Roehampton Gate Café

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Energy Statement

12/04/2024

Rev P02

MAX FORDHAM

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ISSUE HISTORY

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P01	12/04/2024	S1 – Draft Issued for Planning
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CONTENTS

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

This energy statement is in support of the planning application for the new Roehampton Gate Café.

The site is situated off Priory Lane, Richmond Park and is therefore governed by both the London Plan and the London Borough of Richmond Upon Thames Local Plan. The planning policies outline how the Mayor of London and London Borough of Richmond Upon Thames are endeavouring to improve the way energy and other resources are used in London's building stock.

The description of development is as follows and Planning Permission is sought for the following:

The demolition of the existing Roehampton Gate Café and the erection of a new café with a commercial Kitchen, dining area and kiosk as well as facilities and a bike hire.

The report's structure is based on the "Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)" and aims to:

- Demonstrate compliance with Building Regulations Part L2A and L2B, primarily comparing the building emission rate (BER) to the target emission rate (TER) using the Building Regulations Part L 2021.
- Demonstrate the development complies with the London Plan Energy Hierarchy – 'Be lean, be clean, be green'.
- Show the measures adopted to reduce the cooling demand, by following the Cooling Hierarchy, whilst also ensuring the risk from overheating is reduced, in line with TM52 and TM59/Building Regulations Part O.

2.0 Design Philosophy

The proposed development responds to the Mayor's Energy Strategy as stated in The London Plan. The design team has approached the design in the following order:

1. Be Lean: use less energy (energy efficient fabric, high performance lighting and controls)
2. Be Clean: supply energy efficiently (i.e., connection to local district heat network, none present for this site)
3. Be Green: use renewable energy Air Source Heat Pumps (ASHP) and photovoltaic (PV) panels
4. Be Seen: monitor, verify and report on energy performance through the Mayor's post construction monitoring platform

The energy strategy and stage principles applied for Roehampton Gate Café can be summarised as the following

Be Lean: Use less energy

- Improved building fabric/ air tightness: High-performance building fabric, airtightness and thermal bridging to reduce winter heat loss and summertime gains.
- Heat recovery ventilation: Mechanical ventilation with heat recovery (MVHR) in places where Natural ventilation is not an appropriate option.
- Efficient lighting and controls: High efficiency lighting and demand led presence control
- Controls: Variable speed and demand led controls

Be Clean: Supply energy efficiently
The first step in developing the 'Be Clean' strategy was to evaluate whether a connection to an area wide district heating network is possible. There are no existing or proposed area-wide district heat networks in the vicinity of the site available for connection, and so no reduction is available in this part of the hierarchy.

Be Green: Use renewable energy

- Air Source Heat pumps – proposed to provide heating and DHW
- Heat pump AHU- To provide tempered air to the kitchen space
- Photovoltaic (PV) Panels – Solar PV array provides 98m2 of PV are on the sloped roof area

2.1 Emission Factors

For the purposes of this energy statement the proposed development's initial baseline emissions and CO_2 reductions are calculated using the current Building Regulation Part L2 2021 approved software: IES VE Compliance software 2022. For the purposes of the energy hierarchy, the current SAP 10.2 carbon emission factors as directed by the GLA Energy Assessment Guidance.

Source	SAP 10.2
Natural Gas	0.210 kg CO_2/kWh
Grid Electricity	0.136 kg CO_2/kWh

Table 0-1 Carbon factors used in energy modelling

2.2 Summary of Results

GLA London Plan Energy Hierarchy
The GLA energy assessment uses the London Plan 2021 new SAP10.2 carbon factors.

- At the 'Be Lean' stage the development achieves a reduction below the baseline. Due to this development not being considered major, the target of 15% does not apply here.
- 'Be Clean' stage is not targeted as there is no connection to a district heating system, with on-site heating generation proposed.
- Following the 'Be Green' stage the overall development achieves a total cumulative 65% carbon emissions reduction using ASHPs and PV panels. This is well above the GLA's 35% reduction requirement for developments.

Applying London Plan policy
As outlined in the GLA Energy Assessment Guidance updates - Part L 2021 (15 June 2022), the application of the new Part L 2021 means achieving on-site carbon reduction vary for different development types:

- Initially, developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35 per cent improvement. The non-residential element of the proposed development achieves a 65% improvement.

2.3 Site-Wide Carbon Emission Results

	Total regulated emissions (Tonnes CO2 / year)	CO2 savings (Tonnes CO2 / year)	Percentage savings (%)
Part L 2021 baseline	3.95		
Be lean	3.94	0.01	1%
Be clean	-	-	-
Be green	1.39	2.56	65%
Total Savings	-	2.56	65%
	-	CO2 savings off-set (Kg CO2)	-
Off-set	-	2560.0	-

Table 0-2: Site Wide Regulated Carbon Emissions and Savings

2.4 Energy Use Intensity demand

Building type	EUI (kWh/m^2/year) (excluding renewable energy)	Space heating demand (kWh/m^2/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m^2/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m^2/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
Café	59.68	13.47	55	15	Part L2 - approved DSM & CIBSE TM54	

Table 1-3: Reporting EUI and space heating demand

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3.0 SITE DETAILS

3.1 Site Location, Weather and Microclimate

Figure 3-1. Site Location on Ordinance Survey mapping

The proposed café is within the north-east corner of Richmond Park, close to the Roehampton Gate entrance and the Alton Estate. There is an existing café on site which is proposed to be replaced.

As part of Richmond Park, the site is within the boundary of a National Nature Reserve (NNS), Figure and a Site of Special Scientific Interest (SSSI). It is also designated 'Metropolitan Open Land'. The site itself is to be upon existing hard landscape but is adjacent to Wood pasture and Parkland BAP Priority Habitat.

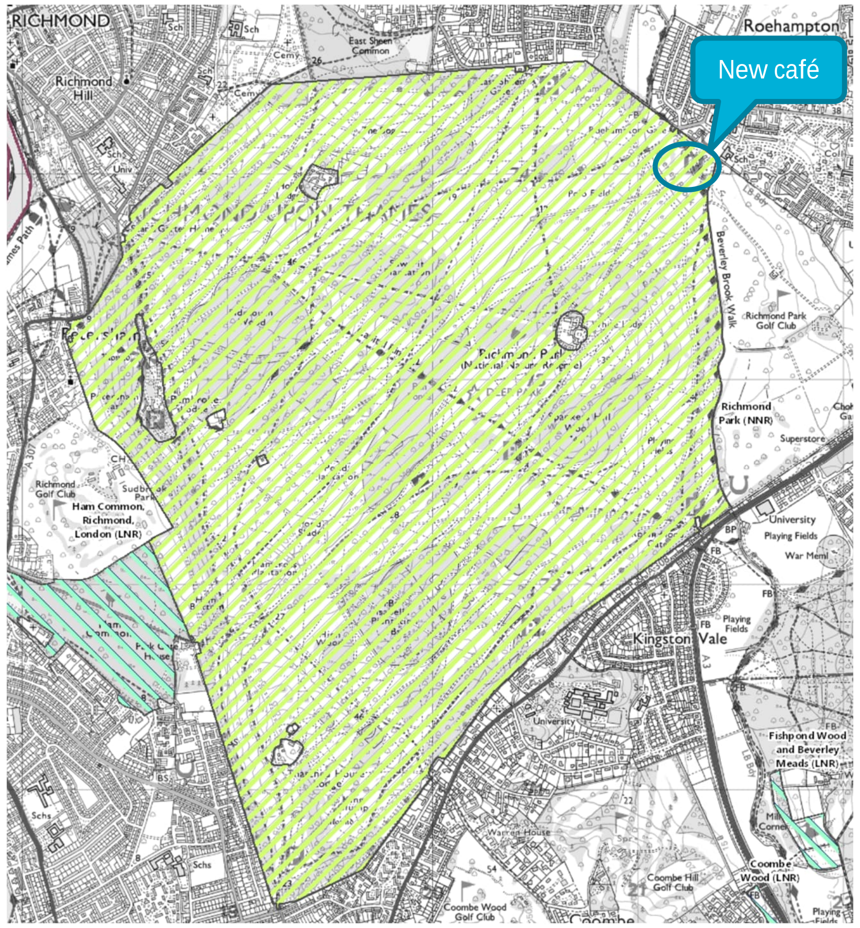

Figure 3-2. Map showing National Nature Reserves (NNS) boundary, courtesy of DEFRA Magic Map

The location of the site does not experience a noticeable microclimate. As such, the analysis was performed using CIBSE's Test Reference Year (TRY) weather file for London from 2005.

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Building Layout, Orientation and Form

Layout & orientation
Given the location in the north-eastern corner of Richmond Park, there is a desire to have the public café space looking out to the south-west to views of the park. This will result in good levels of natural daylight and beneficial solar gains. The building is single storey to minimise the visual impact.

Back of house service spaces are generally clustered to the north. The stores and plant rooms are typically unoccupied and do not have glazing. This helps improve the façade thermal performance and limits unwanted solar gains.

The kitchen is landlocked but includes rooflights to allow natural light to enter.

The information and interpretation room has windows on the east façade, allowing natural ventilation but limiting direct solar gains, particularly in the afternoon. Doors opening to the main café space allow purge cross ventilation.

A stand-alone building provides public toilet facilities and a bicycle hire centre.

Figure 3-2. The new development and the extents of the site.

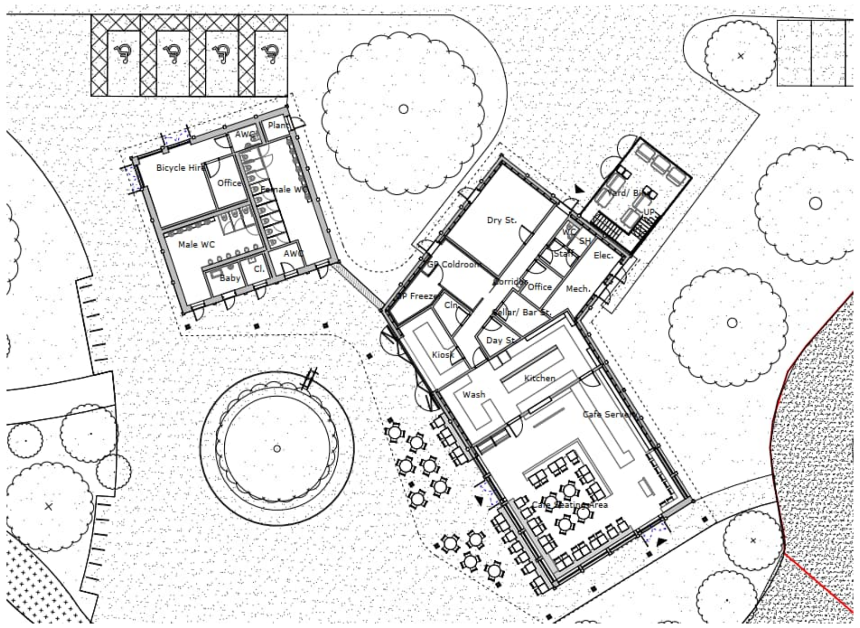

Figure 3-4. Room layouts

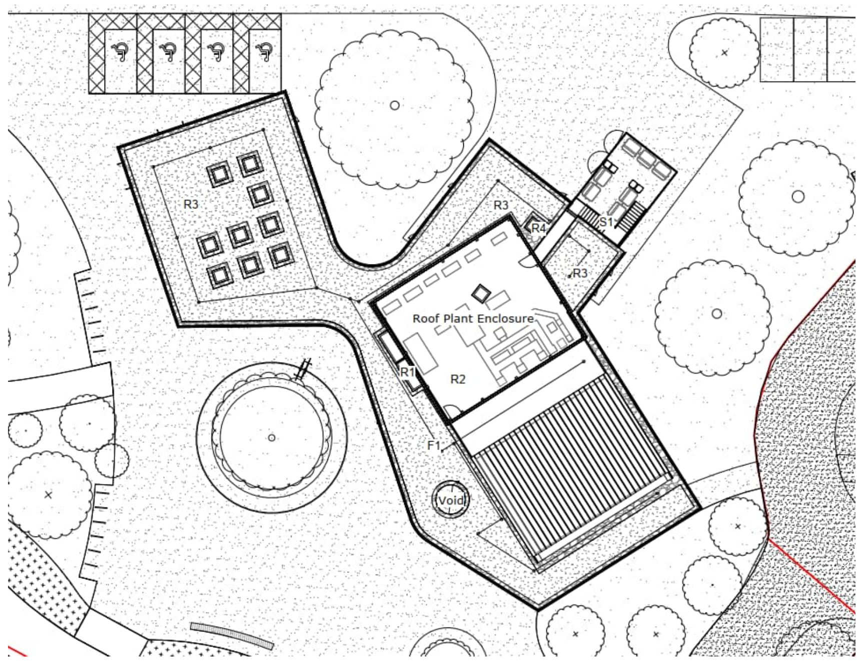

Figure 3-5. Layout showing shading roof structure and plant enclosure

4.0 POLICY CONTEXT

4.1 Policy Context

Under the Climate Change Act 2008, the Government put in place legally binding carbon reduction targets of 35% by 2020 and 80% by 2050 compared to 1990 levels.

The construction and operation of the UK buildings account for approximately 60% of national carbon dioxide emissions. Therefore, planning legislation seeks to mitigate the impacts from building in-use energy in order to minimise these emissions to meet the national targets.

The relevant national, regional and local energy policy requirements have been considered when developing the proposals. The policy documentation provides detailed guidance, therefore only the main influencing policy is summarised below and subsequently referred to in this assessment.

4.2 National Policy

National Planning Policy Framework
The planning process at local level is governed by the 2021 National Planning Policy Framework (NPPF), from which the London Plan and further references and guidance are derived.

The NPPF sets out the overarching planning policies on the delivery of sustainable development through the planning system. It outlines a wide range of topics, such as:

- Sustainable transport
- Delivering high quality homes
- Healthy communities
- Protecting Green Belt land
- Meeting the challenge of climate change, flooding and coastal change
- Conserving and enhancing the natural environment

Building Regulations (England)
The Building Regulations set out statutory requirements and building standards nationally and are applicable to this development. Compliance with the Building Regulations shall be demonstrated to the Approved Inspector.

A new building must be built to a minimum standard of total energy performance. This is evaluated by comparing calculations of the performance of the 'actual building' (known as the Building Emission Rate (BER) against calculations of the performance of a theoretical building, called the 'notional building' (known as the Target Emission Rate). The notional building is the same size and shape as the actual building and has standardised properties for fabric and services. The full properties of the notional building are set out in the National Calculation Methodology Modelling Guide.

4.3 Regional Policy - The London Plan 2021

The London Plan 'Spatial Development Strategy for Greater London', published in March 2021, forms the statutory development plan for Greater London over the next 20-25 years. In it, the Mayor of London lays out the London-wide policy context within which London Boroughs should set their local planning policies.

All policies within the plan promote sustainable development, including mitigating and adapting to the impacts of climate change, as well as promoting health and equality within London. A number of policies directly related to energy use within buildings and energy generation, which form an integral part of the London Plan.

Policy GC6 'Increasing Efficiency and Resilience'
Help London become a more efficient and resilient city:

- Improve energy efficiency and support move toward a low carbon circular economy, contributing towards London becoming a zero-carbon city by 2050.
- Building and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, and avoiding contributing to the heat Island effect.

Policy G1 'Green Infrastructure'
Development proposals should incorporate appropriate elements of green infrastructure that are integrated into London's wider green infrastructure network.

Policy SI1 'Improving Air Quality'
- All major developments need to demonstrate that they will be at least air quality neutral.
- All energy proposals should have emissions lower than those generated by ultra-low NOx emission gas boilers.
- Developments in Air Quality Focus Areas (AQFA) will be under particular scrutiny.
- For major developments preliminary Air Quality Assessments (AQAs) should be carried out before designing the development to inform the design process.

Policy SI2 'Minimising Greenhouse Gas Emissions'
Major developments should be net zero carbon, which means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the Energy Hierarchy:

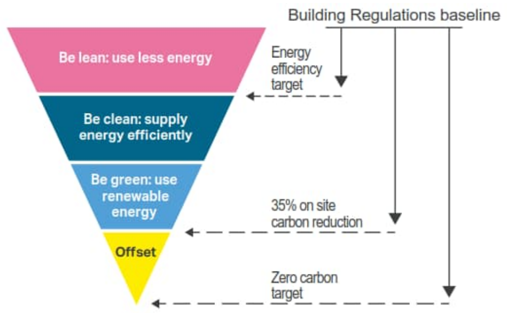

Figure 4-1 London Plan Energy hierarchy

Be Lean: Use less energy and manage demand during operation

Be Clean: Exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

Be Green: Maximise opportunities for renewable energy by producing, storing and using renewable energy onsite

Be Seen: Monitor, verify and report on energy performance

- Major developments to be net-zero carbon overall, although this can be achieved through off-site or offsetting payments.
- As with current London Plan at least a 35% reduction on building regulations must be achieved on site.
- For residential developments 10% of the reductions must be achieved through energy efficiency.
- For non-domestic 15% of reductions must be achieved through energy efficiency.
- Major development proposals should calculate and minimise carbon emissions of unregulated emissions.
- Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.
- All developments to demonstrate how the development will achieve net-zero carbon on-site by 2050.
- All major developments to monitor and report on their energy use for 5 years after completion. It has suggested that DECs might be used to do this (currently only required for public buildings).
- Gas-engine CHP will not be permissible in developments due to the new air quality standards and decarbonising electricity grid.
- The Mayor recognises that Building Regulations use outdated carbon emission factors and that this will continue to cause uncertainty until they are updated by Government. Further guidance on the use of appropriate emissions factors will be set out in the Mayor's Energy Planning Guidance to help provide certainty to developers on how these policies are implemented.
- Demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible, required.

Policy SI3 'Energy Infrastructure'
Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system.

Requirement for an energy masterplan for large-scale developments (town centres and areas of multiple developments) which should consider:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including possible opportunities to utilise heat from energy from waste plants
4) secondary heat sources
5) opportunities for low temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) Implementation options for delivering projects, considering issues of procurement, funding and risk, and the role of the public sector.
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures

The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks
b) use available zero-emission or local secondary heat sources (in conjunction with heat pump, if required
c) Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network).
d) Use ultra-low NOx gas boilers.

CHP and ultra-low NOx gas boiler communal or district heating systems to meet the requirements of policy SI1 (Air Quality).

Policy SI4 'Managing Heat Risk'
Show steps to minimise overheating and avoid active cooling:

1	Minimise internal heat generation through energy efficient design;
2	Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
3	Manage the heat within buildings 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)

Table 4-1 The London Plan Cooling Hierarchy

Policy SI8 Waste capacity and net waste self-sufficiency
A In order to manage London's waste sustainably:
1. the equivalent of 100 per cent of London's waste should be managed
2. within London (i.e., net self-sufficiency) by 2026
3. existing waste management sites should be safeguarded (see Policy SI 9 Safeguarded waste sites)
4. the waste management capacity of existing sites should be optimised. New waste management sites should be provided where required
5. environmental, social and economic benefits from waste and secondary materials management should be created.

B Development Plans should:
1) plan for identified waste needs
2) identify how waste will be reduced, in line with the principles of the Circular Economy and how remaining quantums of waste will be managed
3) allocate sufficient sites, identify suitable areas, and identify waste management facilities to provide the capacity to manage the apportioned tonnages of waste, as set out in Table 9.2 – boroughs are encouraged to collaborate by pooling their apportionment requirements
4) identify the following as suitable locations to manage borough waste apportionments:
   a. existing waste and secondary material sites/land, particularly waste
   b. transfer facilities, with a view to maximising their capacity
   c. Strategic Industrial Locations and Locally Significant Industrial Sites safeguarded wharves with an existing or future potential for waste and secondary material management.

C Mayoral Development Corporations must cooperate with host boroughs to meet identified waste needs.
D Development proposals for materials and waste management sites are encouraged where they:
1) deliver a range of complementary waste management and secondary material processing facilities on a single site
2) support prolonged product life and secondary repair, refurbishment and remanufacture of materials and assets
3) contribute towards renewable energy generation, especially renewable gas technologies from organic/biomass waste, and/or
4) are linked to low emission combined heat and power and/or combined cooling heat and power (CHP is only acceptable where it will enable the
5) delivery or extension of an area-wide heat network consistent with Policy SI 3 Energy infrastructure Part D1c)

4.4 Sustainability design and construction SPG

The Sustainable Design and Construction SPG, adopted in April 2014, provides additional information and guidance to support the implementation of the Mayor's London Plan. The SPG does not set new policy but explains how policies in the London Plan should be carried through into action.

It is applicable to all major developments and building uses so it is not technically applicable to this development, however in line with the developer's intention to implement the requirements of the London Plan it has been used to guide the design. It covers the following areas:

- Resource Management
- Adapting to Climate Change and Greening the City
- Pollution Management

This SPG provides a basis for sustainable design in London. Where additional local policies are addressed by these areas this has also been indicated.

4.5 Richmond Upon Thames Local Plan

The new Local plan for the London Borough of Richmond Up-on Thames is not due to be adopted until Autumn 2024 and therefore this project will be led by the Adopted Local Plan, July 2018. The Local Plan sets out the policies and guidance for the development of the borough, looking ahead to 2033. The applicable policies when considering Low and Zero Carbon Technologies are given below:

Policy LP 10 – Local Environmental Impacts, Pollution and Land Contamination

Air Quality
- Secure at least an 'Emissions Neutral' development

Noise and vibration
- Good acoustic design to ensure occupiers of new and existing noise sensitive buildings are protected

Light Pollution
- Artificial lighting in new developments shall not lead to unacceptable impact

Policy LP 20 – Climate Change Adaption
- Design to minimise the effects of overheating as well as minimising energy consumption in accordance with the cooling hierarchy

Policy LP 22 – Sustainable Design and Construction

A. Achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change.

   New non-residential building over 100sqm will be required to meet BREEAM 'Excellent" standard.

B. Incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon

   All non-residential buildings over 100sqm should achieve a 35% reduction over the target emission rate (TER). From 2019 all major non-residential building should achieve zero carbon standard in line with London Plan policy.

C. Required reduction over the TER should be achieved by following the Energy Hierarchy Be Lean, Be Clean and Be Green.

D. Connect to existing decentralised energy (DE) systems where feasible to help achieve Mayor of London target of 25% of heat and power to be generated through localised decentralised energy.

5.0 'BE LEAN' – DEMAND REDUCTION

As this scheme is within London, the Greater London Authority (GLA) London Plan is applicable. This requires the development to follow the Energy Hierarchy. This includes a 15% reduction at the 'Be Lean' stage, as part of a fabric first approach. In line with this, the scheme is proposed to have a fabric thermal performance typically 15% or better than the current Building Regulations notional building with which it is compared.

The new 2021 Building Regulations *'Approved Document L, Conservation of fuel and power, Volume 2: Buildings other than dwellings'* will be applicable to this scheme. The fabric thermal performance requirements have increased as compared to the previous Part L 2013. The proposed improved values in Table will help to reduce the heat loss (and therefore carbon emissions attributed to space heating) passively before considering active engineering systems and renewable energy. Good air tightness levels are to be achieved to limit additional unwanted heat losses through treated air escaping externally.

	Notional Building Benchmark 2021 (1)	Proposed Specification	Change over notional
			Thermal Transmittance U-values in W/(m².K)
Roofs	0.15	0.12	20%
External walls	0.18	0.15	17%
Party walls	1.8	1.80	0%
Floor	0.15	0.1	33%
Windows and transparent curtain walling (inc. frames)	1.4	1.2	14%
Roof windows and glazed roof-lights (inc. frames)	2.1	1.60	24%
Pedestrian doors (including glazed doors)	1.9	1.4	26%
Vehicle access and similar large doors	1.3	-	-
High-usage entrance doors	1.9	1.40	26%
Roof ventilators (inc. smoke vents)	1.8	-	-
			Glazing Solar and Optical Properties
g-value	Side lit: 29%	0.3-0.45	3%
	Top lit: 40%	-	-
Light transmittance	Side lit: 60%	0.7	17%
	Top lit: 71%	-	-
			Airtightness
Air permeability (m³/(h.m²) at 50 Pa)	Side lit: 3 Top lit: 5	< 3.0	0%

Table 5-1 Fabric performance values

1. Values from Tables 1, 3 & 4 of NCM Modelling Guide 2021

Fabric thermal mass
During summer, thermal mass can help limit overheating by taking advantage of the diurnal temperature changes, allowing the mass to cool overnight and absorb unwanted heat during the day. During winter, thermal mass can absorb solar radiation from direct solar gains. This can then be slowly released into the space, reducing active heating demand. Direct sunlight increases natural light levels which can reduce artificial lighting energy use. A balance between all these must be sought to enable heat gains only when desirable, maximising daylight but limiting glare.

For thermal mass to be effective, it needs to be able to absorb heat readily, which means it needs to:

- present a large surface area, exposed to the room, for heat transfer by convection and radiation
- have a high thermal conductivity so heat can get in and out
- have a high heat capacity so it can store a lot of heat.

Consideration has been given to including thermal mass, and this has been explored as a part of the dynamic overheating modelling using CIBSE's TM52 assessment criteria.

5.1 Daylighting Strategy

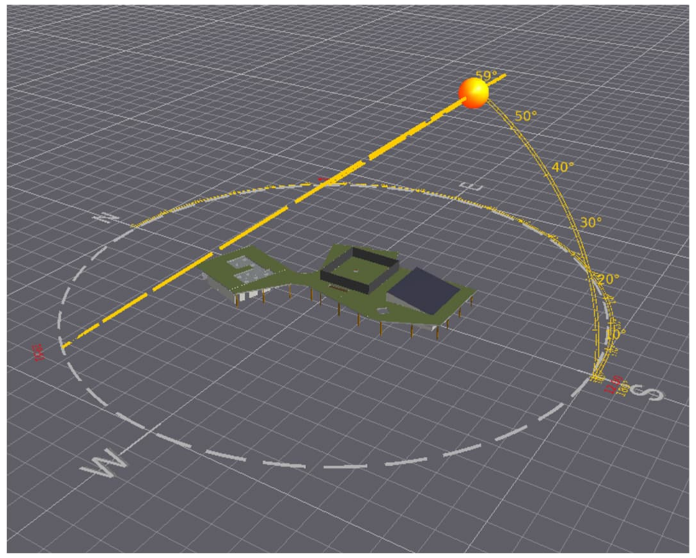

Figure 5-1. Sun path and external shading illustration

The south-west facing café will have a highly glazed façade, allowing high levels of daylight. This natural light will reduce energy use from artificial lighting, and appropriate responsive lighting controls with photoelectric dimming are proposed to allow this. All occupied rooms with windows will have similar daylight dimming controls.

Given the high glazing levels in the café, large window openings are to be included on adjacent external facades, allowing high air volumes through cross ventilation. This is part of a natural cooling strategy. An overhead shade reduces solar gains during midday summer months but allows low angle solar gains during the colder months when the sun's arc remains lower in the sky.

Spaces which do not benefit from daylighting, such as changing rooms, WCs, plantrooms and stores, which have low occupancy or lower lighting level requirements, have been concentrated in the north side or core of the building where there is less access to daylight.

5.2 Solar Control

Associated solar gains from direct sunlight that enters the Café space would result in passive heating. This may be desirable in the colder periods, but also increases risk of overheating at warmer times. The current design includes overhang shading on the south-west façade of the café to limit direct solar gains during peak summer periods where the sun angle is high overhead. Adjacent to the café, on both sides, external canopies will provide additional shading to the café space and provide a shaded outdoor seating area.

The design strategy will adopt a mixture of strategic external shading and solar control glass to limit excessive solar gains. A solar 'g' value of 0.3 is currently proposed for the Café, but this will be further developed in the next design stage using the dynamic overheating modelling following CIBSE's TM52 overheating assessment criteria.

Internal blinds will allow occupant control to limit daylight and glare in the office and interpretation room. The café will have high level internal diffusing blinds to limit glare.

Summary of Solar Control Measures:
Table summarises the proposed solar control measures to achieve the Criterion 3 minimum target and glare comfort. During Stage 3, the design team will further develop the solar control measures that may need to be updated to suit the results.

Area	Shading	Light transmission	Solar 'g' value
Café	External overhang shading + Internal diffusing blinds to top section	70	0.3 – 0.45
West facing external glazing	Standard internal blinds	70	0.3 – 0.45

Table 5-2. Summary of solar control measures to main glazed elevations

5.3 Be Lean Results

At the 'Be Lean' stage the development achieves a reduction below the baseline. Due to this development not being considered major, the target of 15% does not apply here.

	Total regulated emissions (Tonnes CO2 / year)	CO2 savings (Tonnes CO2 / year)	Percentag e savings (%)
Part L 2021 baseline	3.95		
Be lean	3.94	0.01	1%

Table 5-3. Be Lean Modelling Results

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6.0 COOLING AND OVERHEATING

In line with Policy SI 4 'Managing heat risk' of the London Plan, to reduce active cooling demand and associated energy consumption, the strategy followed the cooling hierarchy, and several passive design strategies to limit the impact of the higher summertime temperature have been investigated and integrated into the building design. The Cooling Hierarchy set up by the London Plan has been followed.

Figure 6-1: The Cooling Hierarchy

The proposal is for all cooling to be by passive means. There is no mechanical cooling proposed on site.

6.1 The Cooling Hierarchy

The cooling hierarchy in Policy SI 4 of the London Plan has been applied to the development. The following measures are proposed to reduce the demand for cooling:

Roehampton Gate – Café Space

	Cooling Hierarchy	Steps taken
1	Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure	Use of shading over the southernly facing windows of the café area to minimise summer heat gains.
2	Minimise internal heat generation through energy efficient design	Glazing g value at 0.4 to ensure solar gain limitations are not exceeded.
3	Manage the heat within the building through exposed internal thermal mass and high ceilings	Double height space in café area with operable clerestory window to make use of the natural stratification of rising warm air also known as the stack effect.
4	Passive ventilation	Use of both low level and high-level openings - operable by occupant control. Clerestory window open at night to allow for night purging.
5	Mechanical ventilation	Mechanical ventilation is proposed to provide fresh air to ancillary spaces such as offices, WCS and the Kitchen. No mechanical ventilation is proposed in the main café space.
6	Provide active cooling	Active cooling is not proposed on this site

Table 6-1: Roehampton Gate Café Summary of Steps following cooling hierarchy

6.2 Overheating Risk Analysis

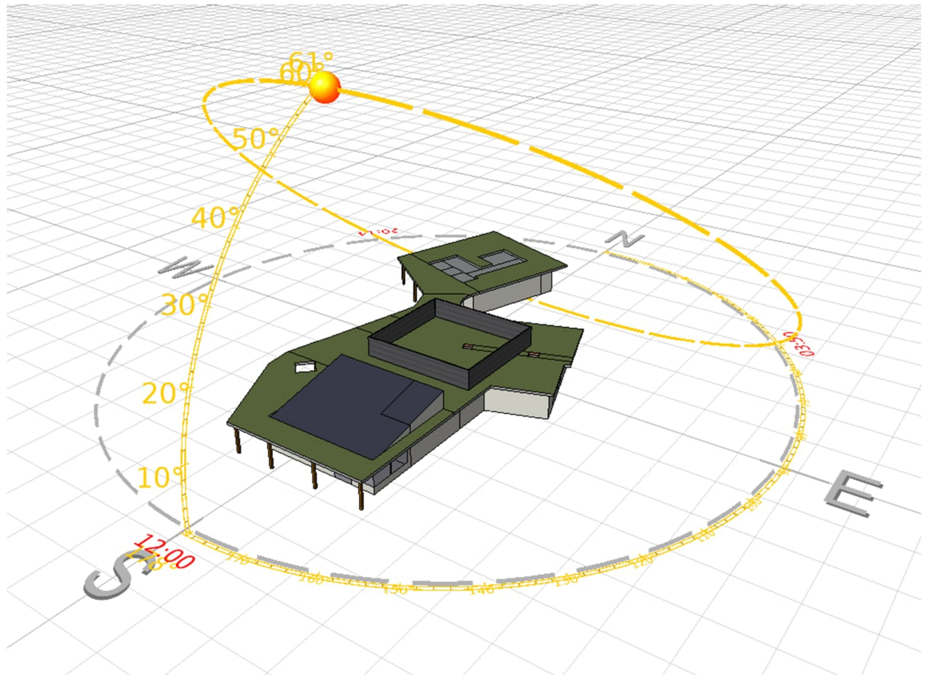

Figure 6-2: 3D View of IES model

An overheating assessment in accordance with the requirements of the GLA London Plan has been undertaken for the proposed development at Roehampton Gate Café. The development comprises the demolition of the existing and the construction of the proposed Roehampton Gate Café. The café is the only space that has been analysed to CIBSE TM52 criteria.

IES VE2022, an AM11 compliant software package, has been used to simulate the buildings, with the non-domestic spaces assessed against CIBSE TM52 criteria.

In accordance with the GLA London Plan, the London Heathrow 2020s DSY1 weather file has been used, for the high emissions scenario at the 50th percentile.

6.3 Modelling Overview

The key measures enabling compliance with TM52 for Roehampton Gate Café are:

- All openings, as indicated on the architectural elevations, must be able to open to at least 45°
- A glazing G value of 0.3 must be achieved.
- Night ventilation must be possible to the clerestory window. It is critical that these measures are retained in the proposals in order to ensure an acceptable level of overheating risk.

6.4 M52 – 'the limits of thermal comfort: avoiding overheating in European buildings'

As Criterion 3 does not cover all factors influencing overheating, and in line with SI 4 of The London Plan and the Sustainable Design and Construction SPG20, a dynamic overheating analysis was completed following CIBSE's TM52 guidance.

A dynamic simulation overheating analysis was completed for the main café seating area due to being a highly glazed, naturally ventilated space.

Summary of overheating modelling assumptions

- Dynamic overheating analysis software: IES Virtual Environment 2018, Macroflo, VistaPro.
- Site location: Roehampton Gate Café
- Site orientation: Main axis runs 0 degrees from north.
- Weather files used: London Weather Centre DSY (Design Summer Year)
  - London_LHR_DSY1_2020High50.epw – *2020s, high emissions, 50% percentile scenario.*

- Ventilation openable areas:

Location	Details	Free area (m2)	Solar 'g' value
Low level	Window openings	12.5	0.3
	Door	4.32	0.3
High level	Clerestory Window	9.4	0.3

Table 6-2 Summary of openable areas

- Internal gains:

Internal Gains	(kW)
People	4.2
Lighting	1.3
Equipment	0.6
TOTAL	6.1

Table 6-3 Summary of internal gains

- Occupancy profiles: 8am to 6pm
- Thermal elements performance (U-values and glazing g-values): For building fabric U-values, refer to Table 5-1 Fabric Performance values.

Ventilation strategy

- Café – Natural ventilation strategy using stack effect with low- and high-level openings, double height space.
- All other occupied zones are mechanically ventilated, with heat recovery, summer bypass and active cooling where required.

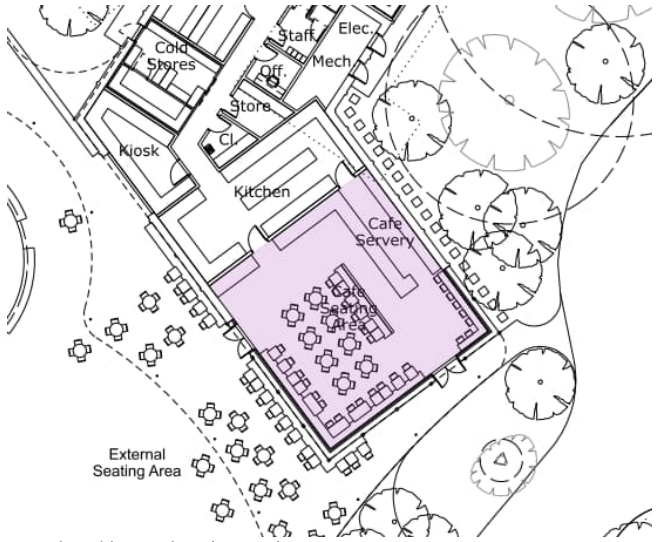

Figure 3: Plan showing area analysed in overheating study.

TM52 Modelling Results
The overheating results for the foyer/café area are presented below.

Room Name	CIBSE Weather File	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Overall Result
Café	London_LHR_DSY1_2020High50.epw	2.81	21	4	1	PASS

Table 6-4 Summary of TM52 Overheating Results

DSY1
In line with the Energy Assessment Guidance, modelling shows that the CIBSE compliance criteria are met for the DSY1 weather scenario.

Conclusion
The overheating mitigation strategy for this development has sought to optimise thermal and aesthetic advice provided from the Design Review Panel. The result is a robust strategy that has been modelled using the most appropriate weather file and passes the DSY1 criteria as required by the GLA showing that the showing that the measures adopted mitigate overheating within acceptable parameters.

Building Regulations Criterion 3
A solar gain analysis was completed for Criterion 3 of the Building Regulations Part L 2021 using the IES VE-Compliance software. This is to ensure the effects of solar heat gain are limited in summer. All applicable space in Roehampton gate passed Criterion 3.

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Office	NO (-44.3%)	No
Office	NO (-47.3%)	No
Café	NO (-39.9%)	No

Table 6-5: Criterion 3 Results

6.5 Active Cooling

Active cooling is not proposed in Roehampton Gate Café.

7.0 'BE CLEAN' – HEATING INFRASTRUCTURE

7.1 District heating suitability

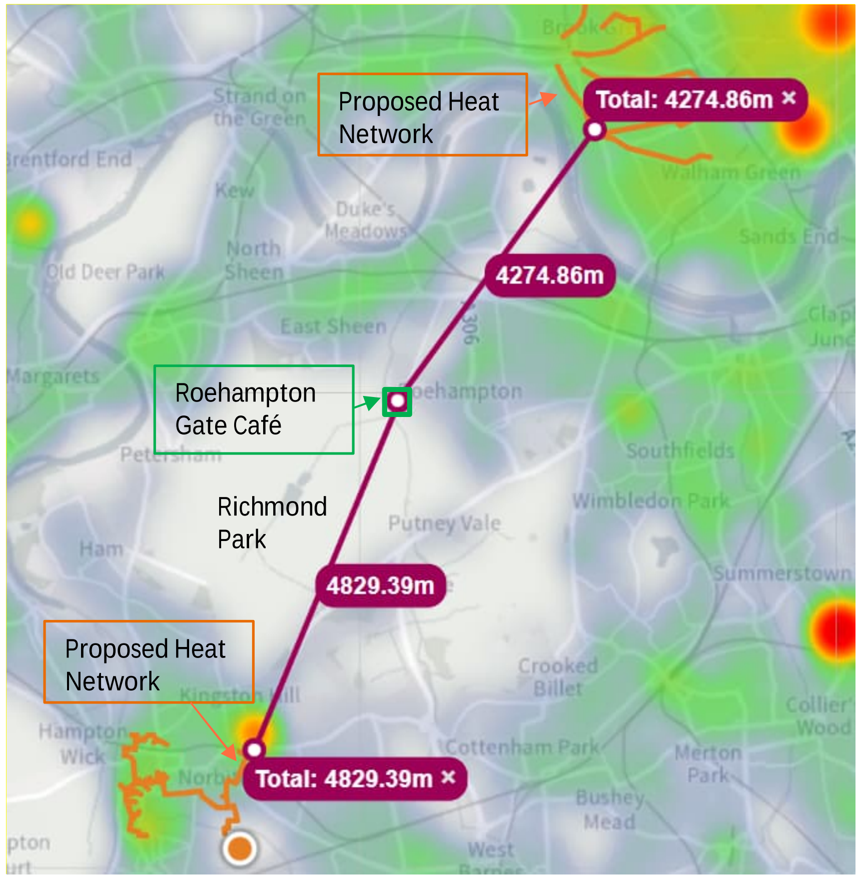

Figure 7-1 London Heat Map in area surrounding Roehampton Gate Café

Figure 7-1 shows the London heat map in the surrounding area of the site. It shows that Roehampton Gate Café is located in an area of low heat demand. The nearest proposed networks are one 4.2km away.

Connecting to either of these networks would require a huge amount of ground works and capital investment. This would make connecting to either the existing or planned network unfeasible due to large associated costs. Excessive ground works

8.0 'BE GREEN' - RENEWABLE ENERGY

8.1 Renewable Energy Feasibility Study

The site's suitability for connection to an existing heating or cooling network has been assessed in the previous section in line with the GLA's recommended hierarchy for selecting a heat source. Since this has been deemed unfeasible, the second option in the GLA hierarchy is to use zero-emission or low carbon heat sources.

Please refer to the Appendix for the BRUKL results.

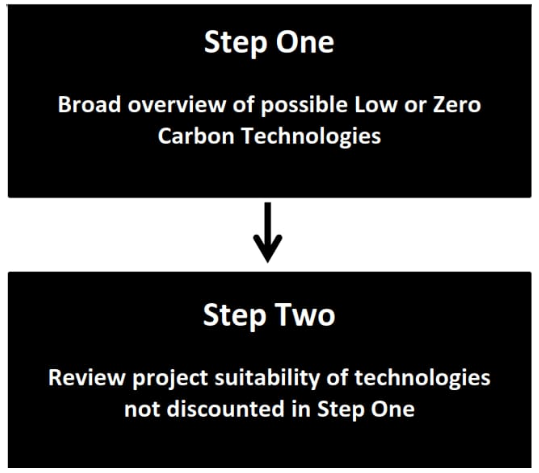

Figure 8-1--Steps in LZCT Feasibility Study

Each stage will be used to refine the choice of LZCTs down further by looking into the possible options in increasing levels of detail. The first stage will involve discounting any obviously unsuitable options due to factors such as site restraints and local criteria. In comparison, stage two will analyse which of the remaining options are suitable for the project and the proposed building in more detail. At this stage LZCTs will be discounted where they are deemed incompatible with the proposed building.

8.2 Step One- High Level Appraisal

The following table shows whether each low or zero carbon technology was accepted or rejected. All rejections have been justified within the table. The criteria used to determine the sustainability of these technologies included:

- London planning guidance
- Richmond Upon-Thames planning obligations (incl. land use, noise, practical feasibility and pollution)

Table 8-2- LZCT Feasibility Assessment- Step 1

Category	Low or Zero Carbon Technology	Suitable
Solar	Solar photovoltaics	Yes
	Solar thermal	Yes
Wind	Small scale wind energy	No- inefficient and vibrations can cause structural problems.
	Large scale wind energy	No- Insufficient space and risk to local ecology.
Water	Water Wheel	No- Closest body of water is Beverley Brook 0.23km away from site. Installation could lead to damage to park land. Risk to local ecology of Beverley Brook.
	Micro hydro	
	Large scale hydro	
	Tidal	
	Wave	
Heat Pumps	Ground source heat pump	Yes
	Water source heat pump	No-0.23km from nearest body of water. Installation could lead to damage to park land.
	Air source heat pump	Yes
	Sewage Heat Recovery	No- Major sewer is not available
Biomass	Woodchip fired boiler	No- The site lies in an Air Quality Management Area. Fuel would have to be sourced from a great distance and would need to be delivered by a HGV. Hence, the biomass combustion and the road transport required would likely increase local air pollution contributing to NOx and particulate levels. In addition, Biomass should not be sourced from the site as this does not align with the management strategy set out by the Richmond Park Management Plan 2019-2029.
	Pellet fired boiler	
CHP	Natural gas	No- As the electricity grid decarbonises the viability for CHP decreases. Gas fired CHP are also associated with high NOx emissions.
Anaerobic Digestion	Powered by food waste	No – Insufficient waste generated on site to meet demand and high maintenance demand.
District heating	Natural gas	No- There is no feasible local district heating source that can be used to serve the building. See discussion below.
	CHP	
	Biomass	

8.3 Step 2- Project Suitability Matrix

The summary table on the following page sets out the advantages, disadvantages and project suitability of the LZCT deemed found credible in step one. This section is set out in a matrix to make comparisons of technologies easier. The technologies deemed suitable in step two are will then be analysed further in step three.

Table 1

TECHNOLOGY NAME	Solar  Photovoltaics (PV)	Solar Thermal 	Air Source Heat Pump (ASHP) 	Ground Source Heat  Pump (GSHP)
LOCATION	Mounted on the roof of the building	Mounted on roof of the building	Located in acoustic enclosure to the rear of the building	Heat pump in plant room with collector buried in the ground
LOAD	Generates on-site electricity	Generates domestic hot water (DHW)	Takes heat from air to heat refrigerant, used for heating and cooling	Generates hot water for heating (35°C to 65°C) and can be used for cooling
ADVANTAGES	• Easy to install • Light weight, low plant space requirement • Low maintenance • Zero carbon electricity	• Zero carbon domestic hot water produced • Light weight	• Heat is extracted from the air to heat the building and the hot water • No boreholes required which reduces capital cost • Heat recovery system can provide heating and cooling simultaneously	• Heat is extracted from the ground to heat the building and hot water • Higher COPs can be achieved than with ASHP, high COP can be maintained in winter • Can be installed in internal plantroom without access to large volumes of fresh air
DISADVANTAGES	• Lower efficiency compared to solar thermal • Large area of panel required to generate a meaningful amount of electricity • Requires direct sunshine to function efficiently	• Relatively low temperature hot water produced • Requires extensive hot water storage and separate heating networks to distribute and store the lower temperature heat to produce hot water • Very high capital costs • Requires more maintenance than a PV system • Surplus energy can't be exported	• Efficiency is low if the heating system is not weather compensated • Systems are much less efficient when generating DHW than space heat • Not as efficient as a ground source heat pump	• Performance dependent on geological conditions • High capital cost • Capacity of installation limited by size of ground array which can be installed – minimum distances required between energy piles to achieve optimum efficiency • COP drops at higher generation temperatures • May not be able to run all year around due to risk of excessively lowering ground temperature
Government Schemes	Smart Export Guarantee (SEG) -4.5p/kWh estimated based on other projects	N/A	N/A	N/A
PROJECT SUITABILITY	• Suitable due to ease of installation, low maintenance requirements and silent, vibration free operation • High utilisation of generated electricity as generation time coincides with commercial building opening hours. • PV has been selected, ahead of solar thermal panels, for installation on the remaining available roof space as the building has high electrical load.	• Solar thermal and PV panels would compete for the same available installation space on the developments roof. • The demand may not match the supply as usage will be unpredictable and irregular. There will be seasonal high generation in the summer with less usage compared to PVs which will have a fairly consistent demand. • Due to prohibitively expensive capital costs compared to PV and the higher requirement for electricity rather than hot water, solar thermal has not been selected for use in this project.	• There is sufficient roof plant space for a number of ASHPs within an acoustic enclosure. • ASHP create noise and will require some acoustic intervention. • ASHP have relatively low capital cost compared to other similar technologies such as GSHPs. • ASHPs are suitable for this project.	• A GSHP would contribute to the base load but is unlikely to be able to run all year round. • The installation of a GSHP would have a high capital cost. • GSHP could be used along with ASHP to heat DHW. • A horizontal GSHP installed at shallower depth is less effective than vertical systems using boreholes that could be installed. • GSHP is suitable for heating and cooling on this project. Suitability of DHW generation will be investigated. • Cooling is not required on this project, continuous absorption of heat with out
	YES	NO	YES	NO

8.4 Heat Pump Information

The proposal is for heating and Domestic hot water to be provided by 2 No. ASHPs located in the plant deck at roof level.

The benefits of ASHPs include:

- Low carbon heat, with potential for zero carbon as grid decarbonises
- No boreholes required which significantly reduces the capital cost compared to other heat pump technologies such as Ground Source

Technology Summary
An air source heat pump installation involves extracting heat from the ambient air to provide efficient space heating to a building. Air temperatures in the UK are reasonably stable, fluctuating from 5-25 °C throughout most of the year. This relatively high temperature can be taken advantage of as a heat source by using a heat pump to 'pump up' the extracted heat to a useful temperature for space heating.

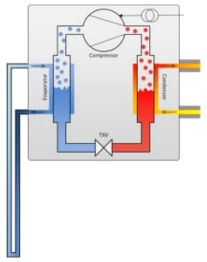

Figure 8-2 Heat Pump Mechanism

Heat pumps operate on the same basis as a fridge, but in the opposite direction. A fridge moves heat from inside the fridge to outside the fridge. In contrast, a heat pump moves heat from outside the building to inside it. This process is more efficient if the source of the heat is warmer.

The electrical-to-thermal efficiency of a heat pump is know as the coefficient of performance, and is the ratio of thermal energy produced by the heat pump to the electrical energy spent running the machine. This value varies as a function of output temperature. The lower the temperature produced by the heat pump the greater the COP.

There are two types of air source heating systems. Air-to-air systems provide warm air, which is circulated to heat the building. On the other hand, air-to-water systems provide warm water to heat a building through radiator or underfloor systems.

The benefits of air source heat pumps are similar to those of ground source heat pumps. Firstly, the system does not require the use or storage of external fuel. The system instead runs on electricity, which eliminates the need for a gas connection or storage of oil/solid fuel. On the other hand, air source heat pumps present an advantage over ground source heat pumps because they require less space to install. Instead of requiring the installation of buried underground coils, air source heat pumps can be fitted using much less space. Also in contrast to the GSHP, the efficiency will not decrease over time. The GSHP's efficiency decreases over time due to the fact that the heat pump process reduces the ground temperature over time as a result of the heating-cooling load imbalance (i.e. heat is taken from the ground and not put back in).

Acoustic intervention must be provided for the external units to mitigate noise from the units to an acceptable level.

Site Applicability

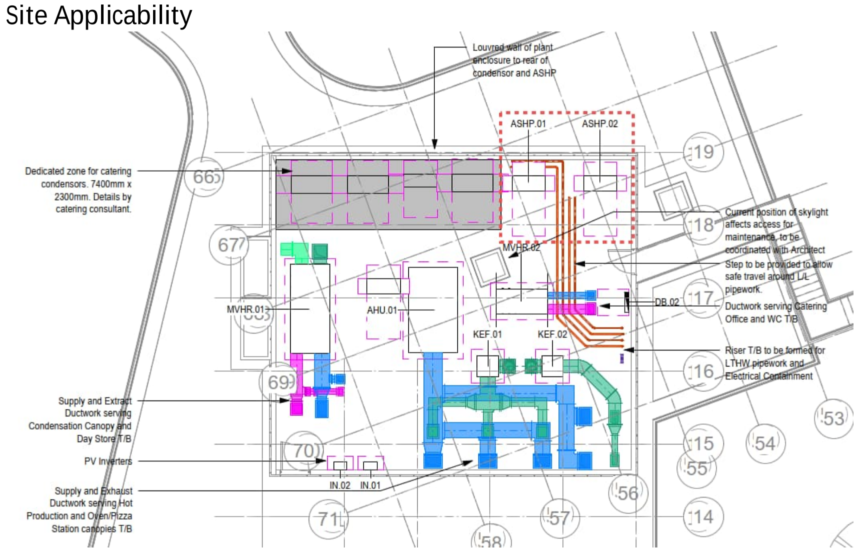

Figure 8-3 Locations of ASHPs and associated plant

The proposed location of the ASHPs is shown in the red dashed box above. The current layout leans to the installation of an ASHPs on the roof of the building above the mechanical/electrical plant room. This allows for short travel between the heat pumps themselves and the ancillary equipment such as a hot water cylinder in the plant room below. Due to the relatively small amount of heated space 2No. 10kW ASHP could be used to provide the heating and hot water load .

8.5 Solar Photovoltaic Panels

A low carbon and renewable technology feasibility study has been carried out for the project. The report concluded that solar PV panels were an appropriate technology for the building to reduce the carbon emissions and comply with the local planning requirement for onsite energy generation.

- Zero carbon electricity
- Easy to install
- Structural assessment of roof required
- Low plant space requirement
- Available flat roof space available

Figure 8-4 PV Array

Technology Summary
Solar photovoltaic (PV) panels convert solar radiation into electricity, providing a carbon free source of electricity for use in building. PVs can be integrated into glazing or roof systems. An inverter and controller are used to convert and synchronise the power with the grid allowing energy to be imported and exported over a standard electricity connection with the addition of an import export meter.

PVs are simple installations with little ongoing maintenance. On the other hand, they have a relatively low efficiency with a current maximum of approximately 21.5%; however due to their low cost they have a good payback time when compared to other technologies.

Site Applicability

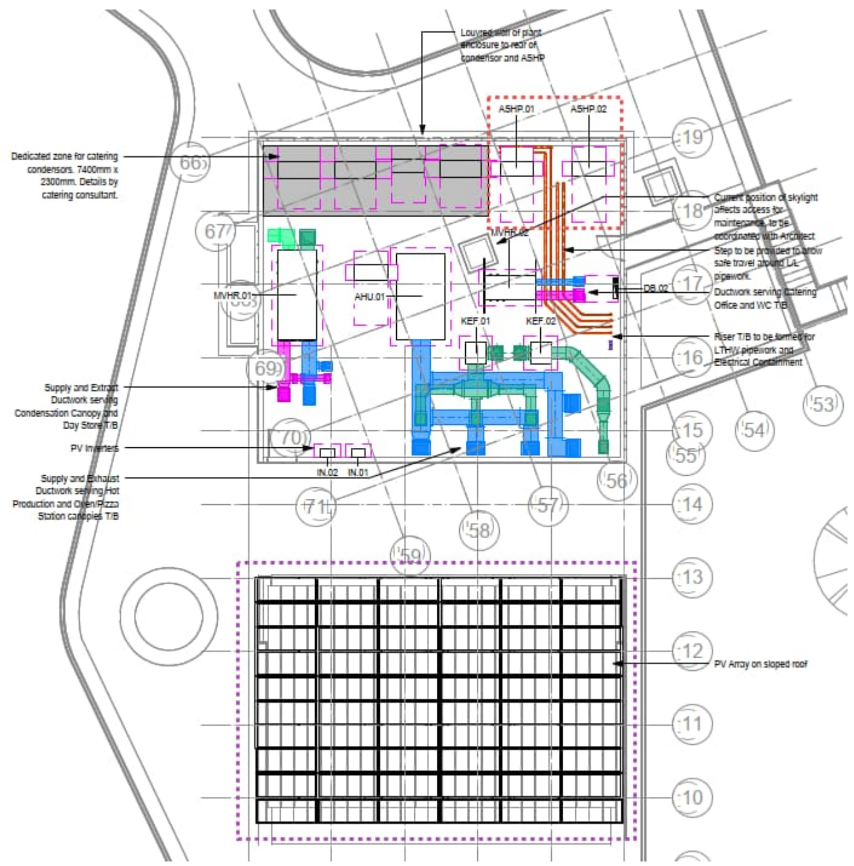

Figure 8-5 PV layout proposal allowing for 60No panels, covering 98m^2 of roof space

The proposed location of the PV Array is shown in the Purple dashed box above. The roof pitch above the Café seating area leans itself to an appropriate PV area. This roof section is not subject to over shading therefore the whole area can be utilised without dropped efficiency. The strategy shown above could allow for 98m^2 of PV area, amounting to about 60 panels. The pitch of the roof allows for the panels to be closely packed together with less requirements for access and maintenance space as a flat roof therefore maximising the PV area with optimal generation.

8.6 Be Green Results

Following the 'Be Green' stage the overall development achieves a total cumulative 62% carbon emissions reduction using ASHPs and PV panels. This is well above the GLA's 35% reduction requirement for developments.

	Total regulated emissions (Tonnes CO2 / year)	CO2 savings (Tonnes CO2 / year)	Percentage savings (%)
Part L 2021 baseline	3.95		
Be Green	1.39	2.56	65%

Table 8-3 Be Green Results