101 Bayham Street, Camden

Energy and Sustainability Statement for Planning

Issue 02 (for Planning)

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CONTENTS

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1.0 EXECUTIVE SUMMARY

The Sustainability Statement supports the planning application for the proposed redevelopment of 101 Bayham Street.

This document describes the proposed approach for the delivery of a sustainable development that fulfils the requirements and objectives of all stakeholders in the planning process from central government to the development's future users.

This report addresses the following:

- Review of relevant planning policy
- Summary of key sustainable strategies
- BREEAM Pre-assessment demonstrating route to BREEAM 'Excellent' with aspirations towards 'Outstanding'

This statement should be reviewed alongside other planning documents that have been submitted for this application.

1.1 Project Introduction

The proposed redevelopment of 101 Bayham Street seeks to extend the usable life of the building through the delivery of high quality, future proofed office space to meet modern occupational demands.

The scheme, located just outside the boundary of Camden Town Centre and within the Knowledge Quarter, realises the need and desire for more engaging and active frontages within the local context.

The proposal seeks to sensitively refurbish the facade to preserve and enhance the character of the Conservation Area, while simultaneously tidying up the roofscape through the screening of the plant area. The overall environmental performance of the building will be significantly enhanced through fabric, and system improvements.

1.2 Sustainability Statement

The following key sustainability themes have been embedded into the redevelopment of 101 Bayham Street, ensuring the development meets the planning requirements relating to sustainability:

- Energy;
- Materials and Waste (including Circular Economy)
- Water;
- Health and Well-being (including noise impact and air quality);
- Nature, Landscape and Biodiversity;
- Adaptation to Climate Change; and
- BREEAM

2.0 PROJECT OVERVIEW

2.1 Site Details

101 Bayham Street is an existing office building, located in the London Borough of Camden. The site has neighbouring buildings to the north and south of the site, however these are not as tall as the project building. Bayham Street runs adjacent to the north-eastern façade of the building, and a shared courtyard is located to the south-west of the site.

Figure 1: 101 Bayham Street front elevation

Bayham Street is a busy street, with noise levels above what would be acceptable for natural ventilation on the lower floors.

The roof area is not overshadowed by any neighbouring buildings and therefore has the potential to be utilised as a sunlit amenity space or for photovoltaic panels. The roof currently houses mechanical plant, and it is expected that as part of the project this plant will be replaced to improve building service efficiency, and the roof arrangement reconfigured to improve its appearance.

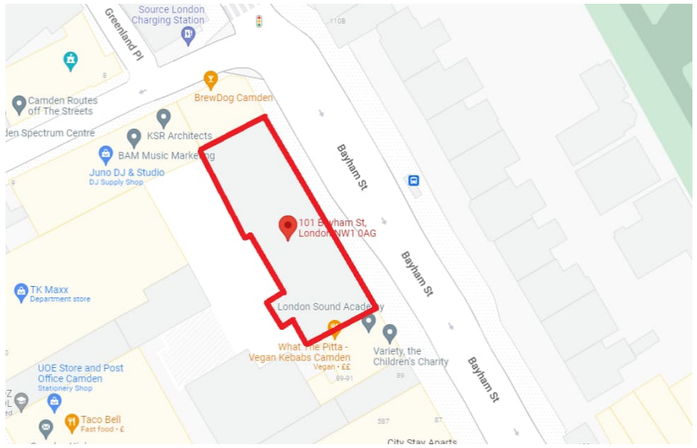

Figure 2: 101 Bayham Street location plan

The site is afforded excellent public transport amenity, achieving a PTAL rating of 6b, the highest rating possible. Camden Town underground station is 3 minutes walk north-west and Mornington Crescent underground station 7 minutes walk south-east. There is a bus stop on the opposite side of the road to the entrance of 101 Bayham Street with buses towards Shepards Bush with further bus stops within less than a minutes walk from 101 Bayham Street with routes towards Clapham Common, Euston Station, Waterloo Station and Kings Cross Station amongst other notable landmarks.

London Cycleway 6 runs along Royal College Street, running parallel to Bayham Street, and continues down to the British Library by Kings Cross Station and as far north as Kentish Town.

St. Martin's Gardens is located a very short walk east of 101 Bayham Street and, as well as outdoor seating, has a playground. The Regent's Park is also a short walk west of the site as well as other small pockets of open green space located within shorts walks of the site.

Being located in Camden the site is also afforded excellent amenity provision with large supermarkets, food outlets, cash points, post offices, and gyms, amongst other facilities, all within a short walk of the site.

2.2 Client Brief

101 Bayham Street is an office project that is aiming to be "Best-in-Class" from the perspective of sustainable development in Camden. The sustainability objectives the project aims to achieve are:

- BREEAM 'Excellent' with aspirations towards 'Outstanding'
- Energy Performance Certificate (EPC) 'B' with aspirations towards 'A'
- BCO 2023 Standards

In addition, the feasibility of the following targets will be explored as the design development:

- WELL 'Platinum'
- NABERS 5*
- Target NZC Building Framework when the target is available.

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3.0 KEY ENERGY AND SUSTAINABILITY POLICIES

3.1 Introduction

The proposed development is submitted within the context of national, regional and local planning policies that seek to address the challenges of climate change and sustainable development. The policies outline how the Government, the Mayor of London, and Camden Council are endeavouring to improve the way energy and other resources are used in London's building stock.

3.2 Policy Summary

- Climate Change Act (2008): 80% reduction in greenhouse gas (GHG) emissions compared to 1990 levels by 2050.
- Current 2013 Part L of the Building Regulations for England & Wales: Sets out maximum levels of CO_2 emissions by comparing the actual buildings, to a notional building.
- Consideration of High-efficiency Alternative Systems: Building Standards requires the technical, environmental and economic feasibility of high-efficiency alternative systems such as renewables, cogeneration, district heating and heat pumps to be considered and taken into account.
- National Planning Policy Framework (2021): Development to promote healthy and safe communities; encourage sustainable modes of transport and use of technology; support transition to low carbon future; mitigate and adapt to climate change, including taking account of flood risk, water supply and biodiversity; conserve and enhance the natural environment; and facilitate the sustainable use of materials.
- London Plan: The energy hierarchy to be followed: be lean, be clean, be green and be seen, all developments to be zero carbon, offsetting can still be used, CHP strongly discouraged due to air quality and grid decarbonisation.
- Camden Local Plan 2017 and Camden Planning Guidance documents provide guidance on a wide range of sustainability subjects
- London Air Quality Management Areas: The development is located within one of London's Air Quality Management Areas (AQMA)

3.3 The Climate Change Act (2008)

The Climate Change Act (2008) commits the UK to a reduction of greenhouse gas emissions (GHGs) by at least 80% by 2050 from 1990. The Act also requires annual emissions reduction targets are set. They restrict the amount of greenhouse gas the UK can legally emit in a five-year period. The UK is currently in the third carbon budget period (2018 to 2022). The 3rd Carbon budget (2018-22) is targeting a reduction of 37% by 2020 from the base year.

UK emissions were 41% below 1990 levels in 2016. The first carbon budget (2008 to 2012) was met and the UK is currently on track to outperform on the second (2013 to 2017) and third (2018 to 2022). However, it is not on track to meet the fourth (2023 to 2027).

To meet future carbon budgets and the 80% target for 2050, the UK Government will need to apply more challenging measures. The construction and operation of UK buildings account for approximately 60% of national carbon dioxide emissions. Therefore, planning legislation seeks to mitigate the impact (in particular) of new construction in order to minimise these emissions and to meet the national targets.

3.4 National Planning Policy Framework (2023)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies on the delivery of sustainable development through the planning system and how these are expected to be applied. It provides a framework within which local people and their councils can produce their own local and neighbourhood plans, which reflect the needs and priorities of their communities.

2. Achieving and Sustainable Development: Developments should consider the three interdependent key objectives in developing a sustainable development:

- Economic objective: To help build a strong, responsive and competitive economy;
- Social objective: To support strong, vibrant and healthy communities; and
- Environment objective: To protect and enhance our natural, built and historic environment.

8. Promoting Healthy and Safe Communities: Developments to consider how to enable and support healthy lifestyles, including improving safety, accessibility, and community interaction as well as access to open, green spaces and recreation.

9. Promoting Sustainable Transport: Developments to consider the environmental implications of traffic and mitigate the impacts. Air quality and public health can be improved through encouraging sustainable modes of transport and offering genuine choices.

14. Meeting the challenge of climate change, flooding and coastal change: Planning system should support the transition to low carbon future in a changing climate, taking full account of long term implications for flood risk, coastal change, water supply , biodiversity and landscapes, and risk of overheating from rising temperatures. Includes requirements for developing energy strategies that are compatible with renewable and low carbon energy sources

15. Conserving and enhancing the natural environment: Policies and decisions should contribute to enhance the natural and local environment.

17. Facilitating the sustainable use of materials: Developments to consider the impact of developments on the material supply chain and how to source materials sustainably.

3.5 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 S4 'Play and Informal Recreation
Development proposals are required to increase opportunities for play and information recreation and enable children and young people to be independently mobile.

Accessible routes to existing play provision, should and youth centres within the local area should also be incorporated where relevant.

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

Policy G4 'Open Space'
Development proposals should not result in a loss of protected open space. Where possible, proposals should also create areas of publicly accessible open space, particularly in areas of deficiency.

Policy G5 'Urban Greening'
Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.

Boroughs should develop an Urban Greening Factor (UGF) to identify the appropriate amount of urban greening required in new developments... the Mayor recommends a target score of 0.4 for developments that are predominately residential, and a target score of 0.3 for predominately commercial development (excluding B2 and B8 uses).

Policy G6 Biodiversity and access to nature
Development proposals should manage impacts on biodiversity and aim to secure net biodiversity gain. This should be informed by the best available ecological information and addressed from the start of the development process

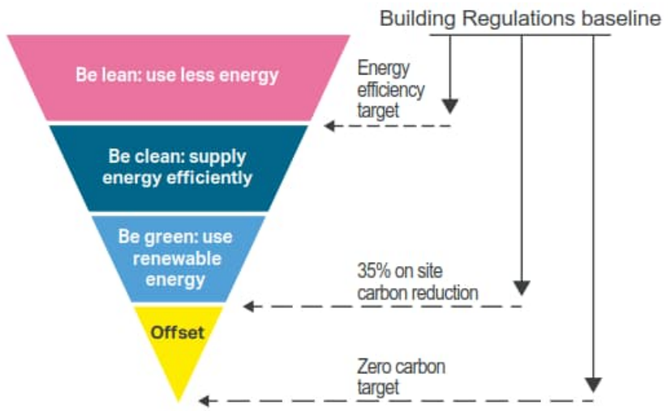
Policy G7 'Trees'
Development proposals should ensure that, wherever possible, existing trees of quality are retained. If it is imperative that trees have to be removed, there should be adequate replacement based on the existing value of the benefits of the trees removed. The planting of additional trees should generally be included in new developments – particularly large-canopied species which provide a wider range of benefits because of the larger surface area of their canopy.

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'
The existing requirements have been strengthened, and some aspirations of the previous plan have been clarified:

The New 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 through orientation, shading, albedo, fenestration, insulation and the provision of green roofs and walls
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) Provide active cooling systems.

Policy SI12 'Flood Risk Management'
Current and expected flood risk from all sources across London should be managed in a sustainable and cost-effective way in collaboration with the Environment agency, the Lead Local Flood Authorities, developers and infrastructure providers.

Policy SI13 'Sustainable Drainage'
Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1) Rainwater harvesting (including a combination of green and blue roofs).
2) Infiltration techniques and green roofs.
3) Rainwater attenuation in open water features for gradual release.
4) Rainwater discharge direct to a watercourse (unless not appropriate).
5) Rainwater attenuation above ground (including blue roofs).
6) Rainwater attenuation below ground.
7) Rainwater discharge to a surface water sewer or drain.
8) Rainwater discharge to a combined sewer.

Development proposals for impermeable paving should be refused where appropriate, including on small surfaces such as front gardens and driveways

Drainage should be designed and implemented in ways that address issues of water use efficiency, river water quality, biodiversity, amenity and recreation.

Policy SI5 'Water Infrastructure'
In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner.

Minimise the use of mains water in line Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption).

Encourage to incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future proofing.

Policy SI7 - Reducing Waste and Supporting the Circular Economy
Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal shall be achieved. Referable applications should promote circular economy outcomes and aim to be net zero-waste. Some key overarching targets set out in this policy are as follows:

- Zero biodegradable or recyclable waste to landfill by 2026
- 65% of municipal waste recycled by 2030
- 95% of construction and demolition waste reused/recycled/recovered
- 95% of excavation waste put to beneficial use

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 and 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)

Policy SI 2 - Minimising Carbon Dioxide 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.

GLA Supplementary Guidance: Circular Economy Statement Guidance & Primer
In support of Policy SI7 - Reducing Waste and Supporting the Circular Economy, projects shall demonstrate how their development, including any public realm and supporting infrastructure, will incorporate circular economy measures into all aspects of the design, construction and operation process. Projects shall ensure that their designs:

- Consider strategies to facilitate the transition towards a circular built environment;
- Recognise opportunities to benefit from greater efficiencies that can help to save resources, materials and money;
- Report against targets that will facilitate monitoring of waste and recycling.

Policy T2 'Healthy Streets'
Development proposals should deliver patterns of land use that facilitate residents making shorter, regular trips by walking or cycling.

In opportunity areas and other growth areas, new and improved walking, cycling and public transport networks should be planned at an early stage, with delivery phased appropriately to support mode shift towards active and public transport travel. Designs for new or enhanced streets must demonstrate how they deliver against the ten healthy streets indicators.

Development proposal should:

1) Demonstrate how they will deliver improvements that support the ten healthy streets indicators in line with transport for London guidance.
2) Reduce dominance of vehicles on London's streets whether stationary or moving.
3) be permeable by foot and cycle and connect to local walking and cycling networks as well as public transport.

Policy T5 'Cycling'
(…) development proposals should help remove barriers to cycling and create a healthy environment in which people choose to cycle. This will be achieved through:

1) Supporting the delivery of a London-wide network of cycle routes, with new routes and improved infrastructure.
2) Securing the provision of appropriate levels of cycle parking which should be fit for purpose, secure and well-located. Developments should provide cycle parking in accordance with the minimum standards set out within the London Plan (see below) and should be designed and laid out in accordance with the guidance contained in the London Cycling design Standards.

3.6 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.

3.7 Camden Local Plan 2017

The below sections do not include all details from these policies: relevant passages have been listed below, in some cases paraphrased for brevity.

Policy A4 Noise and Vibration
Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

a. development likely to generate unacceptable noise and vibration impacts; or
b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.

Where uses sensitive to noise and vibration are proposed close to an existing source of noise or when development that is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application.

Policy T1 Prioritising walking, cycling and public transport

- Provide good quality, well-lit sufficiently wide public realm walking routes
- Provide for accessible, secure cycle parking facilities exceeding minimum standards outlined within the London Plan (Table 6.3) and design requirements outlined within our supplementary planning document Camden Planning Guidance on transport. Higher levels of provision may also be required in areas well served by cycle route infrastructure, taking into account the size and location of the development;
- Make provision for high quality facilities that promote cycle usage including changing rooms, showers, dryers and lockers;

Policy T2 parking and car free development

- Limit on-site parking to spaces designated for disabled people where necessary, and/or ii. essential operational or servicing needs

Policy CC1 Climate change mitigation

- The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.
- Comply with the London plan plus all proposals that involve substantial demolition must demonstrate that it is not possible to retain and improve the existing building;
- All developments to optimise resource efficiency by:
    - reducing waste;
    - reducing energy and water use during construction;
    - minimising materials required;
    - using materials with low embodied carbon content; and
    - enabling low energy and water demands once the building is in use.

Policy A3 Biodiversity
This Policy sets out high level intentions, but project specific actions are covered in the Biodiversity Camden Planning Guidance document

Policy CC2 Adapting to Climate Change
The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

- the protection of existing green spaces and promoting new appropriate green infrastructure;
- not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
- incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
- measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.
- Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement

Policy CC4 Air Quality

- Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact.
- Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan

Policy CC3 Water and flooding

- The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible. We will require development to:
    - incorporate water efficiency measures;
    - avoid harm to the water environment and improve water quality;
    - consider the impact of development in areas at risk of flooding (including drainage);
    - incorporate flood resilient measures in areas prone to flooding;
    - utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and
    - not locate vulnerable development in flood-prone areas.
- Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable

Policy CC5 Waste

Make sure that developments include sufficient facilities for the storage and collection of waste and recycling

Policy C1 Health and Wellbeing

Developments are to positively contribute to creating high quality, active, safe and accessible places.

Proposals for major development schemes shall include a Health Impact Assessment (HIA).

Policy C6 Access for all

- The Council expect all buildings and places to meet the highest practicable standards of accessible and inclusive design so they can be used safely, easily and with dignity by all;
- Spaces, routes and facilities between buildings to be designed to be fully accessible;
- The Council encourages accessible public transport; and
- Provision of secure car parking for disabled people.

3.8 Camden Supplementary Planning Guidance

CPG Air Quality (Jan 2021)
Camden has adopted the World Health Organisation guideline limits for nitrogen dioxide (40µg/m3), PM10 (20µg/m3) and M2.5 (10µg/m3) annual mean concentrations. For the determination of planning applications and appraisal of Construction Management Plans, consideration must be paid to uncertainty in NO2 data, therefore 38µg/m3 (the 40µg/m3 WHO limit less 5%) shall be taken as the limit for this pollutant .

Air quality neutral assessments are required for all major developments. Major developments are schemes of 10 or more dwellings or buildings where the floorspace created is 1,000 square metres or more.

An Air Quality assessment is required where any of the following apply:

- major applications where occupants will be exposed to poor air quality (along a busy road, diesel railway lines or in a generally congested area);
- development that has potential to significantly change road traffic on a busy road;
- the development has more than 75 new residences;
- commercial developments with a floorspace of 2,500 sqm or more;
- developments that include biomass boilers or CHP (combined heat and power) and connections to existing decentralised energy networks (whereby the increased capacity is not already covered by an existing AQA);
- substantial earthworks or demolition; and
- development that introduces sensitive uses into an area of poor air quality.

CPG Biodiversity (March 2018)
An ecological impact assessment (EcIA) and/or ecological constraints and opportunities plan (ECOP) will be required unless the Council's Ecology Officer has agreed that it is not. Applicants are expected to consider opportunities to improve biodiversity for proposal sites.

The Council will assess planning applications against a 'five-point mitigation hierarchy'. To demonstrate that a proposal complies with the five-point hierarchy, applicants should:

- Undertake habitat assessments and/or ecological surveys and prepare an EcIA or ECOP report about the biodiversity of the development site and areas adjacent to it, and the potential impacts and opportunities that the development presents.
- Prepare plans that clearly illustrate existing habitats and features and proposed changes. These must show a proposal has sought to incorporate opportunities to improve and enhance biodiversity within and/or around the development site; and how biodiversity will be protected through the proposal.
- Ensure all surveys and assessments submitted with the planning application are prepared by a professionally qualified ecological consultant. The ecologist must be a member of the Chartered Institute of Ecology and Environment Management (CIEEM) , or a similar organisation.
- Cross-reference Camden's policies and Camden Planning Guidance documents with those of the latest versions of regional and national

policies that support biodiversity. This will help the applicant create a development that has a positive impact to Camden's biodiversity.

CPG Design (Jan 2021)
The Council expects development to be sustainable in design and construction:

- Development should seek to be durable and adaptable to reduce resource use over time to include effective layout of infrastructure servicing development. The layout and design of buildings and planting can reduce energy and water use and mitigate against flooding, pollution and overheating.
- Development should be durable and robust in construction to enable where appropriate, flexibility and adaptability over time to accommodate a range of uses.
- Environmentally friendly materials, and well-designed building patterns and/or building forms that facilitate sustainable resource use and enable climate change mitigation are encouraged. Further details can be found in CPG Energy efficiency and adaptation.

Developers will be required to achieve accessible and inclusive streets and spaces as part of any proposal in accordance with the guidelines set out in "Inclusion by Design" (2008).

Developers should ensure that all waste systems and storage areas in new developments or refurbished developments are:

- designed to provide adequate space for the temporary storage of all types of waste, including internal storage areas with sufficient space for the separation of temporary storage of all recycling, food waste and residual waste;
- sensitively designed and located in relation to the local environment especially in conservation areas and listed buildings;
- safely located and accessible for all users, including waste contractors, and designed to minimise nuisance to occupiers and neighbours and their amenity;
- sufficiently flexible to accommodate future increases in recycling targets;
- designed to include where appropriate, innovative waste management solutions that increase efficiency and help meet and exceed recycling and other waste reduction targets

Developers should submit a waste strategy alongside planning applications for new build developments and for schemes for existing buildings which do not have a waste strategy. Where there is an existing waste strategy, the existing document should be updated and resubmitted as part of the planning application, including for extensions, change of use, or changes in commercial activity,

CPG Energy Efficiency and Adaptation (January 2021)
All development in Camden is expected to reduce carbon dioxide emissions by following the energy hierarchy in accordance with Local Plan policy CC1. Natural 'passive' measures should be prioritised overactive measures to reduce energy. Major residential development to achieve 10%, and non-residential development to achieve 15% reduction (beyond part Building regulations), in accordance with the new London Plan, through on-site energy efficient measures (Be lean stage).

All new major developments in Camden are expected to assess the feasibility of decentralised energy network growth.

Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies. Energy statements are required for all developments involving 5 or more dwellings and/or more than 500sqm of any (gross internal) floorspace. Energy statements should demonstrate how a development has been designed following the steps in the energy hierarchy.

All development in Camden is expected to reduce carbon dioxide emissions through the application of the energy hierarchy and meet the London Plan carbon reduction targets for new buildings. Developments of five or more dwellings and/or more than 500sqm of any gross internal floorspace to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation.

We will expect creative and innovative solutions to repurposing existing buildings, and avoiding demolition where feasible; All development should seek to optimise resource efficiency and use circular economy principles.

In assessing the opportunities for retention and refurbishment developers should assess the condition of the existing building and explore future potential of the site.

All developments should seek opportunities to make a positive contribution to green space provision or greening.

All developments involving 5 or more residential units or 500 sqm or more of any additional floorspace should address sustainable design and construction measures (proposed in design and implementation) in a Sustainability Statement. Applicants should detail how sustainable design and construction principles have been incorporated into the development either in their Design and Access Statement or in a Sustainability Statement.

Local Plan Policy CC2 expects non-residential developments of 500sqm or more of floorspace to achieve an Excellent BREEAM rating, achieving 60% of all available Energy and Water credits and 40% of available Materials credits. These sub-targets are included as achieving this weighting of credits is considered to result in the greatest environmental benefits. Other assessment tools such as Home Quality Mark and Passivhaus are encouraged, they can serve to demonstrate the incorporation of sustainable design principles.

CPG Planning for Health and Wellbeing (January 2021)
Health Impact Assessments (HIA) and screening should be undertaken for all major applications and developments likely to give rise to significant health impacts. This will allow schemes to be refined to maximise positive effects on health and wellbeing.

CPG Transport (January 2021)
Applicants must provide, as a minimum, the quantity of cycle parking spaces as set out in the London Plan and cycling facilities that are fully inclusive and accessible by step free access. All developments must have due regard to the safety, ease of movement and the quality of pedestrian and cycle facilities for people moving to and within a site

CPG Water and Flooding (March 2019)
Major developments and high or intense water use developments should include grey water recycling.

Refurbishments and other non-domestic development will be expected to meet BREEAM water efficiency credits

All developments must not increase the risk of flooding. Developments are required to utilise Sustainable Drainage Systems (using the drainage hierarchy) to achieve greenfield run off rates, where feasible.

4.0 SUSTAINABILITY STATEMENT

4.1 Energy

There are a number of existing MEP installations within the building, many of which are at the end of the useful working life or are now redundant. Therefore, a new energy strategy has been developed for 101 Bayham Street following the "Be Lean, Be Clean and Be Green" energy hierarchy.

Be Lean
Building Fabric – New Thermal Elements: Where elements are new or to be replaced the thermal performance will meet the following limiting U-values:

New/Replacement Fabric Element	U Values (W/m2. K)
	Minimum Standard
Roof	0.16
Wall	0.26
Floor	0.18
Window (overall inc. frame)	1.6
Rooflight (overall inc. frame)	2.2
Pedestrian Doors and High Usage Entrance Doors	1.6

Table 1: Minimum standards for new/replacement thermal elements

For Bayham Street these will only apply where thermal elements are replaced or constructed in their entirety although existing glazing will be retained with additional secondary glazing installed to improve the element's thermal performance.

Building Fabric – Retained Thermal Elements: Retained elements must follow the guidance described within Section 11 of Part L2 which included improved standards for the thermal performance of existing fabric elements (although there are allowances where this is not feasible or financially viable based on payback period):

Existing Fabric Element	U Values (W/m2. K)
	Improved Standard
Pitched Roof – insulation at ceiling level	0.16
Pitched Roof – insulation at rafter level	0.18
Flat roof or roof with integral insulation	0.18
Wall – cavity insulation	0.55
Wall – external or internal insulation	0.30
Floors	0.25

Table 2: Improved standards for existing fabric elements

Building Fabric – Initial Proposals: The following building fabric thermal performance is proposed:

Fabric Element	Improved Proposed Fabric Performance (U Values, W/m^2.K)
Roof	0.18
Wall	0.30 where renovated 1.15 (assumed) elsewhere
Floor	0.30 (assumed)
Window (overall inc. frame)	1.60 where new 2.20 (assumed) where retained

Table 3: Improved proposed fabric performance

Energy Efficiency: The following table presents the proposed energy efficient features, relevant to the "Be Lean" stage of the energy hierarchy, against the GLA reference baseline performance values:

Energy Efficiency Measures	Test Value	Reference - GLA Baseline Values
Improved AHU SFP	1.6 W/(l/s)	2.0 W/(l/s)
FCU SFP	0.2 W/(l/s)	0.4 W/(l/s)
Heat Recovery Efficiency	80%	70%
Efficient Lighting	100 lm/W	60 lm/W

Table 4: "Be Lean" energy efficiency measures.

Ventilation with be through Mechanical Ventilation with Heat Recovery (MVHR) with a heat recovery efficiency of 80% proposed. The efficiency of the ventilation systems will be further optimised through BMS time schedule linkage and demand-based supply (through occupancy (PIR), temperature and air quality [CO_2] linked control).

All lighting will be LED based and controlled via Dali control with a improvement in lumens per circuit Watt comparted to the GLA baseline value. To improve efficiency further the lighting will be controlled via central time scheduling, occupancy based, and daylight dimmed.

The proposed "Be Lean" measures result in a 15% reduction in regulated carbon dioxide emissions (3.4 tonnes CO_2 per annum) compared to notional performance.

Be Clean
There are no existing heat networks, or currently proposed heat networks, at a close enough proximity to 101 Bayham Street where it is technically feasible and financially viable to connect to. As such there are no relevant measures to be incorporated at the "Be Clean" stage.

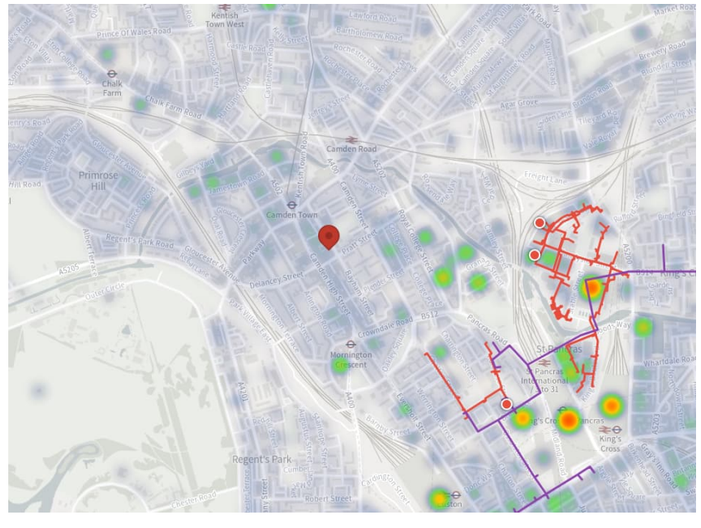


Figure 3: Existing (red) and proposed (purple) heat networks near 101 Bayham Street

Be Green
An LZCT feasibility study has been undertaken (in line with BREEAM RFO 2014, Ene 04 'Low Carbon Design' requirements to assess available the feasibility of low and zero carbon technologies available to 101 Bayham Street. The study concluded that Air Source Heat Pumps (ASHP) could be utilised to provide heating and cooling to office floor plates and photovoltaic (PV) array be installed at roof level with space for a approximately 64m^2 array.

As per the recommendations the proposed energy strategy is ASHP led which will be specified to exceed the minimum performance standards as set out in the ECA and MCS certification requirements. At this point manufacturer's information confirm that the COP for suitable ASHPs range from 3.24 to 3.48

The proposed "Be Green" measures provide a further 17% (4.0 tonnes CO_2 per annum) reduction in regulated carbon dioxide emissions resulting in a total cumulative saving of 32%. The feasibility of increasing the reductions from the "Be Green" measures to achieve the 20% required by Policy CC1 'Climate change mitigation' of the Camden Local Plan will be explored as the design develops.

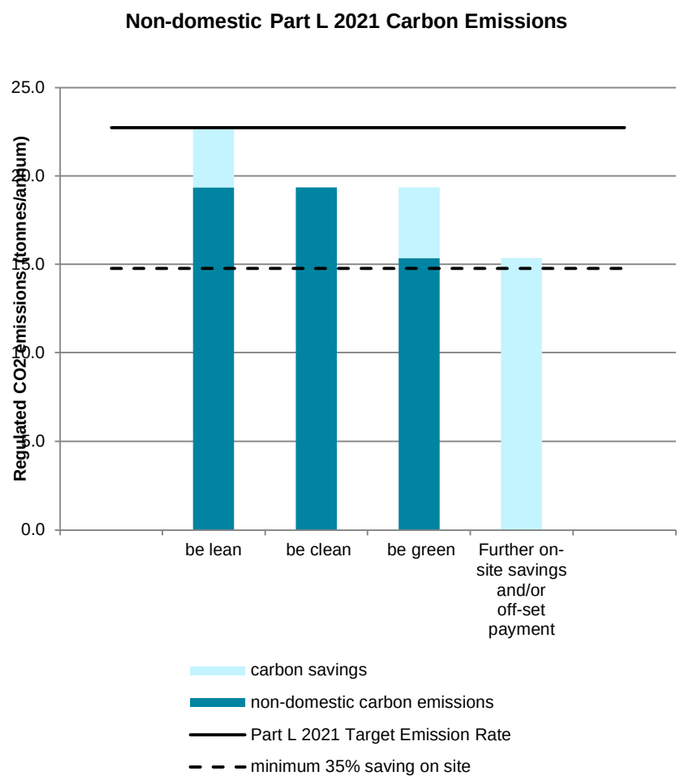


Figure 4: GLA Energy Hierarchy Summary for 101 Bayham Street

The total reduction of 32% represents a shortfall on the 35% reduction target required by the London Plan Should carbon payments be required as per Section 106 this would equate to a figure of £43,890 over a 30-year period (as per GLA's recommended price for offsetting carbon of £95 per tonne).

ASHP Specification
In our experience achieving a COP of 4 is extremely difficult, especially considering the restraints imposed on the M&E design by the existing building. The proposed solution for 101 Bayham Street provides an efficient system, with units achieving a COP of between 3.24 to 3.48, whilst providing a flexible strategy appropriate for the speculative nature of the proposed redevelopment adaptable to a wide range of future tenant needs.

Mitsubishi Electric's City Multi R2 Heat Recovery system is currently being proposed which feature the following key benefits:

- Energy efficient operation through heat recovery, saving up to 30% over heat pumps;
- Utilises lower GWP R32 refrigerant;
- Provides simultaneous heating cooling with a high level of thermal comfort
- Unique 2-pipe system for ease of installation and maintenance;
- Adjustable noise level options to suit application; and
- Connectable to a broad choice of indoor unit types and capabilities.

The size of the outdoor units range from 25.1 kW to 44.8 kW.

PV Specification
SunPower's SPR-MAX3-375-BLK PV panels are currently being proposed with a peak output of 375W and a panel efficiency of 21.2%. The system proposed has a total 13.5kWp output.

A roof layout drawing, showing PV array and ASHP (outdoor units) placement can be found within Appendix 4 as well as a PV schematic.

Air Tightness
No target for improving the air tightness of 101 Bayham Street. However, improvement to the existing building fabric, rationalisation of the roof and the installation of secondary glazing among other design interventions will all contribute to an improvement on existing conditions.

Energy and BREEAM
For the BREEAM RFO 2014, Energy section 101 Bayham Street is targeting 22 out of the 26 credits available, 84.6% of the credits available in the section.

4.2 Circular Economy, Materials and Waste

Waste
A hierarchical waste management strategy, "Prevent, Reduce, Reuse, Recycle" will be employed during the design, construction, and operation of the building.

Figure 5: Waste Hierarchy

Pre-refurbishment Audit and the Reuse/Recycling of Refurbishment/Fit-out Materials
A pre-refurbishment audit has been commissioned to assess the existing property. The pre-refurbishment audit will quantify existing materials within 101 Bayham Street, provide recommendations on what material can be reused and its potential purpose, maximising high grade reuse and recycling opportunities where feasible. The audit will also set targets for waste management in line within those required within BREEAM and planning policy.

Prior to the pre-refurbishment audit the reuse of existing raised access floors has been identified. When new, raised access floors are typically one of the larger contributing individual elements to a building's whole life carbon (typically 160CO_{2e}/m^2 with a 25-year design life for the floor unit and 12 kgCO_{2e}/m^2 with a 60-year design life for the pedestal). Retaining these represents a significant saving in whole life carbon for 101 Bayham Street.

The intention of the pre-refurbishment audit is to identify further opportunities for reducing whole life carbon.

BREEAM rewards projects that reuse and directly recycle waste generated by the refurbishment and fit-out works. "Points" are awarded where relevant materials are either directly re-used on-site or off-site, or are sent back to the manufacturer for flossed loop recycling. For the BREEAM assessment of 101 Bayham Street 1 credit under this issue is being targeted (Wst 01 'Project Waste Management', credit #2 'Reuse and Direct Recycling of Materials') meaning 50% of the available points will need to be achieved.

Construction Waste
The pre-refurbishment audit will contribute towards the development of a Resource Management Plan (RMP). The aim of the RMP will be to promote resource efficiency and to prevent illegal waste activities. The RMP will define:

- A target benchmark for resource efficiency;
- Procedures and commitments for minimising non-hazardous waste in line with the target benchmark;
- Procedures for minimising hazardous waste;
- Procedures for the Principal Contractor and all Subcontractors for monitoring waste, managing and diverting demolition waste from landfill;
- A waste minimisation target and details of waste minimisation actions to be undertaken;
- Procedures for estimating, monitoring, measuring and reporting hazardous and non-hazardous site waste covering the Principal Contractor and all Subcontractors;
- Procedures for sorting, reusing and recycling construction waste into defined waste groups;
- Procedures for revising and updating the plan; and
- The name or job title of the individual responsible for implementing the above.

The RMP will also include:

- Identification and quantification of the key materials where present on the project;
- Potential applications and any related issues for reuse and recycling of the key materials in accordance with the waste hierarchy;
- Identification of local reprocessors or recyclers for recycling of materials;
- Identification of overall recycling rates for all key materials
- Identification of reuse targets where appropriate; and
- Identification of overall landfill diversion rate for all key materials.

As per BREEAM targets (Wst 01 'Project Waste Management', credit #3 'Resource Efficiency') the amount of construction waste generated will not exceed 4.5 m3 per 100m^2 GIFA (1.2 tonnes per 100m^2 GIFA).

The project will aim to meet or exceed the London Plan target of 95% reuse/recycling/recovery of construction and demolition waste (diversion from landfill, exceeding BREEAM diversion of resources from landfill targets) and, although minimal is expected 95% of excavation waste will be put to beneficial use.

Material Efficiency and Functional Adaptability (Circular Economy)
As required for BREEAM issues Mat 06 'Material Efficiency' and Wst 06 'Functional Adaptability' dedicated workshops with key Project Team members have been held to identify potential material efficiency and functional adaptability measures that could be incorporated into the proposals.

The outcome of these workshops was a number of measures aimed at improving material efficiency and functional adaptability that will be explored as the design develops including:

Material Efficiency:

- In-situ reuse of the majority of the existing structure with the aim of reusing elements to be removed (e.g., 20m2 of ground slab to be removed crushed and used as aggregate);
- Explore of reuse of building services items where feasible (e.g., copper pipework, data racks, lift, etc.);
- Hybrid VRF system reduces refrigerant charge associated with the system (a significant factor in a development's whole life carbon); and
- Off-site manufacturing where feasible (e.g., brise soleil, plant room module).

Functional Adaptability:

- Highly flexible floor plates with little to no internal partitioning allow for a wide range of future tenancy options;
- Designing the refurbishment to allow for future change of use based on local precedents. Robust existing substructure lends itself to a potential change of use;
- Designing detailing to allow for shorter lifespan products to be replaceable as function required, with most elements demountable and facilitate the disassembly of interfaces wherever possible; and
- Favoured procurement from suppliers with established takeback schemes to minimise future waste (common with lighting manufacturers and some curtain walling manufacturers).

Full details of the outcomes of both workshops can be found in Appendix 2.

Whole Lifecycle Carbon
A whole lifecycle carbon (WLC) assessment of the proposed refurbishment of 101 Bayham Street will be undertaken during the next stage of works. This will be undertaken to both the RICs and BREEAM RFO 2014 Mat 01 'Environmental Impact of Materials' methodologies.

As well as aiding sustainable procurement of low embodied carbon fit-out materials the WLC assessment will utilise the pre-refurbishment audit (to be complete during the next stage of works) to demonstrate the reduction in embodied carbon achievable through the reuse of existing materials, such as the raised access flooring, where feasible. The assessment will also aim to demonstrate the embodied carbon benefit of the Project Team's refurbishment approach when compared to a demolish and rebuild approach.

Materials and BREEAM
For the BREEAM RFO 2014, Materials section 101 Bayham Street is targeting 12 out of the 14 credits available, 85.7% of the credits available in the section.

4.3 Water

Water Consumption
Water consumption will be reduced through the water saving hierarchy.

- Primarily water demand will be reduced through the use of low water flow fittings to meet best practice requirements in line with building regulations.
- The use of greywater recycling is not proposed due to the higher lifecycle carbon emissions associated with these systems in comparison to the local water network.
- Where feasible, gravity-fed rainwater harvesting will be pursued for use in landscape irrigation.

The project's route to BREEAM 'Excellent' includes targeting 3 of the 5 credits available under Wat 01 'Water Consumption'. To achieve this the following limits will be placed on water consumption of sanitary/kitchenware items (where specified):

- WC – 4 litres effective flush volume
- Wash hand basin taps – 4.5 litres/min
- Showers – 6 litres/min
- Urinal (2 or more) – 1.5 litres/bowl/hr
- Urinal (1 urinal only) – 2 litres/bowl/hr
- Kitchen tap: kitchenette – 5 litres/min
- Kitchen tap: pre-rinse nozzles – 7.3 litres/min
- Domestic sized washing machines – 40 litres/use
- Waste disposal unit – 0 litres/min
- Commercial sized dishwashers – 5 litres/rack
- Commercial/industrial sized washing machines – 7.5 litres/kg

Water Attenuation
Water attenuation measures are limited by structural loading limitation of the fourth floor extension

Water and BREEAM
For the BREEAM RFO 2014, Water section 101 Bayham Street is targeting 7 out of the 9 credits available, 78% of the credits available in the section.

4.4 Health & Well-being

Accessibility
Accessibility to the existing building is poor due to level changes and is inaccessible to wheelchair users due to the steps within the entrance lobby. There are also currently no accessible toilets and existing terrace sliding doors non-DDA compliant.

A key design consideration to the proposed redevelopment of 101 Bayham Street is to improve accessibility throughout. The ground levels will be rationalised to ensure level access, as well as level access throughout the building. Ramps will be provided within the entrance lobby for wheelchair access. In addition, accessible toilets will be provided at each level.

To allow access to the terrace new accessible doors will be added within the existing curtain wall to replace the existing inaccessible sliding doors.

Outdoor Amenity Space
While the existing terrace offers excellent views over St. Martin's Gardens the space is not a welcoming one for building users and as previously notes inaccessible to wheelchair users. Part of the proposed works include the refurbishment and extension of the terrace to improve the well-being of occupants as well as ensure it is accessible to wheelchair users. The terrace will be bookended by planters for occupant amenity as well as improving the site's Urban Greening Factor.

Air Quality
The all-electric building services strategy means that no combustion will occur on-site minimising any negative impact the proposed redevelopment of 101 Bayham Street will have on local air quality.

Noise Impact
A Noise Impact Assessment (NIA) has been submitted as part of this planning application. The NIA concluded that the proposed development is not considered to have an significant adverse effect on the nearest noise-sensitive receptors, and meets the requirements of the Camden Local Plan.

Daylight and Sunlight
Impact on Neighbouring Property: The impact on neighbouring properties' sunlight and daylight amenity has been modelled and found that the proposed development has marginal and limited negative impacts and is fully compliant with the BRE guidance for both daylight and sunlight to the neighbours.

Internal Daylight Amenity: Although internal daylight amenity has not been assessed for 101 Bayham Street, the shallow core plan and partition free internal layout lend itself to excellent internal daylight provision. The internal daylight provision will be formally assessed during the next stage of works to ensure the relevant BREEAM RFO 2014 targets are set to be achieved and explore the possibility of improving upon the number of credits currently targeted.

Overheating
To combat the risk of overheating the cooling hierarchy has been follows as far as feasibly possible:

Minimise internal Heat generation through energy efficient design: Placement of the majority of building services plant at roof level will minimise their impact in terms of internal heat gains. Building services pipework runs will be minimised as much as feasible again to minimise internal heat gains.

Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls: The proposed building fabric performance outlined in Table 3 will minimise heat entering through the building fabric.

Solar shading will be installed at fourth floor level in the form of brise soleil to reduce overheating.

Manage the heat within the building through exposed internal thermal mass and high ceilings: Being a refurbishment project, and the Project Team's desire to ensure floor plates are as open plan as possible to facilitate future adaptability, limits what can be achieved in terms of high ceiling and internal thermal mass.

As far as feasible thermal mass will be exposed to reduce heating and cooling loads.

Passive ventilation: Due to noise issues 101 Bayham Street cannot rely on natural ventilation as a means of cooling.

Due to the acoustic considerations cross ventilation cannot be relied upon as part of the cooling strategy however, occupants will have the ability to open both the external and secondary internal glazing.

Mechanical ventilation: The two Air Handling Units (AHUs) complete with heat recovery will form part of a tempered supply air system to the building alongside the refrigerant based heating and cooling system to control overheating inside 101 Bayham Street.

Active cooling systems (ensuring they are the lowest carbon options): Due to restraints elsewhere a hybrid VRF system capable of producing simultaneous heating and cooling within different spaces of 101 Bayham Street has been specified. The system design means refrigerant charges are reduced compared to a conventional VRF system.

4.5 Nature, Landscape and Biodiversity

Biodiversity
There is no vegetation present on or surrounding the existing building.

The inclusion of a green/biosolar roof was explored however initial surveys conclude that the roof will not be able to support both the PV array and a green roof system. In order to meet the energy/carbon reductions targets the PV array has taken priority.

A number of planters are being added to the fourth-floor accessible terrace to further improve biodiversity and the site's Urban Greening Factor. New planting will target a greening factor of 0.7.

4.6 Adaptation to Climate Change

An adaptation to climate change study has been undertaken for the proposed redevelopment of 101 Bayham Street. This can be found in full within Appendix 3. The study concluded that the potential impacts of climate change proposed a high risk in the following areas, listed along with the potential mitigation measures incorporated/to be explored as the design develops:

Risk of Overheating (Interior)

- External envelope elements to be upgraded and designed to comply with London Plan U-value requirements for refurbished buildings;
- Cross ventilation is already incorporated into the existing design of the building and will continue to be an option available for the refurbished building;
- Proposed brise soleil to reduce cooling loads to exposed fourth floor;
- As the project is a refurbishment there is minimal scope to alter glazing ratios although the total area of glazing on the west elevation is being reduced by infilling some openings; and
- Although active cooling is proposed the refrigerant charge is minimised through the hybrid VRF system.

Potential Issue with Pests

- Remove, clear and contain property from invasive pest species;
- Reduce interior pest expansion by properly ventilating property and ensure effective cleaning and maintenance schedule; and
- It will be ensured that treatment is put on property entrances to limit the ingress of pests into interior spaces.

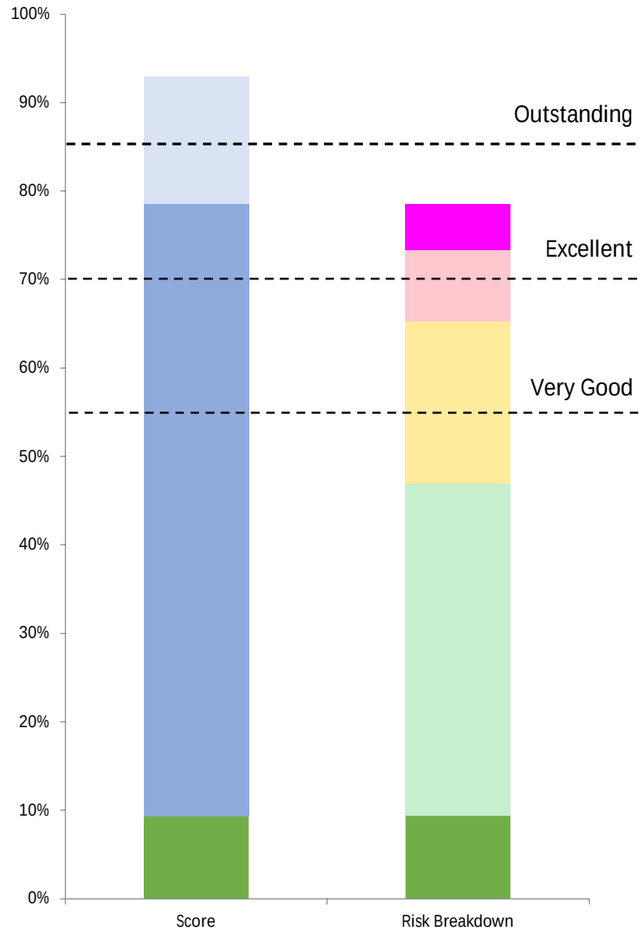
Air Quality Degradation

- The all-electric energy strategy means the proposed development does not contribute towards local air pollution;
- Potential for cross ventilation reduces particulate matter settling in internal occupied spaces;
- An Indoor Air Quality Plan will be developed in line with BREEAM requirements aiming to minimise indoor air pollution during the design, construction and occupation of 101 Bayham Street covering:
    - Removal of contaminant sources;
    - Dilution and control of containment sources;
    - Procedures for pre-occupancy flush out
    - Protection of Heating, Ventilation and Air Conditioning (HVAC) systems from sources of pollution during refurbishment/fit-out works;
    - Procedures for identifying and implementing third party testing and analysis required to ascertain that the contaminant sources have been removed effectively before occupancy; and
    - Commitments for maintaining indoor air quality in-use.
- With the location afforded excellent public transport options occupants will be encouraged to make use of these facilities;
- Basement level cycle storage and cyclist facilities (showers, lockers and changing facilities) provided to encourage occupants to cycle where possible;

4.7 BREEAM

BREEAM Pre-assessment Summary
101 Bayham Street is to be assessment under BREEAM Refurbishment and Fit-out (RFO) 2014. A score of 78.50% has been targeted for 101 Bayham Street, a BREEAM 'Excellent', a further 9.42% has been identified as potential to be explored further with the aim of maintaining a buffer of at least 3-5% over the minimum 70% required to achieve 'Excellent' should targeted credits prove unfeasible as the design develops.

The 'potential' credits relate to credits where a conservative estimate has been assumed until further investigation has been undertaken (e.g., Ene 01 Credit #1) or credit issues where further credits can be targeted at a later date if required but may incur further work (e.g., Hea 01 'Visual Comfort').



A full pre-assessment score sheet is presented within Appendix 1.

Risk Categorisation
In order to minimise the overall risk to the project's BREEAM aspirations each issue has been assigned a risk rating; Critical, High, Medium or Low to make the Client and Design Team aware of issues, urgency or where extra attention should be paid.

An issue is likely to be flagged as 'High' or 'Critical' risk where there is a time dependent action to be undertaken or an additional appointment/additional cost is required. Despite some issues being critical, at the time of writing the project team is on track to meet the tight timescales for these credits.

Risk/Status Category	Description	Symbol
Low risk	Credit though to be achievable, technically simple or have been shown historically to be low risk	L

Medium risk	The credit has some uncertainty in the predicted score at this stage and/or it is technically complex and therefore liable to non-compliance issues	M
High risk	May be highly uncertain, expensive, or historically has been found to be difficult to achieve	H
Critical risk	Requires immediate action	C

Table 5: Risk rating system assigned to credits

All those listed as 'Critical' for the 101 Bayham Street pre-assessment have ongoing RIBA Stage 2 actions that are expected to be completed within the required timeframe.

Early Stage BREEAM Actions
Many BREEAM issues require action by a particular stage of works to ensure that outcomes can be incorporated into the proposed design. The following table presents a narrative on those credits that require action by the end of RIBA Stage 2.

Achieving the required early-stage action does not necessarily mean that the associated credit can be awarded as the credit may have further requirements, e.g., Hea 06 'Security', credit #1 requires evidence that the recommendations of the Security Needs Assessment have been implemented.

BREEAM Issue	RIBA Stage 2 Requirement	Owner	Status
Tra 01 'Transport Assessment and Travel Plan'	Credit #1 'Travel Plan'	Project Manager	Ongoing
Mat 06 'Material Efficiency'	Credit #1 'Material Efficiency'	Max Fordham (Sustainability)	Early-stage actions complete
Wst 01 'Construction Waste Management'	Credit #1 'Pre-refurbishment Audit'	TBC	Pre-refurbishment audit ongoing
Wst 05 & 06 'Adaptation to Climate Change' & 'Functional Adaptability'	Two credits	Max Fordham (Sustainability)	Early-stage actions complete
LE 04 – Enhancing site ecology	One credit	TBC	Ecologist appointed, Ecological Appraisal ongoing

Table 6: Status of early stage (RIBA Stage 2) requirements

BREEAM Issue	RIBA Stage 2 Requirement	Owner	Status
Man 01 'Project Brief and Design'	Credits #1 to #4	Max Fordham (Sustainability), Project Manager, Architect	Ongoing
Man 02 'Life Cycle Cost and Service Life Planning'	Credit #1 'Elemental Life Cycle Cost (LCC)	Currie & Brown	Ongoing
Hea 06 'Security'	Credit #1 'Safety and security'	Project Manager	Ongoing
Ene 04 'Low Carbon Design'	Credit #1 'Passive Design Analysis'	Max Fordham (M&E)	Complete
	Credit #2 'Free cooling'	Max Fordham (M&E)	Not targeted
	Credit #3 'Low and Zero Carbon Technologies'	Max Fordham (M&E)	Complete

MAX FORDHAM

APPENDIX 1 – BREEAM PRE-ASSESSMENT

BREEAM Refurbishment & Fitout 2014

J7274 101 Bayham Street

Project Stage	RIBA Stage 2
Assessor Name	Neil Cogan, (BREEAM AP) Brooke Smith (BREEAM Assessor)
Desired Rating	Excellent
Desired Score	75.00%

Achieved Score	9.38%	Unclassified
Target Score	78.50%	Excellent
Potential Score	87.92%	Oustanding

Category	BREEAM Issue	Credit Number	General Requirements	Stage Requirements	Minimum Requirements	Available		Achieved		Targeted		Potential	Risk	Notes	Design Stage Credit Owner	Design Stage Credit Contributor
						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
Management	Man 01 - Project Brief and Design	#1 - Stakeholder Consultation (project delivery)	Prior to completion of the Concept Design, a clear sustainability brief is set out and roles and responsibilities must be specifically outlined.	Must occur no later than RIBA Stage 2		1	0.57%			1			C	Critical as ongoing Stage 2 action	Project Manager	All
		#2 - Stakeholder Consultation (third party)	During design brief preparation, all relevant parties and bodies are identified and consulted with by the design team - evidence must be gathered that these consultations were incorporated into the design. Consultation plan must be prepared that includes timescale and method of consultation.	Must occur no later than RIBA Stage 2		1	0.57%			1			M	Medium risk as evidencing requirements are onerous	Architect	Client/M&E
		#3 - Sustainability Champion (design)	No later than early RIBA Stage 1, Sustainability Champion is appointed to facilitate setting of BREEAM performance targets. BREEAM target must be contractually agreed between client and project team no later than RIBA Stage 2. Project must undergo Design Stage Certification assessment.	Must occur no later than RIBA Stage 1		1	0.57%			1			L	BREEAM AP already appointed for Design Stages	Sustainability Champion	Client
		#4 - Sustainability Champion (monitoring progress)	Credit #3 has been achieved. Sustainability Champion is appointed to monitor progress against the agreed BREEAM performance targets throughout the design process and formally report progress to the client and design team. Sustainability Champion must attend key design team meetings and prepare regular written reports.	Must occur no later than RIBA Stage 2		1	0.57%			1			L		Sustainability Champion	Architect
	Man 02 - Life Cycle Cost and Service Life Planning	#1 - Elemental Life Cycle Cost (LCC)	An elemental life cycle cost (LCC) analysis has been carried out, at RIBA Stage 2. The LCC analysis shows an outline plan based on the building's basic structure and envelope, appraising a range of options and based on multiple cash flow scenario's e.g.. 20, 30, 50+ years and the fabric and servicing strategy for the project outlining services component and fit-out options (if-applicable) over a 15-year period, in the form of an 'elemental LCC Plan'.	Must occur no later than RIBA Stage 2		2	1.14%			2			C	Critical as oingoing Stage 2 action	Quantity Surveyor	M&E/ Architect/ Project Manager/ Structural Engineer
		#2 - Component Level LCC Plan	A component level LCC plan has been developed by the end of RIBA Stage 4 and includes the following component types in line with PD 156865:2008 (where present): envelope, services, finishes, external spaces. Demonstrate how the component level LCC plan has been used to influence building and systems design/specification to minimise life cycle costs and maximise critical value.	Must occur no later than RIBA Stage 4		1	0.57%					1	M	Medium risk until scope confirmed	Quantity Surveyor	M&E/ Architect/ Project Manager/ Structural Engineer
		#3 - Capital Cost Reporting	Report the capital cost for the building in pounds per square metre (£/m^2), via the BREEAM Assessment Scoring and Reporting tool, Assessment Issue Scoring tab, Management section.			1	0.57%			1			L	Note BREEAM specific requirements including – Construction, including preparatory works, materials, equipment and labour – Site management – Construction financing – Insurance and taxes during construction – Inspection and testing Not dependent on other Man 02 credits being achieved	Quantity Surveyor	
	Man 03 - Responsible Construction Practices	Pre-requisite - Timber Procurement	All timber and timber-based products used on the project are 'legally harvested and traded timber' (see Relevant definitions)			-	-			-			L		Contractor	
		#1 - Environmental Management	Principle contractor operates a compliant Environmental Management System concerning their main operations and implement best practice pollution prevention policies and procedures on site in accordance with Pollution Prevention Guidelines.			1	0.57%			1			L		Contractor	
		#2 - Sustainability Champion (construction)	Sustainability Champion is appointed to monitor the project to ensure ongoing compliance with the relevant sustainability performance/process criteria and BREEAM targets throughout the Construction, Handover and Close out stages and formally report progress to the client and design team. Sustainability Champion must attend key design team meetings and submit a final post construction stage assessment report.			1	0.57%			1			L		Contractor	
		#3 - Considerate Construction	The principal contractor has used a 'compliant' organisational, local or national considerate constructors scheme and their performance against the scheme has been confirmed by independent assessment and verification. Under CCS scheme one credit can be awarded for a score between 25 and 34 with at least 5 in each section, and two credits for a score between 35 and 39 with at least 7 in each section.		1	2	1.14%		No	2	Yes		L		Contractor	
		★ Exemplar Performance - Considerate Construction	Exemplary Level of Practice achieving a score of 40 or above			1	1.00%					1	H	High risk until such time appointed Contractor can confirm targets	Contractor	
		#4 - Monitoring of construction-site impacts	Responsibility has been assigned to an individual(s) for monitoring, recording and reporting energy use and water consumption resulting from all on-site construction processes (and dedicated off-site monitoring) throughout the build programme.			1	0.57%			1			L		Contractor	
		#5 - Transport of Construction Materials and Waste	Responsibility has been assigned to an individual for monitoring, recording, and reporting data on transport movements and impacts resulting from delivery of the majority of construction materials to site and construction waste from site.			1	0.57%			1			M	Medium risk as evidencing requirements are onerous	Contractor	
	Commissioning and Handover	#1 - Commissioning and Testing Schedule and Responsibilities	Project team member appointed to monitor and programme pre-commissioning, commissioning, and where necessary, re-commissioning. Main contractor accounts for commissioning programme, responsibilities, and criteria within main programme of works.	Must occur no later than RIBA Stage 4		1	0.57%			1			L		M&E	Contractor
		#2 - Commissioning Building Services	Specialist Commissioning Manager must be appointed during design stage (by either client or contractor) for complex systems in order to give design input.			1	0.57%			1			L		Contractor	M&E
		#3 - Testing and Inspecting Building Fabric	Credit #1 has been achieved. The integrity of the building fabric is quality assured through completion of post construction testing and inspection. Dependent on building type this can be demonstrated through the completion of a thermographic survey as well as airtightness test and inspection by a qualified professional. Any defects must be rectified prior to building handover/close out.			1	0.57%			1			L		Contractor	

Category	BREEAM Issue	Credit Number	General Requirements	Stage Requirements	Minimum Requirements	Available		Achieved		Targeted		Potential	Risk	Notes	Design Stage Credit Owner	Design Stage Credit Contributor
						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
	Man 04 -	#4 - Handover	Building User Guide is developed for distribution to the building occupiers and premises managers. A training schedule is prepared for building occupiers/premises managers containing the building's design intent, aftercare provision, introduction/demonstration of installed systems and key features, introduction to the Building User Guide, maintenance requirements.		#10 - Building User Guide	1	0.57%		No	1	Yes		L		Contractor	

Category	BREEAM Issue	Credit Number	General Requirements	Stage Requirements	Minimum Requirements	Available		Achieved		Targeted		Potential	Risk	Notes	Design Stage Credit Owner	Design Stage Credit Contributor
						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
	Man 05 - Aftercare	#1 - Aftercare Support	Energy and water consumption data is collected for at least 12 months after occupation and data is analysed. A contract is in place for building aftercare support.			1	0.57%			1			L		Contractor	Client
		#2 - Seasonal Commissioning	Seasonal Commissioning over a 12 month period once building becomes occupied.		1	1	0.57%		No	1	Yes		L		Contractor	M&E
		#3 - Post Occupancy Evaluation	Client makes commitment to carry out a Post Occupancy Evaluation (POE) one year after building occupation to gain building performance feedback. It should be carried out by an independent third party.			1	0.57%			1			M	Medium risk until confirmed as reflective of Project's aspirations, additional cost item	Client	
		★ Exemplar Performance	Occupancy satisfaction, energy and water consumption monitoring for 3 years post occupancy.			1	1.00%					1	L		Client	
					Totals - Base	21	12.00%	0		20		1				
					Total - Innovation	2	2.00%	0		0		2				
Health and Well-being	Hea 01 - Visual Comfort	#1 - Glare Control	Potential for disabling glare has been designed out of all relevant building areas using a glare control strategy. The glare control strategy avoids increasing lighting energy consumption and use or location of shading does not conflict with the operation of lighting control systems.			1	0.79%			1			L		Architect	M&E
		#2 - Daylighting	The building achieves good practice daylighting relevant to the building function to ensure appropriate levels of natural light for the building occupants The relevant building areas meet good practice daylight factor(s) and other criterion OR The relevant building areas meet good practice average and minimum point daylight illuminance criteria			3	2.37%			1			M	Medum risk until initial daylighting assessment undertaken	M&E	Architect
		★ Exemplar Performance	The building achieves exemplar performance daylight factors relevant to the building function to ensure appropriate levels of natural light for the building occupants			1	1.00%									
		#3 - Views Out	95% (for two credits) or 80% (for one credit) of the floor area in relevant building areas is within 7m of a wall which has a window or permanent opening that provides an adequate view out. The window/opening must be ≥ 20% of the surrounding wall area where the room depth is greater than 7m.			2	1.58%			2			L		Architect	
		#4 - Internal and External Lighting Levels, Zoning and Control	Internal and External lighting provides luminance levels in accordance with the SLL Code for Lighting 2012. For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 72 sections 3.3, 4.6, 4.7, 4.8 and 4.9. External lighting provided is specified in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas.			1	0.79%			1			L		M&E	
	Hea 02 - Indoor Air Quality	#1 - Indoor Air Quality (IAQ) Plan	Indoor air quality Plan (IAQ) produced.			1	0.79%			1			L		Contractor	M&E
		#2 - Ventilation	Building has been designed to minimise the concentration and recirculation of pollutants in the building.			1	0.79%								M&E	
		#3 - Volatile Organic Compound (VOC) Emission Levels (products)	VOC levels for all paints and varnishes, and at least 5 of the 7 remaining listed product categories of BREEAM table 18 have been met.			1	0.79%			1			L		Architect	
		#4 - Volatile Organic Compound (VOC) Emission Levels (post construction)	Formaldehyde and VOC concentration levels are tested post-construction. High levels must be remediated in accordance with the IAQ plan.			1	0.79%					1	L		Client	
		★ Exemplar Performance	Minimising sources of air pollution - volatile organic compound (VOC) emission levels (products)			1	1.00%									
		★ Exemplar Performance	Minimising sources of air pollution - volatile organic compound (VOC) emission levels (products)			1	1.00%									
		#5 - Potential for Natural Ventilation	The building ventilation strategy is designed to be flexible and adaptable to potential building occupant needs and climatic scenarios..			1	0.79%									
	Hea 04 - Thermal Comfort	#1 - Thermal Modelling	Thermal modelling has been carried out and ensures design achieves criteria as set out in CIBSE Guide A Environmental Design			1	0.79%			1			L		M&E	
		#2 - Adaptability - for a Projected Climate Change Scenario	Credit #1 has been achieved and the modelling has been undertaken against a projected climate change scenario. Project team are to demonstrate how the building has been adapted, or designed to be easily adapted in the future using utilise passive solutions.			1	0.79%					1	M	Medium risk as comfort criteria compliance can be difficult to meet using passive means only	M&E	
		#3 - Thermal Zoning and Controls	Credit #1 has been achieved and thermal modelling has informed the temperature control strategy in terms of zoning, amount of occupant control, how the systems will interact with each other, and need for accessible building user attenuated manual override for any automatic systems.			1	0.79%			1			L		M&E	
	Hea 05 - Acoustic Performance	#1 - Sound Insulation	Ensure that the building's sound insulation meets the appropriate standards for its purpose			1	0.79%			1			L		Acoustician	
		#2 - Internal Indoor Ambient Noise Levels	Ensure that the building's internal indoor ambient noise levels meet the appropriate standards for its purpose			1	0.79%			1			L			
		#3 - Reverberation	Ensure that the building's reverberation times meet the appropriate standards for its purpose			1	0.79%			1			L			
	Hea 06 - Safety and Security	#1 - Security of Site and Building	Consultation with a Suitably Qualified Security Consultant no later than RIBA Stage 2. Final design must incorporate suggestions from SQSS and must confirm to either Secured by Design and/or Safer Parking Scheme (actual certification not required)	Consultation must occur no later than RIBA Stage 2		1	0.79%								Architect	
					Totals - Base	19	15.00%	0		12		2				
					Total - Innovation	3	3.00%	0		0		0				

Category	BREEAM Issue	Credit Number	General Requirements	Stage Requirements	Minimum Requirements	Available		Achieved		Targeted		Potential	Risk	Notes	Design Stage Credit Owner	Design Stage Credit Contributor
						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
Energy	Ene 01 - Reduction of Energy Use and Carbon Emissions	#1 - Energy Performance	Whole building energy model (up to 15 credits available) Elemental level energy model (up to 12 credits available)		6	15	12.39%		No	8	Yes	4	H	High risk as unknown qualtity until final design stage compliance model has been completed. "For planning" model indicates project on track to exceed targeted credits	M&E	
		★ Exemplar Performance	The development generates an excess of renewable or carbon neutral energy in excess to its own demands in terms of both regulated and unregulated energy			3	3.00%									
	Ene 02 - Energy Monitoring	#1 - Sub-metering of Major Energy Consuming Systems	Energy metering systems are installed that enable at least 90% of the estimated annual energy consumption of each fuel to be assigned at various end-use categories of energy consuming systems. The energy consuming systems in buildings with a total useful floor area greater than 1,000m2 are metered using an appropriate energy monitoring and management system		1	1	0.83%		No	1	Yes		L		M&E	
		#2 - Sub-metering of High Energy Load and Tenancy Areas	An accessible energy monitoring and management system or separate accessible energy sub-meters with pulsed or other open protocol communication outputs to enable future connection to an energy monitoring and management system are provided, covering a significant majority of the energy supply to tenanted areas or, in the case of single occupancy buildings, relevant function areas or departments within the building/unit			1	0.83%			1			L		M&E	
	Ene 03 - External Lighting	#1 - External Lighting	Energy efficient external light fittings are specified for external areas of the development and are only on when required.			1	0.83%			1			L		M&E	
	Ene 04 - Low Carbon Design	#1 - Passive Design Analysis	The first Hea 04 Thermal Comfort credit has bee achieved and the design team has carried out analysis of the proposed building design/development to influence decisions made during Concept Design stage and identify opportunities for the implementation of passive design solutions. The building uses passive design measures to reduce total energy demand of the building.	Must occur no later than RIBA Stage 2		1	0.83%			1			C	Critical as ongoing Stage 2 action	M&E	
		#2 - Free Cooling	Credit #1 has been achieved and the passive design analysis also includes an analysis of free cooling and identifies opportunities for the implementation of free cooling solutions with any of the compliant free cooling strategies specified	Must occur no later than RIBA Stage 2		1	0.83%									
		#3 - Low and Zero Carbon Technologies	LZC feasibility study carried out no later than RIBA Stage 2 with a local LZC technology/technologies specified in line with the recommendations of the feasibility study. The LZC technology/technologies accounts for at least 5% of overall building energy demand and/or CO2 emissions,	Must occur no later than RIBA Stage 2		1	0.83%			1			C	Critical as ongoing Stage 2 action	M&E	
	Ene 06 - Energy Efficient Transportation Systems	#1 - Energy Consumption	Analysis for transportation demand and energy consumption for lifts, escalators, and/or moving walkways takes place. Strategy with lowest energy consumption is to be specified.			1	0.83%			1			L		M&E	
		#2 - Energy Efficient Features	Credit #1 has been achieved and compliant energy efficient features are specified			2	1.65%			2			L		M&E	
	Ene 08 - Energy Efficient Equipment	#1 - Energy Efficient Equipment	Energy efficient equipment specified for small power and plug-in equipment, swimming pools, laundry, kitchen, IT intensive areas, etc. Requires an analysis showing the total annual unregulated energy demand of the development and its operation and ways to reduce consumption.			2	1.65%			2			L		M&E	Client
					Totals - Base	23	19.00%	0		18		4				
					Total - Innovation	5	5.00%	0		0		0				
Transport	Tra 01 - Sustainable Transport Solutions	#1 - Accessibility Index	Up to 3 credits can be awarded in combination from one or both of the following options: Option 1: Credits awarded on a sliding scale based on the proximity of the buildings' accessibility to the public transport network. An Accessibility Index (AI) is determined by the Tra 01 Calculator Tool. Option 2:Where alternative transport measures in BREEAM Refurbishment and Fit-out, Tra 01, Table 35 are provided, credits can be awarded based upon the number of measures implemented as detailed in BREEAM Refurbishment and Fit-out, Tra 01, Table 33			3	3.43%	3		3						
	Tra 02 - Proximity to Amenities	#1 - Proximity to Amenities	Building located in close proximity to building-type-specific local amenities which are likely to be frequently required and used by building occupants.			1	1.14%	1		1			L			
	Tra 03 - Cyclist Facilities	#1 - Cycle Storage	Compliant cycle storage spaces that meet the minimum levels set out in Table 32 of the BREEAM manual.			1	1.14%			1			M	Medium risk until Assessor has confirmed numbers compliant	Architect	
		#2 - Cycle Facilities	#1 is achieved. Provide two of the four options: 1) showers, 2) changing facilities, 3) lockers, 4) drying space for clothes. Showers: 1 for every 10 cycle storage spaces, subject to a minimum provision of one shower. Changing facilities: appropriately sized for the number of users, must be able to hang or store clothes (e.g. benches or hooks). Toilet cubicles do not comply. Lockers: at least equal to the number of cycle spaces required. A dedicated drying space for the drying of wet clothes.			1	1.14%			1			M	Medium risk until Assessor has confirmed numbers and types of facilities compliant	Architect	M&E
	Tra 05 - Travel Plan	#1 - Travel Plan	A travel plan is developed specifically for the site as part of the feasibility and design stages which considers all types of travel relevant to the building type and users. Travel plan must include a package of measures that have been used to steer the design of the development in order to meet the travel plan objectives and minimise car-based travel patterns.			1	1.14%			1			C	Critical as ongoing Stage 2 action	Client	
					Totals - Base	7	8.00%	4		7.00		0				

Category	BREEAM Issue	Credit Number	General Requirements	Stage Requirements	Minimum Requirements	Available		Achieved		Targeted		Potential	Risk	Notes	Design Stage Credit Owner	Design Stage Credit Contributor
						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
Water	Wat 01 - Water Consumption	#1 - Water Consumption	Credits awarded on a sliding scale based on the percentage improvement in water usage over a baseline notional building. Must use the Wat 01 calculator to determine final number of credits awarded. Minimum for one credit is 12.5% improvement, 5 credits awarded for 55% improvement or better. The following domestic scale water consuming components are included: WCs, urinals, taps, showers, baths, dishwashers, washing machines. Grey water and rainwater collection systems are taken into account in the calculator tool.		1	5	3.33%		No	2	Yes	1	L	3 credits achievable through good sanitary/kitchenware specification	Architect	M&E
		★ Exemplar Performance	Exemplar performance in water consumption reduction			1	1.00%									
	Wat 02 - Water Monitoring	#1 - Water Monitoring	Where a water meter with a pulsed output will be installed on the mains supply to each building/unit. Water-consuming plant or building areas that consume 10% or more of the building's total water demand must be fitted with sub meters or have water monitoring equipment with pulsed output enabling it to connect to a BMS system. If the site has an existing BMS belonging to the same owner as the new development, the meters must be connected to this system.		Criterion 1 only	1	0.67%		No	1	Yes		L		M&E	
	Wat 03 - Water Leak Detection	#1 - Leak Detection System	Leak detection system capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter.			1	0.67%			1			L	Capture costs in cost plan	M&E	
		#2 - Flow Control Devices	One of the following types of flow control devices is fitted to each WC area/facility to ensure water only supplied when needed: time controller, programmed time controller, volume controller, presence detector, or central control unit. Criteria does not apply to single WC - in these instances, shut-off could be provided via the same switch that controls the lighting.			1	0.67%			1			L	Capture costs in cost plan	M&E	
	Wat 04 - Water Efficient Equipment	#1 - Water Efficient Equipment	Design team has identified all unregulated water demands that could be realistically mitigated or reduced. Systems or processes have been identified to reduce the unregulated water demand, and demonstrate, through either good practice design or specification, a meaningful reduction in the total water demand of the building.			1	0.67%			1			L	Assumed only unregulated use relates to irrigation (no vehicle wash, etc.)	Architect	Landscape Architect
					Totals - Base	9	6.00%	0		6		1				
Materials	Mat 01 - Life Cycle Impacts	#1 - Life Cycle Impacts	Project Lifecycle Assessment Study (up to 6 credits) *OR*			6	5.36%			4		2	M	Medium risk as extensive piece of work, appointment has been confirmed however	LCA Specialist	All
	Mat 03 - Responsible Sourcing of Materials	Pre-requisite - Legally Sourced Timber	All timber and timber based products used on the project is 'Legally harvested and traded timber'.		#1 - Timber Procurement	-	-		No	-	Yes		L		Architect	Structural Engineer/ Contractor
		#1 - Sustainable Procurement Plan	The principal contractor sources materials for the project in accordance with a sustainable procurement plan.			1	0.89%			1			L		Contractor	
		#2 - Responsible Sourcing of Materials (RSM)	Up to 3 credits can be awarded where the applicable building materials (refer to Table - 44 of BREEAM 2014 Manual) are responsibly sourced in accordance with the BREEAM 2014 methodology.			3	2.68%			1		1	L		Contractor	Architect
		★ Exemplar Performance	Exemplar performance in responsible sourcing			1	0.63%									
	Mat 04 - Insulation	#1 - Embodied Impact	All new insulation specified for external walls, ground floor, roof, and building services must be assessed. The Insulation Index for the building insulation is > 2.5, as determined by the Mat 04 Calculator Tool.			1	0.89%			1			L		Architect	M&E
	Mat 05 - Designing for Durability and Resilience	#1 - Protecting Vulnerable Parts of the Building from Damage and Degradation	Areas of the building identified, both internal and external, where vehicular, trolley, and pedestrian movement occur. Design must incorporate suitable durability and protection measures to prevent damage to vulnerable parts of the building.			1	0.89%			1			H	High risk as requirements historically difficult to achieve (see items relating to protection of external fabric from vehicle collision)	Architect	Structural Engineer
	Mat 06 - Material Efficiency	#1 - Material Efficiency	Design/Construction team must identify, investigate and implement measures to optimise material use at all stages of the project.	Must be undertaken at RIBA Stages 1, 2, 3, and 4		1	0.89%			1			M	Medium risk as requires an update at each RIBA stage	Architect	All
					Totals - Base	14	12.50%	0		9		3				

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						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
Waste	Wst 01 - Project Waste Management	#1 - Pre-refurbishment audit	There is a compliant Resource Management Plan. Where demolition must occur, a compliant pre-demolition audit must take place. Non-hazardous construction waste (excluding demolition and excavation waste) generated by the building's design and construction meets or exceeds resource efficiency benchmarks as set out in the BREEAM 4014 Manual. The less waste generated by area or weight earns more credits	Must be undertaken During Concept Stage	0	1	0.63%			1			C	Critical as ongoing Stage 2 action	Contractor	
		#2 - Reuse and Direct Recycling of Materials	The following percentages, at a minimum, of non-demolition and demolition waste (where applicable) generated by the project have been diverted from landfill: Non-demolition - 70% by volume or 80% by weight. Demolition - 80% by volume or 90% by weight.			2	1.25%			1			H	High risk until both pre-refurbishment audit complete and requirements discussed with Contractor when appointed	Contractor	
		#3 - Resource Efficiency	Develop and implement a compliant Resource Management Plan to minimising waste, and record and report accurate data on waste arisings. Meet or exceed the resource efficiency benchmarks in Table 61.			3				1		1	L		Contractor	
		#4 - Diversion of Resources from Landfill	The percentage of non-hazardous construction and demonlition waste generated have been diverted from landfill as per BREEAM Refurbishment and Fit-out 2014, Wst 01, Table 63.			1				1			L		Contractor	
		★ Exemplar Performance	The development achieves exemplar levels of waste generation and diversion from landfill.			1	1.00%									
	Wst 02 - Recycled Aggregates	#1 - Recycled Aggregates	The percentage of high grade aggregate that is recycled or secondary aggregate, specified in each application (present) must meet minimum % levels (by weight or volume) to contribute to significant use of (25% or more) secondary or recycled aggregates in high-grade building aggregate uses. Aggregates must be *either* construction waste obtained on or off-site, *or* obtained from a non-construction post-consumer industrial by-product source.			1	0.63%									
		★ Exemplar Performance	The percentage of high grade aggregate that is recycled or secondary aggregate exceeds best practice			1	1.00%									
	Wst 03 - Operational Waste	#1 - Operational Waste	Where dedicated, accessible, and properly sized storage space is provided for recycling. Where consistent generation in large volumes of waste or compostable materials are generated, compactors, balers, and/or composting vessels or facilities with water outlet must be provided.		1	1	0.63%		No	1	Yes		L		Architect	
	Wst 04 - Speculative Floor and Ceiling Finishes	#1 - Speculative Floor and Ceiling Finishes	Office building types only 1. For tenanted areas (where the future occupant is not known), prior to full fit-out works, carpets, other floor finishes and ceiling finishes have been installed in a show area only (no more than 25%). 2. In a building developed for a specific occupant, that occupant has selected (or agreed to) the specified floor and ceiling finishes			1	0.63%			1			L		Architect	
	Wst 05 - Adaptation to Climate Change	#1 - Structural and Fabric Resilience	Conduct a climate change adaptation to climate change strategy appraisal for structural and fabric resilience by the end of Concept Design by carrying out a systematic risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change.	Must occur no later than RIBA Stage 2		1	0.63%			1			L		Structural Engineer	Architect/ M&E
		★ Exemplar Performance	A holistic approach to the design and construction of the current building's life cycle, to mitigate against the impacts of climate change.			1	1.00%					1	H	High risk as dependent on achieving credits elsewhere, to be reviewed at Design Stage submission	All	
	Wst 06 - Functional Adaptability	#1 - Functional Adaptability	Client and design team to undertake a building-specific functional adaptation strategy study by Concept Design which includes recommendations for measures in to be incorporated to facilitate future adaptation.	Must occur no later than RIBA Stage 2		1	0.63%			1			L		Architect	M&E
					Totals - Base	12	7.50%	0		8		1				
					Total - Innovation	3	3.00%	0		0		1				
Land Use & Ecology	LE 02 - Protection of Ecological Feautures	#1 - Protection of Ecological Features	All existing features of ecological value will be retained and protected during construction.			1	2.50%	1		1					Ecologist	Landscape Architect
	LE 04 - Enhancing Site Ecology	#1 - Ecologist's Report and Recommendations	Suitable Qualified Ecologist (SQE) is appointed no later than RIBA Stage 1 to report on enhancing and protecting the ecology of the site. SQE must provide an Ecology Report based on a site visit. General recommendations made by SQE must be implemented.	SQE must be appointed no later than RIBA Stage 1		1	2.50%			1			M	Medium risk until Ecologist has provided recommendations and evidence received that these have been implemented by the Project Team	Ecologist	Landscape Architect
	LE 05 - Long Term Impact on Biodiversity	#1 - Long Term Impact on Biodiversity	Suitable Qualified Ecologist (SQE) is appointed prior to commencement of activities on site. SQE confirms compliance with all UK/EU legislation relating to protection and enhancement of ecology, and a 5year landscape/management plan is produced and the Client and the Contractor carry out a number of actions to minimise the longer term impact of the site. Number of applicable actions (from the list of potential actions in the BREEAM Technical Guide p. 346) determines the number of credits achievable in this issue.			2	5.00%			2			M	Medium risk until Ecologist has provided recommendations and evidence received that these have been implemented by the Project Team	Ecologist	Landscape Architect/ Contractor
					Totals - Base	4	10.00%	1		4		0				

Category	BREEAM Issue	Credit Number	General Requirements	Stage Requirements	Minimum Requirements	Available		Achieved		Targeted		Potential	Risk	Notes	Design Stage Credit Owner	Design Stage Credit Contributor
						Credits	Percent	Credits	Minimum Requirements	Credit	Minimum Requirements	Credit				
Pollution	Pol 01 - Impact of Refrigerants	#1 - No Refrigerant Use	No Refrigerant Use			0	0.00%							Assumed use of refrigerants. If no refrigerant use 3 credits under Pol 01 awareded by default	M&E	
		Pre-requisite - Guidelines Compliance	All systems (with electric compressors) must comply with the requirements of BS EN 378:2008 and have a Direct Effect Life Cycle CO_2 of ≤ 100kgCO_2e/kW (2 credits) or ≤ 1000kgCO_2e/kW cooling capacity (1 credit).			2	1.54%			1			L		M&E	
		#3 - Leak Detection	Permanent automated refrigerant leak detection system or an in-built automated diagnostic procedure for detecting leakage has been installed.			1	0.77%									
	Pol 02 - NOx Emissions	#1 -NOx Emissions	Plant installed to meet delivered heating has a low dry NOx emission level: ● ≤ 100mg/kWh - 1 credit ● ≤ 70mg/kWh - 2 credit ● ≤ 40mg/kWh - 3 credit			3	2.31%	3		3			L	All electric strategy confirmed and evidenced	M&E	
	Pol 03 - Flood Risk Management	#1 - Flood Risk Management	<u>If the site is low flood risk:</u> 1) Flood maps show low annual probability of flooding; <u>*OR*</u> 2) The project meets the requirements for avoidance of flooding in accordance with BREEAM Checklist 1, e.g. where the refurbishment or fit-out zone is of a floor level that is 0.3m higher than the obtained/ estimated flood level and safe access/escape routes are available/present, etc. <u>If the site is medium or high flood risk:</u> 1) A site-specific floor risk assessment must be undertaken that takes into account all sources of flooding. 2) One of the following must be undertaken: -the refurbishment and fit-out zone is located entirely on the first floor or above and a flood emergency plan has been developed in accordance with 'Would your business stay afloat? A Guide to preparing your business for flooding', Environment Agency, 2011, <u>*OR*</u> -As a result of the building's floor level or measures to keep water away, the building is defined as achieving avoidance from flooding by following Checklist A-1 3) Where avoidance is not possible, two credits can be achieved where a full flood resilience/resistance strategy is implemented.			2	1.54%			2			M	Assume FRA required for planning. Flood risk very low (Government flood risk for planning mapping)	Structural Engineer	
		#2 - Surface Water Run-Off	<u>One credit - neutral impact of surface water:</u> 1) No increase in impermeable surfaces as a result of the refurbishment works (on-site footpaths are excluded in this calculation). <u>*OR*</u> 2) If there is an increase in impermeable surfaces: -For hardscaped areas: permeable surfaces and/or SuDS must be incorporated so that there is a neutral effect from the run-off from the site (as compared to the run-off volumes of the original site). -For building extensions: where there is an increase in building footprint that extends onto any previous permeable surfaces, additional run-off must be managed on site using SuDS for rainfall depths up to 5mm. <u>Two credits - reducing run-off:</u> 1) An appropriate consultant is used to design a drainage strategy. 2) Either of the following criteria are met: -Decrease in impermeable area by at least 50% from pre-existing impermeable hard surfaces, <u>*OR*</u> -Where run-off is managed on site, peak run-off for 1 in 100yr event is reduced by 50%, total volume of run-off for 1 in 100yr event of 6hr duration is reduced by 50%, and allowance is made for climante change in calculations.			2	1.54%			2			L		Structural Engineer	
		#3 - Minimising Watercourse Pollution	Appropriate consultant appointed to carry out the following analysis: 1) no discharge from developed site for rainfall up to 5mm. 2) Suitable pollution prevention measures put in place for any sources of pollution 3) A comprehensive drainage plan will be made available for the occupants 4) Maintenance agreements for any SuDS must be in place			1	0.77%									
	Pol 04 - Reduction of Night Time Light Pollution	#1 - Reduction of Night Time Light Pollution	Where the external lighting design is compliant with ILE guidance for the reduction of night time pollution and is automatically switched off between 2300 and 0700.			1	0.77%			1			L		M&E	
	Pol 05 - Reduction of Noise Pollution	#1 - Reduction of Noise Pollution	Noise sources from development do not exceed ambient noise levels. Noise impact assessment to be BS 4142 compliant. Credit achieved by default where there are no noise sensitive areas or buildings within 800m radius of development.			1	0.77%			1			L		Acoustician	
					Totals - Base	13	10.00%	3		10		0				
Inno.	Innovation	★ Approved Innovation	One innovation credit can be awarded for each innovation application approved by BRE Global, where the building complies with the criteria defined within an Approved Innovation Application Form			1	1.00%									

MAX FORDHAM

APPENDIX 2 – MATERIAL EFFICIENCY AND FUNCTIONAL ADAPTABILITY WORKSHOP OUTCOMES

Material efficiency

	Opportunities			Challenges			Outcome/Actions
	Architects	**Structures**	**MEP**	**Architects**	**Structures**	**MEP**	
Design for reuse and recovery	Current approach with the existing window - composite glazing new or secondary glazing, roughly equivalent embodied carbon. Recycled content in finishes Timber raised flooring to be removed, aiming for 60% to be refurbed and reused 4th Floor - Will need to upgrade the solid panels in the curtain walls (but retaining glazing and steel)	Removing part of GF slab (~20m) and reusing concrete Reusing the majority of the structure, and no vertical extension means minimal structural strengthening required Structural works are very minimal: removing one existing shear walls, some steel bracing work, overall minimal structural intevention - significant retention minimise additional material requirements Keeping all of steel and glazing in place on 4th floor	Look at reuse of all MEP plant -Data racks can be reused Copper pipework - reusable HDPE for waste as opposed to UPVC materials schedule TBC Existing lift could be repaired and reused	Will need to develop a recycling/reuse for existing windows if replacements taken forward	Space constraints on site make reuse of concrete not viable	From analysis: - Current MEP in building is not reusable - Existing lift requires replacement within existing shaft	Client decision on 22nd aug re glazing strategy. 2 of 3 likely outcomes would be timber-based. -timber-based window systems, composite frame systems, -or secondary glazing with timber framing -or like for like crittal window replacement (steel and plastic framing) MF to look into reclaiming MEP materials organisation. P&M to quantify extent of retained structure (% of original volume to be retained) Pending strip out survey to see viability of reusing raised flooring
Design for offsite construction	Brise soleil offsite manufactured, glazing units too. Option to use offsite construction for part of extension		Offsite plant room module	This has a large cost premium and may be difficult with space restrctions		Not viable for this project	
Design for materials optimisation	Can existing insulation be 'topped up' without removal of material? Curtain glazing - remove cappings of windows, replace with an Alu capping (currently white, colour change for aesthetics) Replacing current terrace finish (timber)- could be replaced with reclaimed paving. Aiming for more durability	designing roof layot with the aim to reuse the external steel structures that support the AHU's, Heat pumps etc.	Hybrid VRF - aiming for lower refrigerant charge			Hybrid VRF system has recangular fan units, cant use round fan coils, so has an impact on aesthetic. Hybrid also has cost uplift of around 300k, benefit of Hybrid VRF is lower refrigerant charge.	
Design for waste efficient procurement	Vast majority of construction waste will be plasterboard - Gypsum powder can potentially be reused new blockwork walls, could be lower embodied carbon than steel stud - aiming to specify a high recycled content. (Hempcrete?)	Specifying high recycled content steel - electric arc manufacturing steel/ reclaimed steel could also be options		Reuse of plasterboard would have a cost premium. Might require a specialist recycling contractor. See pre dem audit	Limited options due to nature of refurb project		
Design for deconstructability and flexibility	Existing roofing to 4th floor terrace, removed and replaced Terrace finish to be replaced, could look into reclaimed pavers - existing is timber, to be removed, aiming for more durability, masonry or similar		Services enable flexible partitioning/subdivision of open plan spaces? - a couple of options have been explored for flexibility, 'medium' flexibility, around agreed positions	Reusing the existing brackets on 4th floor and steelwork somewhat limits the choice of cladding panels		Need to avoid over-provision of MEP equipment	Pre-demolition audit provider to advise on sourcing reclamed materials/paving for terrace
Are there any local or regional schemes/incentives/organisations for reuse, recovery or recycling that provide financial or other benefits?	British gypsum recycling service?						MF to look into organisations who could take back some of existing MEP items for reuse
Other?							

		Considerations	Commentary		Outcomes and Actions
			Envelope and Structure	Core Services and Internal Elements	

Functional Adaptability	**Feasability for major refurbishment**	• Materials
		• Junctions
		• Phasing
		• How would each layer be refurbished?
		  • Site
		  • Structure
		  • Skin
		  • Services
		• Space plan
			The underlying building is robust and suits future refurbishment
			
			Blockwork - aim for a low cement content or lime mortar to enable dissassembly, might depend on blockwork choice as well.
			
			Looked into Hempcrete insulation rather than rockwool, rockwool is favored currently for cost. Thermal mass performance might affect MEP, efficiency - action to work with hempcrete on the potential thermal mass benefits. Manufacturer offered to help with thermal modelling.
			
			Targeting high EPC credentials aiming to prolong the useful life of this iteration of refurbishment.		

	Accessibility: Design aspects that facilitate the replacement of all major plant within the life of the building	• Lifespan of services is typically 15-30 years • How is the plant moved in and out? • Where are the openings and how do they relate to the size of the plant? • What are the requirements for fixings/mountings? • Access to local services, such as local power, data infratructure etc		Access to roof is through ladders, plant replacements would need to be craned in. A frame for hoisting equipment to roof level. (PVs, AHU, ASHP all on roof) Basement plant access is very good: providing double doors to plant area and also accessible via the lift.	

	Degree of adaptability in the internal environment to accommodate change in working practices and of the internal physical space and shell to accommodate change of use	• Change in working practices may include:
		  • Impact of IT on archiving process and reading rooms
		  • Change in use of rooms
		• Adaptable internal environment may include:
		  • Openable/replaceable windows
		  • Good daylight penetration
		  • Potential for replacement of shading opening devices
		  • Moveable partitions for office space changes
		• Adaptable fabric
		• Flexible space
		• In-site concrete frame with some redundancy
		• Alternative uses
		• Acoustic properties of the floor and ceiling
		• Changeable façade and fixings
		• Preference for mechanical fixings over adhesive fixings
		• Implications for means of escape
			Building lends itself to change of use flexibility, this refurbishment allows for future change of use, there is even precedent for resi conversion of similar buildings in the locality.
			substructure is very robust - good for change of use.		

	The likelihood to contain multiple or alternative building uses, area functions and different tenancies over the expected life cycle	• Structural design of the building • Change in use of rooms • Convertibility: degree of adaption of change of space • Moveable partitions for space changes • Adaptable fabric • Flexible space • Location of core and services • Location of structural components within the floor space • Use of products or systems which allow easy replacements. • Layout in standardised grids • Use of standardised material sizes	Designing for building let as a whole or on a oper floor basis. Floor not to be subdivided between tenancies so there is flexiblility for each floor to have a different use. Subdivision could be a potential use case in the future.		

	The potential of the ventilation strategy to adapt to future building occupant needs and climatic scenarios	• Provision of capacity in infrastructure to enable future expansion and adaptation • Inclusion of facilities management requirements and construction design management feedback for future operational needs. • Carry out thermal modelling for future climate scenarios • Thermal modelling in line with CIBSE Guides (A, TM52, TM59 etc.) • Passive design measures to ensure ventilation strategy meets future climatic scenarios	External shading tbc - likely to go ahead. opening windows depends on glazing strategy	Designing for future climate scenarios Cant rely on purely natural ventilation due to noise from Bayham St	Chat with Kai and Blair for modelling scope
	The potential for the building to be extended horizontally or vertically	• Provision of capacity in building services infrastructure to enable future expansion and adaptation • Location and size of core and services • Provision to add extensions or alterations structurally to increase building capacity • Any structural limitations to expansions • Any space limitations on the site • Identifying or recognising potential future functional requirements • Efficient use of space to allow for any increase in occupancy	Stage 1 feasibiliy - vertical extension was explored, foundations were investigated, vertical structure appears to allow for a vertical extension, pending future further investigations into foundations. Some of these foundations investigations will be required for the green/blue roof and structural wall replacement no potential to extend horizontally - constrained site		Further structural investigation
	Design for durability within the context of the lifespan of the building	• Use of materials which require less frequent maintenance, repair or replacement. • Durability of different building elements based on warranties and risk of being broken during disassembly. • Consider building elements within the context of the building life span and the building sector. • Use of temporary structures when a short life span is expected.	Window strategy tbc - depends on warranties to be obtained. additional casettes for curtain walling typical lifespan - could look into a long-warranty product.		
	Designing exposed and reversible connections	• Exposed and reversible connections facilitate disassembly. • How to make connections more visible. • Consider space availability between building elements when aiming to accommodate disassembly. • Poured and welded connections are likely to harm components and prevent disassembly. Consider use of screws and bolts.	Blockwork walls - low cement mortar preferred glazing- end of life recyling should be straightforward 4th floor walls to be relatively easy to dissassemble	Dissassembly of plant - should be standard to have removable plant	

	Designing building systems and components in layers	• Components that could form separate layers.
		• The following principal layers can be identified as follows:
		  • Structure: foundation and load-bearing elements
		  • Skin: exterior surfaces
		  • Services
		  • Space plan: the interior layout
		  • Stuff: furnishings and carpets
		• Different lifespans and maintenance needs of different components.
			Detailing to allow shorter lifespan products to be replaced, most elements are demountable. aiming for dissassemblable interfaces wherever possible.		Link with TFT on access and maintenance strategy

	Avoidance of unnecessary toxic treatments and finishes	• Some finishes can contaminate the substrate in a way that they are no longer reusable or recyclable. This should be avoided unless finishes serve a specific purpose. • Consider VOC, formaldehyde and other toxic properties of potential finishes. • Consider specification of finishes in line with BREEAM credit Hea 02.	Painting a lot of interior surfaces, will specify low VOC and formaldehyde free paints. Sealants for sandblasted surfaces - to look into low toxin/VOC options. Option of Hempcrete benificial on air quality - anti-fungal, moisture moderation	ASHP heating - air quality benefits (no gas on property)	
	Incorporating standardisation into the design	• Consider use of standard-size materials that can accommodate multiple uses, reuse and upgrading. • Consider use of standard component types. • Use of standard types of connections that can be separated and reused more easily. • Use of modularity that allows elements to be slotted together or taken apart to promote disassembly and flexible environments.	Blockwork suitable for high-value reuse after dissassembly. Curtain walling will have to be bespoke sizes so less reuseable. Light fittings and other fixtures and materials - aim for suppliers who already have an established takeback scheme, remanfacturing Reynaers - might have a curtain wall take back / remanufacturing scheme.	Connections in plant should be standard	

APPENDIX 3 – ADAPTATION TO CLIMATE CHANGE STUDY

Climate Change Hazard Risk Assessment Matrix: 101 Bayham Street

Section 1

Climate Change Hazard Risk Assessment Framework

Issue Date: 28/04/2019

Introduction: A Global to Local Response

The Paris Agreement is a significant step forward. 195 nations including the UK will "pursue efforts" to prevent more than a 1.5°C increase in global temperatures. Current commitments to reduce emissions however, even if fully implemented, will lead to an estimated 2.7°C rise. Global emissions would need to peak soon and then decline rapidly for the Paris Agreement goals to be feasible. Even in this scenario the uncertain sensitivity of the climate to greenhouse gases means there would remain at least a small chance of 4°C or more of warming by 2100. It is therefore necessary to prepare for further warming whilst pursuing more stringent emission reductions as part of the global effort. The UK Climate Change Risk Assessment Evidence Report[1] was produced to assess the urgency of further action to tackle current and future risks, and realise opportunities, arising for the UK from climate change. Almost sixty individual risks and opportunities have been assessed by leading academics and other experts as part of this second .

Climate Change cannot be tackled by global policy and agreements alone, so easily put to one side by the whims of nations. To mitigate the impacts of Climate Change we must all play our part and the construction industry is in a position to play a crucial role.

1. https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/uk-climate-change-risk-assessment-2017

Introduction: This document

This document records the climate change risk assessment carried out for the redevelopment of 101 Bayham Street. This study was carried out on prior to the end of RIBA Stage 2 of the masterplan, and was developed using inputs from all the relevant members of the Design Team.

Evidence was reviewed from relevant bodies to identify and understand the expected impacts of increased extreme weather resulting from climate change on the 101 Bayham Street redevelopment. During the workshop the impact posed to 101 Bayham Street from these likely risks was estimated by the group, in particular highlighting the potential risk to structural stability, structural robustness, weather proofing and detailing, material durability, health & safety of building occupants and others, and impacts on building contents and business continuity among other aspects of the design, construction and operation of 101 Bayham Street

Risk reduction and mitigation (as far as is practically feasible) were identified. A member of the Design Team was assigned responsibility for developing each reduction and mitigation measure and a series of actions noted against each. The Climate Change Adaption Risk Assessment should be revisited periodically throughout the design and contruction process to ensure that the measures deemed appropriate and feasible are incorporated into the final design of 101 Bayham Street.

Those risks the participants believed to pose a high risk to 101 Bayham Street were then evaluated with a tolerable risk threshold set. The sensitivity of the study should be reviewed and areas where the risk posed is unacceptable in terms of health & safety, life cycle assessment and project finances should be identified.

1. Identifying Climate Change Hazard

Climate Change Haarzd	Hazard Overview	Hazard Detail
Change in Temperature	Since 1880, there has been a global temperature increase of 0.85°C. This increase is mirrored in the UK climate with the UK has experiencing higher summer temperatures year on year. Average annual UK temperatures over land and the surrounding seas have increased in line with global observations, with a trend towards milder winters and hotter summers in recent decades.	***Increase in Summer Temperature - otter, Drier Summers*** Research indicates that summers will be hotter; by 2050 the average summer day is likely to be 2.7°C warmer and very hot days 6.5°C warmer than the baseline average. 2080 the average day is likely to be 3.9°C hotter and the hottest day of the year 10°C hotter than today's ***Change in Winter Temperature - Warmer, Milder Winters*** Winters will be warmer; the average, mid-century winter's day being 2.2°C warmer and a very warm winter day 3.5°C above the baseline ***Change in Winter Temperature - Increase Frequency of Cold Snaps*** Very cold winters will still occur, but will occur less frequently. However there is expected to be an increase in cold snaps
More Extreme Weather	Whilst natural variability in the climate will continue to have a large influence on individual weather events, the recent episodes of severe and sustained rainfall are consistent with projections of climate change. There has been a noticable, significant rise in the rate of rainfall across the UK, exacebated by the increase in golab oceanic temperatures resulting in weather systems capable of carrying increased loads.	***Wetter Winters*** Although the risk to business continuity due to snow is expected to decrease due to the warmer winter temperatures, by 2050 the average winter is projected to be 15% wetter and the wettest winter 33% wetter than the baseline average. ***Extreme Rainfall Events*** While annual rainfall figures will not change significantly, the distribution through the year will (wetter winters, drier summers). This will increase the intensity of rainfall accodiated with extreme rainfall events. ***Wind/High Wind Speeds*** The frequency of severe autum and winter wind storms increased between 1950 and 2003. However average wind speeds showed a slight decline over the same period across the UK, bar a slight increase in the south-east, consistent with climate change projections. The UKCOP09 projections remain uncertain with regard to increase in extreme wind. General guidance states that the existing high wind standards (for south east England) combined with the limited evidence that high winds will increase dramatically above those extreme weather events observed over the last 20 years mean that the climate change risk to buildings associated with wind is low ***Increase in Driving Rain*** Increases in driving rain are expected, most notably to the western areas of the UK which are most exposed to high frequency driving rain events. These events may only increase over time. ***Increase in Temperature and UV*** With higher temperatures would come an increase in UV radiation. This may put a stain and impact upon building material colour performance and thermal capabilities. Materials with a high movement coefficient/expansion requirements will need more detailing to allow for more movement and space for interfacing between elements. ***Increased Regularity of Rainfall and Humidity*** Icreases in regular rainfall, and temperature increases may lead to more occurances of high humidity. This can lead to material degredation and possible impacts on moisture being retained within building materials. In turn increased moisture retention can lead to devleopment of growth, mould and dampness impacting people's health and overall environmental quality of interior space.
Increase in Water Issues	Annual rainfall figures across the UK are not expected to significantly change, however the increased seasonal nature will pose very different but equally difficult threats. Sea levels globally and around the UK have risen by 15-20 centimetres since 1900. This is caused by polar and glacier ice caps melting, releasing millions of tonnes of frozen water in to the oceans. Such increase in water can desalinate the water flows of the oceans, changing the capacity for heat to be carried around our oceans and increasing sea levels, thus having a hg impact on low laying areas.	***Water Supply*** Although annual rainfall within the UK is not expected to significantly change due to climate change, the increased seasonal nature of rainfall will lead to greater periods of water scarcity. This scarcity is already driving up the price of water leading to water poverty. Reservoir systems are not designed to cope with regular occurances of drought conditions, esacerbating pressure on other sources whilst the demand for potable water increases. ***Drought and Water Shortage*** Summers will be drier; by 2050 the average summer is projected to be 19% drier and the driest summer 39% drier than the baseline average. By the end of the century average summers could be 23% drier than today. With increase temperatures evapotranspiration of moisture from soils and plants will also increase. This makes moisture deficets more likely during period of dry weather. The likelihood of summer drought events may increase, with an increase in drought frequency already detected. ***Flooding and River/Sea Level Risk*** By 2050 the average winter is projected to be 15% wetter and the wettest winter 33% wetter than the current baseline average. This puts an onus on masterplans and infrastructure to be designed to manage both heavier rain events and long term impact of flooding. Key areas of concern are for the management of ground, surface run-off, and fluvial flooding. Increase in storm intensity is also likely to put additional pressure on London's historic sewer system, designed only to cope with a 1 in 30 year storm event.

- **Increase in temperatures change**
- Risk to peoples comfort, health, productivity, over heating of infrastructure systems and services

- **Rain, Flooding and coastal change**
- Communities, business, infrastructure, change in local environment

- **Drought and Water Supply**
- Shortages in public water supply from lack of rain and ground water due to over consumption. Impacting agriculture, biodiversity, ecosystems and soils.

- **Natural Capital Assets**
- Natural capital impacts
- Risk to natural environments and capital, including terrestrial, costal, marine and freshwater ecosystems, soils and biodiversity

- **Emerging Pests**
- risk of existing and emerging pest and disease conditions, invasive and non invasive species, that impact people, animals, plants and property

- **Agricultural food production**
- Risk of domestic and international food production and trade that can be impacted by severe weather, and pests

Climate Change Hazard Risk Assessment Matrix: 101 Bayham Street - for Project team review

Section 2 and 3

1. Hazards → **2. Assessing Climate Change Risk (RIBA Stage 2)** → **3. Addressing Climate Risk: Response and Mitigation (RIBA Stage 2)**

Climate Change Hazard	Key Risk	Impact on Project	Scale of Impact 2020	Scale of Impact 2050	Scale of Risk 2050	Tolerable Risk Level	Risk Mitigation Measure	Risk Mitigation Action and Design Consideration	Responsib'ty & Action Owner	Immediate Risk Mitigation Actions and Next Steps
Change in Temperature							**Designing for Comfort**			
Increase in Summer Temperature	Risk of Overheating (Interior)	**Risk of Overheating (Interior) and Impact on Comfort** * Hotter, drier summers present a large risk to occupant comfort within the building. *Poor design (poor insulation, lack of shading, extensive glazing, limited openings) can present risks and have negative impacts on worker productivity affecting business continuity. * Health impacts are possible from increased internal heat gain, i.e. heat stroke. * Changes in temperature can cause discomfort such as lack of sleep, sweating, dehydration.	M	H	H	Acceptable risk level as per TM52 (non-domestic buildings) and TM59 (domestic buildings) using DSY 2 and DSY 3	Designing to Keep Cool (Interior)	**Optimise Passive Design**		
								* Optimise insulation U-value to exclude heat	**Architect**	External envelope elements will be upgraded and are designed to comply with London Plan U-Value requirements for refurbished commercial buildings.
								* Provide potential for full future natural ventilation should external noise levels be less of an issue in the future	**MEP**	Cross-ventilation is already incorapted intpo the exsiting design of the building (Windows are openable by occupents on both sides of the building).
								* Consider passive cooling where noise levels allow (it can include night time cooling, day time purge natural ventilation)	**MEP**	Please see above.
								* Airtight construction and detail	**Architect**	Refurbishment of external wall elements are to be designed to meet air tightness assumptions outlined in the project's energy model. (Detail to be designed at Stages 3-4)
								Optimise Solar Gain and Glazing		
								*External shading devices and overhangs (self-shading) to limit solar heat gain	**Architect**	A brize-soleil is proposed for exposed glazing at Fourth Floor level to reduce cooling demands - this will be captured in the planning application.
								* Optimised glazing ratios and glazing reflectance performance specification.	**Architect**	As the project is a refurbishment there is minimal scope to alter glazing ratios although the total area of glazing on the West elevation is being reduced by infilling certain window clear openings (captured in the planning application). All replacement windows to be specified so that glazing reflectance meets assumptions outlined in the projects energy model (To be specified at Stage 4).
		Risk of Overheating (Interior)and Environmental Management * Keeping buildings cool in summer is a challenge in terms of design and energy consumption. * Users do not know how to use buildings properly in response to climate change issues, therefore they consume more energy which counter acts environmental design approaches.	M	H	H	Acceptable risk level as per TM52 (non-domestic buildings) and TM59 (domestic buildings) using DSY 2 and DSY 3		**Provide Active Cooling and Control (where needed)**		
								* Utilise active cooling to stabilise and control interior temperatures.	**MEP**	Active cooling is included in the design. However, refirgrinet is aiming to be minimesed via the use of a hybrid VRF system.
	Risk of Overheating (Exterior)	**Risk of Overheating (Exterior) and External Comfort** * Increases in external spaces will impact upon peoples comfort and the local environment. * Urban environments will reflect and radiate heat (urban heat island effect), foliage and planting may become over heated and die off.	L	L	L		Designing to keep cool (Exterior)	**Provide Adaptive Exterior Environments**		
								* Provide mix of surface types (hard, soft, landscaped, shaded, green/ brown roofs)	**Landscape Architect**	External planted and hard surface areas are proposed for Fourth Floor Level, external spaces have both a South and East Aspect ensuring that external areas are at least partially shaded throughout most of the day.
								* Provide mix of native and adaptive planting that provides shade and consumes low levels of water.	**Landscape Architect**	To be specified at Stage 4.
								* Provide deciduous trees that can respond to drier summers, are drought resistant and that provide shade in summer and natural light in winter (leaves drop).	**Landscape Architect**	Little / no scope to include this as part of the project, space-constrained site
								* Select low solar reflectance index (SRI) exterior surfaces to reduce solar heat absorption within the external environment.	**Landscape Architect**	To be specified at Stage 4.
								* Provide 'refuge spaces' for occupants out of the sun	**Landscape Architect**	Externally accessible spaces will be partially shaded in the early morning and from the mid afternoon onwards - a brize soleil will also provide partial shade to external terraced areas. (Captured at planning).

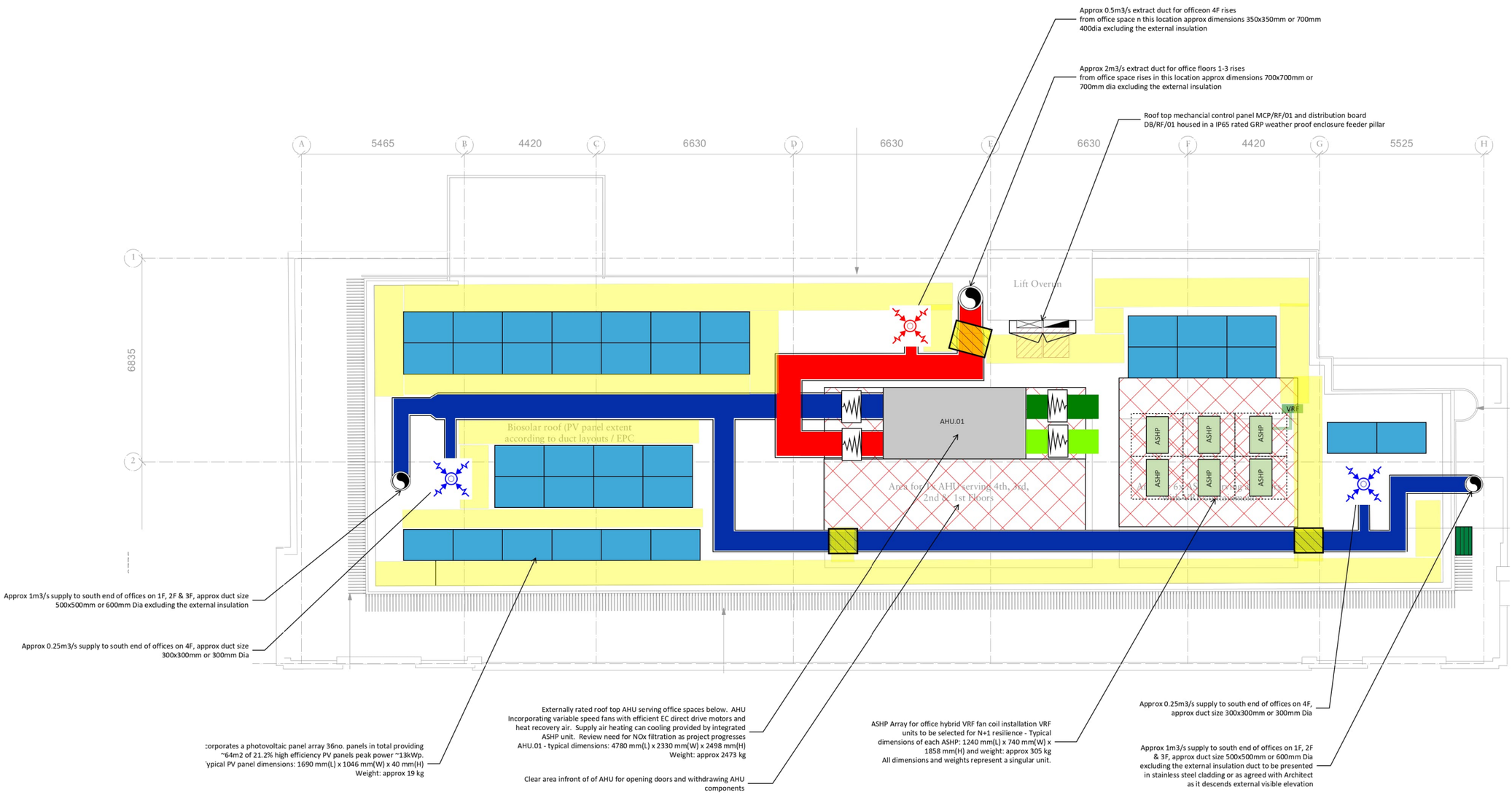
Climate Change Hazard	Key Risk	Impact on Project	Scale of Impact 2020	Scale of Impact 2050	Scale of Risk 2050	Tolerable Risk Level	Risk Mitigation Measure	Risk Mitigation Action and Design Consideration	Responsib'ty & Action Owner	Immediate Risk Mitigation Actions and Next Steps
Change in Winter Temperature	Risk to Natural Habitats	**Risk for Biodiversity and From Pests** * Emerging risks from pests. * Expansive built up areas leading to nature/biodiversity loss * Urban Heat Island intensification *Air-quality reduction *Soil quality reduction, drier conditions *Extreme weather events	L	M	L	* The London Green Space Factor (GSF)	Designing to enhance nature and biodiversity	**Provide Ecosystem Service Valuation (ESV)**		
								* Sourcing of plants increases bringing of pests to the UK	**Ecologist**	To be included in the Ecologists scope when appointed.
								* Planting strategy for reduction of the Urban Heat Island effect and promote well-being	**Ecologist**	To be included in the Ecologists scope when appointed.
								* Regulating processes in place such as carbon cycling, air quality control, water regulation, natural hazard reduction, pollination	**Ecologist**	To be included in the Ecologists scope when appointed.
								* Achieve measurable Biodiversity Net Gain	**Ecologist**	To be included in the Ecologists scope when appointed.
								* Measure climate change modelling results based on proposed interventions, before vs after interventions, to include: PM2.5, PM10, NO2, SO2, and O3 in µg/m3	**Ecologist**	To be included in the Ecologists scope when appointed.
	Risk of Excessive Heating Energy Consumption	**Risk of Excessive Heating Energy Consumption** * Warmer winters are considered to have a positive effect, less energy can be used to heat. But there is a risk that systems are not designed to react to milder winters, thus consuming more energy than is needed. There needs to be management of energy systems which monitor energy to ensure excess use of resources is not undertaken because automated systems are set up. * Warmer air temperatures must be managed to avoid overheating of the interior of the buildings in winter. Steps should be taken to recover heat to limit over heating of the space.	L	L	L		Designing to keep warm	**Provide Controlled Heating Systems**		
								* Ensure that interior building heating and cooling management systems are calibrated and controlled to respond to actual demand rather than automated annual control settings.	**MEP**	Heating and cooling is supplied via the same cassettes units. Therefore, there is no conflict between heating and cooling for envriomental control.
								* Demand responsive settings can help to reduce energy.	**MEP**	Tennats have control over the air temprature in their letted area. (Sara for confirmation)
	Risk of Underheating (Interior)	**Risk of Underheating (Interior)and Impact on Comfort** * Intense drops in winter temperature can put pressure on building services and infrastructure heating systems. Older, inefficient buildings are most at risk due to operational costs. * People are impacted through fuel poverty, lack of productive, and major health issues such as respiratory problems.	L	L	L			**Optimise Passive Heating Strategies**		
								* Ensure facades are designed to limit heat loss (to be carefully considered in selecting the façade construction system.	**Architect**	External envelope elements will be upgraded and are designed to comply with London Plan U-Value requirements for refurbished commercial buildings.
								* Ensure heating systems are sized to accommodate peak demand on extreme weather days.	**MEP**	
	Risk to Building Structure and Services	**Risk to Building Structure and Services** * External building elements (e.g. canopies, exposed concrete and masonry) and building services (e.g. externally mounted water or fluid filled pipework, roof mounted utilities and services) can be vulnerable from extreme drops in temperature	L	L	L		Mitigating the impact of cold snaps	**Mitigating the Effect of Extreme Drops on Temperature**		
								* Design out risk where possible through services design * Effective management and maintenance strategy that includes comprehensive checks of vulnerable areas in winter months	**Architect**	All external areas to be designed to accommodate future anticipated snow impacts. Improved thermal performance of the external envelope to reduce heat loss during extreme drops in temperature.
								* Preparing for periods of unoccupancy during cold periods including timed activation of heating system, water supply shut-off, drain down of piped water services, sufficient pipe lagging and insulation	**MEP**	Insulation, minimum temprature setting and isolation points are incorpated into the design to preseve system in periods of unoccuption.
								* Use of robust materials with known design life and serviceable life periods in line with current best practice. Materials should be designed to current best practice operating temperature ranges	**Façade Consultant**	Majority of existing building is over 90 years old with no superficial evidence of thermal expansion / contraction cracking - assumed that external brickwork walls utilise lime mortar which has greater allowance for thermal expansion / contraction. 1990's Fourth Floor extension is predominantly curtain wall glazing - replacement elements to be specified to accomodate anticipated ranges of thermal expansion / contraction at Stage 4.
								* Accessible drainage elements to allow ease of maintenance	**MEP**	TBC With Price and Myers
								* Accessible façade elements to allow ease of maintenance	**Façade Consultant**	Current proposal is that all windows can be cleaned externally using a telescopic pole from Bayham Street and from the rear yard. Other façade maintenance operations would require a cherrypicker lift or scaffolding (with easy access to the two primary elevations). Viability to be checked by Railpen lawyers.

Climate Change Hazard	Key Risk	Impact on Project	Scale of Impact 2020	Scale of Impact 2050	Scale of Risk 2050	Tolerable Risk Level	Risk Mitigation Measure	Risk Mitigation Action and Design Consideration	Responsib'ty & Action Owner	Immediate Risk Mitigation Actions and Next Steps
More Extreme Weather							**Construction Design**			
Increase in Driving Rain	Risk to Material Durability, Resilience and Quality	**Risk to Material Degradation from Driving Rain** * Increased in rain speed and angle may impact upon the weather proofing of buildings. * Potential increase in winter driving rain will mean construction and fixing design needs to be revised, especially in more exposed areas of the UK. * Changes to the climate may impact upon the quality and durability of materials used in construction due to changes in rain occurrence. * While London is considered sheltered, design case should still be the worst case scenario and design to take into account climate change projections	L	L	L		Design for Material Durability, Resilience and Quality	**Provide Durable Construction**		
								* Ensure that construction is well detailed and constructed to reduce ingress of moisture.	Façade Consultant	
								* Make preference for elements such as recessed window and door reveals to avoid water ingress at the surface of the façade.	Architect	Entrance threshold is designed to sit below an external canopy - internal matting will also mitigate against water ingress. Other window reveals are set back from the external face of the façade.
								* Include for projecting cills with drips to expel water from the façade and interior space.	Façade Consultant	
								* Render finishes	Architect	Infilled clear openings on the rear façade will be rendered to match the finish across the rest of the wall - care will be taken at Stage 3 / 4 to ensure that appropriate drip details are incorporated into the parapet above the rendered façade to reduce impact of surface moisture.
								* Provide greater laps and fixings to the roof and cladding systems	Architect	To be designed at Stage 4
								* Increase pressure testing requirements to 900Pa	MEP	(Sara for review)
Increase in Temperature and UV Radiation		**Risk to Material Resilience and Durability from Temperature Change and UV** * Changes to the climate may impact upon the quality and durability of materials used in construction due to temperature changes and UV.	L	M	M			**Provide Resilient Materials**		
								* Investigate and assess material build ups thoroughly for durability and resilience to climate impacts	Architect	Agreed, product / material selection will considerdurability and resilience at every stage of the design process.
								* UV 'resistant' design already a requirement of the specification	Architect	Agreed, product / material selection will consider UV resistance at every stage of the design process.
Increase in Moisture / Dampness		**Risk to Moisture Ingress from Change in Humidity** * Increases in moisture levels (warmer temperatures can hold more moisture) which can lead to damp and moisture build up within facades, and construction elements, thus damaging material durability, causing damp, mould, poor health if spaces are not properly ventilated.	L	M	M			**Optimise the Moisture Barrier and Moisture Ingress**		
								* Ensure spaces are well ventilated to reduce chance of moister being retained within spaces.	Architect	Ability to open windows factored into the Stage 2 design the air handling system will also assist in keeping internal moisture levels within acceptable boundaries.
								* Utilise damp proof materials and finishes.	Architect	Roof will be detailed to prevent water ingress into the building.
Increase in Water Issues							**Managing Water**			
Water Supply	Risk of Lack of Water Supply	**Risk of Lack of Water Supply (Interior)** * Rainfall occurrences have changed in the UK and seasonal patterns have altered meaning that some areas are at increased risk of drought, whilst others are at increased risk of rainwater flooding. * Consumers are using increased levels of water. * Risk of drought may be increased by possibility of higher than anticipated water consumption in the future	L	M	M		Design for Water Conservation	**Potable Water Conservation (Interior)**		
								* Ensure potable water consumption is reduced from the outset through the use of low flow and efficient fixtures.	Architect	Low consumption sanitaryware fittings to be specified in line with targeted credits under the Wat01 issue.
								* With roof gardens especially at risk, drought tolerant planting to be specified	Landscape Architect	Drought tolerant planting to be specified at Stage 4
Drought and Water Shortage		**Risk of Lack of Water Supply (Exterior)** * Changes in rainfall patters have placed greater demand on water supply for irrigation purposes, coupled with increased in temperatures, planting requires more water for nourishment.	L	M	M			**Irrigation Water Conservation**		
								* Ensure preference is made for the selection of native, adaption and drought resistant species to ensure they can cope with changes in available rainfall.	Landscape Architect	To be specified at Stage 4
								* Ensure irrigation is installed (where required) as a drop fed system, used only at night to avoid evaporative losses.	Landscape Architect	To be specified at Stage 4
								* Avoid the use of excessive lawn space to reduce the need for irrigation.	Landscape Architect	No lawn space proposed

Climate Change Hazard	Key Risk	Impact on Project	Scale of Impact 2020	Scale of Impact 2050	Scale of Risk 2050	Tolerable Risk Level	Risk Mitigation Measure	Risk Mitigation Action and Design Consideration	Responsib'ty & Action Owner	Immediate Risk Mitigation Actions and Next Steps
Flooding and River/Sea Level Risk	Risk of Flooding	**Risk of Surface Water Flooding** * Increase of rainfall in the winter, exacerbated by excess water from facades, is likely to lead to the greater rainwater ponding and flooding. * Increases in rain will lead to greater risk of surface water flooding and saturation of the ground. * Intense rainfall for shorter period is likely to lead to the ground becoming saturated and unable to absorb rainfall (which results in ponding). * Long term flooding and flood management/ run off issues * Extreme weather, rainfall events can lead to flash flooding damaging buildings, infrastructure and business continuity. * Greater risk of flooding to basement	L	M	M		Design for Flooding Protection	**Design Sustainable Urban Drainage Systems** * Ensure that SUDS and attenuation strategies are included within building and site design. * Drainage - increase by 40% to account for climate change	Landscape Architect	
								* Install green/ brown roofs to provide on site attenuation and rainwater attenuation. * Specification of secant walls will significantly design out flood risk to basement (and therefore critical infrastructure located within).	Landscape Architect	
								* Install site landscaping and limit non-porous surfaces.	Landscape Architect	Proposed and captured in planning application
								* Protection of critical infrastructure	MEP	No life saftefy systems have been placed in the basement. Risk to data racks and AHU in basement to be elevatuated in stage 3.
Inadequate drainage capacity	Risk of Drainage Failure	**Risk of Drainage Capacity Failure** * Drains may become overwhelmed with extreme rainfall and surface water run off, and debris.	L	M	M		Design for Drainage Management	**Drainage** * Design to include for larger capacity building gutters and downpipes to cope with increases in rainfall		
		* Foul drainage systems may fail due to changes in water levels and consumption patters. They may fail due to water levels within them changing, thus impacting how water flows within them.	L	L	L					
Pests	Pests	* The impact of pests are potentially high for building occupants and property continuity. *Warmer, wetter conditions expected by climate change enable some species to expand in population and impact native species.	L	H	H	**Remove Invasive Plant Species** **Remove and inhibit pests**	Pest Control	**Remove Invasive Plant Species** * Remove and dispose of invasive plant species.	Ecologist	To be included in the Ecologists scope when appointed.
									Ecologist	To be included in the Ecologists scope when appointed.
								Remove and inhibit pests * Remove, clear, and contain property from invasive pest species. Reduce interior pest expansion by properly ventilating dwellings, and cleaning space.	Ecologist	To be included in the Ecologists scope when appointed.
								* Ensure treatment is put on property entrances to limit the ingress of pests into interior spaces.	Ecologist	To be included in the Ecologists scope when appointed.
Air Quality and Pollution	Air Quality Degradation	* Poor interior and exterior air quality can lead to poor health, respiratory issues, maintained issues for ventilation services, dust, cleaning maintenance issues within buildings. It is harder to manage external air pollution issues.	M	H	H		Air Pollution Control	**Air Quality Management** * Ensure that passive design and ventilation takes into account sources of external pollution. * Locate window openings away from sources of pollution (roads, exhausts if feasible). * Ensure cross ventilation is available so that air can be moved through a space efficiently and to reduce PPM settling in an area. * Implement site construction air quality management plan. * Ensure that services flush out is undertaken once installed. * Ensure filters are provided within mechanical services to filter out particulates. Ensure filters are maintained and replaced on regular basis.		

Key- Scale of impact on development	
L	Low Risk
M	Medium Risk
H	High Risk
E	Emerging

APPENDIX 4 – ROOF PLANT LAYOUT (PV ARRAY AND ASHPS)



Notes

1. Do not scale from this drawing.

2. Print this drawing in colour.

3. Read this drawing in conjunction with all other MXF drawings, specifications and schedules.

4. This drawing indicates main rooftop plant and the access strategies for maintenance operations.

5. Provide fire stopping around ductwork pipework where it passes through a fire compartment. Duct work to be provided with smoke fire dampers where it passes through a fire compartment boundary.

6. All penetrations through roof or building fabric to be wind and water tight, airtightness line to be maintained and services to have enhanced insulation and be metal clad to prevent energy loss and minimise cold bridging.

7. All pipe work on roof to be trace heated to prevent freezing.

KEY

- Low level concealed pipe
- Low level exposed pipe
- High level concealed pipe
- High level exposed pipe
- Cold water Service
- Hot water service
- Downstand beam
- T/A To above
- F/B From below
- WH Electric Water Heater/ Electric Shower
- FCU Fan Coil Unit
- HBC VRF Hybrid Box Controller
- VRF System pipes on cable tray
- Extract ventilation duct
- Supply ventilation duct
- Exhaust ventilation duct
- Intake ventilation duct
- Natural smoke clearing vent
- Extract ventilation grille
- Supply ventilation grille
- M Water meter
- Stepped walk over platform with handrail
- Plant maintenance access route Minimum 700mm width
- Guarded ladder access to roof from balcony level (TBC by Architect)
- Photovoltaic panel (PV)
- Electrical distribution board (DB.XX)
- Mechanical plant control panel (MCP.XX)

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client: **Railpen Ltd**
job no. **7274** | project leader **AL** | scale at A1 **1:75**
status code and description: **S2 - Suitable for Information**

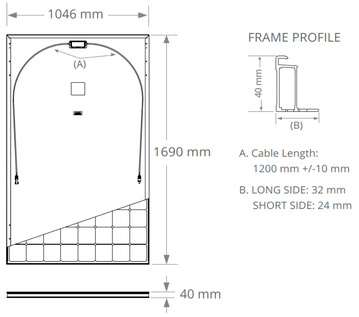
project: **101 Bayham street**
issue date **31/07/23** | revision **P01** | classification **PM_40_40_15**

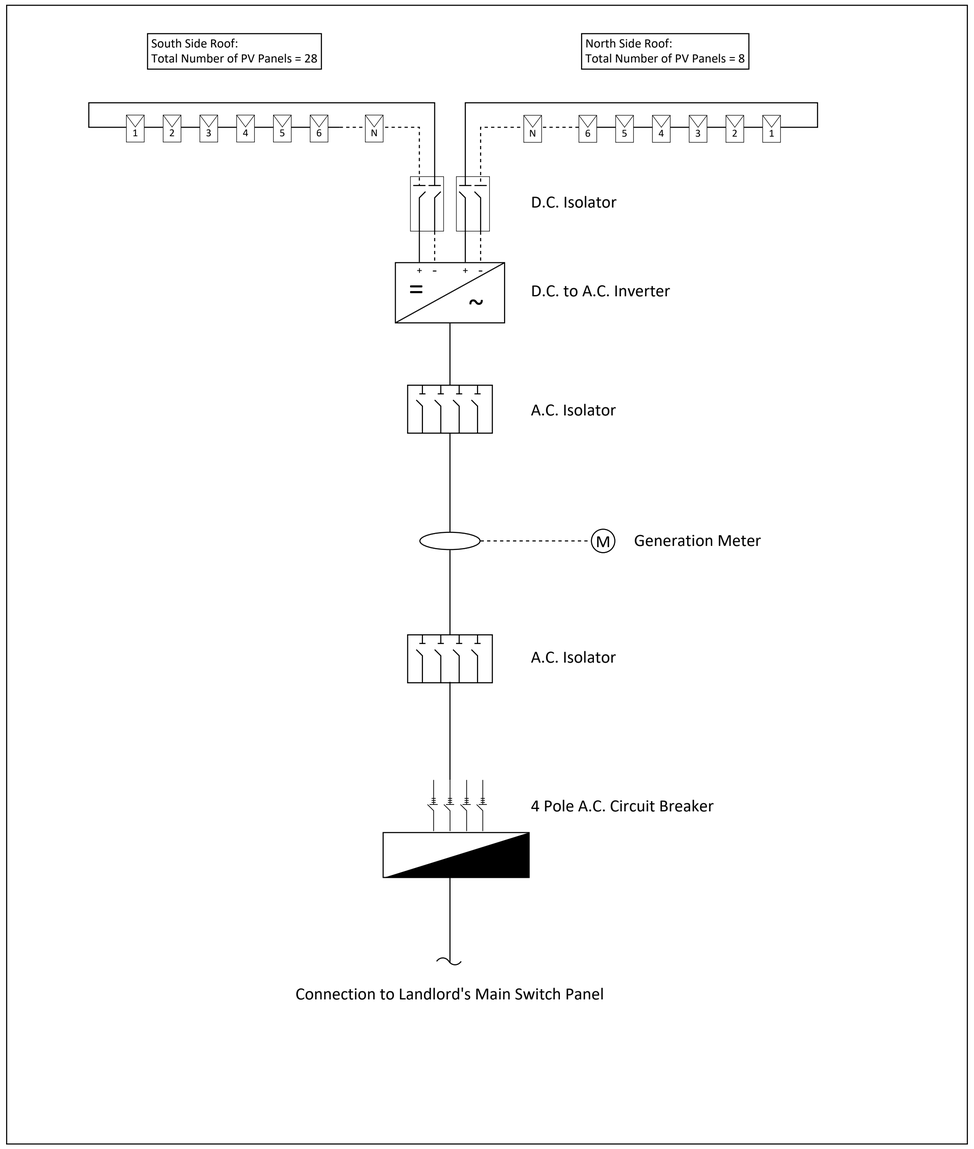
drawing title: **Combined Services Roof Level**
project code **J7274** - orig. **MXF** - volume **XX** - level **RF** - type **DR** - role **J** - number **30100**

Total Number of PV Panels = 36
Total PV Output = 13.5 kWp

PV information

- Manufacturer: SunPower
- Model: SPR-MAX3-375-BLK
- Peak Output: 375 W
- Panel Efficiency: 21.2%

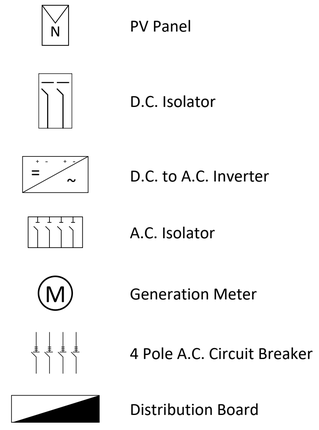




NOTES

1. Do not scale from this drawing.
2. Schematic to be reviewed in conjunction with all relevant Max Fordham schedules, layouts and drawings.
3. Please refer to drawings:
J7274-MXF-XX-RF-DR-J-30100 - Combined Services Roof Level
4. Refer to architects, structural engineers and landscape architects information for further details.

KEY



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client: **Railpen Ltd**
project: **101 Bayham street**
drawing title: **PV Schematic**
job no. **7037** | project leader **AL** | scale at A1 **NTS**
status code and description: **S1 - Suitable for Coordination**
issue date **15/09/2023** | revision **P01** | classification **Ss_70_10_00_00**
project code **J7274 - MXF - XX - ZZ - DR - E - 10200**