Energy & Sustainability Statement

18-23 Hand Court
High Holborn Estate
SRG Holborn Ltd.

26th September 2018

Energy & Sustainability Statement

18-21 Hand Court & 22-23 Hand Court

Client: S.R.G Holborn Ltd
Project: 18-23 Hand Court, London

GDM PARTNERSHIP
SUSTAINABLE ENGINEERING

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N1	16-05-2018	For Information	AJ	CS
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N3	06-07-2018	For Planning	AJ	CS
N4	21-09-2018	For Planning	AJ	CS

GDM PARTNERSHIP
SUSTAINABLE ENGINEERING

CONTENTS

1 INTRODUCTION

GDM Partnership Building Services Consultants Limited were requested by S.R.G Holborn Ltd to undertake a LZC (Low and Zero Carbon) Technologies feasibility report at 18-21 Hand Court.

This report assesses the feasibility of providing LZC technologies to the scheme and if LZC is appropriate for the project, this report will inform the design team of recommendations for the most appropriate LZC technology.

Viable LZC technologies have been assessed with due consideration to the following issues:

- Energy generated and CO2 emissions reduction
- Payback period
- Local planning criteria
- Potential to export energy
- Any available grants (if applicable)

2 EXECUTIVE SUMMARY

This Energy Statement has been prepared by GDM Partnership on behalf of S.R.G Holborn Ltd to provide a commentary on the sustainability energy issues for the proposed development at 18-21 and 22-23 Hand Court. It sets out the energy efficiency and carbon reduction measures that will be incorporated into the development.

Energy efficiency measures will be implemented to provide carbon savings of approximately **19.2%** in comparison to a baseline building that is fully compliant with the standard set by Part L 2013.

The energy efficiency measures contained within this proposal include: enhanced fabric insulation; enhanced air tightness; high efficiency fans; high efficiency heating and cooling plant, heat recovery on ventilation systems and daylight control of the lighting. This will ensure the development achieves part L 2013 compliance through energy efficiency measures alone.

The London Heat Map has been utilised to check if the development can connect into an existing distribution network. However currently there are no existing or proposed heat distribution networks in the vicinity and as such this option has been disregarded.

Combined heat and power engines are not viable for developments of this nature due to the low annual heating demand and there being no significant background heat demand during the summer. As such we do not propose to utilise CHP. This combined with the lack of a district heating scheme means that the Green measures for this development are not viable It should therefore be noted that the carbon emissions at the end of the 'be clean' stage are identical to those being at the end of the 'be lean' with no further improvements achieved.

Photovoltaic collectors are compatible with the proposed building services solution albeit there is limited space available on the roof. With this in mind the extent of the PV array has been restricted to an area of 83m² as shown on architect's layouts.

2.1 GLA Table 3

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13
Be Lean	51.2	46.13
Be Clean	51.2	46.13
Be Green	46.55	46.13

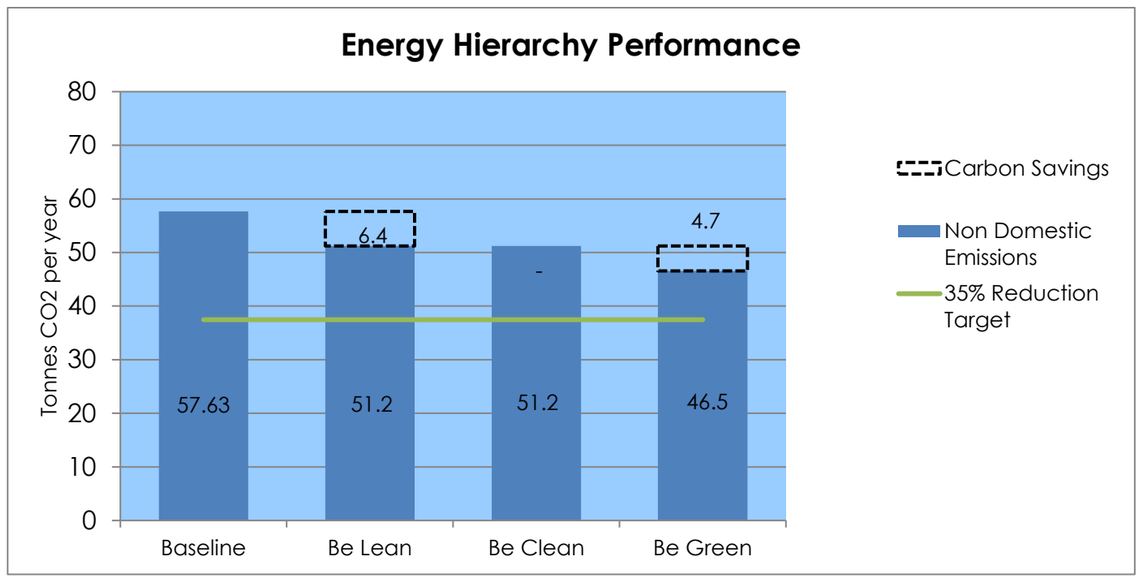
2.2 GLA Table 4

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	6.4	11.2%
Be Clean	-	0.0%
Be Green	4.7	8.1%
Total cumulative savings	11.1	19.2%

The total site wide regulated carbon saving go beyond Part L 2013 Building Regulations through the combination of energy efficient design and renewable technologies is **19.2 %.**

Due to the 18-21 Hand Court not reaching a carbon reduction target of 35%, a carbon offset payment will accommodate the additional 15.8%. With the London Borough of Camden's carbon offset costing £90 per tonne, 18-21 Hand Court's cost over a 30 year period is £24,536 which equals £818 per year.

2.3 Energy Hierarchy Performance Chart 18-21 Hand Court



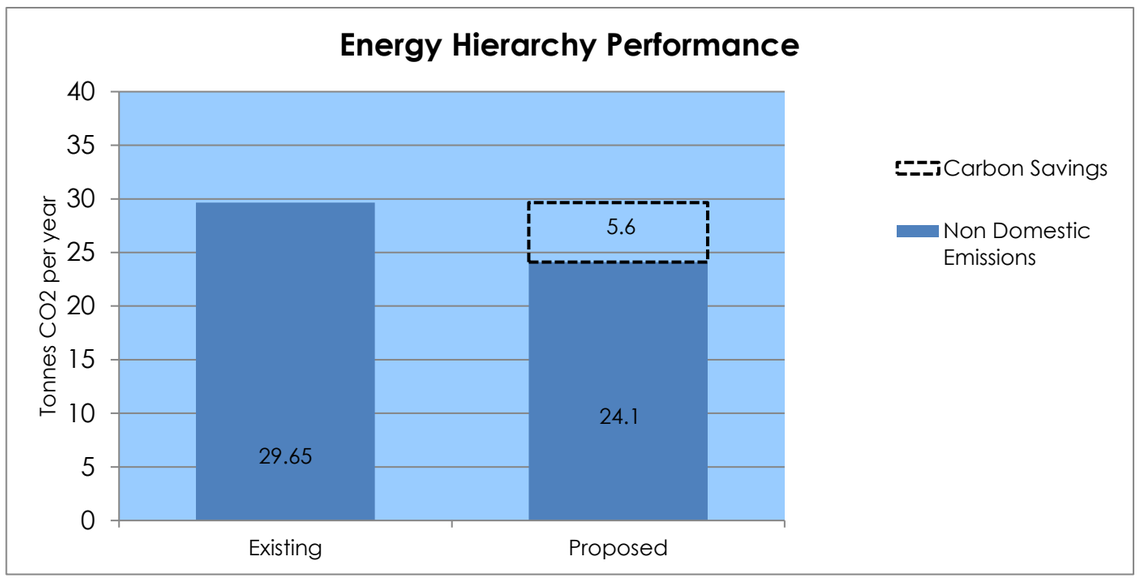
2.4 Carbon Emissions for Existing and Proposed

22-23 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	29.65	12.73
Proposed	24.10	12.73

2.5 Carbon Emissions and Reduction

22-23 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Proposed	5.6	18.7%

2.6 Energy Hierarchy Performance Chart 22-23 Hand Court



Energy efficiency measures will be implemented to provide a reduction in carbon emissions in comparison to the existing 22-23 Hand Court building. The energy efficiency measures include; high efficiency fans; high efficiency heat recovery heating and cooling plant, heat recovery on ventilation systems; daylight control of the lighting.

The Tables above show the savings in carbon dioxide achieved. The total site wide regulated carbon saving through the combination of energy efficient design is **18.7%.**

No refurbishment works are being carried out to the building fabric of 22-23 Hand Court, however through the installation of upgraded building services equipment, the estimated carbon reduction has been calculated at 18.7% when compared against the existing 22-23 Hand Court development.

3 BACKGROUND

This Energy Statement has been prepared by GDM Partnership on behalf of S.R.G Holborn Ltd to provide a commentary on the sustainability energy issues for the proposed building at 18-21 Hand Court and 22-23 Hand Court. It sets out the energy efficiency and carbon reduction measures that will be incorporated into the development.

3.1 The Buildings

3.1.1 18-21 Hand Court

18-21 Hand Court consists of demolishing the existing 3 storey office building and constructing a larger 6 storey (Basement – 5th).

3.1.2 22-23 Hand Court

22-23 Hand Court consists of a change of use from office (B1) to retail (A1/A3) at basement/ground level and a refurbishment within the office area of the 1st floor.

3.2 Planning Policy

3.2.1 Background

The energy strategy will be developed in accordance with requirements of the London Plan and specifically the GLA Energy Team's Guidance Note 'Guidance on Preparing Energy Statements', April 2014.

Policies within Chapter 5 of the London Plan (March 2016) set out relevant design and climate change adaptation policies relating to developments, and establishes expectations for applicant's commitments in terms of CO_2 savings and measures proposed.

As required by the GLA's Guidance, after establishing the baseline energy demand and profile for the site, the strategy for the project will follow the Mayor's Energy Hierarchy in appraising appropriate measures to reduce carbon emissions and other climate impacts from the development:

- Use Less Energy - 'Be Lean'
- Supply Energy Efficiently - 'Be Clean'
- Use Renewable Energy - 'Be Green'

The planning application is 'full' and, accordingly, the Energy Assessment is based on dynamic simulation modelling using software approved for the use in Building Regulations Energy Performance Calculations.

The London Plan policy 5.2 requires a saving of 35% regulated carbon savings against a 2013 compliant building.

3.2.2 The Energy Hierarchy

The Mayor's energy hierarchy is central to the climate change policies. The stages of the hierarchy are:

Use Less Energy/Reduce Demand- 'Be Lean'

- Reduce use through behaviour change
- Improve insulation
- Incorporate passive heating and cooling
- Install energy efficient lighting and appliances

Supply Energy Efficiently - 'Be Clean'

- Use CHP and community heating and/or cooling
- Cut transmission losses through local generation

Use Renewable Energy - 'Be Green'

- Install renewables on site
- Import renewable energy

3.3 Structure of the Energy Assessment

This statement is structured to respond to the Energy Hierarchy following the GLA's guidance. The statement includes:

An assessment of the baseline carbon emissions based on the target emission rate for the retail and commercial elements.

A review of the energy efficient features incorporated into the design.

An assessment of the feasibility of connecting to a district heating network or incorporating a combined heat and power system.

A review of renewable energy technologies and their application for this development.

Recommendations and commitments.

4 BASELINE ENERGY CONSUMPTION AND CARBON EMISSIONS (18-21 H.C)

Before energy efficiency measures are investigated, it is necessary to establish the baseline energy consumption of the scheme, for comparison and evaluation of the proposed carbon reduction measures.

The baseline case against which carbon savings are assessed is a new development designed to achieve the target emission rate calculated in accordance with Part L (2013) of the Building Regulations. This baseline case represents a typical new build arrangement; where electricity for the development is imported from the grid and space and heating water are provided by fossil fuel sources.

The on-site energy consumption associated with non-regulated uses (e.g. lifts, small power and information technology) is included in the baseline carbon emission analysis.

The following 'regulated' energy uses are considered in the baseline energy analysis.

- Space Heating/Cooling
- Water Heating
- Ventilation
- Fans, Pumps and Controls
- Lighting (internal)

4.1 Proposed Development

4.1.1 Summary of modelling inputs at Baseline Stage

		Baseline
U Values W/m²K (Average)	External Walls	0.35
	Floor	0.22
	Roof	0.25
	Glazing	1.6 (Gv 0.4)
	Air Permeability	10
Lighting	Electricity Power Factor	<0.9
	Auto Presence Detection	For lighting data, please refer to the lighting table below
	Daylight Control	
	Luminaire Lumens/ Circuit Watt or W/m²	
	Lux Levels	
Air Side Config Office & Retail	DHW Type	Natural Gas
	Heat Source Type	LTHW Boiler
	Heat Recovery	Thermal Wheel
	HVAC Type	Fan Coil Systems
	Exchanger Efficiency	0.7
	AHU Extract SFP W/l/s	0.8
	AHU Fresh Air W/l/s	0.8
	Terminal Fan SFP W/l/s	0.4
Nat Vent Circulation	DHW Type	N/A
	Heat Source Type	LTHW Boiler
	HVAC Type	Radiators
	Heating Type	Radiators
Extract Only WC	DHW Type	Natural Gas
	Heat Source Type	LTHW Boiler
	HVAC Type	Radiators
	Extract Fan SFP W/l/s	0.4
	Heating Type	Radiators
Heating Circuit	Fuel Source	Natural Gas
	Heat Pump?	N/A
	Distribution Efficiency %	98
	SCOP %	98
Cooling Circuit	Fuel Source	Electricity
	SEER	5
	Distribution Efficiency %	100
DHW Circuit	Fuel Source	Natural Gas
	Heat Pump?	N/A
	Distribution Efficiency %	98
	Efficiency %	98

4.2 Conclusion

4.2.1 Carbon Emissions at End of 'Baseline' Stage (GLA Table 3)

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13

Based upon the results of this model a target emission rate of 26 kg/m²/year has been identified as the baseline figure.

5 BE LEAN – REDUCE ENERGY DEMAND (18-21 H.C)

This section outlines how energy consumption will be reduced through the implication of Lean design measures.

This is achieved by passive measures and the introduction of more energy efficient plant and services. Any improvement achieved at this stage will affect the extent of measures or size of plant needed to address the subsequent 'be clean' and 'be green' stages. As necessary to achieve the 35% carbon saving over a Part L 2013 compliant building.

5.1 Proposed Development

5.1.1 Summary of Modelling inputs at 'Be Lean' Stage

Below is a summary of the changes to the baseline inputs:

U Values W/m²K (Average)	**External Walls**	0.26
	Roof	0.18
	Glazing	1.4
	Air Permeability	5
Lighting	**Auto Presence Detection**	For lighting data, please refer to the lighting table below
	Daylight Control	
	Luminaire Lumens/ Circuit Watt or W/m²	
	Lux Levels	
Air Side Config Office & Retail	**DHW Type**	Electric Heaters
	Heat Source Type	Air Source Heat Pump
	HVAC Type	Split or Multi Split Systems
	AHU Extract SFP W/l/s	0.7
	AHU Fresh Air W/l/s	0.7
	Terminal Fan SFP W/l/s	0.4
Nat Vent Circulation	**Heat Source Type**	Air Source Heat Pump
	HVAC Type	No Heating or Cooling
	Heating Type	N/A
Extract Only WC	**DHW Type**	Electric Heaters
	Heat Source Type	Air Source Heat Pump
	HVAC Type	Electric Heaters
	Heating Type	Electric Heaters
Heating Circuit	**Fuel Source**	Electricity
	Heat Pump?	Yes
	Distribution Efficiency %	100
	SCOP %	500
Cooling Circuit	**SEER**	6.7
DHW Circuit	**Fuel Source**	Electricity
	Distribution Efficiency %	100
	Efficiency %	100

	Baseline		
Zone	**Presence Detection System**	**Daylight Control**	**Lm/W**
Showers	Auto On / Auto Off	N/A	70
Circulation	Auto On / Auto Off	N/A	70
Office	Auto On / Auto Off	Photocell Dimming	75
Plant	None	N/A	70
Reception	None	Photocell Dimming	70
Store	None	N/A	70
Toilet	Auto On / Auto Off	N/A	70
Retail	None	N/A	70

	Lean		
Zone	**Presence Detection System**	**Daylight Control**	**Lm/W**
Showers	Auto On / Auto Off	N/A	70
Circulation	Auto On / Auto Off	N/A	70
Office	Auto On / Auto Off	Photocell Dimming	80
Plant	Auto On / Auto Off	N/A	80
Reception	Auto On / Auto Off	Photocell Dimming	70
Store	Auto On / Auto Off	N/A	70
Toilet	Auto On / Auto Off	N/A	70
Retail	None	N/A	70

For all inputs at 'Be Lean' stage please refer to Appendix A.

5.2 Conclusion

Based on the proposed systems the building emission rate is 11.2% lower than the baseline target emission rate. Dropping from 26 kg/m²/yr to a value of 23.1 kg/m²/yr.

The improvement results from implementing a broad range of measures, including:

- High efficiency lighting
- High efficiency fans
- Air source heat pumps
- Very high efficiency heating system

The 'Be Lean' measures provide a carbon reduction against the baseline L2A 2013 compliant building of 11.2% on regulated emissions.

5.2.1 Carbon Emissions at End of 'Be Lean' Stage (GLA Table 3)

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13
Be Lean	51.20	46.13

5.2.2 Carbon Emissions at End of 'Be Lean' Stage (GLA Table 4)

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	6.4	11.2%

6 BE CLEAN – SUPPLY ENERGY EFFICIENTLY (18-21 H.C)

The next step in the Energy Hierarchy is the 'Be Clean' strategy of supplying the required energy as efficiently as possible.

Potential approaches include connecting the scheme to existing low carbon or CHP-led district energy networks, or if no existing schemes exist, investigating whether such networks are planned in the area and designing systems with the flexibility to connect to these in the future.

With or without a district energy system, the feasibility of CHP (combined heat and power). For larger developments, the use of a site wide communal heating system should be provided if considered viable.

6.1 Proposed Development

6.1.1 District Energy Networks

The London Heat Map has been reviewed to check if the development can connect into an existing distribution network. Currently there are no existing or proposed heat distribution networks in the vicinity and as such this technology has not been incorporated into the proposed scheme.

6.1.2 CHP

Combined heat and power engines are not viable for a development of this nature due to a low constant heat demand and there being no significant background heat demand during the summer. As such we do not propose to utilise CHP.

6.2 Conclusion

The development will not be connected to a district heating network or be provided with a CHP engine and as such these Clean measures have not been adopted as part of GDM's proposals.

The carbon emissions at the end of the 'be clean' stage are identical to those at the end of the 'be lean' as indicate within tables GLA 1 and 2.

6.2.1 Carbon Emissions at End of 'Be Clean' Stage (GLA Table 3)

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13
Be Lean	51.20	46.13
Be Clean	51.20	46.13

6.2.2 Carbon Emissions at End of 'Be Clean' Stage (GLA Table 4)

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	6.4	11.2%
Be Clean	-	0.0%

Total saving with Lean and Clean measures applied equals **11.2%.**

7 BE GREEN – RENEWABLE ENERGY (18-21 H.C)

The third and final stage of the energy hierarchy - 'Be Green' is to review the potential of a range of renewable energy systems to serve the energy requirements of the site and thereby offset CO_2 emissions.

7.1 Proposed Development

7.1.1 Summary of Modelling inputs at 'Be Green' Stage

Renewables	**Inclination**	10
PV	**Solar Reflectance**	0.2
	Surface Area m²	83
	Efficiency %	15

7.1.2 Solar Water Heating

Solar thermal domestic hot water consumption is technically viable for this development. However, installing a solar thermal system to serve the office toilets will not make a significant carbon saving as the domestic hot water demand is very low. This combined with the limited available space at roof level has resulted in this technology being excluded from the final design proposals.

7.1.3 Wind Power

It is recognised that wind generators are often associated with unacceptable visual and noise implications. Wind technology as a renewable energy source is not considered appropriate for this site as it is felt that the wind turbines would not be visually appropriate for this development and this technology being excluded from the final design proposals.

7.1.4 Biomass Heating

Biomass heating is not considered to be a suitable technology for urban locations. With local boilers in each unit biomass boilers are not a viable solution due fuel distribution problems on the site. In addition, the boilers are often un-used due to maintenance issues, fuel supply issues, and operating costs as such this technology being excluded from the final design proposals.

7.1.5 Photovoltaics

PV Panels are a viable technology for this development and there is sufficient south facing flat roof area to provide a substantial PV array. The building is not significantly overshadowed so PV panels would get significant amounts of sunlight. There is limited space available on the roof. With this in mind the maximum PV array proposed at roof level is 64m² and an additional 19m² above the roof level plant enclosure. The total PV area is 83m² as shown on architect's layouts.

A PV Array of 83m² offers 8.1% carbon savings compared to the Lean/Clean emissions for this scheme.

7.2 Conclusion

Photovoltaic collectors are the only viable solution for the proposed development. Therefore, a PV array of 83m² has been incorporated into the 'Be Green' design proposal.

7.2.1 Carbon Emissions at End of 'Be Green' Stage (GLA Table 3)

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13
Be Lean	51.20	46.13
Be Clean	51.20	46.13
Be Green	46.55	46.13

7.2.2 Carbon Emissions at End of 'Be Green' Stage (GLA Table 4)

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	6.4	11.2%
Be Clean	-	0.0%
Be Green	4.7	8.1%

8 CONCLUSION – 18-21 HAND COURT

Energy efficiency measures will be implemented to provide carbon savings of 35% in comparison to a baseline building that is fully compliant with the standard set by Part L 2013. The energy efficiency measures include: improved fabric insulation; improved air tightness; high efficiency fans; high efficiency heat recovery heating and cooling plant, heat recovery on ventilation systems; daylight control of the lighting and a 83m² array of PV. This will ensure the development achieves part L 2013 compliance through energy efficiency and green measures.

Photovoltaic collectors are the only viable solution for the proposed development. Therefore, a PV array of 83m² has been incorporated into the 'Be Green' design proposal.

GLA tables 3 and 4 show the savings in carbon dioxide achieved by the three steps. The total site wide regulated carbon saving through the combination of energy efficient design and renewable technologies is **19.2%.**

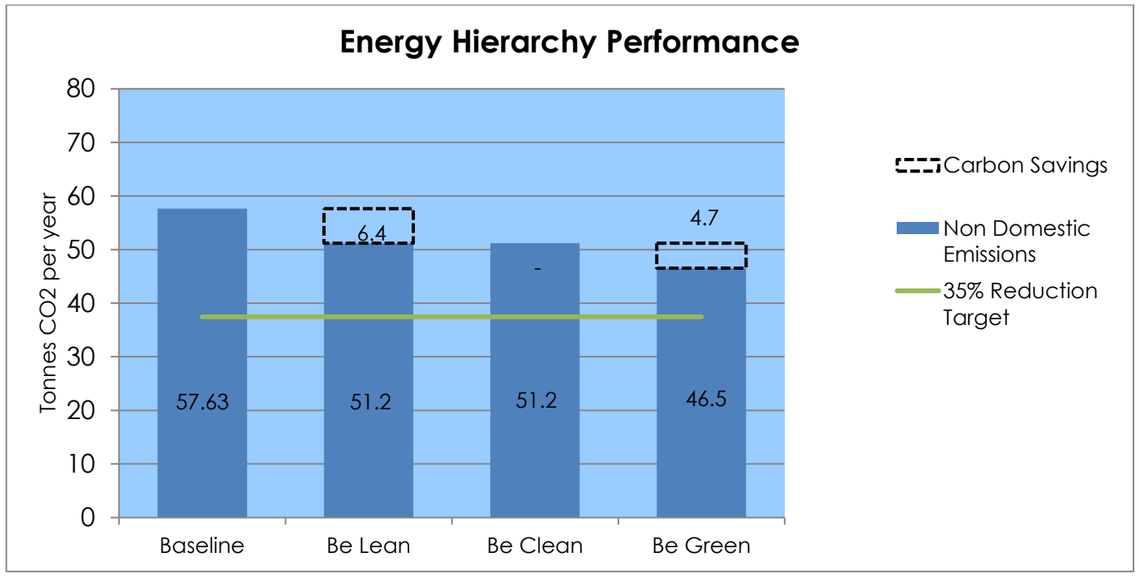
Due to the development not reaching a carbon reduction target of 35%, a carbon offset payment will accommodate the additional 15.8%. With the London Borough of Camden's carbon offset costing £90 per tonne, 18-21 Hand Court's cost over a 30 year period is £24,536 which equals £818 per year.

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13
Be Lean	51.20	46.13
Be Clean	51.20	46.13
Be Green	46.55	46.13

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy

18-21 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	6.4	11.2%
Be Clean	-	0.0%
Be Green	4.7	8.1%
Total cumulative savings	11.1	19.2%



9 BASELINE ENERGY CONSUMPTION AND CARBON EMISSIONS (22-23 H.C)

Before energy efficiency measures are investigated, it is necessary to establish the baseline energy consumption of the scheme, for comparison and evaluation of the proposed carbon reduction measures.

The baseline case for this development will be the existing 22-23 Hand Court development.

The on-site energy consumption associated with non-regulated uses (e.g. lifts, small power and information technology) is included in the baseline carbon emission analysis.

The following 'regulated' energy uses are considered in the baseline energy analysis.

- Space Heating/Cooling
- Water Heating
- Ventilation
- Fans, Pumps and Controls
- Lighting (internal)

9.1 Proposed Development

9.1.1 Summary of modelling inputs at Baseline Stage

		Baseline
U Values W/m²K	External Walls	1.45
	Floor	0.82
	Roof	1.73
	Glazing	5.14
	Air Permeability	25
Lighting	Electricity Power Factor	<0.9
	Auto Presence Detection	For lighting data, please refer to the lighting table below
	Daylight Control	
	Luminaire Lumens/ Circuit Watt or W/m²	
	Lux Levels	
Air Side Config Office & Retail	DHW Type	Electric DHW Heaters
	Heat Source Type	Air Source Heat Pump
	Heat Recovery	Yes
	HVAC Type	Split or Multi Split
	Exchanger Efficiency	0.6
	AHU Extract SFP W/l/s	1.5
	AHU Fresh Air W/l/s	1.5
Nat Vent Circulation	DHW Type	Electric DHW Heaters
	HVAC Type	Local Heater - Unfanned
	Heating Type	Direct Electric
Extract Only WC	DHW Type	Same As Circulation
	HVAC Type	
	Extract Fan SFP W/l/s	
	Heating Type	
Heating Circuit	Fuel Source	Electricity
	Heat Pump?	Yes
	Distribution Efficiency %	95
	SCOP %	300
Cooling Circuit	Fuel Source	Electricity
	SEER	2.5
	Distribution Efficiency %	95
DHW Circuit	Fuel Source	Electricity
	Heat Pump?	No
	Distribution Efficiency %	90
	Efficiency %	95

9.2 Conclusion

9.2.1 Carbon Emissions for 22-23 Hand Court Existing

22-23 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	29.65	12.73

Based upon the results of this model a target emission rate of 45.9 kg/m²/year has been identified as the baseline/existing building figure.

10 PROPOSED DEVELOPMENT (22-23 H.C)

This section outlines how energy consumption will be reduced through the implication of the refurbishment works.

This is achieved by passive measures and the introduction of more energy efficient plant and services. The refurbishment works consist of new MEPH equipment to the office and retail areas.

The new VRF system shall generally comprise of an external condenser unit connected to a number of internal fan coil units. The condenser shall be sited on the roof of 22-23 Hand Court complete with acoustic treatment. Refrigerant pipework shall be fixed to containment within the redundant stair case.

The first floor of 22-23 Hand Court shall be provided with its own air handling unit (AHU) complete with a high efficiency heat exchanger within the ceiling void of the floor plate. Fresh air intake shall be via the light well to the East, while vitiated air shall be discharged via the redundant stair case to the West.

Space shall be allocated at the 2nd floor level of 22-23 Hand Court for the future A1/A3 tenant's plant.

10.1 Proposed Development

10.1.1 Summary of Modelling inputs for 22-23 Hand Court proposed

		Proposed
U Values W/m²K	External Walls	1.45
	Floor	0.82
	Roof	1.73
	Glazing	5.14
	Air Permeability	25
Lighting	Electricity Power Factor	<0.9
	Auto Presence Detection	For lighting data, please refer to the lighting table below
	Daylight Control	
	Luminaire Lumens/ Circuit Watt or W/m²	
	Lux Levels	
Air Side Config Office & Retail	DHW Type	Electric DHW Heaters
	Heat Source Type	Air Source Heat Pump
	Heat Recovery	Yes
	HVAC Type	Split or Multi Split
	Exchanger Efficiency	0.7
	AHU Extract SFP W/l/s	0.7
	AHU Fresh Air W/l/s	0.7
Nat Vent Circulation	DHW Type	N/A
	HVAC Type	Local Heater - Unfanned
	Heating Type	Direct Electric
Extract Only WC	DHW Type	Electric DHW Heaters
	HVAC Type	Local Heater - Unfanned
	Extract Fan SFP W/l/s	0.5
	Heating Type	Direct Electric
Heating Circuit	Fuel Source	Electricity
	Heat Pump?	Yes
	Distribution Efficiency %	100
	SCOP %	500
Cooling Circuit	Fuel Source	Electricity
	SEER	6
	Distribution Efficiency %	100
DHW Circuit	Fuel Source	Electricity
	Heat Pump?	No
	Distribution Efficiency %	100
	Efficiency %	100

10.2 Conclusion

Based on the proposed systems the building emission rate is 18.7% lower than the Existing Building target emission rate. Dropping from 45.9 kg/m²/yr to a value of 37.3 kg/m²/yr.

The improvement results from implementing a broad range of measures, including:

- High efficiency lighting
- High efficiency fans
- Air source heat pumps
- Very high efficiency heating system

The 'Proposed' measures provide a carbon reduction against the Existing Building of 18.7% on regulated emissions.

10.2.1 Carbon Emissions for Existing and Proposed

22-23 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	29.65	12.73
Proposed	24.10	12.73

10.2.2 Carbon Emissions and Reduction

22-23 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	5.6	18.7%

11 CONCLUSION – 22-23 HAND COURT

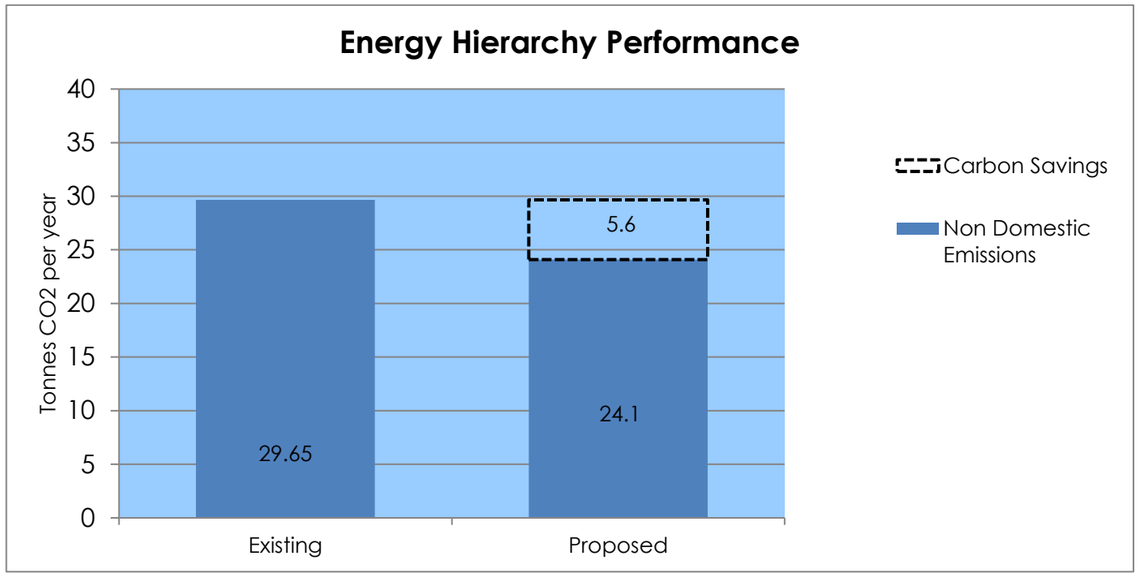
Energy efficiency measures will be implemented to provide a reduction in carbon emissions in comparison to the existing 22-23 Hand Court building. The energy efficiency measures include; high efficiency fans; high efficiency heat recovery heating and cooling plant, heat recovery on ventilation systems; daylight control of the lighting.

The Tables below show the savings in carbon dioxide achieved. The total site wide regulated carbon saving through the combination of energy efficient design is **18.7%.**

No refurbishment works are being carried out to the building fabric of 22-23 Hand Court, however through the installation of upgraded building services equipment, the estimated carbon reduction has been calculated at 18.7% when compared against the existing 22-23 Hand Court development.

22-23 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	29.65	12.73
Proposed	24.10	12.73

22-23 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Proposed	5.6	18.7%



12 FINAL SUMMARY

12.1 18-21 Hand Court

As 18-21 Hand Court is a new build development and 22-23 Hand Court is only an internal refurbishment the targeted 35% reduction in regulated carbon emissions is deemed to be applicable to 18-21 Hand Court only.

Energy efficiency measures have been implemented to provide carbon savings of approximately 19.2% in comparison to a baseline building that is fully compliant with the standard set by Part L 2013.

Due to the development not reaching a carbon reduction target of 35%, a carbon offset payment will accommodate the additional 15.8%. With the London Borough of Camden's carbon offset costing £90 per tonne, 18-21 Hand Court's cost over a 30 year period is £24,536 which equals £818 per year.

GLA Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	57.63	46.13
Be Lean	51.20	46.13
Be Clean	51.20	46.13
Be Green	46.55	46.13

GLA Table 4: Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
18-21 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Be Lean	6.4	11.2%
Be Clean	-	0.0%
Be Green	4.7	8.1%
Total cumulative savings	11.1	19.2%

12.2 22-23 Hand Court

22-23 Hand Court is only an internal refurbishment so no carbon reduction target is required. However, carbon reduction calculations have been carried out comparing the existing building with the proposed to demonstrate the predicted reduction in CO2 achieved in this part of the development.

Energy efficiency measures via new building services provide carbon savings of approximately 18.7% in comparison to the existing 22-23 Hand Court development.

22-23 Hand Court Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	29.65	12.73
Proposed	24.10	12.73

22-23 Hand Court Development	Carbon dioxide savings (Tonnes CO_2 per annum)	Carbon dioxide savings (%)
Proposed	5.6	18.7%

13 APPENDIX A

		Baseline	Be Lean	Be Green
U Values W/m²K (Average)	External Walls	0.35	0.26	0.26
	Floor	0.22	0.22	0.22
	Roof	0.25	0.18	0.18
	Glazing	1.6 (Gv 0.4)	1.4	1.4
	Air Permeability	10	5	5
Lighting	Electricity Power Factor	<0.9	<0.9	<0.9
	Auto Presence Detection	For lighting data, please refer to the lighting table below	For lighting data, please refer to the lighting table below	For lighting data, please refer to the lighting table below
	Daylight Control			
	Luminaire Lumens/ Circuit Watt or W/m²			
	Lux Levels			
Air Side Config Office & Retail	DHW Type	Natural Gas	Electric Heaters	Electric Heaters
	Heat Source Type	LTHW Boiler	Air Source Heat Pump	Air Source Heat Pump
	Heat Recovery	Thermal Wheel	Thermal Wheel	Thermal Wheel
	HVAC Type	Fan Coil Systems	Split or Multi Split Systems	Split or Multi Split Systems
	Exchanger Efficiency	0.7	0.7	0.7
	AHU Extract SFP W/l/s	0.8	0.7	0.7
	AHU Fresh Air W/l/s	0.8	0.7	0.7
	Terminal Fan SFP W/l/s	0.4	0.3	0.3
Nat Vent Circulation	DHW Type	N/A	N/A	N/A
	Heat Source Type	LTHW Boiler	Air Source Heat Pump	Air Source Heat Pump
	HVAC Type	Radiators	No Heating or Cooling	No Heating or Cooling
	Heating Type	Radiators	N/A	N/A
Extract Only WC	DHW Type	Natural Gas	Electric Heaters	Electric Heaters
	Heat Source Type	LTHW Boiler	Air Source Heat Pump	Air Source Heat Pump
	HVAC Type	Radiators	Electric Heaters	Electric Heaters
	Extract Fan SFP W/l/s	0.4	0.4	0.4
	Heating Type	Radiators	Electric Heaters	Electric Heaters
Heating Circuit	Fuel Source	Natural Gas	Electricity	Electricity
	Heat Pump?	N/A	Yes	Yes
	Distribution Efficiency %	98	100	100
	SCOP %	98	500	500
Cooling Circuit	Fuel Source	Electricity	Electricity	Electricity
	SEER	5	6.7	6.7
	Distribution Efficiency %	100	100	100
DHW Circuit	Fuel Source	Natural Gas	Electricity	Electricity
	Heat Pump?	N/A	N/A	N/A
	Distribution Efficiency %	98	100	100
	Efficiency %	98	100	100
Renewables PV	Inclination	N/A	N/A	10
	Solar Reflectance	N/A	N/A	0.2
	Surface Area m²	N/A	N/A	83
	Efficiency %	N/A	N/A	15
	EPC	B32	B29	B26
TER	kg.CO2/m².yr	26	25.7	25.7
BER	kg.CO2/m².yr	25.5	23.1	21
	Pass/Fail	Pass	Pass	Pass