Energy and Sustainability Statement

Martin Robeson Planning Practice (MRPP)

38 Frognal Lane
London
NW3 6PP

SRE

Version	Revision	Date	Author	Reviewer	Project Manager
1	A	21.05.2021	Iain Turrell	Aniruth Raghunathan	Iain Turrell
1	B	24.05.2021	Iain Turrell	Aniruth Raghunathan	Iain Turrell

The figures within this report may be based on indicative modelling and an assumed specification outlined within the relevant sections. Therefore, this modelling may not represent the as built emission or energy use of the Proposed Development and further modelling may need to be undertaken at detailed design stage to confirm precise performance figures. Please contact SRE should you have any questions, or should you wish further modelling to be undertaken post planning.

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Contents

Executive Summary

Executive Summary

This Energy and Sustainability Statement has been written by SRE on behalf of MRPP (The Client) to demonstrate the overall sustainability measures in place for the Proposed Development at 38 Frognal Lane, London Borough of Camden.

The Energy strategy for the Proposed Development has been developed by following the GLA Energy Hierarchy of Lean, Clean, Green and Seen, local policy guidance, and guidance contained within the London Plan with regards to the Circular Economy[1] and Whole Life-Cycle Carbon Assessments[2].

Overall, the Proposed Development demonstrates compliance with the Energy Hierarchy, showing a >35% CO_2 emissions reduction over a Building Regulations Compliant design, with a >10% emissions reduction being achieved through fabric efficiency measures alone, and a >20% CO_2 emissions offset from on-site renewable energy – far exceeding the requirements of Local Policy.

In addition to the measures outlined within this report, a Whole Life Carbon Assessment (WLCA) has also been undertaken on the Proposed Development to determine the whole life carbon cost of the proposals and a comparison with the currently consented scheme for the site (ref. 2019/4220/P). Full results are shown within the supporting Whole Life Carbon Assessment which supports this application.

	CO_2 emissions (t/yr)	Improvement	Improvement over baseline
Baseline	8.53		
Lean	7.41	13.13%	13.13%
Clean	7.41	0.00%	13.13%
Green	4.95	33.20%	41.96%

Table 1 - Summary of regulated carbon dioxide savings

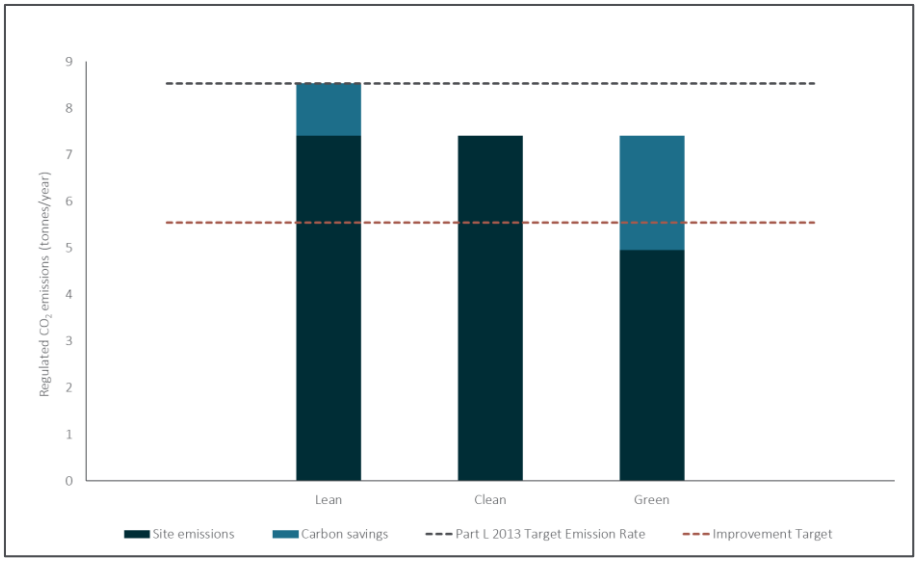


Figure 1 - Summary of regulated carbon dioxide savings

[1] Mayor of London: Circular Economy Statement Guidance (Draft for consultation, October 2020)
[2] Mayor of London: Whole Life-Cycle Carbon Assessments Guidance (Consultation Draft, October 2020)

Proposed Energy Strategy

- Passive and active design measures including:
  - >10% improvement from fabric efficiency measures
  - >20% CO_2 offset from Low/Zero Carbon technologies
  - Advanced temperature controls.
  - 100% low energy lighting.
  - Enhanced hot water storge.
  - Enhanced building fabric.
  - Reduced building permeability.
- Air Source Heat Pump to provide heating
- Whole house mechanical ventilation with heat recovery
- Roof mounted PV of min. 2.8kWp total

	CO_2 emissions (t/yr)	Improvement over Baseline
Green	4.95	41.96%

Table 2 - Green emissions summary

Introduction

1.0 Introduction

This Energy and Sustainability Statement has been written by SRE on behalf of MRPP (The Client) to demonstrate the sustainability measures incorporated into the design of the proposed new build residential dwelling at 38 Frognal Lane, London (the Proposed Development), located within the London Borough of Camden.

The Proposed Development will deliver lower energy and water use, lower carbon emissions and lower operational costs than a Building Regulations Compliant design through adopting a 'fabric first' approach to the building design in line with best practice. The site will also be assessed in accordance with the Royal Institute of Chartered Surveyors (RICS) 'Whole Life Carbon Assessment for the Built Environment' and will incorporate Circular Economy principles within the overall construction process, procurement and design.

The Site currently consists of a ~1880's residential dwelling which has been extended numerous times over its lifetime and is consequently a mix of architectural styles and construction quality as a result. The Proposed Development consists of the removal of the existing structures and the construction of a new residential dwelling with high levels of energy efficiency. The Proposals are for a 5 bedroom detached dwelling, constructed over 4 no. floors, including basement.

Overall, the Proposed Development provides a modern dwelling with high levels of energy efficiency which will outperform the currently consented new-build dwelling (ref. 2019/4220/P) for whole life carbon emissions, and provide a modern, high quality and efficient family dwelling.

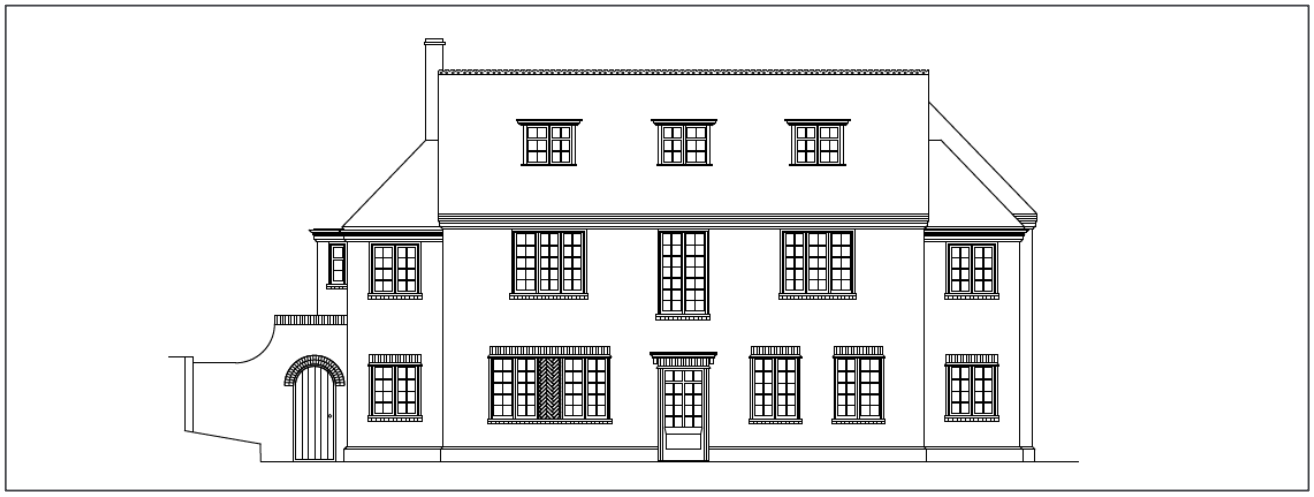


Figure 2 – Front Elevation of the Proposed Development (Charlton Brown Architecture & Interiors)

Planning Policy	Requirement
The New London Plan 2021	Policy S12 How the zero-carbon emissions target will be met within the framework of the energy hierarchy
	Policy S12 A minimum on-site reduction of 35% with at least 10% through energy efficiency measures alone
	Policy S14 Limit internal heat gain through the cooling hierarchy
London Borough of Camden Local Plan	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. We will: a) promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy; b) require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met; c) ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks; d) support and encourage sensitive energy efficiency improvements to existing buildings; e) require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and f) expect all developments to optimise resource efficiency. For decentralised energy networks, we will promote decentralised energy by: g) working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them; h) protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and i) requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network. To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

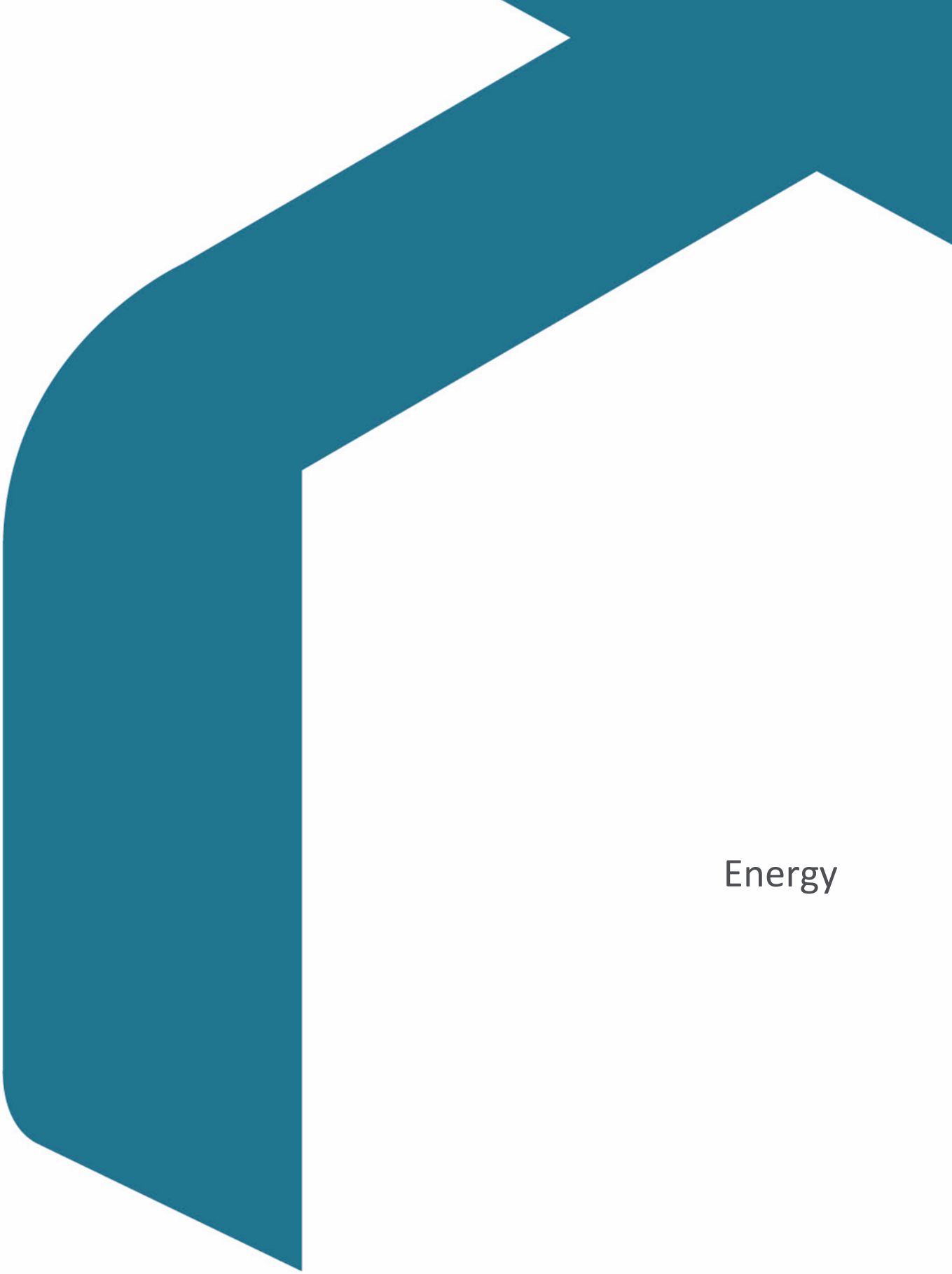
	Policy CC2: Adapting to climate change a) The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as: the protection of existing green spaces and promoting new appropriate green infrastructure; b) not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems; c) incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and d) 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. Sustainable design and construction measures The Council will promote and measure sustainable design and construction by: e) ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation; f) encourage new build residential development to use the Home Quality Mark and Passivhaus design standards; g) encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and h) expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.
Camden Planning Guidance – Energy Efficiency and Adaption (March 2019)	General Guidance from the London Borough of Camden on the preparation of Energy Statements for Planning, the requirements needing to be met, and the information required to be displayed.

Table 3 - Summary of local planning policy requirements

In accordance with the Camden Planning Guidance – Energy Efficiency and Adaption (March 2019) document, the Proposed Development is deemed to be a 'medium' residential new-build. The Proposed Development is required to achieve the emissions reductions in line with those outlined within the London Plan, as follows:

- min 10% CO_2 emissions reduction from efficiency measures (lean) alone
- min. total 35% CO_2 emissions reduction on site.

In addition, the Proposed Development will demonstrate a high level of sustainability through the use of sustainable construction techniques and materials, site management and procurement procedures.



Energy

2.0 Energy

2.1 Method

The Proposed Development will implement energy improvements in line with the Mayor of London's Energy Hierarchy[3], through seeking to be:

Lean

Minimise the overall environmental impact and energy use through energy efficiency measures

Clean

Ensure that energy systems on-site (heat & power) are efficient & produce minimal CO_2 emissions

Green

Implement suitable technologies to provide renewable and emission free energy sources

Seen

Incorporate monitoring through SMART metering and accessible displays

CO_2 Conversion Factors (Table 4) have been taken from Building Regulations 2013 as these are the current Building Regulations to which buildings within the UK must meet. In line with the London Plan, conversion to the new 'SAP 10' emissions figures for each stage of the energy hierarchy are shown within the Appendices.

	CO_2 Conversion Factor ($kgCO_2/kWh$)
Electricity (mains)	0.519
Electricity (offset)	-0.519
Gas (mains)	0.216
Heating Oil	0.298
Wood Pellets	0.039
Woodchip	0.016

Table 4 - CO_2 conversion factors by energy source

The energy modelling for the Proposed Development has been calculated using SAP software in accordance with Building Regulations 2013 Part L1A. The basement level plant space has been deemed at this stage to be conditioned and included within the buildings thermal envelope to simplify construction processes. It should also be noted that the energy use of private swimming pools (the heating and pumping of the body of water) is not directly covered by Building Regulations Part L and is therefore not included within any calculations within this report.

[3]The London Plan: https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021

2.2 The Existing Building

By way of a comparison, an initial SAP model has been created by Monitor Energy Consultancy[4] for the current building based on the performance of the existing fabric, heating systems etc. This is not used as part of the energy hierarchy as the existing building is a different size and layout to the Proposed Development but is shown here by way of a comparison.

	CO_2 emissions (t/yr)
Existing Building	13.50

Table 5 – Existing Building CO_2 emissions

In addition, SAP calculations were undertaken to determine the CO_2 emissions that would be associated with the dwelling should this be upgraded to a minimum of Building Regulations Part L1B requirements.

These calculations – again undertaken by Monitor Energy Consultancy[4] – show that the following total regulated emissions are possible for the current site, with a comprehensive building upgrade.

	CO_2 emissions (t/yr)
Existing Building – Upgraded	8.20

Table 6 – Existing Building CO_2 emissions – upgraded

The emissions of the residential upgrade of the existing building are significantly less than the existing building as it stands. However, the validity of some of the upgrades proposed within this scenario are to be confirmed and within refurbishments in general, real life performance cannot always be compared to the outputs of SAP modelling.

2.3 The Baseline Scenario

As part of the modelling undertaken on the Proposed Development, a 'notional' model is constructed in conjunction with the 'proposed' dwelling. The notional building provides the energy baseline and is the exact size and shape of the Proposed Development but is based on notional U-values and heating specifications outlined in Approved Document L and the Domestic Building Services Compliance Guide.

To pass building regulations Part L, all buildings must improve upon the baseline scenario as a minimum. For the London Borough of Camden, this energy baseline forms the basis upon which all improvements are measured.

	CO_2 emissions (t/yr)
Baseline	8.53

Table 7 - Baseline CO_2 emissions

[4] Energy and Sustainability Report: 38 Frognal Lane – February 2020

2.4 LEAN – Demand Reduction

The lean scenario can achieve a 13.14% reduction in CO_2 emissions using passive and active design measures, over the Baseline scenario.

	CO_2 emissions (t/yr)	Improvement
Baseline	8.53	
Lean	7.41	13.14%

Table 8 - Lean CO_2 emissions and improvement over Baseline

2.4.1 Passive Design Measures

Passive design measures are those which are inherent within the proposed design and construction and are not reliant on additional, active technologies to provide energy efficiency improvement.

The Proposed Development has been positioned within the site to maximise natural solar gain where this is possible, taking into consideration the need for sensitive design within a Conservation Area. The rear of the building – which is not street facing – can make the most of passive solar gains, with large windows provided to the dining and living spaces.

All glazed areas of the building will have elements of shading provided by the building form or internal curtains/blinds. The building orientation and design – with a predominantly rear south facing aspect - will maximise natural light and positive solar gains. Glazing on the north elevation is limited as far as practicable to minimise overall heat loss and retain a street facing façade which is in keeping with the characteristics of the surrounding buildings. Solar gains will be further controlled through Low E glazing installed throughout.

The form of construction at this stage is assumed to be of a traditional cavity construction above ground, which will provide a 'medium' thermal mass as a minimum. A medium thermal mass balances the provision high energy efficiency whilst limiting potential overheating during the peak summer months.

Building Element	Notional Compliance (U-value)	Proposed (U-value)
External Walls	0.18	0.13
Ground Floor	0.13	0.10 – 0.18
Roof	0.13	0.12
Windows and rooflights	1.40	1.00
External Doors	1.00	1.00
Air Tightness @ 50 N/m^2	10 (m^3/hr/m^2)	3 (m^3/hr/m^2)
Thermal Bridge	Default	Accredited Construction Details on all applicable junctions

Table 9 - Fabric energy efficiencies

2.4.2 Active Design Measures

Active efficiency measures are those which are not only inherent to the overall construction of the dwelling but work to increase the efficiency of the site through the installation of energy efficient technologies and equipment.

The Proposed Development will utilise 100% low energy/LED lighting in excess of Building Regulation requirements. All external lighting will be positioned to avoid excessive light pollution and be supported by PIR/daylight sensor and time controls with a maximum lamp capacity of 150W (equivalent) for essential security lighting.

A high efficiency natural gas boiler has been proposed within this Lean scenario in line with the Energy Hierarchy. The addition of time, temperature and zone controls allow the control of individual zones/rooms throughout the building, reducing waste and increasing the efficiency of the system as a whole.

A suitably sized (300l), well insulated hot water cylinder is also proposed at this stage.

In modern air-tight buildings, careful consideration needs to be given to the specification of ventilation systems to ensure moisture is removed and ventilation standards are met to ensure a healthy standard of internal air.

To provide continuous air changes within the dwelling whilst minimising heat losses, mechanical ventilation with heat recovery (MVHR) is proposed throughout. This system will extract warm, damp air from wet rooms and kitchen spaces, and through the use of a heat exchanger, the heat within this is exchanged into the fresh incoming are supplied to the habitable living space. There is potential for this to be linked in with the pool area in the basement – utilising heat loss from the pool to heat the house supply air. However, this may also be managed via a separate system. At present a Vectair WHHR Maxi[5] unit has been proposed as an example of a high performing unit which is suitable for dwellings of this size.

[5] Indicative product only – this does not constitute a product endorsement.

2.4.3 Cooling

The cooling hierarchy has been used to ensure that passive building design has been optimised to reduce the cooling load for the Proposed Development.

Cooling Hierarchy	Potential Design Measures
Minimising internal heat generation through energy efficient design	All primary pipework to be insulated, therefore low system losses. High specification hot water cylinder installed with low heat loss. Low energy lighting throughout.
Reducing the amount of heat entering the building in summer	Low E glass windows and internal blinds are to be provided to minimize solar gain. All walls are to be well insulated.
Use of thermal mass and high ceilings to manage the heat within the building	Thermal mass is anticipated to be medium with ground floors and external walls being of 'massive' construction.
Passive Ventilation	Openable windows will be provided to all rooms and cross ventilation is possible.
Mechanical Ventilation	MVHR provided to the whole dwelling – automatic summer bypass is to be specified as standard.

Table 10 - Design measures following the cooling hierarchy

As cooling is not being proposed within the Proposed Development, an overheating study is not required as part of London Borough of Camden compliance requirements. Within the SAP modelling undertaken to date, no issue with potential overheating has been highlighted within the Criterion 3 (Limiting the effects of heat gains in summer). It is therefore considered that the above measures are suitable, and that the dwelling is not considered to be at risk of overheating.

2.5 CLEAN – Heating Infrastructure

Due to type and location of the Proposed Development the implementation of 'Clean' technologies is not possible, and therefore no improvement can be shown within this section.

	CO_2 emissions (t/yr)	Improvement
Baseline	7.41	
Lean	7.41	0.00%

Table 11 - Lean CO_2 emissions and improvement over Baseline

District Heat Networks

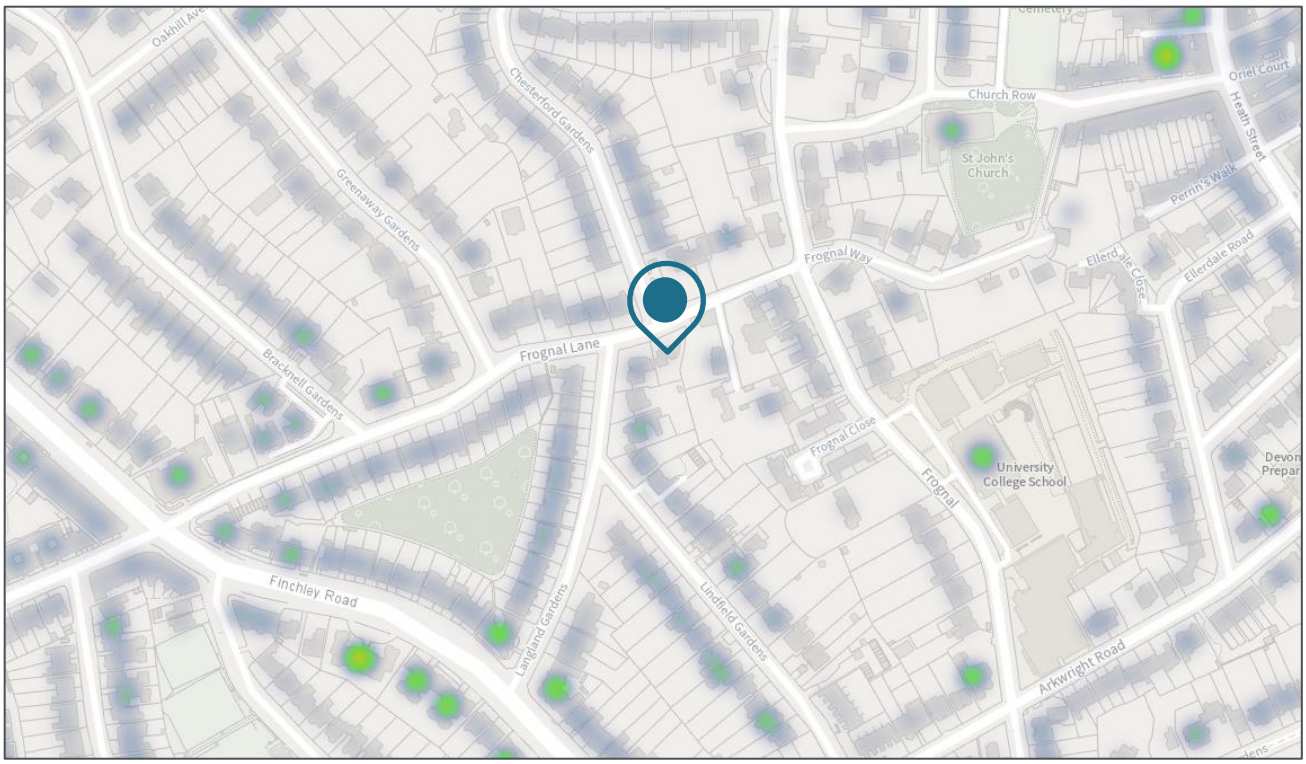


Figure 3 - London Heat Map (maps.london.gov.uk/heatmap/)

The London Heat Map shows that the Proposed Development is not within an area of high heat density and neither is there an existing heat network to connect to, nor is there one planned. Therefore, the potential use of a heat network has been discounted at this stage.

Communal Systems

The Proposed Development is a single dwelling and is therefore not able to provide a communal based system.

2.6 GREEN – Low Carbon and Renewable Energy

The addition of 'Green' technologies can provide a significant reduction in CO_2 emissions and enable the Proposed Development to meet the threshold of 35% improvement over Baseline emissions and a 20% reduction in CO_2 emissions from 'Green' technologies in line with local policy requirements.

	CO_2 emissions (t/yr)	Improvement
Clean	7.41	
Green	4.95	33.20%

Table 12 - Green CO_2 emissions and improvement over Clean

2.6.1 Heat Pumps

Heat Pumps are a good way of reducing the CO_2 emissions associated with heating (and cooling, where specified) systems. All Heat Pump systems consume electricity to operate - the Coefficient of Performance (CoP) of the system is the ratio of electrical energy consumed, to heat energy emitted. Generally, a CoP of 3 - 4 can be achieved, meaning 3 or 4 units of thermal energy are produced for each unit of electricity consumed.

In addition, heat pumps can be located anywhere on the site, allowing for appropriate placement of the plant on this sensitive location.

Heat pumps will only deliver low grade heat (up to ~50°C) efficiently, and therefore these systems alone are relatively inefficient in providing hot water, as this requires additional electrical input (immersion or increased compressor use) to raise the water temperature further. This however is taken into consideration within the energy modelling calculations.

Ground Source Heat Pumps

Ground Source Heat Pump (GSHP) systems use the ground as the collector array for any heating and cooling provided. Generally, this is provided through a ground loop system or, in locations where space is at a premium, through boreholes (set ~5m apart).

Although GSHP can provide a greater efficiency of performance, it comes at a significantly higher capital cost, due to the extensive groundworks needed to install either 'slinky' ground loops or 100m+ deep boreholes needed to provide the required collector array surface area.

The Application Site is relatively constrained, with the dwelling taking up a majority of the available space with the rear garden of the property being ~180m^2 in area. Generally an area of 4-5 times the building floor area is needed for GSHP via a ground loop system to provide adequate heat, which would not be possible on this site. There are also established trees on site, impeding the installation of a GSHP further. Therefore, the use of a ground loop system would not be possible. Likewise, deep level piling would not be appropriate for the site to serve the requirements of a GSHP, therefore this technology is not being proposed at this stage.

The use of GSHP at this stage has therefore been discounted.

Air Source Heat Pump

The use of Air Source Heat Pumps (ASHP) has the potential to supply the heating requirements, and a large proportion of the hot water requirements of the Proposed Development. The use of ASHP often provide a significant proportion of the benefits of a GSHP, without the need for extensive groundworks.

The application of ASHP to the Proposed Development would be subject to the provision of correctly sized heating emitters (oversized radiators and/or underfloor heating).

ASHPs tend to generate some noise and therefore the location in which the pump is positioned would need to be adequately sound insulated in order to prevent disturbances to the building's occupants and neighbours.

The use of a heat pump has been proposed at this stage. As an indicative unit, a Stiebel Eltron WPL25AS[6] has been selected. The implementation of an ASHP system shows the following improvements over the 'Lean' scenario.

	CO_2 emissions (t/yr)	Improvement
Clean	7.41	
Green	6.06	18.21%

Table 13 - Green CO_2 emissions and improvement over Clean – ASHP Only

2.6.2 Roof Mounted Solar (Photovoltaics and Solar Water Heating)

The use of roof mounted technologies for the site – including solar PV – is possible. However, due to the location of the site within a Conservation Area and the sensitivities of the application of this type of technologies within this type of location, the positioning of the panels needs to be carefully considered – potentially limiting the implementation of this technology compared to a location which is unconstrained in this regard.

An indicative investigation into the roof area on the proposed development shows that there is an area of flat roof that would allow PV to be installed with minimal visual impact. The flat roof space – indicated in red below – is approximately 28m^2 in area.

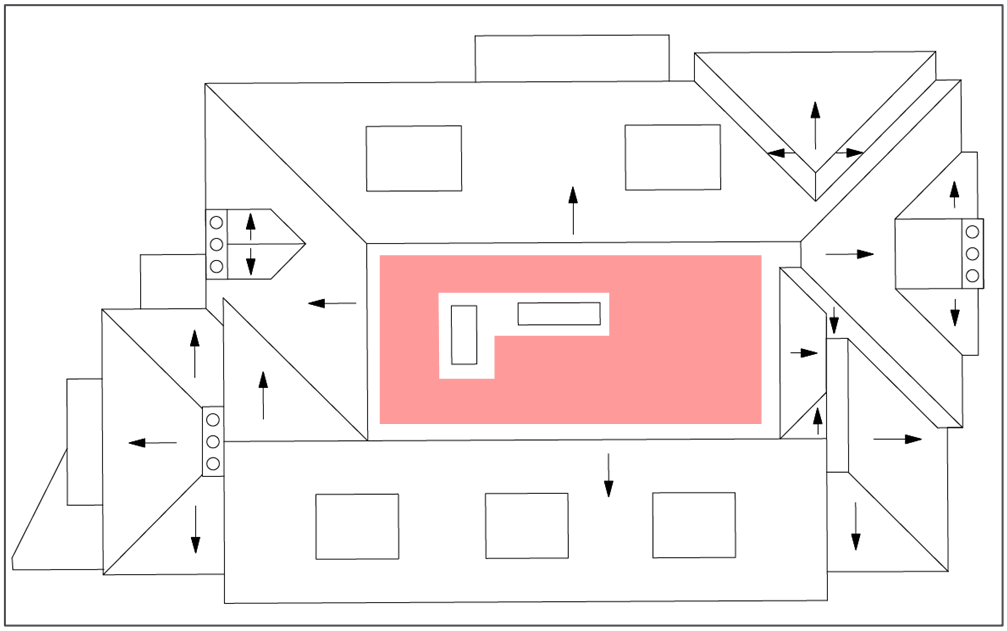


Figure 4: indicative roof space available for PV

Whilst relatively large in area, the roof is constrained by the positioning of 2 no. roof lights, and therefore any PV installation would need to be arranged appropriately to avoid any obscuring of these. Therefore, at this stage it is assumed that the installation of 8 no. 350 Watt panels (1m x 1.7m in size) would be appropriate for this

[6] Indicative unit only – this does not constitute a product endorsement

space given allowances for access and spacing to avoid overshadowing. This would equate to 2.8kWp total output.

The PV would be positioned horizontally (or as near to horizontal as possible within warranty parameters) to minimise visual intrusion and would be generally orientated south.

The inclusion of a 2.8kWp PV array as discussed above gives the following performance.

Proposed PV	Size of Array (kWp)	No. 350W panels	Orientation	Inclination	Predicted Energy Generation (kWh/yr)	Predicted CO_2 emissions offset (tCO_2/yr)
38 Frognal Lane	2.8	8	South	~Horizontal	2129.38	2.13

Table 14 – Proposed PV Array Performance.

The use of PV as outlined above is encouraged for the Proposed Development to provide additional CO_2 emissions offset.

2.6.3 Energy Storage

It is not anticipated that the energy generated by the PV will surpass the energy demand of the building, and therefore there will be little surplus energy to store. However, the installation of battery storage may be investigated further at Detailed Design Stage to analyse whether this may be of use in storing energy generated during the day, and using this to run background systems (MVHR, External Lighting etc) during the night time.

2.7 SEEN – In-use monitoring

It is recommended that the Proposed Development will be supplied with Smart Meters (where available from the utility supplier) and a building energy management system (BEMS) or equivalent SMART home technology, along with associated internal energy displays. This will further improve energy efficiency by allowing occupants to observe their energy use in 'real time' and manage it more effectively.

2.8 Energy Conclusions

The Proposed Development will deliver passive and active energy demand reduction measures along with low and zero carbon technologies to reduce energy demand and associated CO_2 emissions resulting from the Proposed Development's operation.

The calculations undertaken demonstrate that the Proposed Development will robustly exceed Building Regulations Part L1B compliance by >35% in line with local and regional policy, with a >20% CO_2 emissions offset on-site through the specification of 'Green' technologies.

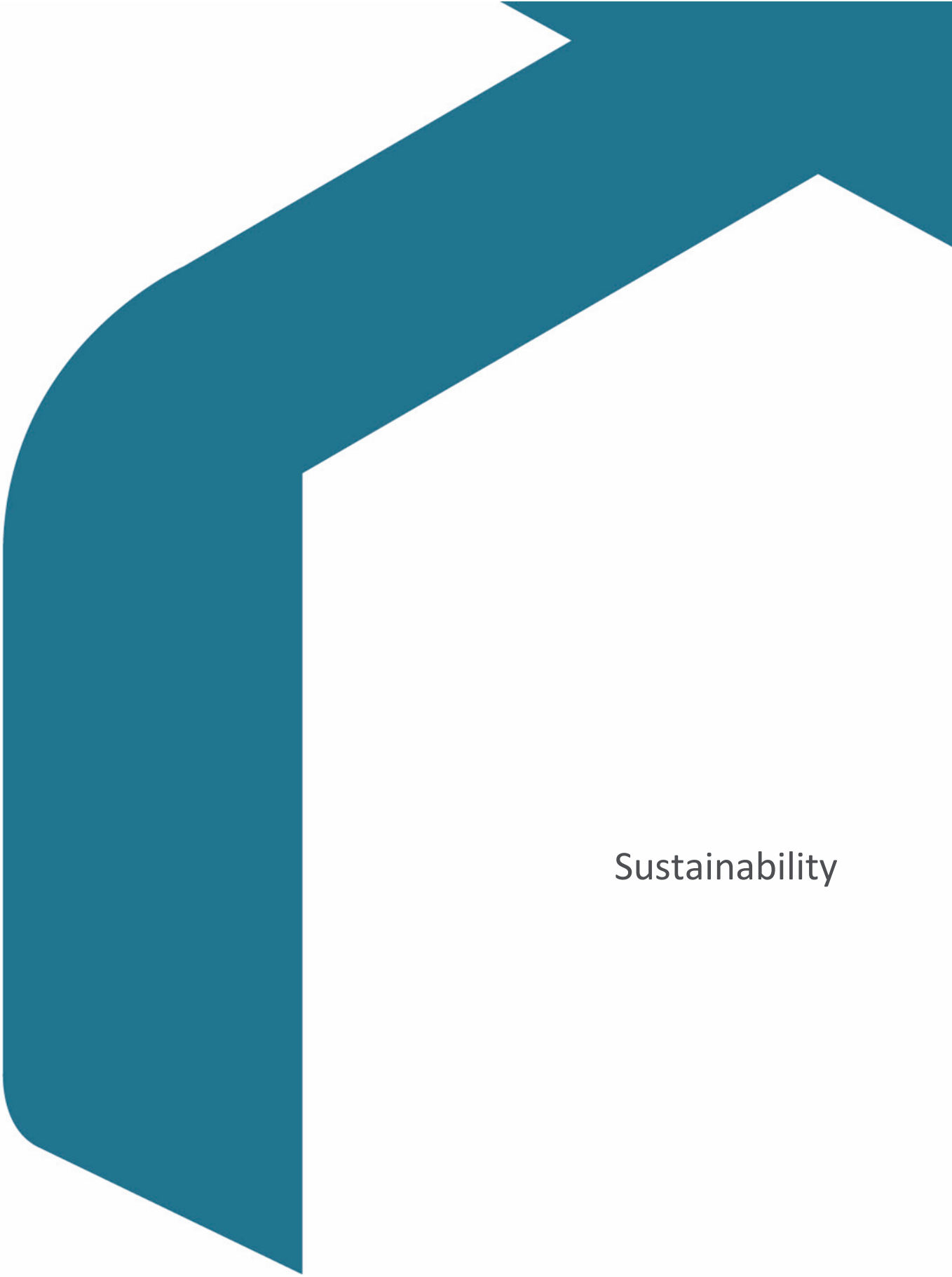
	CO_2 emissions (t/yr)	Improvement	Improvement over baseline
Baseline	8.53		
Lean	7.41	13.13%	13.13%
Clean	7.41	0.00%	13.13%
Green	4.95	33.20%	41.96%

Table 15 - Summary of CO_2 emissions, incremental improvement and improvement over Baseline

The Proposed Development also represents a 63% improvement in overall CO_2 emissions when compared to the existing building on the site, a 39.6% improvement over the improved retained building (13.5 tCO_2/yr), and a 7.5% reduction in CO_2 emission over the currently consented new build scheme (5.32 tCO_2/yr) for the site.

In delivering the Green energy strategy, the Proposed Development provides:

- Passive and active design measures including:
    - >10% improvement from fabric efficiency measures
    - >20% CO_2 offset from Low/Zero Carbon technologies
    - Advanced temperature controls.
    - 100% low energy lighting.
    - Enhanced hot water storge.
    - Enhanced building fabric.
    - Reduced building permeability.
- Air Source Heat Pump to provide heating
- Whole house mechanical ventilation with heat recovery
- Roof mounted PV of min. 2.8kWp total



Sustainability

3.0 Sustainability

The World Commission on Environment and Development (WCED) report: Our Common Future, describes Sustainable Development as development that:

"meets the needs of the present without compromising the ability of future generations to meet their own needs."

This principle has guided national policy since the WCED report, and continues to be the foundation to which 'sustainability' is embedded within processes of all industries, including construction and development.

Over the years the policy requirements have become more prescriptive in nature, with targets on CO_2 emissions and resource use being tightened through Policy and Regulations changes as the UK moves towards zero carbon by 2050. Changes to regulations gradually, aims to allow industry to adapt to new methods, whilst challenging industry leaders to provide innovative services, technologies and other solutions to meet the ever-stricter demands.

Whilst reducing emissions is key to ensuring the reduction of pollution and CO_2 emissions – the primary cause of anthropogenic Climate Change – the primary aim of sustainable measures is to ensure that future generations have the same – if not better – ability to meet their needs than the current generation. As such, wider aspects must be taken into account when looking at sustainability in the round.

3.1 Environmental Assessment & Whole Life Carbon

Over and above the standard requirements for a scheme of this type, the Proposed Development is undertaking a Whole Life Carbon Assessment to establish the Whole Life impact of the proposals in relation to embodied, operational and end of life CO_2 emissions.

A Whole Life Carbon Assessment (WLCA) is being undertaken in accordance with the 'RICS Whole Life Carbon Assessment for the Built Environment' (First Edition, November 2017) which outlines the process of WCLA, and what is, and what is not included. The aim of the RICS document provides clarity on the EN 15978: 2011 for the sustainability assessment of buildings, and provides clarity on the approach required within this methodology.

The aim of this assessment will be to model the whole life carbon impact of the proposed design, and compare this to the previously consented new build proposal for the site. A comparison can be made between the schemes and an assessment made on the whole life carbon impact of the current proposals.

Overall, it has been found that current proposals have a net carbon benefit when compared to the currently consented scheme. The Carbon Emissions saved through the current proposals are approximately 4.05 tCO_2.

Please see the supporting Whole Life Carbon Assessment document from SRE for full details, which supports this application.

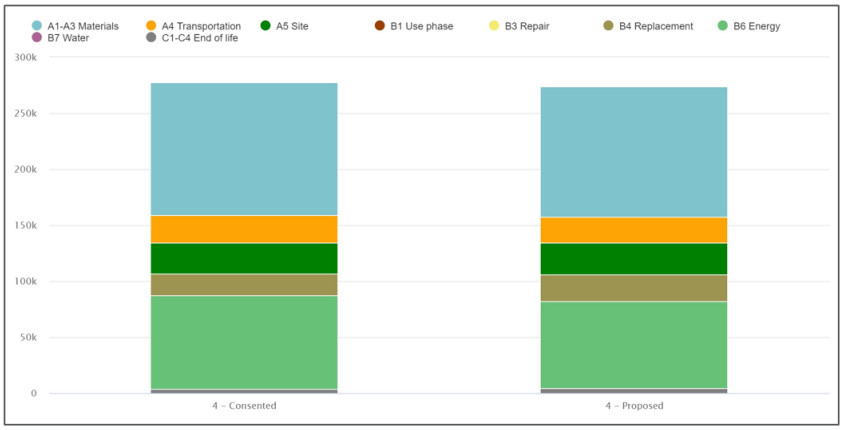


Figure 5 – Outline WLCA Results

3.2 The Circular Economy

The circular economy ethos is driving the move away from a 'Take – Make – Use – Discard' economy to a 'Re-make and Use Again' economy.

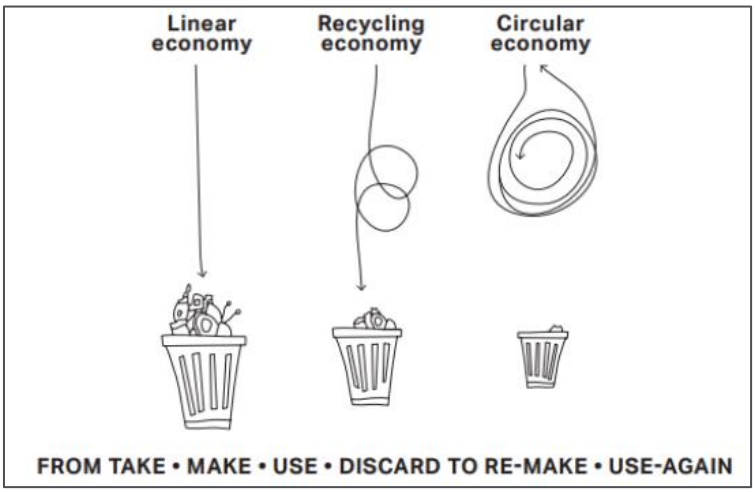


Figure 6: Linear, Recycling and Circular Economies Diagram (GLA 2019)

As part of circular economy considerations, developments should aim to:

- *Design out waste* – consider impacts of waste from both construction, operation and end of life.
- *Design for longevity* – appropriate material specification for intended use.
- *Design for adaptability and flexibility* – meeting present and future needs within the building form and providing potential for the building form to be repurposed at a later stage.
- *Design in layers* – applying appropriate materials within the building layers which will allow them to be easily replaced when required, dependent on lifespan.
- *Design for the future* – individual products and services to be 'loose fit' to allow easy upgrade and replacement.
- *Select appropriate materials* – specifying low impact, recyclable and where possible, reused materials which have minimal impact on the environment and health and wellbeing.

For building development, the impacts to the circular economy can be categorised into the following sections:

- Demolition and reclamation
- Design and construction impacts
- Site waste and its management
- Operational waste storage
- End of life disassembly and re-use

Impacts at each of these stages are required to be considered and mitigated as much as possible to ensure that the impact on the environment is minimised, and materials are fed back into the supply chain to be re-used.

3.2.1 Fabric Removal and Reclamation

This element of the cycle is the most difficult to control as the current development on the site has been constructed at various stages over the course of a century or so. Therefore, there are a variety of material types present across the site, with undoubtably little attention shown to the lifecycle impact of the materials at the time of construction.

In addition, the date of some of the extensions to the original house could also mean that potentially dangerous products were used in its construction – such as asbestos.

None the less, all materials on site will be managed in accordance with the waste hierarchy (Figure 7,below) with as much as possible of the removed structure being re-used on the site within the new build elements. Key items being reused are as follows:

- Key construction timbers where these are able to be re-used.
- Internal finishes (Stone flooring etc.) where these can be reclaimed.
- Concrete construction materials (such as blocks etc).
- Roofing tiles where these are undamaged.

Where materials cannot be used or reclaimed on site, these will be considered for crushing and reuse within the sub-structure of the Proposed Development, preventing as much as possible of the materials leaving site by way of waste removal.

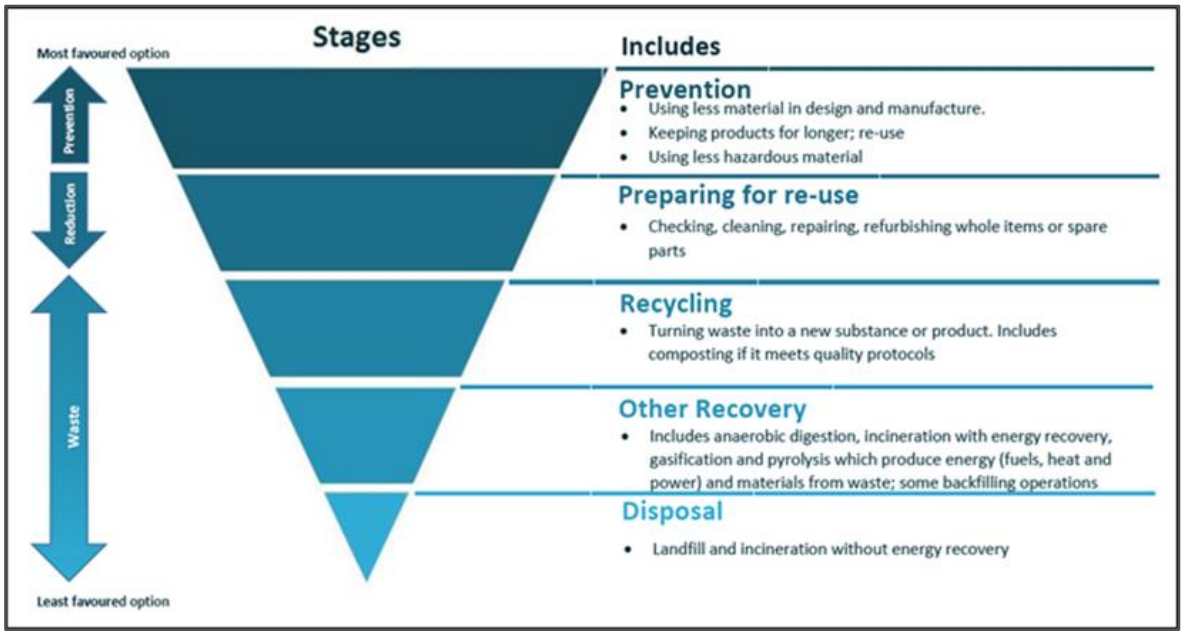


Figure 7 - The waste hierarchy

Where waste has to be removed from site and is not re-usable, this will be managed through a licenced waste contractor with the following benchmarks for diversion from landfill being targeted in line with Best Practice[7]:

Type of Waste	Volume	Tonnage
Non-Demolition	85%	90%
Demolition	85%	95%
Excavation	95%	95%

Table 16 – BREEAM New Construction Wst 01 Diversion from Landfill Benchmarks – Exemplary Level

3.2.2 Design and Construction Impacts

The proposed development is a new build structure and therefore the current building on the site is required to be demolished to accommodate this. The retention and upgrading of the current building on the site, whilst possible, would not produce an end product which is as thermally efficient or as suitable for the needs of a modern family.

[7] BREEAM New Construction 2018 – Wst 01 'Construction Waste Management' criteria. (Table 52)

As much as practicable of the current building structure will be retained on site through their re-use within the substructure as aggregate, blinding, landscaping materials or hardcore. However, the site constraints do limit this re-use to a point, and therefore this will need to be carefully considered at a later stage of the design process.

Due to the nature of the Proposed Development and the structure required for some elements of the build, the use of concrete is unavoidable. The dwelling is to be traditionally constructed with brick and block where structural requirements allow, with reinforced concrete used where required.

However, as part of the procurement process, the use of materials with a high recycled content and/or locally/nationally produced will be investigated. In addition, the use of the suppliers and manufacturers with a certified Environmental Management System will also form a key part of the procurement strategy.

Sustainable Procurement

As part of the procurement process, the use of materials with a high recycled content and/or locally produced will be investigated. In addition, the use of the suppliers and manufacturers with a certified Environmental Management System will also for a key part of the procurement strategy.

The design specification and procurement of lower impact construction products will be enhanced through the use of Environmental Product Declarations (EPDs) on all key materials designed and procured as part of the Proposed Development. As an EPD is an independently verified environmental label in accordance with the requirements of ISO 14025, the reduced risk and environmental impact from poor supplier information will be avoided within the design and construction stages.

Timber also forms a key part of the design and construction, with timber used in the primary structure, studding of internal and external walls, floor joists and boarding. New timber will be accompanied with appropriate chain of custody certification (FSC/PEFC) ensuring it is from a managed, sustainable supply.

The use of a Sustainable Procurement Plan by the Client and contractor team will manage and inform this process from design through to construction.

3.2.3 Site Waste and its Management

Site waste will be managed on site through a Construction Management Plan which will emphasise the need to minimise waste leaving site and the reuse of materials on site in line with the waste hierarchy. As with the demolition stage of works, waste from the site will be managed via a certified waste contractor and will be monitored through best practice site management procedures.

Quantity of waste diverted from landfill will be in accordance with Table 16 above, with regular reports requested from the waste contractor, and stored as part of ongoing site monitoring and management.

To facilitate the re-use of materials on the site, appropriate areas will be allocated within the Construction Works Plan and associated method statement for the storage of re-usable materials from the demolition and construction phases.

Any ‘muck away’ resulting from the digging out of the basement (or other excavation) will be, where possible, relocated on site to reduce the transportation of waste. Where this is not possible, this will be dealt with in line with the Waste Hierarchy by a licenced waste contractor in line with all other waste from the site.

3.2.4 Operational Waste Storage

The ability of the occupier to appropriately sort and store domestic waste as part of the general operation of a dwelling is strongly influenced by the location and ease of access of the waste stores provided.

Therefore, the appropriate storage of refuse and recycling both internal and external will be incorporated into the overall design and layout of the scheme.

The London Borough of Camden offer waste collection services to the site and provides conventional refuse collections (fortnightly) in addition to mixed recycling and food waste collections (weekly).

The "Waste storage and arrangements for residential and commercial units"[8] offers full and complete guidance on the services offered and requirements for storage of these waste streams.

Waste storage is considered in both internal and external locations, with the following being required to achieve general compliance with the standards for residential dwellings.

Internal Storage

- Internal bin within the kitchen space (or other appropriate space) that comprises 2 no. segregated storage spaces (for general waste and recycling) or equal volume – min. 60 litre capacity.
- At least a 7 litre allowance for food waste storage allowed for within the kitchen layout.
- Total minimal capacity: 127 litres

External Storage

With regards to external waste storage, the Waste storage and arrangements for residential and commercial units document outlines the following:

"The minimum bin storage space for general waste on a kerbside street accessed collection based on a 0-3 bedroom property is a 240L bin. For larger residences up to 9 bedrooms an additional 20L for general waste and 20L for mixed recycling per bedroom per week."

Therefore, the Proposed Development will have an allowance for 280 litres of conventional waste storage and 320 litres of mixed recycling.

For external food waste bins, sizing is not determined within the Camden guidance, however it is assumed at this stage that this will be provided through a minimum of a 23 litre external 'kerbside caddy'.

In line with best practice, a dedicated storage position with clear and appropriate access from the kitchen will be provided to the waste storage location. This should generally be no more than 30m from the nearest door, and be as level and accessible as possible with appropriate surfaces for walking.

It is assumed that this stage that waste storage is to be in line with the Camden requirements and therefore wheelie bins are to be provided. Where alternative arrangements are to be made, appropriate consideration will also be given to prevent rodent and other pests gaining access to the stored waste.

The storage of the external bins has also been considered within the Proposed Development, with a store being provided to the west of the site. This removes the visual intrusion of wheelie bins in line with Conservation Area design guidance.

Occupant Information

The provision of information on the ability of occupants to recycle items is shown to strongly increase recycling uptake. Therefore, information on the waste bins provided, what can be placed in each bin, where larger items can be taken and when, will be provided to residents to inform their waste decisions during the operational phase of the development.

In addition, consumables within the buildings – furniture, decorations etc. – are not within the control of the contractor. These items often have the shortest lifespan and can have a significant impact on the quantity and type of waste generated by the Proposed Development during operation. Therefore, further information on the impact of waste disposal, with a focus on the use of natural, biodegradable products will be provided to

[8] 4f682792-29fa-89ca-00b1-f2a7fb5a6dc1 (camden.gov.uk)

occupants, in addition to information about reusing, repurposing and upcycling to minimise the quantity of household consumables being sent to landfill.

Information on the Local Authority Household Waste Recycling Centre (HWRC), curb side collections, and information on the product manufacturers responsibilities under the Waste Electrical and Electronic Equipment (WEEE) Directive will also be provided.

3.2.5 End of life disassembly and re-use

The consideration of the materials used on the site have been selected on multiple basis including the potential for re-use at the end of the buildings useful life. As such, high quality and durable materials are selected to ensure a long and maintenance free lifespan of the building as far as practicable.

A 'Building in Layers' approach has been undertaken to ensure that the materials/products installed are:

1. Fit for purpose, durable and of correct specification to ensure longevity of finish.
2. Is of an appropriate type to withstand any wear and tear from their specific location.
3. 'loose fit' where appropriate to allow easy replacement when the product reaches end of life.
4. Are as reusable and/or recyclable as possible when finally disposed.

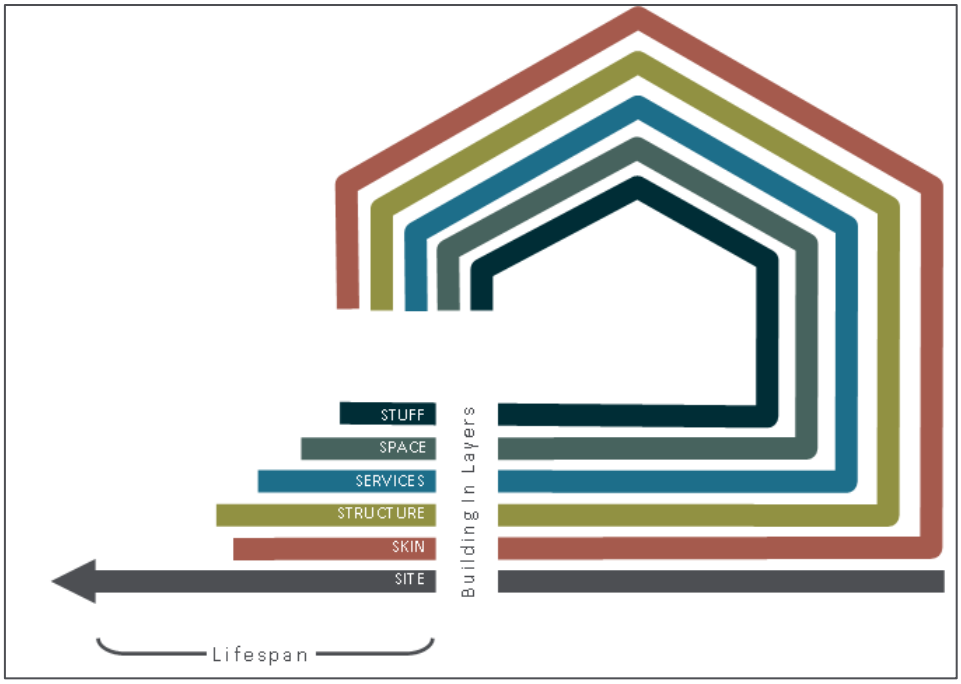


Figure 8 – Building in Layers Diagram

The predominant construction materials on the site are brick, concrete block and timber – all of which are potentially re-usable when the building is demolished.

Brickwork is to be unrendered, and therefore minimising the effort required to clean up the product at the end of use on this site. This is the same as the blockwork on the site, with the majority being internal facing and with a light skim coat of plaster as a finish. As such these main construction materials will be suitable for re-use with minimal effort.

Timber will be adequately protected from the potential for rot, warping and damp to allow this to be reused at the end of life. The majority of timber will be mechanically fixed in place with minimal use of adhesives, resulting in a more effective removal of the material with minimal damage sustained.

3.3 Pollution

Air

The Proposed Development will aim to limit its contribution to local air pollution by installing a heating and cooling system which emits zero on site emissions (ASHP). The ASHP will emit no onsite NOx emissions but will consume grid electricity. As the NOx emissions resulting from the production of electricity decreases at the national scale, the resulting theoretical emissions from the Proposed Development will do also – further improving the carbon emissions associated with the site.

The Proposed Development is located within a high NOx emissions area as defined by the UK NOx emissions map, see Figure 9. Therefore, the proposed energy strategy will assist in the reduction in emissions with contribute to poor air quality, and associated health conditions.

Noise

The Proposed Development is located on the site of an existing residential dwelling and will therefore not produce any greater noise pollution than was generated during the operation of the current site conditions.

ASHPs do tend to produce some noise during their operation, therefore the placement and shielding of this technology will be carefully considered as part of the Detailed Design.

In addition, the Proposed Development will be a highly insulated building with excellent air-tightness which should limit any noise from inside the building far below that of the existing.

The Proposed Development is not a change of use, and is remaining a residential building. Therefore, there is not anticipated to be any additional vehicular traffic associated with the site over and above that currently.

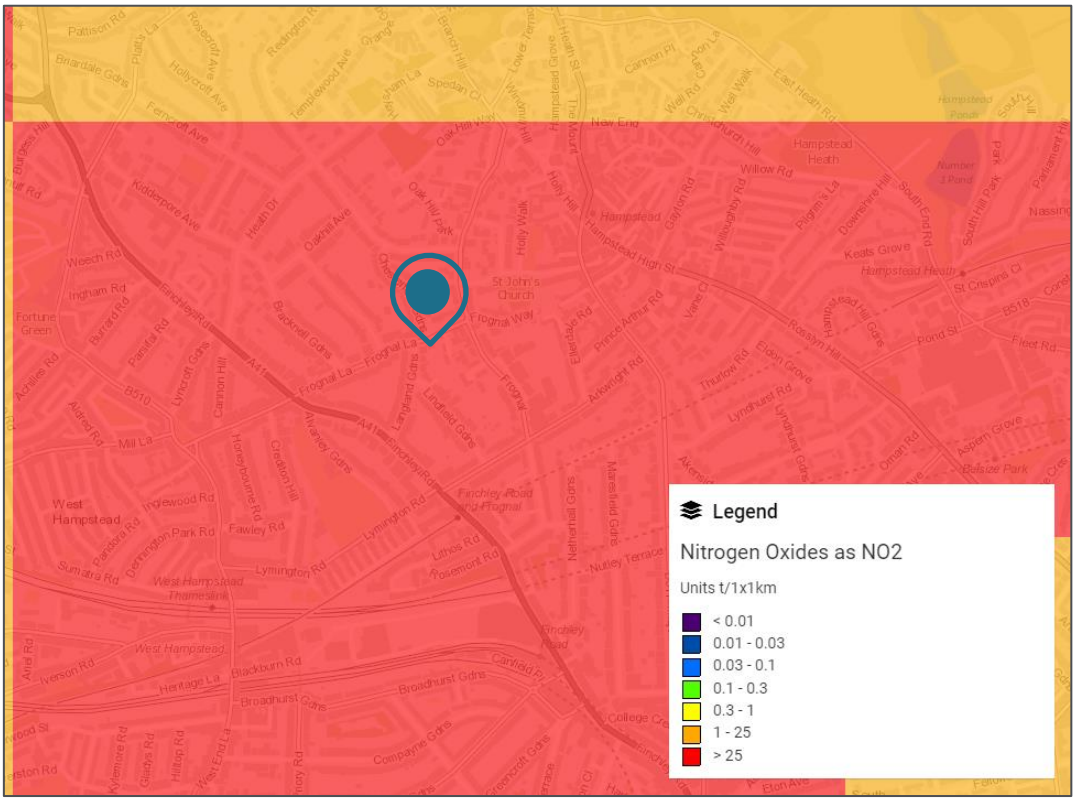


Figure 9- UK Air Pollution Map showing pollution from Nitrogen Oxides as NO_2 (https://naei.beis.gov.uk/emissionsapp/)

Light

The design and layout of the site for practical use has been considered while trying to maximise internal daylight levels and provide a building of high architectural quality. All spaces occupied by residents have glazing to provide natural daylight, and light-coloured curtains or roller blinds will be provided to enable glare control and privacy.

Light Pollution will be minimised where possible through the careful specification and positioning of external lighting around the Proposed Development, ensuring minimal light pollution from the site. Special attention will be given to security lighting (where fitted) to ensure it is appropriately focused and controlled.

All external space lighting will be provided through low energy fittings, with security lighting being PIR and daylight/timer controlled.

3.4 Flood Risk

The selected site is at very low risk of flooding from rivers and seas (Figure 10) and while the surrounding area has several roads shown as at risk of flooding from surface water, the areas adjacent are mainly very low and low risk with the actual site is not shown as at risk of flooding from surface water (Figure 11).

The Proposed Development has undertaken a full flood risk assessment and will include Sustainable urban Drainage System (SuDS) as part of the measures to reduce surface water run-off from the site. This will be assessed under the BREEAM issue Pol03.

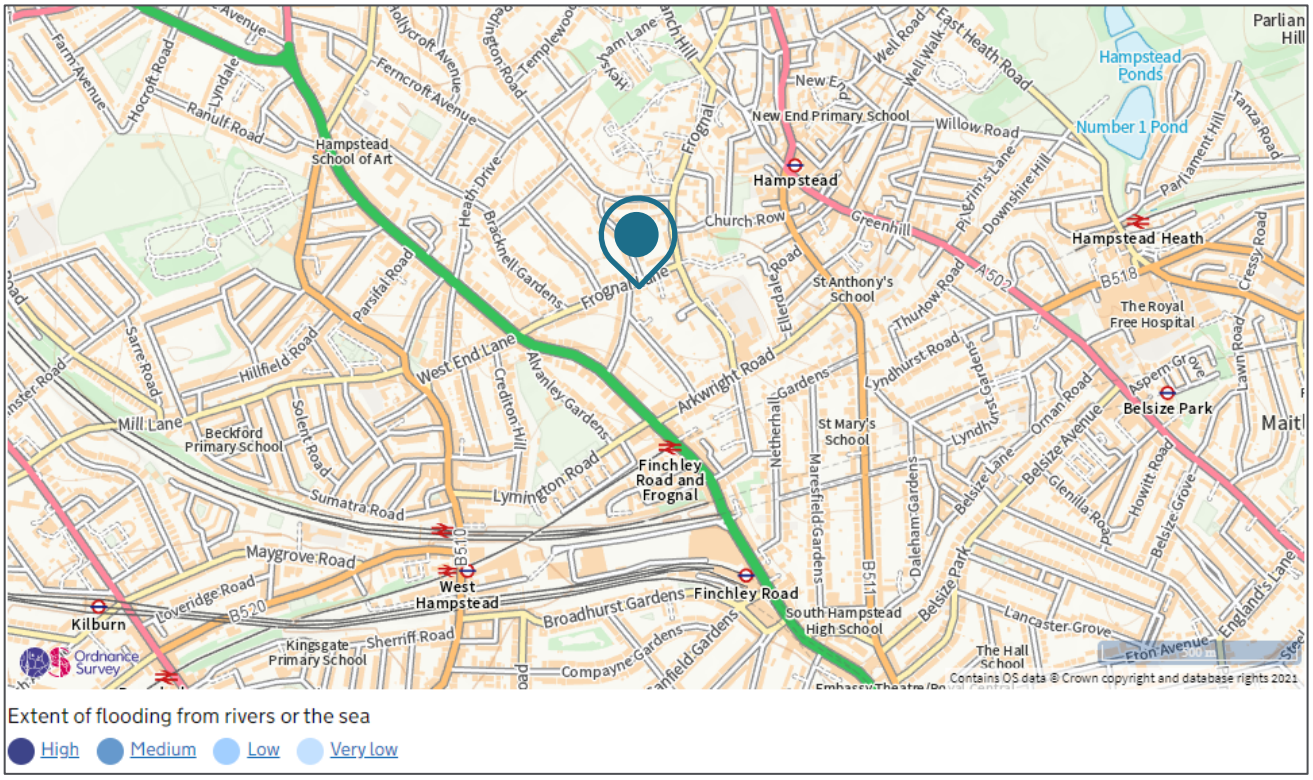


Figure 10 - Flood map showing risk of flooding from rivers or the sea (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)

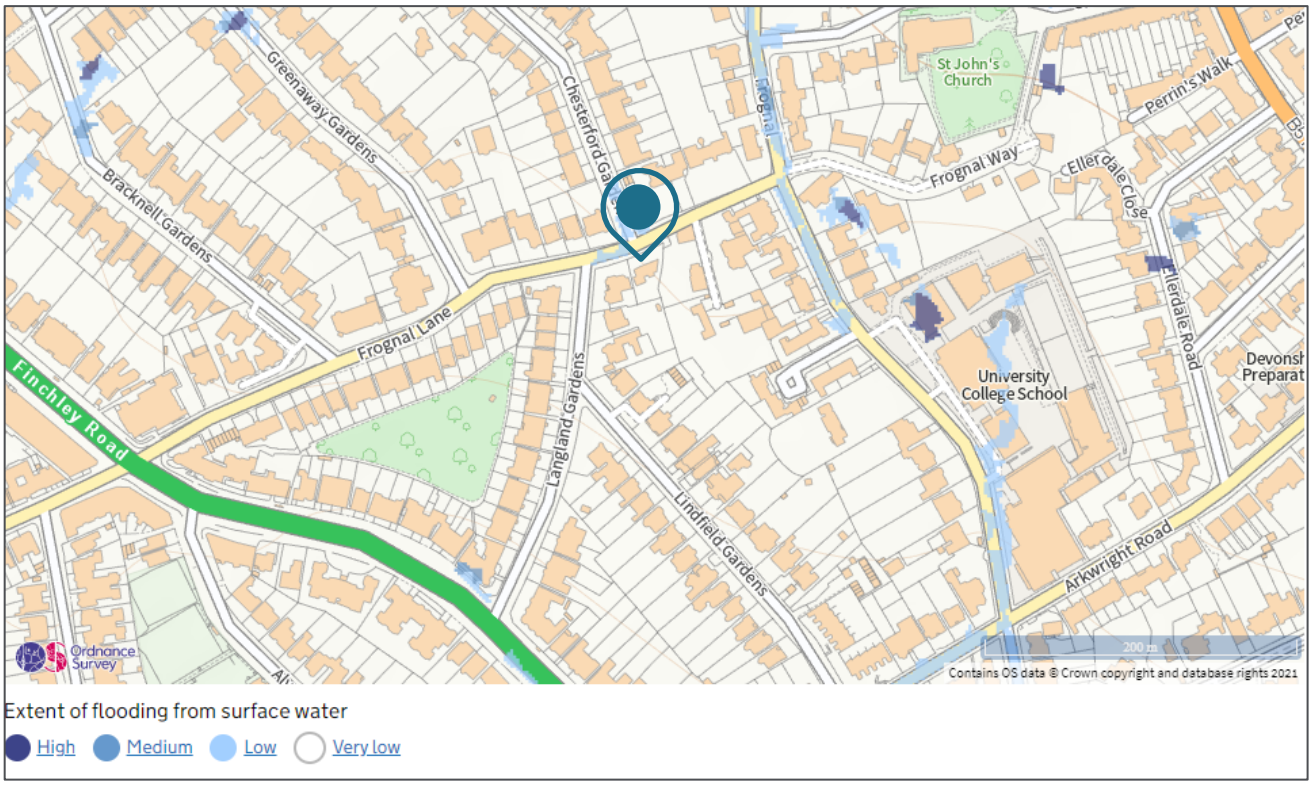


Figure 11 - Flood map showing risk of flooding from surface water (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)

3.5 Transport

Public Transport

Being located in central London, the Proposed Development is well served by public transport which will assist in the reduction of emissions associated with the use of private vehicles for local trips.

Bus stops are located 200m to the west of the site on Finchley Road and provide bus services to and from central London (Marylebone), and as far out as Edgeware to the north. Further stops are located to the east of the site near to Hampstead underground station. All routes offer connections to the wider TfL bus network to provide local, city-wide travel opportunities.

The nearest train station for overground services is West Hampstead which provides Thameslink Services. This station is located 800m to the south west of the Application Site. The nearest London Underground station to the Proposed Development is Hampstead, 300m to the north east of the site, offering Northern Line Services to the wider London Underground Network.

Overall, the Proposed Development has a wide offering of Public Transport, which will assist in the occupants making sustainable transport decisions for local and long-distance travel.

Parking

Parking provision on the site is to be provided and will be in line with the overall landscaping plan for the scheme.

Parking is to be provided for 2 no. vehicles in the front courtyard space, which will reduce the overall parking burden on the local surrounding areas on-street parking provision.

Car-Pooling

In addition to the location of public services surrounding the site, the option to car pool is also a popular method of having all the advantages of a private vehicle, without the need to own one.

There is a car-pooling service provided by Zip Car, located <50m east of the site on Frognal Lane. This is a round trip vehicle, and therefore will always be at this location when available. To use this service, you must be a member of the Zip Car scheme (join online for free). Proximity to a car-pooling service will allow residents access to cars without the need to own one.

3.6 Biodiversity

Biodiversity is generally considered to be the variety of life forms within a certain ecosystem. The Proposed Development currently consists of an existing dwelling which is to have some element of fabric removal, with a new extension provided.

The proposed new dwelling broadly follows the outline of the current buildings, with the key areas of external space to the rear of the site retained and enhanced.

Current areas of hard standing to the front of the dwelling are to be removed and replaced as part of the development.

It is recommended that in general, native species are investigated to be included within the proposed planting mix to enhance local biodiversity and allow feeding and habitat opportunities for native wildlife.

3.7 Resource efficiency

Internal Water Use

Areas of the South East of England have been declared areas of 'serious water stress', particularly Greater London. Water is a vital resource and efficient usage should be encouraged in all buildings.

In line with policy CC3: Water and Flooding, the Proposed Development aims to significantly reduce mains water use through a combination of efficiency measures, including the use of fittings with a low capacity or flow restrictors.

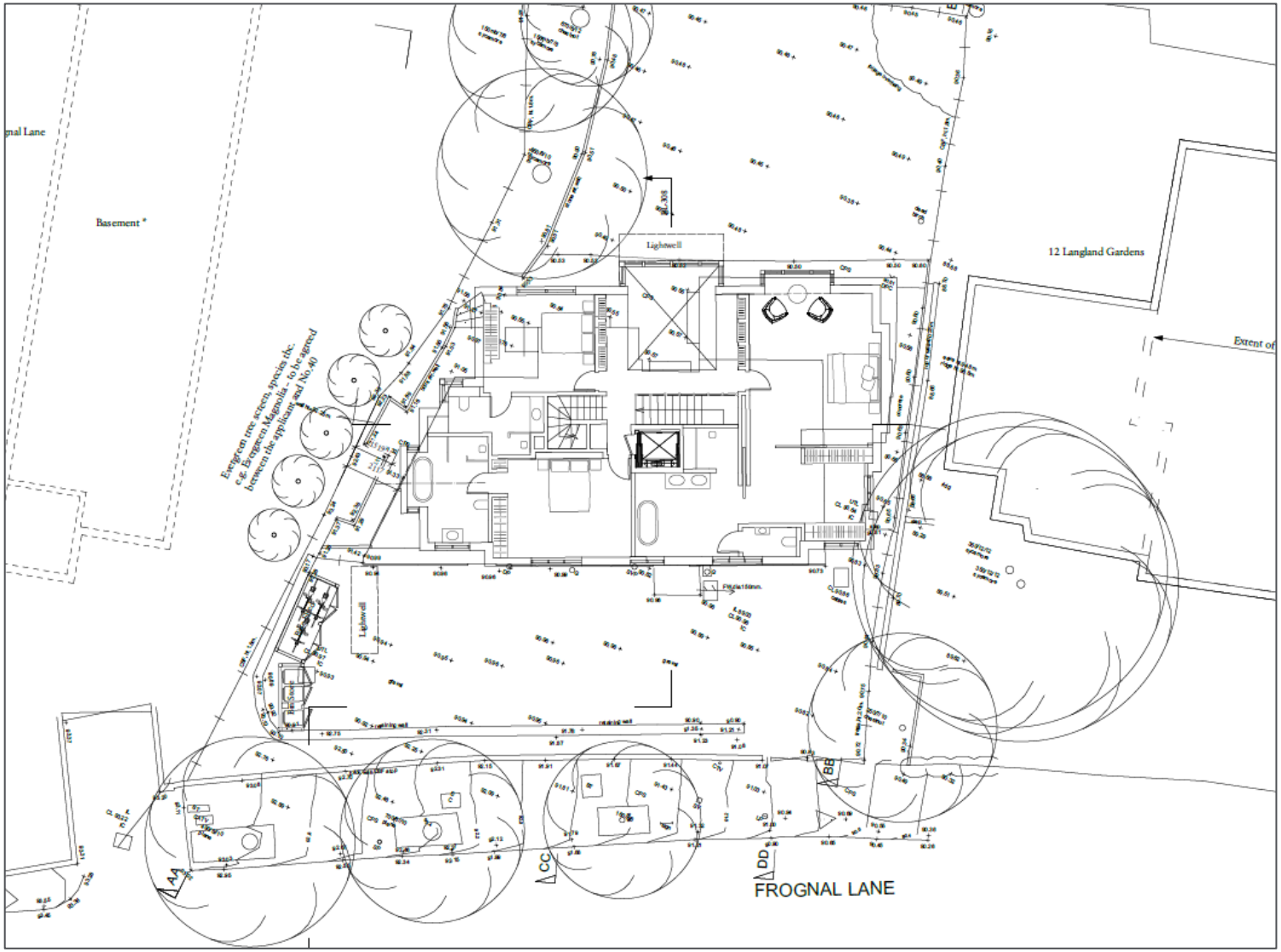
Internal water use will be reduced to less than 110 litres/person/day in line with Policy requirement. The specification below gives an indication of the flow rates and capacities needed to achieve this requirement, but final calculations will be needed based on the sanitaryware and appliances installed to confirm.

- W/Cs: 4/6 litre dual flush
- Basin Taps: 4 litres/minute
- Bath: Max. 200 litres to overflow[9]
- Showers: 7 litres/minute
- Kitchen Taps: 5 litres/minute
- Washing Machines: 8.17 litres/kg dry load
- Dishwashers: 1.25 litres/place setting

[9] Please note that this is the volume of the bath to overflow without the allowance for displacement

Appendix A

Appendix A – Site Plan



Appendix B – SAP Summary Sheet

Frognal Lane

BRegs L1A 2013

Option	Units	External Wall	Party Wall	Dormer Wall	Sheltered Wall	Ground Floor/ Basement Floor	Pool Floor	Exposed Floor	Pool Services floor	Roof	Windows/Door	Heating	Delayed Start Thermostat	Weather / load Compensator	Secondary Heating	HW Cylinder	Renewables (PV)	Renewables (Area)	Mechanical Ventilation	Air- Permeability	DER v TER Improvement	DFEE vs TFEE Improvement
Type	Plot No	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	U Value	Make	Y/N	Y/N	Y/N	(litres)	(kWp)	m^2	Type		%	%
Detached	House	0.15	0	0.20	0.18	0.10	0.22	0.15	0.18	0.12	1.0	ASHP (Stiebel Eltron WPL25 AS)	N	N	N	300.00	2.80	13.60	MVHR	3	61.55	18.58

Element	U Values	Description
External Wall SAP Wall Type 1	**0.15**	102.5mm brick outer leaf, 50mm clear cavity, 100mm Kingspan K108 insulation (0.018 conductivity), 100mm dense blockwork, 12.5mm plasterboard on dabs, plaster skim.
Basement Wall SAP Wall Type 1	**0.15**	250mm concrete block, 100mm insulation (0.022 conductivity), 12.5mm plasterboard
Dormer Wall SAP Wall Type 2	**0.20**	10mm clay tiles, 25mm cavity, 20mm timber board, 90mm Kingspan K103 insulation between timber studs, 45mm Kingspan K103 insulation,12.5mm plasterboard
Sheltered Wall (F2) SAP Floor Type 3	**0.18**	102.5mm brick outer leaf, 100mm cavity filled with 90mm Kingspan K106 insulation (0.018 conductivity), 100mm dense blockwork, 12.5mm plasterboard on dabs, plaster skim.
Ground Floor/Basement Floor SAP Floor Type 1	**0.10**	20mm floor tiles, 65mm screed, 160mm PIR insulation (0.022), 150mm concrete slab.
Pool Floor SAP Floor Type 2	**0.22**	65mm screed, 65mm PIR nsulation (0.022 conductivity), 150mm concrete slab
Exposed Floor SAP Floor Type 3	**0.15**	100mm Rockwool insulation between joists, 150mm over
Pool Services Floor SAP Floor Type 5	**0.18**	65mm screed, 85mm PIR nsulation (0.022 conductivity), 150mm concrete slab
External Flat roof / Dormers SAP Roof Type 1	**0.12**	Single-ply membrane, 160mm Kingspan TR27 insulation (0.024), VCL, 50mm screed to fails, 150mm concrete/timber deck, 3mm skim coated 12.5mm plasterboard on battens.
Pitched Roof (Joists) SAP Roof Type 2	**0.12**	220mm mineral wool over joists, 150mm joists fully filled with mineral wool (0.042), 12.5mm plasterboard.
Pitched Roof (Rafters) SAP Roof Type 3	**0.12**	Tiles on batten and counter batten, breather membrane, 150mm rafters fully filled with Kingspan K107 (0.018), 52.5mm Kingspan K118 insulated plasterboard.
Windows/Glazed Door	**1.00**	Triple Glazed
Solid Door	**1.00**	Solid wooden door
Construction Details (PSI values)	**-**	Accredited Construciton Details psi-values have been proposed for all applicable junctions.
Boiler	**Y**	ASHP, modelled based on Stiebel Eltron WPL25 AS heat pump
Controls	**-**	Time and Temperature Zone Control
Heating Emitters	**-**	Underfloor
HW Cylinder	**-**	300L cylinder Volume with 2.09kWh/day standing loss
Secondary Heating	**-**	n/a
Mechanical Ventilation	**Y**	MVHR , modelled based on Vectaire Ltd
Lighting	**-**	100% Low Energy Lighting - CFL or LED
Renewables	**Y**	2.8kWp, based on south east facing panels with <15 degree pitch
Overheating	**-**	OVERHEATING RISK: Windows open half the time therefore security restrictors need to be fitted on ground floor glazing.
Notes		All specs indicative

Sign Off of details								
	Name	**PP M Maclean**	**Date**	**21.05.2021**	**On behalf of the contractor/client:**	**Name**		**Date**
	Sign	**(on behalf of SRE)**				**Sign**		

Appendix C – Unfeasible Low and Zero Carbon Technologies

Biomass Boiler

Biomass boilers generate heat from the burning of renewable or 'waste' fuels. They require a regular feed of fuel and regular heat demand to operate efficiently. A flue taller than the surrounding buildings must be incorporated into the design to minimise air pollution impacts at ground level from particulate emissions.

The use of a biomass boiler system to supply space heating and DHW has been deemed unsuitable due to the high level of particulates emitted from their use. The use of such a system would negatively impact the air quality of the surrounding area and.

Wind Power

Wind power is a developed and productive method of renewable energy generation, however the main limiting factor to its implementation is opposition at a local public and local government level.

To generate a meaningful amount of electricity, large-scale turbines are required which have noise and the visual impacts for the local area. The use of wind turbines has therefore been deemed unsuitable.

Appendix D – Internal Water Use Calculations

Building Regulations 2013 Part G	Planning Stage Specification				
		Capacity / flow rate	Use factor	Fixed use (litres/ person/ day)	Litres/ person/ day
WC (single flush)	Flush volume (litres)	0.00	4.42	0.00	0.00
WC (dual flush)	Flush volume (litres)	6.00	1.46	0.00	8.76
	Part flush volume (litres)	4.00	2.96	0.00	11.84
WCs (multiple fittings)	Average flush volume (litres)	0.00	4.42	0.00	0.00
Taps (excluding kitchen / utility)	Flow rate (litres/minute)	4.00	1.58	1.58	7.90
Bath (where shower also present)	Capacity to overflow (litres)	200.00	0.11	0.00	22.00
Shower (where bath also present)	Flow rate (litres/minute)	7.00	4.37	0.00	30.59
Bath only	Capacity to overflow (litres)	0.00	0.50	0.00	0.00
Shower only	Flow rate (litres/minute)	0.00	5.60	0.00	0.00
Kitchen/utility room sink taps	Flow rate (litres/minute)	5.00	0.44	10.36	12.56
Washing machine	Litres/kg dry load	8.17	2.10	0.00	17.16
Dishwasher	Litres/place setting	1.25	3.60	0.00	4.50
Waste disposal unit	Litres/use	0.00	3.08	0.00	0.00
Water softener	Litres/person/day	0.00	1.00	0.00	0.00
				Total calculated use	115.31
				Contribution from greywater (litres/person/day)	0.00
				Contribution from rainwater (litres/person/day)	0.00
				Normalisation factor	0.91
				Total internal water consumption	**104.93**
				External water use	5.00
				Total water consumption	**109.93**

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