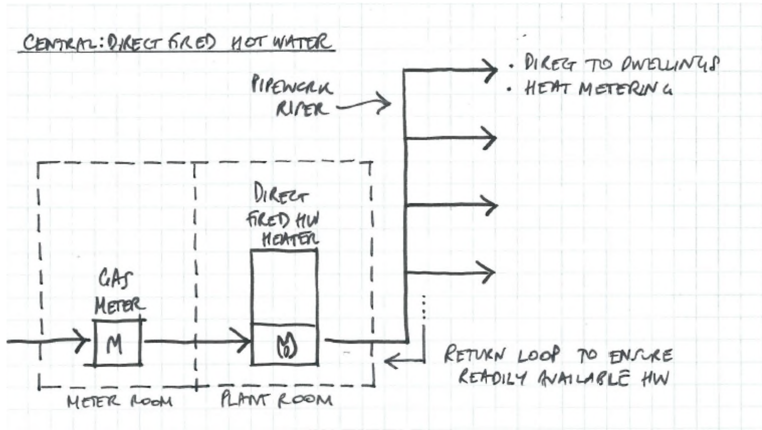
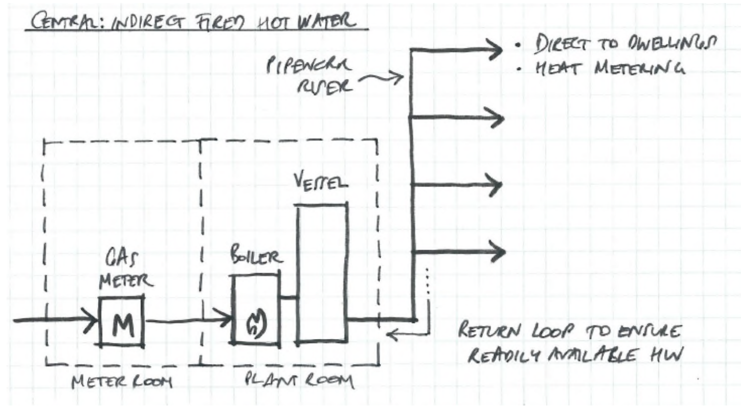
Energy generation across the estate has been carefully considered and assessed under SAP. A number of opportunities for connection of proposed building to existing energy generation systems have been investigated, with those considered viable being incorporated into the strategy.

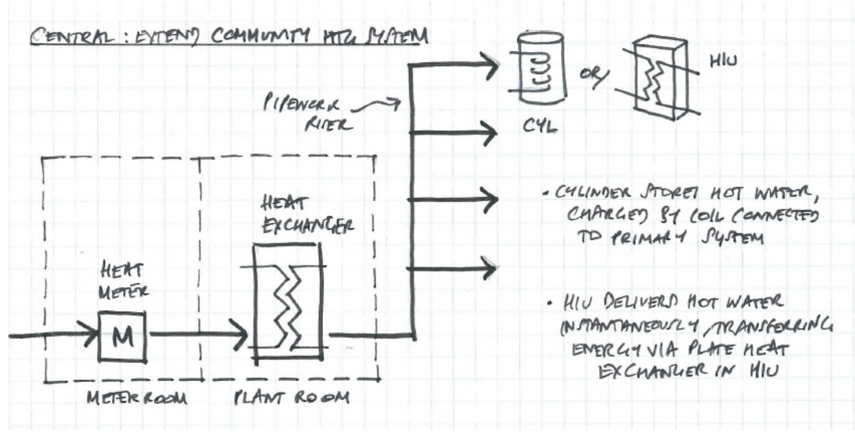
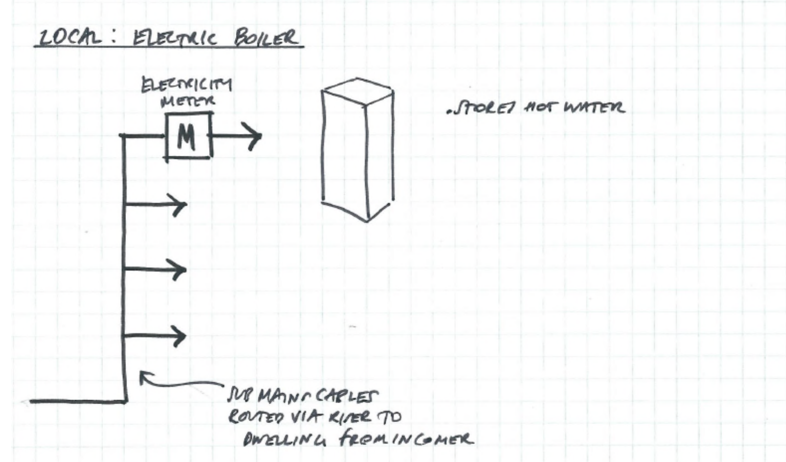
The most appropriate means for the generation and delivery of energy in all other blocks comprises both local and central gas fired boiler installations. The incorporation of roof mounted solar photovoltaics (PV) will further reduce carbon emissions.

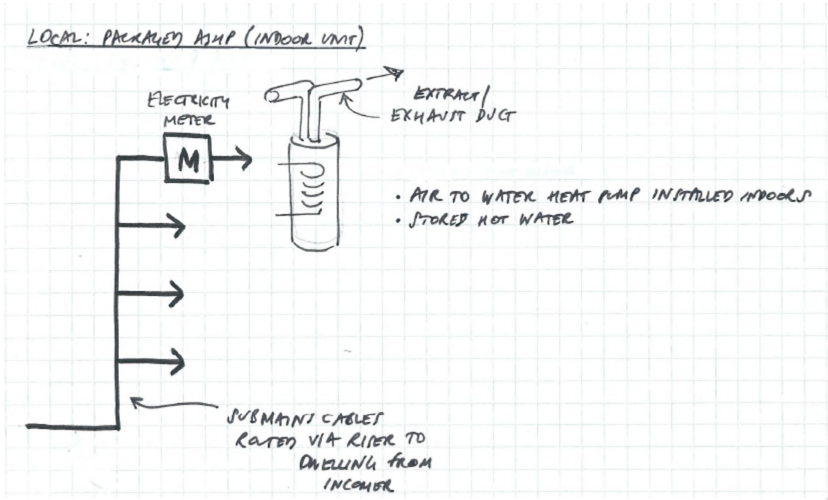
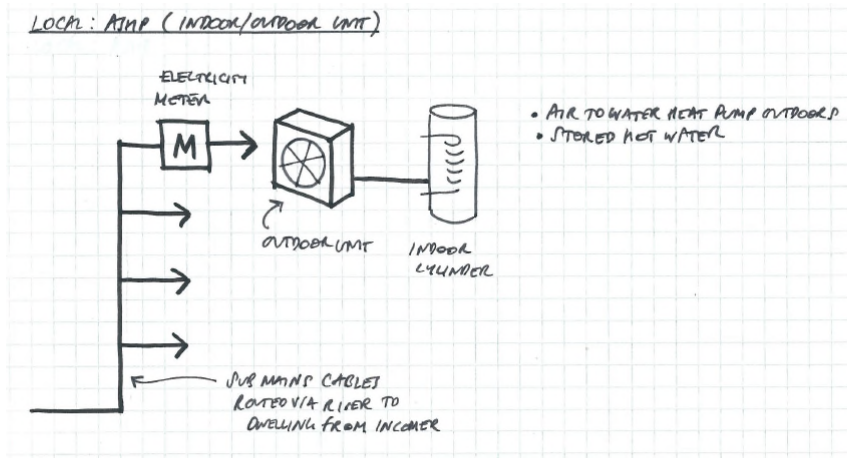
Beyond the incorporation of PVs, in order to meet the 35% reduction in carbon emissions, a contribution will be allocated to improve the fabric of existing building stock within the locality.

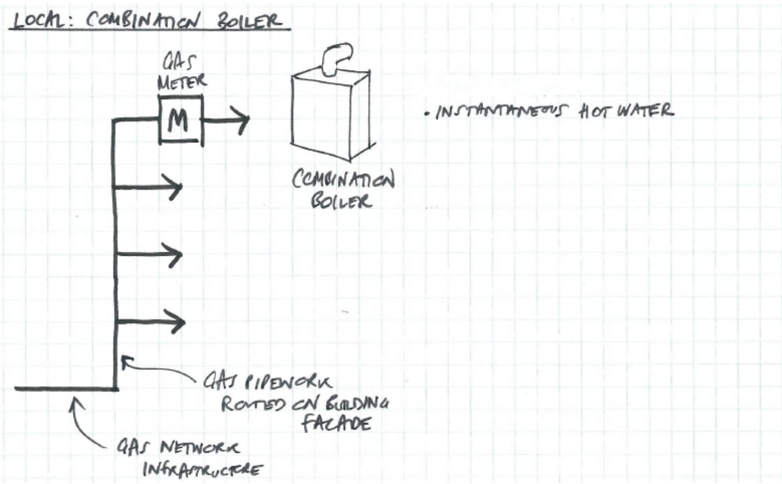
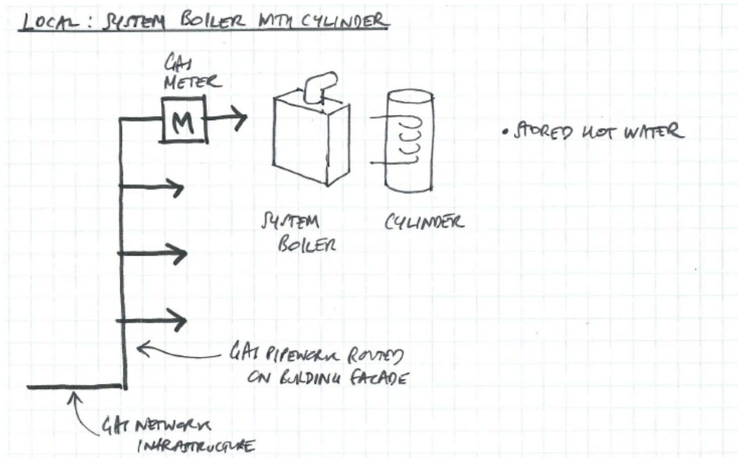
APPENDIX A - SERVICING OPTIONS MATRIX

<table>
<tr><th>System</th><th>Central: Primary heating via gas fired boilers</th><th>Central: Primary heating via ASHP</th></tr>
<tr><td>Concept schematic</td><td>
</td><td>
</td></tr>
<tr><td>Incoming services</td><td>▪ Single larger gas supply to serve central plant
▪ Dedicated meter room required, accessible from highway</td><td>▪ Single larger electrical supply to serve central plant
▪ Dedicated meter room required, accessible from highway</td></tr>
<tr><td>Plant/equipment</td><td>▪ Boilers, vessels, pumps, pressurisation and controls to be located in plant room.
▪ Dedicated plant space required. Extent dependent on number of dwellings served
▪ Loss of saleable area</td><td>▪ Condensing plant, controls to be located in plant room
▪ Dedicated plant space required. Extent dependent on number of dwellings served
▪ Loss of saleable area</td></tr>
<tr><td>Distribution within building</td><td>▪ Primary heating flow and return pipework routed via common ceiling voids and risers
▪ Must be accessible from common areas</td><td>▪ Refrigerant pipework routed via common ceiling voids and risers
▪ Must be accessible from common areas</td></tr>
<tr><td>External considerations</td><td>▪ Flues associated with plant extend to a height approximately 3m above roof level.
▪ Plant room and gas meter enclosure will require louvres on external walls to provide ventilation</td><td>▪ Condensing equipment located externally in compound or on roof</td></tr>
<tr><td>Dwelling HW</td><td>▪ Via indirect cylinder (stored) or Heat Interface Unit (instantaneous)
▪ Cylinder will require dedicated cupboard, HIU location flexible (i.e. in kitchen unit if required)</td><td>▪ Via indirect cylinder (stored)
▪ Cylinder will require dedicated cupboard</td></tr>
<tr><td>Dwelling heating</td><td>▪ Provided by whole house heat recovery system.
▪ Supplementary heating coil in supply air stream ‘back-fed’ from cylinder, or fed from plate heat exchanger</td><td>▪ Provided by whole house heat recovery system.
▪ Supplementary heating coil in supply air stream ‘back-fed’ from cylinder</td></tr>
<tr><td>Billing</td><td>▪ Intuitive heat metering, contra charging
▪ Financial risk, management burden</td><td>▪ Intuitive heat metering, contra charging
▪ Financial risk, management burden</td></tr>
<tr><td>Lifecycle</td><td>▪ Robust installations offer up to 25 - 30 year life cycle</td><td>▪ ASHP option: 15 – 20 year life cycle</td></tr>
<tr><td>Maintenance</td><td>▪ Annual inspection and maintenance of dwelling installations
▪ Complex central installations require specialist input
▪ Regular maintenance of plant in plant room
▪ More expensive plant repairs
▪ Single point of failure (subject to resilience)</td><td>▪ Annual inspection and maintenance of dwelling installations
▪ Complex central installations require specialist input
▪ Regular maintenance of plant in plant room
▪ More expensive plant repairs
▪ Single point of failure (subject to resilience)</td></tr>
<tr><td>Carbon</td><td>▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand
▪ Requires supplementary LZC, likely to be PV/solar thermal to meet sustainability targets. Dwelling quantities do not warrant the use of CHP since base loads unlikely to be met
▪ Central system enables demand to be diversified for larger quantities of dwellings</td><td>▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand
▪ Higher CoP therefore expected to require less in the way of supplementary LZC
▪ Central system enables demand to be diversified for larger quantities of dwellings</td></tr>
</table>

System	Central: Direct fired hot water	Central: Indirect fired hot water
Concept schematic		
Incoming services	▪ Single larger gas supply to serve central plant ▪ Dedicated meter room required, accessible from highway	▪ Single larger gas supply to serve central plant ▪ Dedicated meter room required, accessible from highway
Plant/equipment	▪ Hot water heater, pumps, pressurisation and controls to be located in plant room. ▪ Dedicated plant space required. Extent dependent on number of dwellings served ▪ Loss of saleable area	▪ Boiler, vessel, pumps, pressurisation and controls to be located in plant room. ▪ Dedicated plant space required. Extent dependent on number of dwellings served ▪ Loss of saleable area
Distribution within building	▪ Hot water flow and return pipework routed throughout common areas' ceiling voids and risers ▪ Must be accessible from common areas	▪ Hot water flow and return pipework routed throughout common areas' ceiling voids and risers ▪ Must be accessible from common areas
External considerations	▪ Flues associated with plant extend to a height approximately 3m above roof level. ▪ Plant room and gas meter enclosure will require louvres on external walls to provide ventilation	▪ Flues associated with plant extend to a height approximately 3m above roof level. ▪ Plant room and gas meter enclosure will require louvres on external walls to provide ventilation
Dwelling HW	▪ Direct from distribution	▪ Direct from distribution
Dwelling heating	▪ Provided by whole house heat recovery system. ▪ Supplementary electric heating coil in supply air stream	▪ Provided by whole house heat recovery system. ▪ Supplementary electric heating coil in supply air stream
Billing	▪ Intuitive heat metering, contra charging ▪ Financial risk, management burden	▪ Intuitive heat metering, contra charging ▪ Financial risk, management burden
Lifecycle	▪ 25 - 30 year life cycle	▪ 25 - 30 year life cycle
Maintenance	▪ Complex central installations require specialist input ▪ Regular maintenance of plant in plant room ▪ More expensive plant repairs ▪ Single point of failure (subject to resilience)	▪ Complex central installations require specialist input ▪ Regular maintenance of plant in plant room ▪ More expensive plant repairs ▪ Single point of failure (subject to resilience)
Carbon	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Requires supplementary LZC, likely to be PV/solar thermal to meet sustainability targets. ▪ Central system enables demand to be diversified for larger quantities of dwellings	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Requires supplementary LZC, likely to be PV/solar thermal to meet sustainability targets. ▪ Central system enables demand to be diversified for larger quantities of dwellings

System	**Central:** Connect to decentralised energy network	**Local:** Electric boiler installation
Concept schematic		
Incoming services	▪ Reliant on existing community heating system with sufficient capacity ▪ Dedicated plant room to accommodate heat exchanger plant	▪ Multiple incoming service connections and utility services through building ▪ Dedicated space for meters
Plant/equipment	▪ Plate heat exchanger, vessels, pumps, pressurisation and controls to be located in plant room. ▪ Dedicated plant space required. Extent dependent on number of dwellings served ▪ Loss of saleable area	▪ Local boiler with integral cylinder, controls ▪ Self-contained within dwelling
Distribution within building	▪ Primary heating flow and return pipework routed via common ceiling voids and risers ▪ Must be accessible from common areas	▪ Multiple utility services, installed in accordance with utility provider requirements ▪ Utility services must be accessible from common areas
External considerations	▪ None	▪ None
Dwelling HW	▪ Via indirect cylinder (stored) or Heat Interface Unit (instantaneous) ▪ Cylinder will require dedicated cupboard, HIU location flexible (i.e. in kitchen unit if required)	▪ Via indirect cylinder (stored)
Dwelling heating	▪ Provided by whole house heat recovery system. ▪ Supplementary heating coil in supply air stream 'back-fed' from cylinder, or fed from plate heat exchanger	▪ Provided by whole house heat recovery system. ▪ Supplementary heating coil in supply air stream 'back-fed' from cylinder, electric heating coil in supply air stream or fed from boiler (if equipment permits)
Billing	▪ Intuitive heat metering, contra charging ▪ Financial risk, management burden	▪ Direct to consumer no further action
Lifecycle	▪ Dependent on age of existing system. Robust installations offer up to 25 - 30 year life cycle	▪ 10 – 12 year life cycle.
Maintenance	▪ Annual inspection and maintenance of dwelling installations ▪ Complex central installations require specialist input ▪ Regular maintenance of plant in plant room ▪ Single point of failure (subject to resilience) ▪ Reliant on central plant, managed and maintained by others	▪ Annual inspection and maintenance of local systems ▪ Simple installations require 'conventional' maintenance ▪ Inexpensive repairs but these occur at a higher frequency. ▪ Access required to dwellings to attend maintenance/repairs, may result in multiple call outs if access is not achievable
Carbon	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Likely to require supplementary LZC, likely to be PV to meet sustainability targets ▪ Connecting onto existing communal system enables demand to be diversified for larger quantities of dwellings, however extensive primary pipe runs have increased pipe losses resulting in plant running longer and harder to ensure demand is met	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ High carbon intensity of all electric system type. Requires supplementary LZC, likely to be PV/solar thermal to meet sustainability targets. ▪ Full capacity installations, no diversity ▪ Intermittent operation

System	**Local:** Packaged ASHP (indoor unit)	**Local:** Packaged ASHP (outdoor unit)
Concept schematic		
Incoming services	▪ Multiple incoming service connections and utility services through building ▪ Dedicated space for meters	▪ Multiple incoming service connections and utility services through building ▪ Dedicated space for meters
Plant/equipment	▪ Cylinder with integral heat pump extracts energy from surroundings and transfers to cylinder ▪ Self-contained within dwelling	▪ Cylinder with external heat pump extracts energy from outdoors and transfers to cylinder ▪ Self-contained within dwelling, condensing units located externally
Distribution within building	▪ Multiple utility services, installed in accordance with utility provider requirements ▪ Utility services must be accessible from common areas	▪ Multiple utility services, installed in accordance with utility provider requirements ▪ Utility services must be accessible from common areas
External considerations	▪ Cylinder to be located adjacent external wall for exhaust connection	▪ External condensing unit to be located adjacent dwelling
Dwelling HW	▪ Via indirect cylinder (stored)	▪ Via indirect cylinder (stored)
Dwelling heating	▪ Provided by whole house heat recovery system. ▪ Supplementary heating coil in supply air stream 'back-fed' from cylinder	▪ Provided by whole house heat recovery system. ▪ Supplementary heating coil in supply air stream 'back-fed' from cylinder
Billing	▪ Direct to consumer no further action	▪ Direct to consumer no further action
Lifecycle	▪ 10 – 15 year life cycle.	▪ 10 – 15 year life cycle.
Maintenance	▪ Annual inspection and maintenance of local systems ▪ Less 'conventional' than boilers however relatively simple installations/maintenance ▪ Inexpensive repairs but these occur at a higher frequency. ▪ Access required to dwellings to attend maintenance/repairs, may result in multiple call outs if access is not achievable	▪ Annual inspection and maintenance of local systems ▪ Less 'conventional' than boilers however relatively simple installations/maintenance ▪ Inexpensive repairs but these occur at a higher frequency. ▪ Access required to dwellings to attend maintenance/repairs, may result in multiple call outs if access is not achievable
Carbon	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Higher CoP therefore expected to require less in the way of supplementary LZC ▪ Full capacity installations, no diversity ▪ Intermittent operation	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Higher CoP therefore expected to require less in the way of supplementary LZC ▪ Full capacity installations, no diversity ▪ Intermittent operation

System	Central systems	Local systems
Concept schematic		
Incoming services	▪ Multiple incoming service connections. ▪ Dedicated space for meters ▪ Multiple utility pipelines through building, potentially on face of building	▪ Multiple incoming service connections. ▪ Dedicated space for meters ▪ Multiple utility pipelines through building, potentially on face of building
Plant/equipment	▪ Local boiler, controls ▪ Self-contained within dwelling	▪ Local boiler, cylinder, controls ▪ Self-contained within dwelling
Distribution within building	▪ Multiple utility services, installed in accordance with utility provider requirements ▪ Utility services must be accessible from common areas	▪ Multiple utility services, installed in accordance with utility provider requirements ▪ Utility services must be accessible from common areas
External considerations	▪ Local flues from each unit	▪ Local flues from each unit
Dwelling HW	▪ Via combination boiler (instantaneous)	▪ Via indirect cylinder (stored)
Dwelling heating	▪ Provided by whole house heat recovery system. ▪ Supplementary heating coil in supply air stream fed from boiler	▪ Provided by whole house heat recovery system. ▪ Supplementary heating coil in supply air stream 'back-fed' from cylinder, or fed from boiler
Billing	▪ Direct to consumer no further action	▪ Direct to consumer no further action
Lifecycle	▪ 10 – 15 year life cycle.	▪ 10 – 15 year life cycle.
Maintenance	▪ Annual inspection and maintenance of local systems ▪ Simple boiler installations require 'conventional' maintenance ▪ Inexpensive repairs but these occur at a higher frequency. ▪ Access required to dwellings to attend maintenance/repairs, may result in multiple call outs if access is not achievable	▪ Annual inspection and maintenance of local systems ▪ Simple boiler installations require 'conventional' maintenance ▪ Inexpensive repairs but these occur at a higher frequency. ▪ Access required to dwellings to attend maintenance/repairs, may result in multiple call outs if access is not achievable
Carbon	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Requires supplementary LZC, likely to be PV/solar thermal to meet sustainability targets. ▪ Full capacity installations, no diversity ▪ Intermittent operation	▪ Strategy requires passhivhaus equivalent fabric standards minimise heating demand ▪ Requires supplementary LZC, likely to be PV/solar thermal to meet sustainability targets. ▪ Full capacity installations, no diversity ▪ Intermittent operation

APPENDIX B - SUMMARY OF CARBON ANALYSIS

Local extract ventilation (local & central)

Site	Roof space available for PV	PV req to achieve 25%	25% Shortfall	PV req to achieve 35%	35% Shortfall	Total carbon (25%)	Total carbon (35%)	Carbon deficit
	m2	m2	m2	m2	m2	tCO2	tCO2	tCO2
Cape of Good Hope	67.4	99	-31.6	160.05	-92.65	18.718	16.129	2.589
St Bede's mews	30	21	9	33.95	-3.95	3.971	3.421	0.549
Former One Stop Shop	114.8	161	-46.2	224	-109.2	19.115	16.429	2.686
Newlands plot	128	322	-194	448	-320	38.230	32.858	5.373
The Victory pub	89	69	20	111.55	-22.55	13.046	11.241	1.804
Robert Street car park	113.5	99	14.5	160.05	-46.55	18.718	16.129	2.589
Varndell Street Corner	41	78	-37	126.1	-85.1	14.748	12.708	2.040
Dick Collins Hall	87	96	-9	155.2	-68.2	18.151	15.640	2.511
Camden People's Theatre	0	18	-18	29.1	-29.1	3.403	2.933	0.471
Totals	670.7	963	-292.3	1448	-777.3	148.100	127.488	20.612

Local extract ventilation (local & central inc. CHP)

Site	Roof space available for PV	PV req to achieve 25%	25% Shortfall	PV req to achieve 35%	35% Shortfall	Total carbon (25%)	Total carbon (35%)	Carbon deficit
	m2	m2	m2	m2	m2	tCO2	tCO2	tCO2
Cape of Good Hope	67.4	99	-31.6	160.05	-92.65	18.718	16.129	2.589
St Bede's mews	30	21	9	33.95	-3.95	3.971	3.421	0.549
Former One Stop Shop	114.8	71.75	43.05	134.75	-19.95	19.260	16.597	2.662
Newlands plot	128	143.5	-15.5	269.5	-141.5	38.519	33.195	5.325
The Victory pub	89	69	20	111.55	-22.55	13.046	11.241	1.804
Robert Street car park	113.5	99	14.5	160.05	-46.55	18.718	16.129	2.589
Varndell Street Corner	41	78	-37	126.1	-85.1	14.748	12.708	2.040
Dick Collins Hall	87	96	-9	155.2	-68.2	18.151	15.640	2.511
Camden People's Theatre	0	18	-18	29.1	-29.1	3.403	2.933	0.471
Totals	670.7	695.25	-24.55	1180.25	-509.55	148.533	127.994	20.540

Heat Recovery ventilation (local & central)

Site	Roof space available for PV	PV req to achieve 25%	25% Shortfall	PV req to achieve 35%	35% Shortfall	Total carbon (25%)	Total carbon (35%)	Carbon deficit
	m2	m2	m2	m2	m2	tCO2	tCO2	tCO2
Cape of Good Hope	67.4	102.3	-34.9	161.7	-94.3	18.743	16.177	2.567
St Bede's mews	30	21.7	8.3	34.3	-4.3	3.976	3.431	0.544
Former One Stop Shop	114.8	147	-32.2	210	-95.2	19.187	16.494	2.692
Newlands plot	128	294	-166	420	-292	38.373	32.989	5.384
The Victory pub	89	71.3	17.7	112.7	-23.7	13.063	11.275	1.789
Robert Street car park	113.5	102.3	11.2	161.7	-48.2	18.743	16.177	2.567
Varndell Street Corner	41	80.6	-39.6	127.4	-86.4	14.767	12.745	2.022
Dick Collins Hall	87	99.2	-12.2	156.8	-69.8	18.175	15.686	2.489
Camden People's Theatre	0	18.6	-18.6	29.4	-29.4	3.408	2.941	0.467
Totals	670.7	937	-266.3	1414	-743.3	148.436	127.915	20.521

Heat Recovery ventilation (local & central inc. CHP)

Site	Roof space available for PV	PV req to achieve 25%	25% Shortfall	PV req to achieve 35%	35% Shortfall	Total carbon (25%)	Total carbon (35%)	Carbon deficit
	m2	m2	m2	m2	m2	tCO2	tCO2	tCO2
Cape of Good Hope	67.4	102.3	-34.9	161.7	-94.3	18.743	16.177	2.567
St Bede's mews	30	21.7	8.3	34.3	-4.3	3.976	3.431	0.544
Former One Stop Shop	114.8	71.75	43.05	134.75	-19.95	19.351	16.659	2.692
Newlands plot	128	143.5	-15.5	269.5	-141.5	38.701	33.317	5.384
The Victory pub	89	71.3	17.7	112.7	-23.7	13.063	11.275	1.789
Robert Street car park	113.5	102.3	11.2	161.7	-48.2	18.743	16.177	2.567
Varndell Street Corner	41	80.6	-39.6	127.4	-86.4	14.767	12.745	2.022
Dick Collins Hall	87	99.2	-12.2	156.8	-69.8	18.175	15.686	2.489
Camden People's Theatre	0	18.6	-18.6	29.4	-29.4	3.408	2.941	0.467
Totals	670.7	711.25	-40.55	1188.25	-517.55	148.928	128.408	20.520

APPENDIX C - LBC SUSTAINABILITY OPTIONS APPRAISAL

13 April 2015

Regent's Park Estate HS2 Regeneration – HASC Sustainability Options Appraisal

This report has been produced further to a request for assistance in identifying additional energy efficiency / renewable energy measures that can be undertaken as part of the Regent's Park Estate HS2 housing replacement programme.

In its current design, the scheme will deliver a shortfall of **20tCO_2/year** against planning obligations set down in CPG3 Sustainability, CS13 of Camden Core Strategy 2010-2025 and DP22 of Camden Development Policies 2010-2025. The target is for 35% emission rate improvement over ADL1 2013 building regulations. Policy CS13 follows the London Plan's energy hierarchy through which developments must contribute to minimising carbon emissions:

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

Actions in hierarchy

1. Insulation of other Regent's Park Estate blocks

The table below details all blocks near the proposed developments on the Regent's Park Estate which could benefit from insulation measures, along with the costs and carbon savings:

Table 1 - Range of uninsulated blocks on Regent's Park Estate

Block Name	Post Code	Dwellings	Wall Type	CO2 Saving per flat (tonnes CO_2/year)	Block annual CO_2 saved (tonnes)	Lifetime in years (from ECO)	Block lifetime CO2 saved (tonnes)	Cost per flat	Block total cost	Cost per tonne CO_2
1-28 The Tarns [with1-32 Waterhead (Cons)]	NW1 3RR	28	Cavity	0.4	11.20	42	470.40	£650	£18,200	£38.69
1-24 Coniston (Cons)	NW1 3SG	24	Solid	0.92	22.08	36	794.88	£6,500	£156,000	£196.26
1-12 Mosedale (Cons)	NW1 3QH	12	Solid	0.92	11.04	36	397.44	£6,500	£78,000	£196.26
1-16 Kirkstone (Cons)	NW1 3SL	16	Solid	0.92	14.72	36	529.92	£6,500	£104,000	£196.26
1-6 Wasdale (Cons)	NW1 3QN	6	Solid	0.92	5.52	36	198.72	£6,500	£39,000	£196.26
1-12 Newby (Cons)	NW1 3RN	12	Solid	0.92	11.04	36	397.44	£6,500	£78,000	£196.26
41-87 Robert Street(Odd)	NW1 3JS	24	Solid	0.92	22.08	36	794.88	£6,500	£156,000	£196.26
1a-6a Stanhope Parade (Cons)	NW1 3RD	6	Solid	0.92	5.52	36	198.72	£6,500	£39,000	£196.26

The above table uses cost assumptions for solid wall insulation from recent works (these include access and enabling works). Alternative figures from the Energy Saving Trust[1] show that for England

[1] EST Solid Wall Insulation http://www.energysavingtrust.org.uk/domestic/content/solid-wall

and Wales, the typical carbon savings for a gas-heated flat are 0.61kgCO2/year for a minimum installed cost of £5,000 per flat. This equates to an average of £228 per tonne/CO2:

Cost per flat	£5,000
Lifetime CO2 (tonnes)	21.96
Cost per tonne	£228

2. Connection of new blocks to Netley School CHP/other district networks

Second in the energy hierarchy of Camden's Planning Guidelines is a requirement that connection to a decentralised energy network is expected unless it can be demonstrated that it is not technically or financially feasible. Whilst this is outside the scope of this options appraisal, work is ongoing by the energy consultants to assess the feasibility of connection to the new Netley CHP scheme, existing Newlands, existing Rothay House and existing Camden People's Theatre systems. HASC Sustainability are supporting this process where appropriate.

3. Installation of Solar PV on other Regent's Park Estate blocks

The table below details the existing blocks near the proposed developments that could accommodate the installation of solar PV panels along with costs and carbon savings. The blocks have been chosen because of limited shading and suitable roof space:

Table 2 – range of blocks with suitable roof spaces for solar PV installations on Regent's Park Estate

Block Name	Post Code	Dwellings	Roof area available (m2)	Size of system available (kW)	kWh generation per year (850 kWh/kwp)	CO2 saving per year (tonnes)	Lifetime CO2 saving (tonnes)	Installed cost (£1,300/ kWp)	Cost per tonne CO2
77-87 CLARENCE GARDENS	NW1 3LL	11	271.6	33.95	28,858	13.68	273.57	£44,135	£161
88-105 CLARENCE GARDENS	NW1 3LP	18	217.7	27.21	23,131	10.96	219.28	£35,376	£161
1-44 SWALLOWFIELD	NW1 3PJ	44	125	15.63	13,281	6.30	125.91	£20,313	£161
1-70 THE COMBE	NW1 3PJ	70	149.1	18.64	15,842	7.51	150.18	£24,229	£161
1-67 CARTMEL	NW1 3SH	69	260	32.50	27,625	13.09	261.89	£42,250	£161

The above table is based on assumed roof size requirements of 8m^2/kWp, and energy generation of 850kWh/kWp. Carbon savings are based on UK grid carbon intensity of 515gCO_2/kWh[2] and embodied CO_2 of solar PV of 41gCO_2e/kWh[3]. Costs are based on assumption of £1,300/kWp.

Preferred carbon saving option

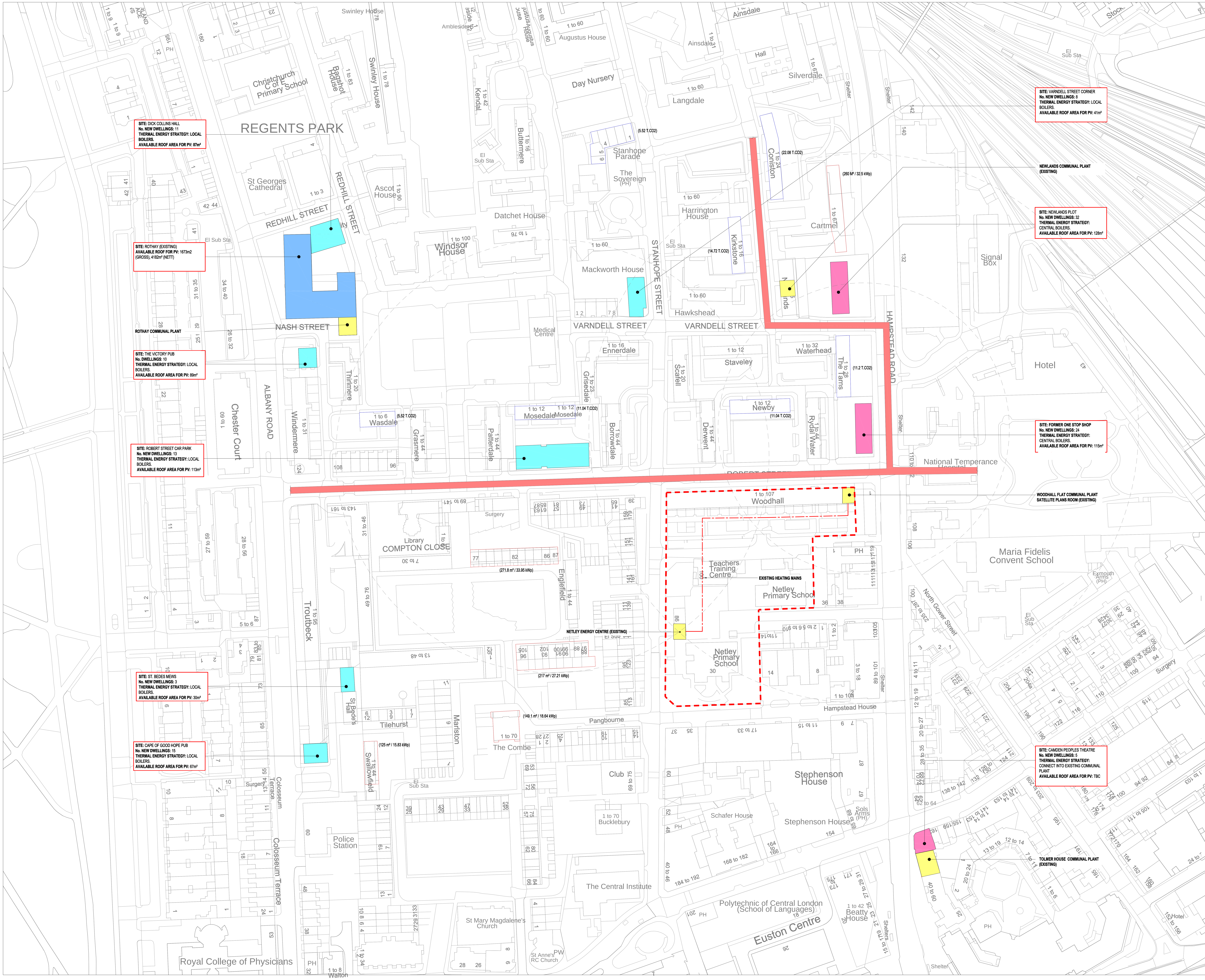
The provision of energy efficiency measures through cavity and solid wall insulation on the existing estate is the favoured option. In addition to delivering significant benefits to residents on the estate and helping to reduce levels of fuel poverty, a programme of insulation will have the potential to bring in external funding from other sources such as ECO (Energy Company Obligation). It is preferable to undertake such a programme across all possible blocks and we plan to explore this to be completed in line with or ahead of the 2017 construction timeline, incorporating a commensurate financial contribution towards this as part of HS2 housing development to make up the carbon shortfall.

---

[2] Grid carbon intensity - DECC

[3] Solar PV cradle to grave emissions – IPCC Working Group 3

APPENDIX D - SITE LAYOUT PLAN IDENTIFYING KEY STRATEGIES



This drawing should be read in conjunction with the specification and shall **not** be used in lieu of the service contractors working drawings. At construction stage, the service contractors are required to prepare co-ordinated drawings for construction purposes under the terms of the contract.

A1

LEGEND

- LOCAL INSTALLATIONS PROPOSED
- EXISTING COMMUNAL PLANT LOCATION
- COMMUNAL INSTALLATION PROPOSED
- CONNECTION TO EXISTING
- HS2 DIVERSIONS
- FABRIC IMPROVEMENT
- PV LOCATION

REV	DATE	DESCRIPTION	ALT	DO CHK	ORIG CHK	AP
1	28-04-2015	CANDIDATE ' OFFSITE ' BUILDINGS ADDED	YA	GK	AM	AM
0	20-03-2015	PERLIMINARY	JS	GK	HM	SJ

tga | CONSULTING ENGINEERS

a sustainable future... engineered.

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Project
REGENTS PARK ESTATE
CAMDEN

Title
ENERGY STRATEGY

Architect
-

Client
-

Drawing Number	Revision	Scale	
7482ME(5-)99-006	1	A1	1:1000
		A3	NTS
		A4	NTS

Path
J:\7482\MECH\

Architects Drawing Reference
-

Drawn	DO Check	Originator	Approved
JG	GK	AM	AM

Date APRIL 2015

Status PRELIMINARY

APPENDIX E - CODE FOR SUSTAINABLE HOMES PRE-ASSESSMENT

Code for Sustainable Homes

Pre-Assessment Report

Regents Park Estate

Camden

Issue No. 2

April 2015

Future Energy Surveys Ltd
Clifford Chambers
4 Clifford Street
York
YO1 9RD
www.consultfes.co.uk

Pre-assessment Report
FES Version 1.1
October 2013

Contents:

1 Introduction

This Code for Sustainable Homes Pre-assessment has been prepared by Future Energy Surveys on behalf of TGA Consulting Engineers for the residential development known as Regents Park Estate, Camden. The development will see the regeneration of multiple sites within the estate. The current proposal will see the phased construction of 120 residential units, 112 of which are to be assessed against the Code for Sustainable Homes criteria. The proposed development has been put forward to offer displacement housing due to the forthcoming HS2 rail link proposal.

The report will consider and assess the commitments made by the developer to achieve Code for Sustainable Homes Level **Four** certification. A design team meeting was held at MAEs office on Tuesday 16th December 2014 which was attended by the Code assessor (author) to ensure all members of the design team understood the principals of the assessment and all mandatory criteria. Each section was discussed in detail to ascertain credits available and credits unavailable through a multitude of potential reasons i.e. site restrictions or impracticality for specific project etc.

The report below details the points targeted based on the design team meeting. It confirms a route to achieving Code for Sustainable Homes Level 4 exists with a current predicted score of **73.74 – 75.08 (level 4)** see Page 17, Summary Score for details.

1.1 Assessor Declaration

I, Andrew Parry have compiled this report to the best of my ability and have based all findings on the information that is referenced within this report. To the best of my knowledge all the information contained within this report is correct and accurate.

I have within my possession all the reference material that is named within this report, which is available for Inspection by the Client, the client's representative or STROMA Accreditation for Quality Assurance monitoring.

Signed

Andrew Parry

STRO008645

STROMA CERTIFIED ENERGY ASSESSOR
STROMA CERTIFIED CODE ASSESSOR

2 Code Assessment

The Code for Sustainable Homes assesses each dwelling against nine categories, many of which complement the National Planning Policy Framework, such as; Protecting Green Belt Land, Meeting the Challenge of Climate Change, Flooding and Coastal Change, Conserving and Enhancing the Natural Environment, Facilitating the Sustainable Use of Minerals etc. The nine categories assessed are:

- Energy and Carbon Dioxide Emissions
- Water Consumption
- Environmental Impact of Materials
- Surface Water Run-off
- Waste Management
- Pollution
- Health and Wellbeing
- Management
- Ecology

The Code sets mandatory requirements at each level. To obtain Code for Sustainable Homes Level 4 certification, the following (as a minimum) must be adhered to;

- The assessed dwellings must achieve a 19% carbon reduction over Part L1A 2013.
- Achieve a maximum internal water consumption of 105 litres per person per day
- A total assessment score of 68 points.
- Responsible Sourcing of Materials: All site timber must be sourced from suppliers capable of proving that the timber is responsibly sourced in line with the UK Government's timber procurement policy
- Materials specification must be designed to ensure at least three key elements achieve a green guide rating of A+-D
- Surface Water Run-off – An engineer/hydrologist must be appointed to complete the SUR 1 checklist and a flood risk assessment in accordance with PPS25.
- Provisions for both internal and external waste and recycling must be provided.

2.1 Assessor Notes

This report is based on the information provided by the client and best practice/standard for Code for Sustainable Homes commitments.

2.2 Code Commitments

Energy

ENE 1 – Dwelling Emission Rates...10 Credits

As a full fabric and services specification is yet to be resolved it is difficult to determine how many credits will be achieved at this stage. However, the site is required to comply with Policy 5.2, Section 7 of The London Plan therefore a carbon reduction over ADL1A 2013 of ≥35% must be achieved.

Four Credits Anticipated

ENE 2 – Fabric Energy Efficiency..9 Credits

As a fabric specification is yet to be resolved it is difficult to determine how many credits will be achieved. An effort should be made to ensure the following FEEs are achieved:
Apartment Blocks & Mid-terraces - ≤43kWh/m^2/year
End/Semi-detached Terraces & Detached - ≤52kWh/m^2/year

Five Credits Anticipated

ENE 3 – Display Energy Device...2 Credits

Each dwelling will be provided with an energy display device capable of monitoring primary fuel consumption AND current electricity usage data. Early enquiries with power supply companies are recommended as a number of providers will fit these items for free at the first fix stage of the build.
The device must meet the following specification display requirements:

- Local time
- Current mains energy consumption (kW & kWhs)
- Current emissions
- Current tariff
- Current cost in real time
- Historic consumption
- Visual & numerical representation of data

Two Credits Anticipated

ENE 4 – Drying Space..1 Credit

Dedicated drying facilities will be provided to each dwelling. Drying lines can be located either internally or externally. The following criteria must be adhered to:

- Be a minimum length of 4m for all 1 & 2 bed dwellings
- Be a minimum length of 6m for 3+ bed dwellings

One Credit Anticipated.

ENE 5 – Energy Labelled White Goods...2 Credits

It has currently been assumed white goods will be provided to each dwelling upon completion. Where this is the case, the following must be provided:

- Fridge and freezer/fridge-freezer with an energy rating of A+
- Washing machines and dishwashers with an energy rating of A
  AND EITHER
- Washer dryers or tumble dryer with a B rating
  OR
- Where a washer dryer/tumble dryer are not provided, details on the EU labelling scheme Information Leaflet are provided to each dwelling.

Two Credits Anticipated.

ENE 6 – External Lighting..2 Credits

All external space and security lighting will be provided in accordance with the guidance set out in the Code technical guide.

External space lighting shall be provided by dedicated, energy efficient light bulbs.

Security Lighting – Burglar Security

- Have a maximum wattage of 50w
- Be fitted with movement detectors
- Be fitted with daylight cut-off sensors

Other Security Lighting

- Provided with energy efficient fittings
- Fitted with daylight cut-off sensors

Two Credits Anticipated

ENE 7 – Low or Zero Carbon Technologies...2 Credits

A services specification is yet to be determined, however it is highly likely renewable technologies will be provided to ensure the carbon off-set requirement as detailed in the London Plan is met. It is therefore reasonable to assume the specified technology will account for a 15% carbon reduction.

Two Credits Anticipated.

ENE 8 – Cycle Storage..2 Credits

Cycle storage will be provided for each dwelling. Based on the current recommendations made by MAE, the following provisions and credit allocations can be made:

No. of Bedrooms	No. of Cycle Provisions	No. of Credits
1 Bed	1	2
2 & 3 Bed	2	2
4 Bed	2	1

The cycle storage must meet the following size requirements:

- When cycles are stored on the floor, the storage size must be
  - 2m x 0.75m for 1 cycle
  - 2m x 1.5m for 2 cycles
  - 2m x 2.5m for 4 cycles
- When a proprietary storage /hanging system is provided, the system must allow for each cycle to be removed independently.
- When cycle storage is provided in a shed, a minimum of $1m^2$ must be left free for garden tools; also the shed must be set on concrete foundation and secure fixing needs to be provided.

Storage must meet the following criteria:

- Be protected from the weather (have a minimum of 3 sides and a roof
- Be provided with a secure ground anchor/fixing
- Have direct access to a public right of way

ENE 9 – Home Office...1 Credit

Provisions will be made for a home office. This room will satisfy the following specification;

- Achieve an average daylight factor of 1.5%.
- Have a 1.8m stretch of wall allowing the provision of a desk.
- Two double power sockets and a telephone point.
- The room will be large enough to continue to operate as its intended purpose.

Suitable Rooms:

- 1 & 2 bed dwelling – living room, dining room, one of the bedrooms or any other suitable area in the dwelling such as a large hall or dining room.
- 3+ bed dwelling – A room other than kitchen, living room, master bedroom or bathroom

One Credit Anticipated.

WATER

WAT 1 – Internal Water Consumption..5 Credits

It is mandatory that the dwelling achieves an internal water consumption no greater than 105 litres per person per day. The developer has confirmed this will be adhered to.

Three Credits Anticipated.

WAT 2 – Outdoor Water...1 Credit

Credits not sought. Water butts will not be supplied.

Zero Credits Anticipated

MATERIALS

MAT 1 – Environmental Impact of Materials..15 Credits

A full fabric specification is yet to be determined however the following Green Guide Ratings are advised.

Roof – C
External Walls – C
Internal Walls (including separating walls) – C
Ground Floor - B
Upper Floors (including separating floors) – B
Windows – A

Five Credits Anticipated

MAT 2 & 3 Responsible Sourcing of Materials..9 Credits

EMS and CoC's certificates will be obtained from all suppliers. A conservative score of **Six** has currently been assumed.

SURFACE WATER RUN OFF

SUR 1 – Management of Surface Water Run-off..2 Credits

The inclusion of a drainage design would be required for the development to achieve the mandatory SUR 1 requirement.

It has been assumed the mandatory element will be achieved,

Additional credits may be awarded where:

1. The run off from hard surfaces shall receive an appropriate level of treatment in accordance with the SUDs Manual to minimise the risk of pollution. Compliant SUDs techniques could include;
    - Soakaways
    - Permeable paving
    - Green/Brown roofs
    - Attenuation
    - Rainwater harvesting
2. Adequate measures are put in place to ensure there is no discharge from the developed site for rainfall depths of up to 5mm

One Credit Anticipated (Assumed point 1 will be met due to the incorporation of green roofs)

Additional credit to be reviewed by appropriate member of the design team.

See Appendix A, Code Checklists: Checklist SUR 1 for details on compliance requirements.

SUR 2 – Flood Risk Assessment...2 Credits

The site is located in zone 1 of the Environment Agency flood risk map; however a flood risk assessment must be undertaken to confirm the site as having a low flood risk from all sources in accordance with PPS25.

Two Credits Anticipated.

WASTE

WAS 1 – Storage of Waste..4 Credits

WAS 1 is a mandatory subsection of the Code. Plans must be produced to show there is sufficient space for the storage of LA waste bins. These bins must be accessible and satisfy the requirements of the Checklist IDP.

- The door must have a level threshold.
- The route must be level or gently sloping. **Steps are not allowed.**
- The route must be hard standing, i.e. paved or similar
- There must be a 1500mm turning circle in front of the bins.
- The bins must be placed on hard standing.
- The route must be less than 30m.

It has been confirmed that each dwelling will have dedicated and fixed recycling facilities in the form of three recycling bins within the dwelling.

Four Credits Anticipated.

See Appendix A, Code Checklists: Checklist IDP for details on compliance requirements.

WAS 2 – Site Waste Management...3 Credits

A SWMP will be implemented. This will adhere to the principles of the Waste Hierarchy, and an effort will be made to ensure a minimum of 85% of all non-hazardous site waste is diverted from landfill.

Three Credits Anticipated.
See Appendix A, Code Checklists: Checklist WAS 2 for details on compliance requirements.

WAS 3 – Composting...1 Credit

Credits not sought

POLUTION

POL 1 – GWP of Insulants...1 Credit

A commitment has been made to ensure all insulating materials used will have a confirmed GWP of less than 5.

One Credit Anticipated.

POL 2 – NOx Emissions...3 Credits

The client has made a commitment to install a gas boiler with confirmed NOx emissions of 40mg/kWh or less. Where CHP is proposed, calculations will be carried out by the assessor based on a proposed CHP unit, it is reasonable to assume (based on similar projects) the NOx emissions relating to the CHP heating will be less than 40mg/kWh.

Three Credits anticipated.

HEALTH & WELLBEING

HEA 1 – Daylighting...3 Credits

Detailed calculations have been carried out to determine the average daylight factor associated with the living room, dining room and study. These confirm that each room will achieve the following minimum standard:
Kitchen – 2%
Living Room – 1.5%
Dining room – 1.5%
Study – 1.5%

Two credits Anticipated.

HEA 2 – Sound Insulation..4 Credits
An effort will be made to ensure adequate acoustic insulation is provided to ensure pre-completion sound testing achieves a 5dB betterment over Approved Document Part F.

Three Credits Anticipated

HEA 3 – Private Space...1 Credit
Sufficient and accessible private space will be provided to each dwelling. This will be either private or communal space and will be a minimum size of 1.5m^2 per bed space. Accessibility will be design to be in accordance with the Checklist IDP *(See Appendix A, Code Checklists: Checklist IDP for details on compliance requirements)*

One Credit Anticipated.

HEA 4 – Lifetime Homes..4 Credits
A commitment should be made to design and build each dwelling in accordance with Lifetime Homes, and meet all 16 criteria set out in the lifetime homes checklist.

Four credits Anticipated.
See Appendix A, Code Checklists: Checklist HEA 4 for details on compliance requirements.

MANAGEMENT

MAN 1 – Home User Guide..3 Credits

A home user guide will be provided upon completion. This will be compliant with Checklist Man 1a & 1b.

Three Credits Anticipated.

See Appendix A, Code Checklists: Checklist MAN 1 for details on compliance requirements.

MAN 2 – Considerate Constructors Scheme..2 Credits

The site will be registered with the Considerate Contractors Scheme, and a commitment will be made to go significantly beyond best practice. This will require a minimum score of 35, scoring 7 in each section.

Two credits Anticipated.

MAN 3 – Construction Site Impacts...2 Credits

The contractor will make a commitment to monitor the following for site wide activities:

- Monitor energy consumption on site – take regular electricity meter readings
- Monitor water consumption on site – take regular water meter readings.
- Adopt best practice with respect to air pollution.
- Adopt best practice with respect to water pollution.

Two Credits Anticipated.

See Appendix A, Code Checklists: Checklist MAN 3 for details on compliance requirements.

MAN 4 – Security...2 Credits

An Architectural Liaison Officer (ALO) or someone similar shall be consulted with, and their recommendations will be acted upon to ensure Section 2 of Secured by Design will be achieved.

Two credits Anticipated

ECOLOGY

ECO 1-4 – Ecological Value of the Site...7 Credits

An ecological assessment will be carried out. Initial inspection of the site shows it to be of low ecological value therefore the following credits breakdown has been assumed (an ecologist MUST be appointed to confirm the below):

ECO 1 – It has currently been assumed each development site will be of low ecological value (to be confirmed by ecologist). **One Credit Anticipated**

ECO 2 – An ecologist will be appointed to provide both key and additional recommendations as to how the site can be enhanced. The developer will ensure all key recommendations and 30% of the additional recommendations are incorporated into the design. **One Credit Anticipated**

ECO 3 – The site has currently been assumed to be of low ecological value (to be confirmed by ecologist). Where this is not the case, the developer must work with the ecologist to ensure the preservation of any species of ecological merit. **One Credit Anticipated**

ECO 4 – The ecologist will provide a planting schedule which confirms a minor ecological enhancement (>3 and <9) is achieved post construction. **Three Credits Anticipated**

Six Credits Anticipated.
See Appendix A, Code Checklists: ECO – Summary Report Template for details on compliance requirements.

ECO 5 – Building Footprint..2 Credits

Initial calculations based on the floor areas provided confirm the following floor area ratios will be achieved:

St Beads – 3.57:1 **(One Credit Anticipated)**
Cape of Good Hope – 6.4:1 **(Two Credits Anticipated)**
The Victory Pub – 4.69:1 **(Two Credits Anticipated)**
Newlands – 5.54:1 **(Two Credits Anticipated)**
Rydal – 6.64:1 **(Two Credits Anticipated)**

2.3 Summary Score

The tables below details the point scores thought achievable for this development.

			St Beads	Regents Park - 1 - 3 Bed Dellings	Regents Park - 4+ Bed Dellings
CATEGORY	ISSUE ID	ISSUE	TARGET CREDITS	TARGET CREDITS	TARGET CREDITS
Energy & CO2 Emissions	ENE1*	Dwelling Emission Rate	4.2	4.2	4.2
	ENE2	Fabric Energy Efficiency	5.0	5.0	5.0
	ENE3	Energy Display Devices	2	2	2
	ENE4	Drying Space	1	1	1
	ENE5	Energy Labelled White Goods	2	2	2
	ENE6	External Lighting	2	2	2
	ENE7	LZC Technologies	2	2	2
	ENE8	Cycle Storage	2	2	1
	ENE9	Home Office	1	1	1
		Section Total	21	21	20
WATER	WAT 1*	Indoor Water Use	3	3	3
	WAT 2	External Water Use	0	0	0
		Section Total	3	3	3
MATERIALS	MAT 1*	Environmental Impact of Materials	5	5	5
	MAT 2	Responsible Sourcing of Materials Basic Building Elements	4	4	4
	MAT 3	Responsible Sourcing of Materials Finishing Elements	2	2	2
		Section Total	11	11	11
SURFACE WATER	SUR 1*	Surface Water Runoff from Developments	1	1	1
	SUR 2	Flood Risk	2	2	2
		Section Total	3	3	3
WASTE	WAS1*	Storage of Non-recyclable Waste and Recyclable Household Waste	4	4	4
	WAS2*	Construction Site Waste Management	3	3	3
	WAS3	Composting	0	0	0
		Section Total	7	7	7
POLLUTION	POL 1	GWP of Insulants	1	1	1
	POL 2	NOx Emissions	3	3	3
		Section Total	4	4	4
HEALTH & WELLBEING	HEA 1	Daylighting	2	2	2
	HEA 2	Sound Insulation	3	3	3
	HEA 3	Private Space	1	1	1
	HEA 4*	Lifetime Homes	4	4	4
		Section Total	10	10	10
MANAGEMENT	MAN 1	Home User Guide	3	3	3
	MAN 2	Considerate Constructors Scheme	2	2	2
	MAN 3	Construction Site Impacts	2	2	2
	MAN 4	Security	2	2	2
		Section Total	9	9	9
ECOLOGY	ECO 1	Ecological Value of Site	1	1	1
	ECO 2	Ecological Enhancement	1	1	1
	ECO 3	Protection of Ecological Features	1	1	1
	ECO 4	Change in Ecological Value of Site	3	3	3
	ECO 5	Building Footprint	1	2	2
		Section Total	7	8	8
		Total Score	75.2	76.2	75.2
		Total Points	73.74	75.08	73.90
			LEVEL 4	LEVEL 4	LEVEL 4

2.4 Notes

The estimated point scores achieved all equate to a Code Level 4. This score is based on realistic recommendations made in each section, which you must review to ensure achievement for a final Code assessment.

Mandatory

Note that the following commitments are mandatory and therefore crucial to the current assessment:

- ***ENE 1 – Dwelling Emission Rates***
- ***ENE 2 – Fabric Energy Efficiency***
- ***WAT 1 – Internal Water Consumption***
- ***MAT 1 – Environmental Impact of Materials***
- ***SUR 1 – Management of Surface Water Run-off - Flood Risk Assessment***
- ***WAS 1 – Storage of Waste***

Third Party Assumptions

There are a number of sections were assumptions have been made dependent on third parties, please see list below.

- **SUR 2 –** Flood Risk Assessment – It is a mandatory requirement to have a FRA

- **Eco -** We would recommend the appointment of a suitably qualified ecologist to achieve the ecology estimated points.

APPENDIX F - BREEAM DOMESTIC REFURBISHMENT PRE-ASSESSMENT

BREEAM UK

BREEAM UK Domestic Refurbishment 2014 Pre-Assessment Estimator v0.1

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

Building name	Regents Park Estate
Indicative building score (%)	71.53%
Indicative BREEAM rating	BREEAM Excellent

Minimum Standards	Pass	Good	Very Good	Excellent	Outstanding
Ene 02	✓	✓	✓	✓	✗
Wat 01	✓	✓	✓	✓	✗
Hea 05	✓	✓	✓	✓	✓
Hea 06	✓	✓	✓	✓	✓
Pol 03	✓	✓	✓	✓	✓
Mat 02	✓	✓	✓	✓	✓

Management | Health & Wellbeing | Energy | Water | Materials | Waste | Pollution

INNOVATION — Section Weighting: 10% — Indicative Section Score: 2.00%

Comments

MANAGEMENT — Section Weighting: 12% — Indicative Section Score: 10.91%

Man 01 Home Users Guide

No. of BREEAM credits available	3	Available contribution to overall score	3.27%
No. of BREEAM innovation credits	0	Minimum Standards applicable:	No

Assessment Criteria

Where a Home Users Guide be provided to all dwellings, covering all issues set out in the 'Users Guide Contents list', three credits may be awarded

Indicative Credits: 3

Comments

Man 02 Responsible Construction Practices

No. of BREEAM credits available	2	Available contribution to overall score:	2.18%
No. of BREEAM innovation credits	1	Minimum Standards	No

Assessment Criteria

Where a compliant considerate construction scheme will be used, credits are awarded depending the score achieved as outlined below:

Indicative Credits: 2

Large Scale - project with more than 5 units

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 25-34 with a score of 5 in each section	Score of 35-39 with a score of 7 in each section
Alternative Compliant Scheme	Compliance	Beyond Compliance

Small Scale - project with 5 units or fewer

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 25-34 with a score of 5 in each section	Score of 35-39 with a score of 7 in each section
Alternative Compliant Scheme	Compliance	Beyond Compliance
Checklist A-3	50% of the optional items	80% of the optional items

Exemplary Credit

Considerate Constructors Scheme	Score of 40 or more with a score of 7 in each section
Alternative Compliant Scheme	Exemplary Level Compliance
Checklist A-3*	All Items (Optional & Mandatory)

* Small Scale Project Only

Indicative Innovation Credits Achieved: Please Select

Comments

This project will be assessed as a large scale project (more than 6 dwellings with a project duration in excess of 6 weeks). The site will be registered with the CCS prior to the comencment of works on site. A score of significantly beyond best practice will be made (score of 7 in each sections (minimum scor of 35)).

Man 03 Construction Site Impacts

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where evidence demonstrate that site impacts will be monitored, as detailed below:

Indicative Credits: 1

	One Credit
Large Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-4** are completed
Small Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-5** are completed

Sections of Checklist

Large Scale - Checklist A-4	Small Scale - Checklist A-5
Monitor, report and set targets for CO2 production of energy use arising from site activities	Set objectives for reducing CO2 production from energy use arising from site activities
Monitor, report and set targets for water consumption arising from site activities	Set objectives for reducing water use arising from site activities
A main contractor with an environmental materials policy	Main contractor environmental materials statement
A main contractor that operates an Environmental Management System	80% of site timber is reclaimed, re-used or responsibly sourced
80% of site timber is reclaimed, re-used or responsibly sourced	

Same definition of small and large scale as in Man 02

Comments

2 or more of the sections in checklist A4 will be monitored/carried out

Man 04 Security

No. of BREEAM credits available	2	Available contribution to overall score:	2.18%
No. of BREEAM innovation credits	0	Minimum Standards applicable:	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 2

One Credit Secure windows and doors	External doors and accessible windows meet minimum standards and appropriately certified

Two Credits Secured by design	Principles and guidance of Secured by Design Section 2 are complied with
	A suitably qualified security consultant is consulted at the design stage and their recommendations are incorporated into the refurbishment

Comments

All new windows and doors will meet the following security standards; Ext Doors - PAS24:2007 OR LPS1175 Issue 7 security rating1, Windows - BS7950:1997 (36)
A comitment to achieve secured by design section 2 will also be made.

Man 05 Protection and Enhancement of Ecological Features

No. of BREEAM credits available	1	**Available contribution to overall score:**	1.09%
No. of BREEAM innovation credits	1	**Minimum Standards applicable:**	No

Assessment Criteria
Where the following requirements will be met:

Indicative Credits: 1

One Credit Protecting Ecological Features	Site survey carried out to determine presence of ecological features
	Statutory Nature Conservation Organisation notified of protected species
	Features of ecological value protected during refurbishment works

Indicative Innovation Credits Achieved: Please Select

Exemplary Credit **Ecological enhancement**	A suitably qualified ecologist recommends features to enhance ecology of the site
	adopts all general ecological recommendations
	adopts 30% of additional recommendations

Comments

A suitably qualified ecologist will be apointed to carry out an ecological survey

Man 06 Project Management

No. of BREEAM credits available	2	**Available contribution to overall score**	2.18%
No. of BREEAM innovation credits	2	**Minimum Standards applicable**	No

Assessment Criteria
Where the following requirements will be met:

Indicative Credits: 1

One Credit Project Roles and Responsibilities	Where all of the project team are involved in the project decision making
	Small Scale - the project manager assigns individual and shared responsibilities amongst the project team including all trades on site
	Large Scale - the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages: i. Planning and Building control notification ii. Design iii. Refurbishment iv. Commissioning and handover v. Occupation

Small Scale projects: five units or fewer and less than £100k

Large Scale projects: more than five units and more than £100k

One Credit Handover and Aftercare	Handover meeting arranged
	2 or more of the following committed to: - A site inspection within 3 months of occupation - Conduct post occupancy interviews with building occupants or a survey via phone or posted information within 3 months of occupation - Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

Indicative Innovation Credits Achieved: 1

Exemplary Credits

One Exemplary Credit Early Design Input	Where A BREEAM Accredited Professional has been appointed to oversee key stages within the project. OR Where a BREEAM Domestic Refurbishment Assessor has been appointed at an early stage of the project, prior to the production of a refurbishment specification
One Exemplary Credit Thermographic Surveying and Airtightness Testing	Where Thermographic surveying and Airtightness testing have been carried out at both pre and post refurbishment stages Where an improved air tightness target has been set at design stage and testing demonstrates that this has been achieved post refurbishment

Comments

The project manager will assign individual and shared responsibilites across the following key design and refurbishment stages:
Planning and building, design, refurbishment, commissioning andhandover, occupation.
An innovative credit can be awarded as a BDR assessor has been apointed at an early stage to offewr advice and recomendations.

HEALTH & WELLBEING | **Section Weighting: 17%** | **Indicative Section Score 8.50%**

Hea 01 Daylighting

No. of BREEAM credits available	2	**Available contribution to overall score**	2.83%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria
Where the refurbishment results in a neutral impact on daylighting or where minimum daylighting standards are met, up to two credits may be awarded as follows:

Indicative Credits: Please Select

For Existing Dwellings and Change of Use Projects

First Credit Maintaining Good Daylighting	The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study

Where the property is being extended

First Credit Maintaining Good Daylighting	New spaces achieve minimum daylighting levels
	The extension does not significantly reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties

For All Properties

Second Credit Minimum Daylighting	The dwelling achieves minimum daylighting levels in the kitchen, living room, dining room and study

Comments

Insufficient information available at this stage to determine the effect on the daylighting levels in the kitchen, livingroom, dining room and study.

Hea 02 Sound Insulation

No. of BREEAM credits available	4	**Available contribution to overall score**	5.67%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria

To ensure the provision of acceptable sound insulation standards and so minimise the likelihood of noise complaints.

Indicative Credits: 3

Properties where sound testing has been carried out:

Up to Four Credits	Four credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual

Properties where sound testing is not feasible and not required by the appointed Building Control body

Two Credits	Where existing separating walls and floors are designed to meet the requirements of Building Regulations with compliant construction details
Up to Four Credits	Where a Suitably Qualified Acoustician (SQA) provides recommendations for the specification of all existing separating walls and floors
	SQA confirms in their professional opinion that they have the potential to meet or exceed the sound insulation credit requirements
	Where these recommendations are implemented
	See table in additional information in Technical Manual

Historic Buildings

Up to Four Credits	Where the dwelling is a Historic Building and sound testing results demonstrate existing separating walls and floor meet the Historic Building credit requirements
	See table in additional information in Technical Manual
	Where sound testing is not feasible and not required by the appointed Building Control body meeting criteria 2 and 3 using Table 12
	Properties where sound testing has been carried out, credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual
	Where the dwelling is a detached property
	Where the dwelling is a propertywith separating walls or floors only between non habitable rooms OR Testing not required by building control body

Detached Properties

Four Credits	By Default

Properties with separating walls or floors only between non habitable rooms OR Testing not required by building control body

Four Credits	By Default

Comments

Addequate upgrades will be carried out to the existing partyy walls and fllors to ensure pre-completion acoustic testing confirms a 3dB betterment over ADE.

Hea 03 Volatile Organic Compounds

No. of BREEAM credits available	1	**Available contribution to overall score**	1.42%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria

Where the refurbishment avoids the use of VOCs with new products meeting the following requirements:

Indicative Credits: Please Select

One Credit Avoiding the use of VOCs	Where all decorative paints and varnishes used in the refurbishment have met the requirement listed in table 5.4 in the Technical Manual
	Where at least five of the eight remaining product categories listed in table 5.4 have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within table 5.4 in the Technical Manual
	Where five or less products are specified within the refurbishment, all must meet the requirements in order to achieve this credit.

Comments

Hea 04 Inclusive Design

No. of BREEAM credits available	2	**Available contribution to overall score**	2.83%
No. of BREEAM innovation credits	1	**Minimum Standards applicable**	No

Assessment Criteria

Where an access statement has been carried out using Checklist A-8 of the Technical Manual to optimise the accessibility of the home as follows:

Indicative Credits: Please Select

	Checklist A-8 of the Technical Manual	
	Section 1	**Section 2**
One Credit Minimum Accessibility	Completed with Evidence	
Two Credits Advanced Accessibility	Completed with Evidence	Completed with Evidence

Exemplary Performance

One Credit	Where an access expert suitably qualified member of the design team has completed sections 1, 2 and 3 of Checklist A-8, access statement template with evidence provided of the measures implemented in the refurbishment

Indicative Innovation Credits Achieved: Please Select

Comments

Insufficient info available at this stage to confirm if this credit is achievable.

Hea 05 Ventilation

No. of BREEAM credits available	2	**Available contribution to overall score**	2.83%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	Yes

Assessment Criteria

Where the dwelling meets the following ventilation requirements:

Indicative Credits: 2

One Credit Minimum Ventilation Requirements	A minimum level of background ventilation is provided (with trickle ventilators or other means of ventilation) for all habitable rooms, kitchens, utility rooms and bathrooms compliant with section 7, Building Regulations Approved Document Part F, 2010
	A minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5, Building Regulations Approved Document Part F 2010.
	A minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7, Building Regulations Approved Document Part F, 2010.
	It is an historic building and meets historic building requirements in CN4 of the technical manual
Two Credits Advanced Requirements	Ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full
	Where the building is a historic building and meets the requirements for Historic Buildings in compliance note 4 of the technical manual

Comments

It is a minimum standard for one credit to be achieved - Section 5 and 7 of part F to be complied with. Additional credit acchieved and targeted for complying with section 5 in full.

Hea 06 Safety

No. of BREEAM credits available	1	**Available contribution to overall score**	1.42%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	Yes

Assessment Criteria

Where a fire and carbon monoxide (CO) detection and alarm system is specified as follows:

Indicative Credits: 1

One Credit Fire and Carbon Monoxide (CO) Detection and Alarm Systems	Where a compliant fire detection and fire alarm system is provided
	Carbon Monoxide detector installed if dwelling is supplied with mains gas or other fossil fuel
	Mains supplied fire detection and alarm system if project involves re-wiring*
	Battery operated fire detection and alarm system if no re-wiring* is to take place

*** see CN9 in Hea 06 for the definition of re-wiring**

Comments

MANDATORY REQUIREMENT - Compliant smoke and fire alarm to be installed in accordance with part B. mut be wired to mains electricity.

ENERGY | **Section Weighting: 43%** | **Indicative Section Score 29.66%**

Ene 01 Improvement in Energy Efficiency Rating

No. of BREEAM credits available	6	**Available contribution to overall score**	8.90%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria

Where the following targets are met for the improvement in Energy Efficiency Rating achieved as a result of refurbishment:

Indicative Credits: 3

Improvement in EER	Credits
≥ 5	0.5
≥ 9	1
≥ 13	1.5
≥ 17	2
≥ 21	2.5
≥ 26	3
≥ 31	3.5
≥ 36	4
≥ 42	4.5
≥ 48	5
≥ 54	5.5
≥ 60	6

Comments

A score of 3 should be targeted. This will require a comparison between pre development and post development SAPs showing a EER improvement of >26.

Ene 02 Energy Efficiency Rating Post Refurbishment

No. of BREEAM credits available	4	**Available contribution to overall score**	5.93%
No. of BREEAM innovation credits	2	**Minimum Standards applicable**	Yes

Assessment Criteria

Where the following Energy Efficiency Rating benchmarks will be met as a result of refurbishment:

Indicative Credits: 2.5

EER post refurbishment	Credits	Minimum requirements
≥50	0.5	'Pass' level EER of 50
≥55	1	'Good' level EER of 58
≥60	1.5	
≥65	2	'Very Good level' EER of 65
≥70	2.5	'Excellent' level EER of 70
≥75	3	
≥80	3.5	'Outstanding' level EER of 81
≥85	4	

Exemplary	Credits
≥90	1
≥100	2

Indicative Innovation Credits Achieved: Please Select

Comments

A minimum EER of 70 MUST be achieved for Excellence. This has been assumed as a worst case.

Ene 03 Primary energy demand

No. of BREEAM credits available	7	Available contribution to overall score	10.38%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following Primary Energy Demand benchmarks will be met as a result of refurbishment:

Indicative Credits: 5.5

Primary Energy Demand Post Refurbishment	Credits
≤ 400	0.5
≤ 370	1
≤ 340	1.5
≤ 320	2
≤ 300	2.5
≤ 280	3
≤ 260	3.5
≤ 240	4
≤ 220	4.5
≤ 200	5
≤ 180	5.5
≤ 160	6
≤ 140	6.5
≤ 120	7

Comments

Based on previous similar project, it is reasonable to assume a PED of <180 will be achieved.

Ene 04 Renewable Technologies

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the dwelling will meet the following % contribution from renewables and primary energy demand targets as a result of refurbishment

Indicative Credits: 1

Dwelling Type	Primary Energy Demand	Percentage from Renewables	
		1 Credit	2 Credits
Detached	≤ 250 kWh/m^2/year	≥10%	≥20%
Semi-Detached		≥10%	≥20%
Bungalow		≥10%	≥20%
End of Terrace		≥10%	≥20%
Mid Terrace	≤ 220 kWh/m^2/year	≥10%	≥20%
Low Rise Flat		≥10%	≥20%
Mid Rise Flat		≥10%	≥15%
High Rise Flat		≥10%	≥15%

Comments

Renewables are likely to be proposed, an effort should be made to have a suitable sizing which will:
Provide 10% of the sites energy requirement
The dwellings enhanced specification (prior to inclusion of renewables) has reduced PED to <220

Ene 05 Energy Labelled White Goods

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where Energy Efficiency White goods are to be provided as follows:

Indicative Credits: 2

First Credit

Appliance	Appliance provided	Appliance not to be provided
Fridges, Freezers and Fridge-Freezers	A+ Rating under EU Energy Efficiency Labelling Scheme	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Second Credit

Appliance	Appliance provided	Appliance not to be provided
Washing Machines and Dishwashers	Washing Machine A++ under EU Energy Efficiency Labelling Scheme AND Dishwasher A+ uner EU Energy Efficiency Labelling Scheme	Second credit not achieved
Washer-Dryers and Tumble Dryers	Appliances specified with A Rating under EU Energy Efficiency Labelling Scheme	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Comments

Energy labelled white goods will be provided to each dwelling

Ene 06 Drying Space

No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where adequate, secure internal or external space with posts and footings or fixings is provided with the following:

Indicative Credits: 1

1 Credit

Number of bedrooms	Drying line required
1-2	4m+
3+	6m+

Comments

Internal drying lines will be provided to each dwelling meeting the above length requirements.

Ene 07 Lighting

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where energy efficient internal and external lighting is provided as follows:

Indicative Credits: 2

External Lighting - 1

Energy Efficient Space Lighting of more than 45 lumens per circuit watt and Energy Efficient Security Lighting OR
Where Energy Efficient Space Lighting is provided ONLY

Internal Lighting - 1

Maximum average wattage across the total floor area of the dwelling of 9 watts/m2

Comments

Energy eficient space and security lighting will be supplied (security lighting to be adequately controled (PIR). In addition to this, each flat with have an averag wattage of 9W/sqm.

Ene 08 Display Energy Devices

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where consumption data is displayed to occupants by a compliant energy display device

Indicative Credits: 2

Electricity usage data displayed	Primary Heating Fuel: Electricity	Primary Heating Fuel: Other
Electricity usage data displayed	2 credits awarded	1 credit awarded
Primary Heating Fuel usage data displayed	N/A	1 credit awarded
Electricity & Primary Heating Fuel usage displayed	N/A	2 credits awarded

Exemplary Credits

One credit Recording consumption data	Where the first two credits are achieved Where any compliant Energy Display Device is capable of recording consumption data

Indicative Innovation Credits Achieved: 1

Comments

Energy display devices will be provided capable of monitor and recording consumption data of gas and electricity.

Ene 09 Cycle Storage

No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where individual or communal compliant cycle storage is provided as follows:

Indicative Credits: Please Select

Dwelling Size	One Credit	Two Credits
Studios/ 1 bedroom	1 per two dwellings	1 per dwelling
2-3 bedrooms	1 per dwelling	2 per dwelling
4 bedrooms	2 per dwelling	4 per dwelling

Comments

Insufficient evidence available at this stage

Ene 10 Home Office

No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where sufficient space and services will be provided to allow occupants to set up a home office in a suitable room with adequate ventilation

Indicative Credits: 1

Comments

Each dwelling will be provided with a home office. Each area dedicated as home office will be able to accommodate a 1.8m long desk with two doublw power sockets and two telephone points.

WATER — Section Weighting: 11% — Indicative Section Score 8.80%

Wat 01 Internal Water Use

No. of BREEAM credits available	3	Available contribution to overall score	6.60%
No. of BREEAM innovation credits	1	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwellings water consumption meets the following consumption benchmarks, or where terminal fittings meet the following water consumption standards:

Indicative Credits: 2

Calculated Water Consumption (litres/person/day)	Equivalent terminal fitting standards	Minimum Standard	Credits
>150	Typical baseline performance	N/A	0
from 140 to ≤ 150	All showers specified to 'Good' **OR** All taps and WC's to 'Good' **OR** Kitchen fittings specified to 'Excellent'	N/A	0.5
from 129 to < 140	All showers specified to 'Excellent' **OR** All showers and bathroom taps to 'Good'	BREEAM Very Good	1
from 118 to < 129	All bathroom and WC room fittings specified to 'Good' **OR** All bathroom fittings specified to 'Excellent'	N/A	1.5
from 107 to < 118	All Bathroom and WC room fittings specified to 'Excellent' **OR** All Bathroom fittings Specified to 'Excellent' and WC room fitting specified to 'Good' **OR** All Bathroom fittings, kitchen and utility sittings specified to 'Good'	BREEAM Excellent	2
from 96 to < 107	All kitchen, bathroom, utility room and WC room fittings specified to 'Good' **OR** All bathrooms, kitchens and utility rooms specified to 'Excellent'	N/A	2.5
< 96	All bathroom fittings specified to 'Excellent' and WC room, kitchen and utility room fittings specified to 'Good'	BREEAM Outstanding	3

NOTE: 'Good' fittings are equivalent to good practice fittings with "Excellent" fittings equivalent to best practice fittings (see the technical manual for full details.

Exemplary Credit	If the water consumption is less than 80l/person/day

Indicative Innovation Credits Achieved: Please Select

Comments

It is a minimum requirement that an internal water consumption of no greater than 107-118 be achieved.

Wat 02 External Water Use

No. of BREEAM credits available	1	Available contribution to overall score	2.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits: 1

Requirements:

Where a compliant rainwater collection system for external/internal irrigation use has

One Credit	been provided to dwellings. **OR** Where dwellings have no individual or communal garden space.

Comments

Where no individual garden space or only terraces have been provided, this credit is awarded by default.

Wat 03 Water Meter

No. of BREEAM credits available	1	**Available contribution to overall score**	2.20%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria

Where an appropriate water meter for measuring usage of mains potable water meter has been provided to dwelling(s), one credit may be awarded

Indicative Credits: 1

Comments

Each flat will be provided with a water meter

MATERIALS — **Section Weighting: 8%** — **Indicative Section Score 4.17%**

Mat 01 Environmental Impact of Materials

No. of BREEAM credits available	25	**Available contribution to overall score**	4.16%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria

Up to 25 credits can be awarded, with credits calculated using the Mat 01 calculator tool. The table below shows the maximum number of credits available for each element:

Indicative Credits: 12

Elements	Green Guide Rating credits available	Thermal performance credits
Roof	5	3
External walls	5	3.8
Internal walls (including separating walls)	5	-
Upper and Ground Floor	5	1.2
Windows	5	2

The full 25 credits represents all of the elements containing refurbished or existing materials that meet the Green Guide Rating of A+(6)

GG Rating	Points for existing / refurbished elements	Points for new elements
A+ (6)	5	
A+ (5)	4.6	
A+ (4)	4.2	
A+ (3)	3.8	
A+ (2)	3.4	
A+	3	3
A	2	2
B	1	1
C	0.5	0.5
D	0.25	0.25
E	0	0

Where the full 25 credits cannot be achieved the score can be 'topped up' with thermal performance credits. The full number of thermal performance credits for each element can be achieved when achieving the minimum U-values shown below.

Elements	Minimum U-Value
Roof	0.11
External walls	0.15
Internal walls (including separating walls)	-
Upper and Ground Floor	0.15
Windows	1.4

Comments

A conservative scor of 12 has been targeted. This should be achievable as the majority of the existing strucure will remain.

Mat 02 Responsible Sourcing of Materials

No. of BREEAM credits available	15	**Available contribution to overall score**	2.50%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	Yes

Assessment Criteria

Where new materials are responsibly sourced, up to 12 credits may be awarded where 80% of new materials for an element are responsibly sourced. The credits achieved are dependent on % of point achieved which is based upon the responsible sourcing tier level of each material sourced as detailed below:

Indicative Credits: 5

Sustainable Procument Plan (3 BREEAM credits)
The principal contractor sources materials for the project in accordance with a documented sustainable procurement plan
OR Where the principal contractor is a Small Company (up to 3 BREEAM credits)
Checklist A-9 is filled in with supporting evidence

Will all new timber used in the project be sourced in accordance with the UK Government's Timber Procurement — Yes

Table 1

BREEAM credits	% of available points achieved
12	≥54%
10	≥45%
8	≥36%
6	≥ 27%
4	≥ 18%
2	≥ 9%

Comments

The timber procurement policy is a minimum standard. In addition to this, the developer/contractor must source materials from suppliers capable of provided CoC/EMS certificates.

Mat 03 Insulation

No. of BREEAM credits available	8	**Available contribution to overall score**	1.33%
No. of BREEAM innovation credits	0	**Minimum Standards applicable**	No

Assessment Criteria

Where any new insulation specified for use within external walls, ground floor, roof and buildings services meet the following requirements:

Indicative Credits: 8

Requirements

4 Credits	Where the Insulation Index for new insulation used in the buildings is ≥2 Where Green Guide ratings are determined using the Green Guide to specification tool

Requirements

4 Credits	Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced.

Comments

All insulating materials should comply with this section. To be speced with guidance from the assessor.

WASTE	Section Weighting: 3%	Indicative Section Score 3.00%

Was 01 Household Waste

No. of BREEAM credits available	2	Available contribution to overall score	1.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where compliant recycling and composting facilities are provided, up to two credits may be awarded as follows

Indicative Credits
2

First Credit - Recycling Facilities

Scenario	Internal recycling storage requirements
Compliant collection scheme in place	3 internal recycling containers provided where recycling is not sorted post collection
	1 internal recycling container provided where recycling is sorted post collection
	Minimum 30 litre total capacity, no single container less than 7 litre capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place No adequate external storage	3 internal recycling containers provided
	Minimum 60 litre total capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place Adequate external storage provided	3 internal recycling containers provided
	Minimum 30 litre total capacity, no single container smaller than 7 litre
	Dedicated position in accordance with compliance note 1

Second credit - Composting facilities

With external space	Without external space
Where a composting service or facility is provided for green/garden waste	Where a composting service or facility is provided for kitchen waste
Where a composting service or facility is provided for kitchen waste	Where an interior container is provided for kitchen composting waste of at least 7 litres
Where an interior container is provided for kitchen composting waste of at least 7 litres	

Comments

Each flat will be provided with 3x 10litre bins fixed to the inside of a kitchen cupboard. Camden County Council also opperate a kitchen waste recycling service, therefore an additional 7litre compost waste bin will be provided.

Was 02 Refurbishment Site Waste Management

No. of BREEAM credits available	3	Available contribution to overall score	1.80%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Up to three credits are available depending on the site waste management plan to be implemented as follows

Indicative Credits
3

Indicative Innovation Credits Achieved
Please Select

Projects up to £100k

Three Credits	Where waste generated through the refurbishment process is managed in accordance with Checklist A-9
Exemplary Credit	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place

Projects up to £300k

Three Credits	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place
Exemplary Credit	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	The percentage of non-hazardous construction waste and demolition waste generated by the project has been diverted from landfill and meets or exceeds the refurbishment & demolition waste diversion benchmarks

Projects over £300k

First Credit Management Plan	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
Second Credit Good Practice Waste Benchmarks	First credit achieved
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	Amount of waste generated against £100,000 of project value is recorded in the SWMP
	Pre-refurbishment audit of the existing building is completed
	If demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials
Third Credit Best Practice Waste Benchmarks	Where the first two credits have been achieved achieved
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the refurbishment & demolition waste diversion benchmarks
Exemplary Credit	Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the *exemplary level resource efficiency benchmark*
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the exemplary level diversion benchmarks

Comments

All three section detailed under >300k SWMP will be implementd. It has not been assumed (at this stage) that the exemplary credit will be achieved.

POLLUTION	Section Weighting: 6%	Indicative Section Score 4.50%

Pol 01 NOx Emissions

No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Credits are awarded on the basis of NOx emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows:

Indicative Credits: 3

	Dry NOx Emissions
One Credit	≤100 mg/kWh (NOx class 4 boiler)
Two Credits	≤70 mg/kWh (NOx class 5 boiler)
Three Credits	≤40 mg/kWh

Comments

Each dwelling will be provided with a boiler with a confirmed Nox rating of less than 40mg/kWh

Pol 02 Surface Water Runoff

No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where impacts of the refurbishment on surface water runoff are neutralised or where runoff is reduced as a result of refurbishment, up to three credits can be awarded as follows:

Indicative Credits: 1

	Requirements
One Credit Neutral Impact on Surface Water	New hard standing areas must be permeable
	If building on to previously permeable area additional run-off must be managed on site
	Calculations should be carried out by an appropriately qualified professional

	Requirements
OR Second Credits Reducing Run-Off From Site: Basic	Where the criteria needed for One Credit has been achieved
	Where all run-off from the roof for rainfall depths up to 5 mm, have been managed on site using source control methods
	Include runoff from all existing and new parts of the roof.
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site

	Requirements
OR Three Credits Reducing Run-Off From Site: Advanced	Where run-off as a result of the refurbishment is managed on site using source control
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.
	The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

	Requirements
Exemplary Credit	Where all run-off from the developed site is managed on site using source control
	The peak rate of run-off as a result of the refurbishment for the 1 in 1 year event is reduced to zero.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event is reduced to zero.
	There is no volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Indicative Innovation Credits Achieved: Please Select

Comments

A neutral impact on the surface water run-off will be achieved. It may be possible to reduce the surface water run-off through SUDs techniques, however this will be reviewed at a later stage.

Pol 03 Flooding

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

Assessment Criteria

Where the dwelling is located in a low flood risk zone, or where in a medium to high flood risk zone and a flood resilience/resistance strategy has been implemented, up to two credits can be awarded as follows:

Indicative Credits: 2

Minimum Standards	A minimum of two credits must be achieved for this issue at the Excellent and Outstanding levels

Option 1 - Low Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding.

Option 2 - Medium / High Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a medium or high annual probability of flooding.
	Two credits are awarded where as a result of the dwellings floor level or measures to keep water away the dwelling is defined as achieving avoidance from flooding by following Checklist A-10; Decision Strategy Flow Chart.
	Where avoidance is not possible, two credits are achieved where a full flood resilience/resistance strategy is implemented for the dwellings in accordance with recommendations made by a Suitably Qualified Building Professional

Comments

Initial inspection of the site on Environment agency FRA map shows it to be in Zone 1, low probability of flooding. A full FRA will be required to confirm this.