Harefield Grove, Rickmansworth Road

Revised Energy Assessment

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1 Introduction

1.1 Introduction

1.1.1 Brooks Development Practice Ltd (BD) was instructed by Comer Group to prepare a Revised Energy Assessment for the proposed development at Harefield Grove, Rickmansworth Road, Harefield.

1.1.2 The proposed development at Harefield Grove received planning permission on 23 September 2016 (App Ref: 28301/APP/2013/3104). An Energy and Sustainability Statement (2 December 2014) written by MES Building Solutions was submitted as part of the planning application that received permission. The Energy and Sustainability Statement stated that 'the recommended low and zero carbon (LZC) strategy is the implementation of ground source heat pumps for the three new build/reinstated properties with a Biomass system utilised for the main house and thirteen attached flats. The remaining dwellings require individual efficient gas boilers…'

1.1.3 Since its submission, further investigation into the LZC strategy has been undertaken. As a result of this investigation, and the loss of the supply of local biomass from a nearby farm, this report has been prepared to propose an alternative LZC strategy to achieve the targeted CO_2 reductions set out in Policy 5.2 of The London Plan.

1.1.4 It will serve as evidence that the carbon reduction targets set out in the London Plan (March 2016), and the relevant aspects of Policies EM1 and BE1 of the London Borough of Hillingdon (LBH) Local Plan: Part 1 (November 2012), and Polices DMEI 2 and DMEI 3 of the Proposed Submission Version of the LBH Local Plan: Part 2 (October 2015) have been satisfied subject to approval of the proposals and their implementation thereafter.

1.1.5 The development would be built in accordance with the energy hierarchy. Energy efficiency measures would reduce regulated carbon dioxide (CO_2) emissions by 19.2% beyond those mandated by Part L of the 2013 Building Regulations. The proposed construction specification to the new build dwellings would incorporate low U values, a low air leakage, good thermal bridging, a highly efficient heating system, and 100% low energy lighting to reduce energy demand. The proposed construction specification to the conversions would include upgrades to certain elements of the building fabric, a highly efficient heating system, and 100% low energy lighting to reduce energy demand. Active cooling systems would not be installed due to the passive measures that would be adopted to minimise the risk of overheating. This would include reducing internal gains, reducing external gains, and installing openable windows to allow for cross ventilation.

1.1.6 The development would not connect to a decentralised energy network nor allow provision for future connection to a district heating network. This is because there is no reasonable expectation that the development would be served by a district heating network in the future. The development would not connect to a shared heat network because the development is isolated with no other major heat loads in the immediate vicinity. Neither a site-wide combined heat and power (CHP) system nor a biomass primary heating system is considered a feasible solution due to the relatively small, variable and intermittent heat loads of the development. For these reasons, highly efficient individual gas boilers have been chosen as the most appropriate heating system for both the new build dwellings and conversions.

1.1.7 The installation of logburners to provide secondary heating to the Main House and the Conservatory House, and the installation of a 40kWp photovoltaic (PV) system would reduce regulated CO_2 emissions by 15.8%. A cumulative on-site reduction in regulated CO_2 emissions of 35.0% would be achieved and, therefore, the London Plan targets would be met. Tables 1 and 2, and Figure 1 provide a summary of the regulated carbon dioxide emissions savings from each stage of the energy hierarchy.

Figure 1: The energy hierarchy – site emissions and CO_2 savings

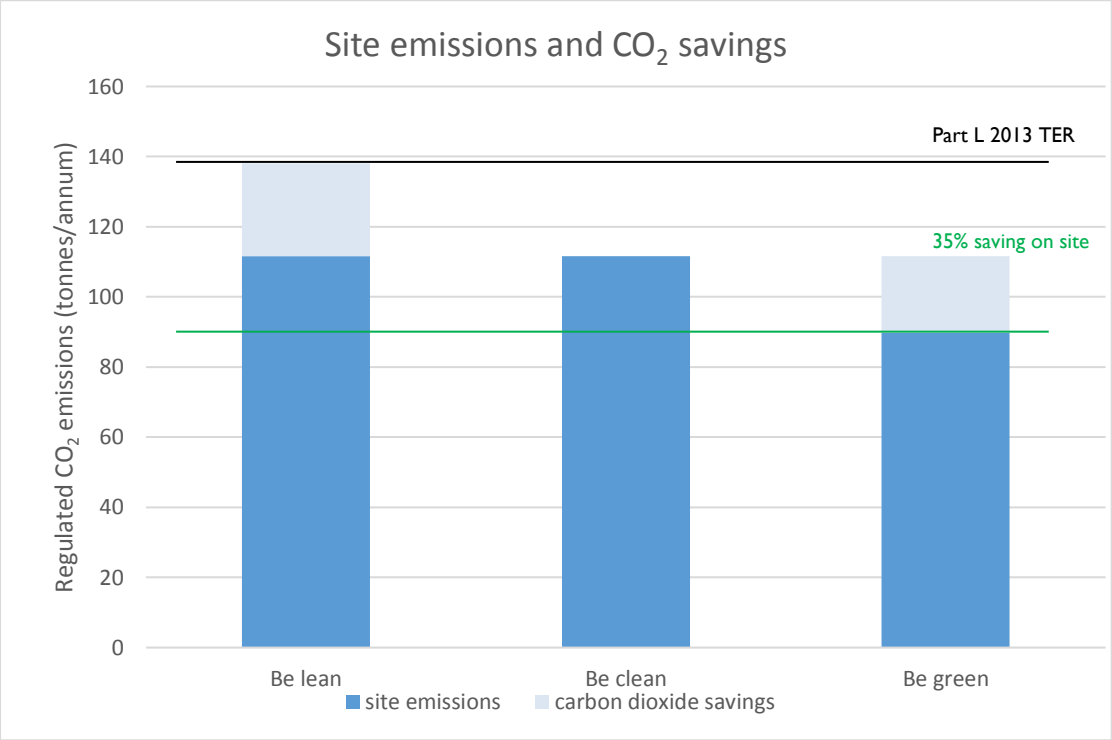


Table 1: CO_2 savings after each stage of the energy hierarchy

	Carbon dioxide emissions (tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations compliant development	138.08	53.95
After energy demand reduction	111.58	53.95
After Combined Heat and Power (CHP)	111.58	53.95
After renewable energy	89.75	53.95

Table 2: Regulated CO_2 savings from each stage of the energy hierarchy

	Regulated carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	26.50	19.2
Savings from heat network/CHP	0.00	0.0
Savings from renewable energy	21.83	15.8
Cumulative on site savings	48.33	35.0

1.1.8 It should be noted that whilst this report sets out the construction specification and location of the PV panels used to calculate the reduction in CO_2 emissions, this is subject to change as the detailed design of the development progresses. The key commitment to reduce the development's regulated carbon dioxide emissions by 35% beyond those mandated by Part L of the Building Regulations will not change.

1.2 Development Description

1.2.1 Harefield Grove lies 1km north of the centre of the village of Harefield in the London Borough of Hillingdon (LBH). The proposed development is to refurbish and redevelop the existing buildings at Harefield Grove to provide new residential accommodation. In addition new buildings are proposed together with limited demolition. In total, the development would provide 24 dwellings.

1.2.2 For the purposes of estimating the CO_2 emissions, the dwellings proposed within the Main House, the East and West Wings, the Stable Block, the Cottage House, and the Garden House are considered conversions and are therefore subject to Part L1B of the Building Regulations. The Conservatory House and Orchard House are considered new build dwellings and are therefore subject to Part L1A of the Building Regulations. The Main House is Grade II listed.

2 Legislation, Policy and Guidance

2.1 Legislation, Policy and Guidance

2.1.1 The following national and local planning policy guidance have been considered in applying the energy standards for the proposed development.

2.2 National Planning Policy Framework (NPPF) (March 2012)

2.2.1 In March 2012 a significant change to planning policy was published in the form of the National Planning Policy Framework (NPPF). The NPPF was designed to simplify and clarify planning policy and to make the planning system more accessible as well as detailing the government's view of what sustainable development in England means in practice. It states that there are three dimensions to sustainable development: economic, social and environmental.

- **An economic role** – contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including provision of infrastructure;
- **A social role** – supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating high quality built environment, with accessible local services that reflect the community's need and support its health, social and cultural well-being; and
- **An environmental role** – contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

2.2.2 The following are extracts from the NPPF that specifically relate to energy which have been referenced due to their relevance to this report.

Paragraph 95

To support the move to a low carbon future, local planning authorities should:

- *Plan for new development in locations and ways which reduce greenhouse gas emissions;*
- *Actively support energy efficiency improvements to existing buildings;*
- *And when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.*

Paragraph 96

In determining planning applications, local planning authorities should expect new development to:

- *Comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable;*
- *And, take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.*

2.3 Written Ministerial Statement (March 2015)

2.3.1 In a written ministerial statement delivered on 25 March 2015, the government announced that:

> *From the date the Deregulation Bill 2015 is given Royal Assent, local planning authorities and qualifying bodies preparing neighbourhood plans should not set in their emerging Local Plans, neighbourhood plans, or supplementary planning documents, any additional local technical standards or requirements relating to the construction, internal layout or performance of new dwellings. This includes any policy requiring any level of the Code for Sustainable Homes to be achieved by new development; the government has now withdrawn the code …From 1 October 2015 existing local plans, neighbourhood plan, and supplementary planning document policies should be interpreted by reference to the nearest equivalent new national technical standard. Decision takers should only require compliance with the new technical standards where there is a relevant current Local Plan policy.*

2.3.2 In regards to energy performance the government announced that:

> *For the specific issue of energy performance, local planning authorities will continue to be able to set and apply policies in their Local Plans which require compliance with energy performance standards that exceed the energy requirements of Building Regulations until commencement of amendments to the Planning and Energy Act 2008 in the Deregulation Bill 2015. This is expected to happen alongside the introduction of zero carbon homes policy in late 2016. The government has stated that, from then, the energy performance requirements in Building Regulations will be set at a level equivalent to the (outgoing) Code for Sustainable Homes Level 4. Until the amendment is commenced, we would expect local planning authorities to take this statement of the government's intention into account in applying existing policies and not set conditions with requirements above a Code level 4 equivalent.*

2.4 National: Fixing the foundations: Creating a more prosperous nation (July 2015)

2.4.1 In July 2015 the government further announced that:

> *The government does not intend to proceed with the zero carbon Allowable Solutions offsetting scheme, or the proposed 2016 increase in on-site energy efficiency standards, but will keep energy efficiency standards under review, recognising that existing measure to increase energy efficiency of new buildings should be allowed time to become established.*

2.5 Regional: The London Plan (March 2016)

2.5.1 The London Plan (incorporating Minor Alterations) was adopted in March 2016. It includes the following summarised policies relating to energy:

Policy 5.2 – Minimising Carbon Dioxide Emissions

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

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

The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. Residential buildings:

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

Major developments should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Policy 5.6 – Decentralised Energy in Development Proposals

Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

Major development proposals should select energy systems in accordance with the following hierarchy:

1) *Connection to existing heating or cooling networks*
2) *Site-wide CHP networks*
3) *Communal heating and cooling*

Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 – Renewable Energy

Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

Policy 5.9 – Overheating and Cooling

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

1) *Minimise internal heat generation through energy efficient design*
2) *Reduce the amount of heat entering a building in the summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls*
3) *Manage the heat within the building through exposed internal thermal mass and high ceilings*
4) *Passive ventilation*
5) *Mechanical Ventilation*
6) *Active cooling systems (ensuring they are the lowest carbon options)*

Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs.

2.6 Regional: GLA guidance on preparing energy assessments (March 2016)

2.6.1 The Greater London Authority (GLA) guidance on preparing energy assessments contains detail on how to prepare an energy assessment to accompany strategic planning applications.

2.7 Local: LBH Local Plan: Part 1 – Strategic Policies (November 2012)

2.7.1 Policy EM1 is the council's policy on climate change adaption and mitigation:

Policy EM1: Climate Change Adaption and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. *Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.*
2. *Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.*
3. *Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.*
4. *Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.*
5. *Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.*
6. *Targeting areas with high carbon emissions for additional reductions through low carbon strategies.*
7. *Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation as part of their proposals.*
8. *Encouraging the installation of renewable energy for all new development in meeting the carbon reduction target savings set out in the London Plan.*
9. *Promoting new development to contribute to the upgrading of existing housing stock where appropriate.*

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. *Locating and designing development to minimise the impacts of flooding.*
11. *Requiring major development to consider the whole water cycle impact.*
12. *Giving preference to development of previously developed land to avoid the loss of further green areas*
13. *Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase carbon sinks.*
14. *Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.*

2.7.2 Policy BE1 is the council's policy on the built environment. Of relevance to this report it states:

Policy BE1: Built Environment

The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents. All new developments should:

10. Maximise the opportunities for all new homes to contribute to tackling and adapting to climate change and reducing emissions of local air quality pollutants. The Council will require all new development to achieve reductions in carbon dioxide emissions in line with the London Plan targets through energy efficient design an effective use of low and zero carbon technologies. Where the required reduction from on-site renewable energy is not feasible within major developments, contributions off site will be sought. The Council will seek to merge a suite of sustainable design goals, into a requirement measured against the Code for Sustainable Homes and BREEAM. These will be set out within the Hillingdon Local Plan: Part 2 – Development Management Policies Local Development Document (LDD). All developments should be designed to make the most efficient use of natural resources whilst safeguarding historic assets, their settings and local amenity and include sustainable design and construction techniques to increase the re-use and recycling of construction, demolition and excavation waste and reduce the amount disposed to landfill.

2.8 Local: LBH Local Plan: Part 2 – Development Management Polices, Revised Proposed Submission Version (October 2015)

2.8.1 Policies DMEI 2 and DMEI 3 of the LBH Development Management Policies provide more detail on the council's expectation with regards to reducing carbon dioxide emissions. These are summarised below:

Policy DMEI 2: Reducing Carbon Emissions

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

B) All major development proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, if the Council is minded to approve the application despite not meeting the carbon reduction targets, then it will seek an off-site contribution to make up for the shortfall. The contribution will be sought at a flat rate of £/tonne over the lifetime of the development, in accordance with the current 'allowable solutions cost.'

Policy DMEI 3: Decentralised Energy

A) All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN).

B) Major developments located within 500 metres of an existing DEN, and minor new-build developments located within 100 metres, will be required to connect to that network, including provision of the means to connect to that network and a reasonable financial contribution to the connection charge, unless a feasibility assessment demonstrates that connection is not reasonably possible.

C) Major developments located within 500 metres of a planned future DE, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection and a commitment to connect via a legal agreement or contract, unless a feasibility assessment demonstrates that connection is not reasonably possible.

D) The Council will support the development of DENs and energy centres in principle, subject to meeting the wider policy requirements of this plan and in particular on design and air quality.

2.9 Condition 15 of the permission for development (28301/APP/2013/3104)

Condition 15

Prior to the commencement of development full details (including specifications) of the low and zero carbon technology required to meet the CO_2 reductions set out in the Energy and Sustainability Statement (MES, 2 December 2014) shall be submitted to and approved in writing by the local planning authority. The details shall include roof plans and elevations for the proposed Photovoltaics. In addition, full details in relation to the size, maintenance and operation of the biomass plant shall be submitted. This information shall also include delivery, storage and management of biomass facility as well as the technical specifications as to how the development will connect to it. Full details of any other technologies shall also be submitted.

The development must proceed in accordance with the approved details and a monitoring report submitted to the Local Planning Authority quarterly for the first 5 years on completion of the development.

***Reason** – To ensure the reduction of CO_2 in accordance with Policy 5.2 of the London Plan (2015).*

3 Energy Assessment

3.1 Methodology

3.1.1 This Revised Energy Assessment has been structured in accordance with the Greater London Authority guidance on preparing energy assessments (March 2016) in order to demonstrate how the development complies with the London Plan targets. Since the approved application for development was submitted between 2013-2016, a 35% reduction in the development's regulated carbon dioxide (CO_2) emissions beyond those mandated by Part L of the Building Regulations is targetd.

3.1.2 To meet the London Plan targets, the development would be designed in accordance with the energy hierarchy;

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

3.2 Establishing Baseline Regulated CO_2 Emissions

3.2.1 To establish the development's baseline predicted regulated CO_2 emissions, preliminary Standard Assessment Procedure (SAP) calculations have been undertaken in SAP 2012 software to all 24 dwellings.

3.2.2 For new build dwellings, SAP uses the target emission rate (TER), which is expressed in kilograms of carbon dioxide per metre square of total useful floor area per annum, as the benchmark for Part L Building Regulations compliance. By multiplying the TER of each dwelling by its total useful floor area and by summing the results, the Part L regulated CO_2 emissions for the new build dwellings have been determined.

3.2.3 For conversions, SAP has been used to estimate baseline CO_2 emissions of the conversions assuming that the fabric, heating, ventilation and lighting were upgraded in accordance with the minimum standards specified in Part L1B of the Building Regulations. Further details of the minimum standards applied are provided in Tables 4 to 6 of this report.

3.2.4 By following this approach, the baseline predicted regulated CO_2 emissions of the development have been calculated as 138.08 tonnes CO_2 per annum.

3.3 Establishing Baseline Unregulated CO_2 Emissions

3.3.1 To establish the development's baseline predicted unregulated CO_2 emissions, the CO_2 emissions from appliances and cooking have been calculated in accordance with Section 16 of SAP. By following this approach, the baseline predicted unregulated CO_2 emissions of the development have been calculated as 53.95 tonnes CO_2 per annum.

3.4 Energy Demand Reduction – Be Lean

3.4.1 Baseline predicted regulated CO_2 emissions would be reduced by 19.2% through the following energy demand reduction measures.

Passive Solar Design

3.4.2 The building is designed in accordance with the principles of passive solar design as far as is practical given the limitations of the site and the fact that the majority of the proposed new dwellings are conversions of existing buildings. The development site is located in a rural area which means that there is little to no overshading from surrounding development. This allows the development to benefit from a large amount of solar energy.

3.4.3 Heat gains and losses through new windows would be controlled through careful consideration of the solar transmittance values and thermal conductivity values of the glazing to ensure high performance in winter months whilst minimising the risk of summer overheating.

Passive Cooling Design

3.4.4 The dwellings are designed in accordance with the principles of passive cooling design. Internal heat generation would be minimised by:

- Specifying gas combination boilers where practical. This heating system does not require a hot water cylinder and reduces heat loss from stored hot water. It also does not require communal heating pipes which would reduce the risk of overheating in the communal areas;
- Insulating all hot water pipes;
- Installing 100% low energy lighting;
- Installing energy efficient equipment where applicable.

3.4.5 External heat gains would be minimised by:

- Specifying glazing with a solar transmittance value that has been carefully considered to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer;

3.4.6 Passive ventilation has been designed for by:

- Avoiding small single façade units;
- Including openable windows to all rooms and ensuring that all dwellings can benefit from cross ventilation.

3.4.7 These measures would help to ensure that the dwellings are at less risk of overheating and would not be specified with active cooling systems.

3.4.8 Preliminary SAP calculations demonstrate that the new build dwellings are not at significant risk of overheating and pass Criterion 3 of Part L1A of the Building Regulations. Due to the passive cooling design measures outlined above it is contested that dynamic modelling of the internal temperatures should not be required to support the findings of preliminary SAP calculations in this instance.

High Standards of Energy Efficiency

3.4.9 Table 3 details the construction specification proposed to the new build dwellings. The first column in this table sets out Part L1A limiting fabric parameters and the requirements of the Domestic Heating Compliance Guide in order to show the elements of the specification that provide an improvement over what is required by Building Regulations. The specification incorporates low U values, a low air leakage, good thermal bridging, a highly efficient heating system, and 100% low energy lighting.

Table 3 – Proposed Construction Specification to the new build dwellings

Element	Part L1A Limiting Fabric Parameters and Requirements of Domestic Heating Compliance Guide	Proposed Construction Specification
U value of External Wall	0.30 W/m^{2}K	0.18 W/m2K
U value of Floor	0.25 W/m^{2}K	Circa 0.13 W/m2K
U value of Roof	0.20 W/m^{2}K	0.11-0.18 W/m2K
U value of Windows	2.00 W/m^{2}K	1.4 W/m2K
Air Permeability	10 m^3/h.m^2 at 50 Pa	5 m^3/h.m^2 at 50 Pa
Heating System	88% SEDBUK 2009 Gas boiler	>88% SEDBUK 2009 Gas boiler
Heating Controls	Programmer, room thermostat and TRVs, and boiler Interlock	Time and temperature zone control, and boiler Interlock, and delayed start stat
Ventilation	Intermittent Extracts	Intermittent Extracts
Thermal Bridging	Default y value of 0.15	The use of constructive details and approved construction details where applicable
Low Energy Lighting	75%	100%

3.4.10 The construction specification would ensure that all new build dwellings meet the Part L1A target fabric energy efficiency standards.

3.4.11 Tables 4 to 6 detail the construction specifications proposed to the conversions. The second column in these tables sets out the minimum requirements of Part L1B and the Domestic Heating Compliance Guide in order to show the elements of the specifications that provide an improvement over what is required by Building Regulations. The specifications incorporate upgrades to certain fabric elements, a highly efficient heating system, and 100% low energy lighting.

3.4.12 It should be noted that the Main House is Grade II listed. It is considered that compliance with certain energy efficiency requirements set out in Part L1B would unacceptably alter the character or appearance of the building. For this reason upgrades are not proposed to several of the elements.

Table 4 – Proposed Construction Specification to the Main House

Element	Minimum Requirements of Part L1B and Domestic Heating Compliance Guide	Proposed Construction Specification
U value of External Wall	An upgrade to this element is not proposed as it would unacceptably alter the character or appearance of the building	
U value of Floor	An upgrade to this element is not proposed as the existing floor is assumed to have a U value of <0.70 W/m^{2}K	
U value of Plane Roof	0.16 W/m^{2}K	0.11 W/m^{2}K
U value of Windows	An upgrade to this element is not proposed as it would unacceptably alter the character or appearance of the building	
U value of Doors	An upgrade to this element is not proposed as it would unacceptably alter the character or appearance of the building	
Air Permeability	Default - 15 m^3/h.m^2 at 50 Pa	Default - 15 m^3/h.m^2 at 50 Pa
Heating System	88% SEDBUK 2009 Gas boiler	>88% SEDBUK 2009 Gas boiler
Heating Controls	Programmer, room thermostat and TRVs, and boiler Interlock	Time and temperature zone control, and boiler Interlock, and delayed start stat
Thermal Bridging	Default y value of 0.15	Default y value of 0.15
Low Energy Lighting	75%	100%

Table 5 – Proposed Construction Specification to East/West Wings and the Stable Block

Element	Minimum Requirements of Part L1B and Domestic Heating Compliance Guide	Proposed Construction Specification
U value of External Wall	An upgrade to this element is not proposed as the existing wall is assumed to have a U value of <0.70 W/m^{2}K	
U value of Floor	An upgrade to this element is not proposed as the existing floor is assumed to have a U value of <0.70 W/m^{2}K	
U value of Plane Roof	0.16 W/m^{2}K	0.11 W/m^{2}K
U value of Sloping Roof	0.18 W/m^{2}K	0.18 W/m^{2}K
U value of Windows	3.10 W/m^{2}K	1.40 W/m^{2}K
U value of Doors	3.00 W/m^{2}K	1.20 W/m^{2}K
Air Permeability	Default - 15 m^3/h.m^2 at 50 Pa	Default - 15 m^3/h.m^2 at 50 Pa
Heating System	88% SEDBUK 2009 Gas boiler	>88% SEDBUK 2009 Gas boiler
Heating Controls	Programmer, room thermostat and TRVs, and boiler Interlock	Time and temperature zone control, and boiler Interlock, and delayed start stat
Thermal Bridging	Default y value of 0.15	Default y value of 0.15
Low Energy Lighting	75%	100%

Table 6 – Proposed Construction Specification to Cottage House and Garden House

Element	Part L1A Limiting Fabric Parameters and Requirements of Domestic Heating Compliance Guide	Proposed Construction Specification
U value of External Wall	0.28 – 0.30 W/m^{2}K	0.25-0.30 W/m2K
U value of Floor	An upgrade to this element is not proposed as the existing floor is assumed to have a U value of <0.70 W/m^{2}K	
U value of Plane Roof	0.16 W/m^{2}K	0.11 W/m2K
U value of Sloping Roof	0.18 W/m^{2}K	0.18 W/m^{2}K
U value of Windows	1.60 W/m^{2}K	1.4 W/m2K
U value of Doors	1.80 W/m^{2}K	1.20 W/m^{2}K
Air Permeability	Default - 15 m^3/h.m^2 at 50 Pa	Default - 15 m^3/h.m^2 at 50 Pa
Heating System	88% SEDBUK 2009 Gas boiler	>88% SEDBUK 2009 Gas boiler
Heating Controls	Programmer, room thermostat and TRVs, and boiler Interlock	Time and temperature zone control, and boiler Interlock, and delayed start stat
Ventilation	Intermittent Extracts	Intermittent Extracts
Thermal Bridging	Default y value of 0.15	Default y value of 0.15
Low Energy Lighting	75%	100%

3.4.13 The combination of the energy demand reduction measures detailed means that development CO_2 emissions would be reduced by 26.50 tonnes CO_2 per annum beyond those mandated by Part L of the 2013 Building Regulations. This equates to a 19.2% reduction in development regulated CO_2 emissions.

3.5 Heating Infrastructure – Be Clean

3.5.1 Having reduced the energy demand of the dwellings, the next step in the energy hierarchy is to supply energy efficiently in accordance with the following order of preference:

i. Connection to existing heating or cooling network
ii. Shared heat network
iii. Site-wide CHP network
iv. Communal heating and cooling

3.5.2 According to the London Heat Map there are no existing or proposed distribution networks in the vicinity of the proposed development. Neither is it located in an area identified as having decentralised energy potential. This is illustrated in Figure 2. The red spot indicates the location of the proposed development. The purple zone indicates areas identified as having decentralised energy potential.

Figure 2 – London Heat Map

Shared heat network

3.5.3 The development is isolated with no other major heat loads in the immediate vicinity. For this reason, it is not considered feasible to supply heat beyond the site boundary or to link to any existing developments.

Site-wide CHP network

3.5.4 As a rule of thumb, it is suggested that a CHP system should have operational running hours in excess of 5,000 hours per annum to make it economical. Residential buildings have relatively low space heating demand and intermittent water heating demand. This means that if a CHP system was installed at this residential development, in order to meet the 5,000 hours per annum it would most likely only be sized to meet a small proportion of the maximum heat output required. It is likely that back-up gas boilers would provide the majority of the heat demand of the development.

3.5.5 In addition, if a CHP system sized to meet the base heat load was installed at this site then it would require the export of electricity to the grid. It is considered that the administrative burden of managing CHP electricity sales at this small scale, where energy service companies (ESCOs) are not active, is too great for operators of residential developments to bear. For these reasons a site-wide CHP system is not considered a feasible solution.

Biomass primary heating

3.5.6 New dwellings have short heating response times because they are relatively well insulated and often light-weight. They also have variable and intermittent demands. Biomass boilers are not suited to this because the burning of fuel is not instantaneous and they take a long time to heat up and cool down. The boilers are also not usually able to modulate below 30% of output meaning that gas back-up boilers would be required to not only provide output when heat demand was high, but also to provide output when heat demand was low. These factors reduce the potential running hours of a biomass boiler and mean that a biomass primary heating system would not operate efficiently at this development.

3.5.7 In addition, the successful operation of a biomass primary system relies on the availability of a local fuel supply. One of the main reasons why a biomass system was recommended in the Energy and Sustainability Statement (2 December 2014) written by MES Building Solutions was because at the time there was a local supply of biomass available from a nearby farm. This supply is no longer available to the development.

3.5.8 For these reasons a biomass primary heating system is not considered a feasible solution at this development.

Site Wide/Individual Renewable Heating – Air Source Heat Pumps

3.5.9 Air source heat pumps are powered by electricity. The carbon factor of electricity as stated in SAP 2012 is 0.519kgCO_2/kWh. This is higher than that for natural gas which has a carbon factor of 0.216kgCO_2/kWh. This means that despite the high efficiencies achieved by air source heat pumps, their installation typically leads to an increase in CO_2 emissions in new dwellings when compared to the installation of a gas boiler. For this reason they are not considered an environmentally feasible solution.

Site Wide/Individual Renewable Heating – Ground Source Heat Pumps

3.5.10 Ground source heat pumps are also powered by electricity. Despite typically achieving higher efficiencies than air source heat pumps, the CO_2 emissions resulting from their installation, and their operating costs, are typically comparable to a gas boiler. However, they are considerably more expensive to install than gas boilers with installation costs of around £13,000 - £20,000. For this reason they are not considered a financially viable solution.

Gas fired communal heating

3.5.11 A gas fired communal heating system can operate at higher efficiencies than individual gas boilers. They also provide a single energy centre solution meaning that it is easier to connect to a future district energy network. However, they have the following disadvantages which have led to the conclusion that it is not a practical or desirable solution on this development. Instead individual gas boilers have been chosen as the most practical and suitable heating system.

- Space is required for a plant room in which to house the communal boiler.
- Distribution losses for communal systems can be high with between 5% and 15% of heat generated lost before it reaches the intended location.
- Communal systems require long runs of communal pipes which are usually distributed in the ceilings of the communal cores and corridors. Even when insulated to Building Regulations standards these communal pipes act as a heat source to the communal areas throughout the year and can cause a high risk of overheating during the summer months. Cooling and ventilation systems requiring energy would need to be specified to mitigate this risk.
- A communal system would require the installation of hot water cylinders and buffer tanks. The storing of hot water results in heat loss.
- Residents have to pay more via their service charge for maintenance and depreciation of the equipment installed.
- System failure means that there is no heating and hot water for all properties, not just one.
- Residents are not able to choose who their supplier is.
- Residents do not have access to the same services offered by mainstream utility companies including discounts for payments by direct debit or single occupancy.
- There is no reasonable expectation that the development would be served by a district heating network in the future.

Future connection to a district heating network

3.5.12 Provision has not been made for future connection to a district heating network because there is no reasonable expectation that the development would be served by a district heating network in the future.

3.6 Renewable Energy Systems – Be Green

3.6.1 Renewable energy is the final consideration in the energy hierarchy. Below is an assessment of the feasibility of incorporating renewable energy systems at this site.

Wind Power

3.6.2 Locating a wind turbine in a residential area presents a number of difficulties. These include the area required for the turbine, turbulence caused by nearby buildings, installation and maintenance access, environmental impact from noise and vibration, and visual impact on the landscape.

3.6.3 The Numerical Objective Analysis Boundary Layer (NOABL) Wind Map Tool shows that average wind speed at 25 metres above ground at this development is 5.7 m/s. Once the turbulence from the man-made obstacles around the development has been taken into consideration, it is unlikely that a wind turbine would generate sufficient electricity to make it cost effective. For these reasons wind power is not considered a feasible solution.

Solar Thermal Collectors

3.6.4 Solar thermal collectors are a mature and reliable technology. There is sufficient roof area at a favourable orientation to achieve reductions in CO_2 emissions through their installation. It is suggested that this technology is technically feasible to the top floor flats and houses, although it would require the installation of a large hot water cylinder which would have an impact on useful floor space and on heat gain within the dwellings.

3.6.5 Due to long runs of hot water pipes that would be required to serve the flats on the lower levels, and the heat loss associated with this, it is not considered a practical solution to these units.

3.6.6 In addition, it is suggested that the roof space could be used to achieve greater CO_2 reductions if it were used for photovoltaic (PV) panels instead of solar thermal collectors. This is because the PV panels generate electricity and would off-set the use of grid electricity which has a carbon factor of 0.519kgCO_2/kWh, whereas solar thermal collectors would off-set the use of gas which has a carbon factor of 0.216kgCO_2/kWh.

Photovoltaic (PV) Panels

3.6.7 PV panels are a mature and reliable technology. There is sufficient roof area at a favourable orientation to achieve significant reductions in CO_2 emissions through their installation. It is suggested that this technology is feasible. However, consideration should be given to safe access required for maintenance and service checks.

Biomass secondary heating

3.6.8 Where secondary heating systems are proposed, biomass secondary heating systems provide an opportunity to use a renewable fuel. Consideration must be given to the NO_x and PM_{10} emissions of systems to ensure that the development is 'air quality neutral'. It is suggested that this technology is feasible to the Main House and the Conservatory House where fireplaces are being provided.

3.6.9 In this way, solar thermal collectors, biomass secondary heating systems and PV panels are the renewable technologies considered to be technically, financially and environmentally feasible at this development. To achieve the on-site target reduction in CO_2 emissions required, renewable energy equipment needs to offset 21.83 tonnes CO_2 per annum. In order to do this, the preferred approach is to install logburners to the Main House and the Conservatory House and to install a PV array. A 40kWp PV system is proposed on the South-West facing sloping roofs of the East and West Wings. Using the irradiance figures detailed in the Microgeneration Scheme Guide to the Installation of Photovoltaic Systems, it has been estimated that a 40kWp PV system would generate 34,960kWh/yr and off-set 18.14 tonnes CO_2 per annum. The logburners would offset 3.69 tonnes CO_2 per annum. In total renewable technologies would offset 21.83 tonnes CO_2 per annum.

3.6.10 A drawing showing the location of the proposed PV panels is provided in Appendix A. There is little shading to either roof.

4 Conclusions

4.1.1 The proposed development at Harefield Grove received planning permission on 23 September 2016 (App Ref: 28301/APP/2013/3104). An Energy and Sustainability Statement (2 December 2014) written by MES Building Solutions was submitted as part of the planning application that received permission. The Energy and Sustainability Statement stated that 'the recommended low and zero carbon (LZC) strategy is the implementation of ground source heat pumps for the three new build/reinstated properties with a Biomass system utilised for the main house and thirteen attached flats. The remaining dwellings require individual efficient gas boilers…'

4.1.2 Since its submission, further investigation into the LZC strategy has been undertaken. As a result of this investigation, and the loss of the supply of local biomass from a nearby farm, this report has been prepared to propose an alternative LZC strategy to achieve the CO_2 reductions.

4.1.3 The report demonstrates that the proposed development at Harefield Grove would meet the carbon reduction targets as set out in Policy 5.2 of The London Plan. It would achieve a 35% reduction in regulated CO_2 emissions beyond those mandated by Part L 2013 of the Building Regulations by following the energy hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

4.1.4 Solar passive design measures and energy efficiency measures would ensure that Part L is achieved prior to the installation of low or zero carbon technologies creating high performance buildings with relatively low energy demands.

4.1.5 The development would not connect to a decentralised energy network nor allow provision for future connection to a district heating network. This is because there is no reasonable expectation that the development would be served by a district heating network in the future. The development would not connect to a shared heat network because the development is isolated with no other major heat loads in the immediate vicinity. Neither a site-wide combined heat and power (CHP) system or a biomass primary heating system is considered a feasible solution due to the relatively small, variable and intermittent heat loads of the development. For these reasons, highly efficient individual gas boilers have been chosen as the most appropriate heating system for both the new build dwellings and conversions.

4.1.6 Logburners would be installed to the Main House and to the Conservatory House, and a 40kWp photovoltaic system would be installed on the South-West facing sloping roofs of the East and West Wings.

4.1.7 The risk of overheating within buildings would be mitigated and the demand for cooling minimised through passive cooling design measures. The dwellings would not be specified with active cooling systems.

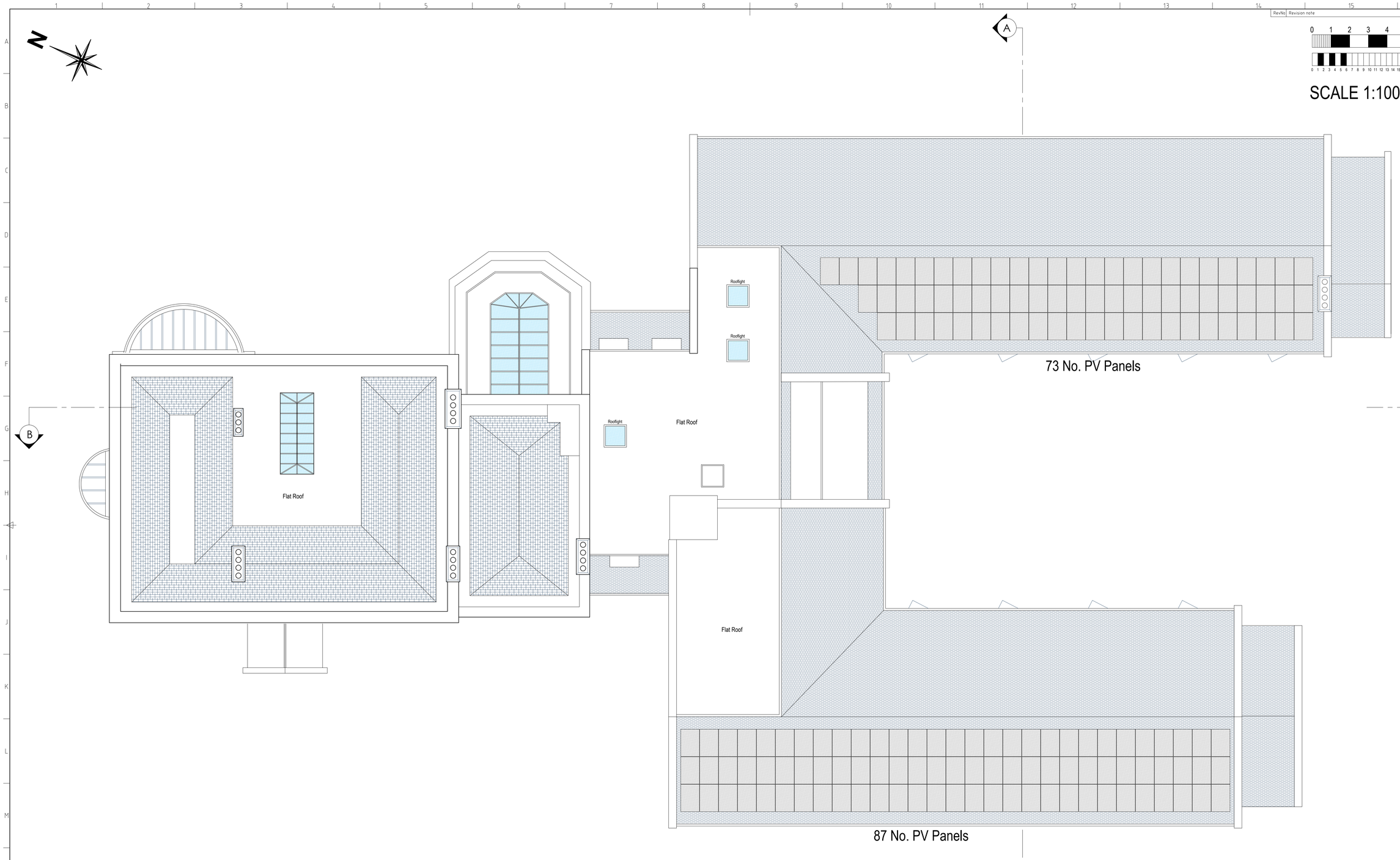
5 Appendix A – Location of PV Panels

RevNo	Revision note	Date	Signature	Checked

0 1 2 3 4 5 6 Metre

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Feet

SCALE 1:100 @ A1



KEY

0.25kWp PV Panel

PROPOSED MAIN HOUSE, EAST & WEST WINGS - ROOF PLAN
HAREFIELD GROVE, RICKMANSWORTH ROAD, HAREFIELD , MIDDLESEX

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E-MAIL: ROOFSMITHARCH@NCLOUD.COM

AS PROPOSED ROOF PLAN

MAIN HOUSE, EAST & WEST WINGS - HAREFIELD GROVE

COMER HOMES GROUP

Designed by	Drawn by	Approved by – date	Filename	Date	Scale
PS	AC	–		OCT 2011	1:100

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20-MHEWW-13

Revision B