5.4 SUSTAINABLE MANAGEMENT OF THE CONSTRUCTION SITE

The contractor will be required to develop and implement practices to minimise environmental impact as well as nuisance during construction. As a minimum, the contractor will be required to consider the following:

- Register the site with the Considerate Constructors Scheme and aim to achieve formal certification with a minimum score of at least 35 points with no less than 7 points in each of the five CCS sections.
- Monitor site impacts including as a minimum water consumption, energy consumption and carbon emissions associated to all deliveries of materials coming to site and waste collections leaving site.
- Brief all employees involved in the project on the energy and sustainability targets.
- Designate a Sustainability Champion (like the contractor's environmental manager) to monitor environmental performance and ensure implementation of relevant measures during the Construction, Handover and Close Out stages. The sustainability champion will be a suitably accredited person, such as a BREEAM Accredited Professional who will visit the site regularly to carry out spot checks (and record evidence including photos), with the relevant authority to do so and require action to be taken to address shortcomings in compliance, which should be reported at relevant project team meetings.
- The BREEAM target rating will form a requirement of the principal contractor's contract and the rating is achieved at PC.

An Air Quality Assessment by Waterman (June 2017) has been developed in support of the planning application which identifies that although the assessment has shown that mitigation measures are not required, a range of environmental management controls should be implemented, in line with best practice.

The Air Quality Assessment contains guidance relating to mitigation impacts to air quality during demolition and construction for Low Risk sites such as this. Section 4 of the report includes a schedule of measures focused on nuisance dust, construction vehicle exhaust emissions, and construction plant emissions.

A detailed Construction Management Plan has been developed by Bisset Adams which illustrates the deliveries and access arrangements during the construction phase. A copy of this has been included in support of the planning application.

5.5 MINIMISING POLLUTION

Nuisance on neighbouring properties will be avoided by minimising light and noise pollution as follows:

5.5.1 Light Pollution

The following measures are being proposed:

- External lighting will be designed to meet the ILP Guidance notes for the reduction of obtrusive light.
- All external lighting will be controlled by a timer or a presence detector to have the capability to be switched off at night time.
- Safety or security lighting required to stay on during night time will be designed in compliance with the lower levels of lighting recommended during these hours in Table 2 of the ILP's Guidance notes.
- All external lighting will have a luminous efficacy of at least 60 lumens per circuit watt

5.5.2 Noise Pollution

A Noise Impact Assessment has been completed by Hann Tucker Associates which is being submitted as part of this planning application. The assessment, which has been based on the results of an environmental sound survey undertaken to establish the prevailing background and incident sound pressure levels at the site concludes that:

- Suitable plant noise emissions criteria have been proposed based on the results of the baseline noise survey and the provisions in national policy on noise. These limits should be achievable using conventional noise control techniques.

The proposed design criteria will ensure that the noise levels from the proposed plant and building services are within the limits required under the London Borough of Camden's policy.

5.5.3 Air Pollution

An Air Quality Statement has been prepared by Waterman on behalf of Birkbeck, University of London in support of a Planning Application.

The main likely effects on local air quality during construction relates to nuisance dust. A range of mitigation measures to minimise or prevent dust emissions would be implemented through the construction works, this would ensure that the effects would be negligible at all receptor locations.

It is anticipated that the effect of construction vehicles entering and egressing the Site during the construction period would be negligible, in the context of local background pollutant concentrations.

Any emissions from plant operating on the Site would be very small in comparison to the emissions from traffic movements on the roads adjacent to the Site. It is therefore considered that the likely effect on local air quality would be negligible.

In accordance with LLAQM.TG, only the short-term Air Quality Strategy (AQS) objectives apply for future users of the Development. The nearest automatic monitor shows the short-term objectives for NO2 and PM10 are below the respective AQS objectives. Based on the monitoring data the future concentrations for future users of the Development are considered insignificant.

5.6 SUSTAINABLE TRANSPORT

One of the most effective measures to reduce carbon emissions associated to transport is to discourage car/vehicle based travel, therefore no car parking spaces have been provisioned.

In order to encourage sustainable transport, secured and covered bike storage accommodating 12no. cycle spaces is proposed at Ground Floor level within easy access for cyclists from the rear of the site. Basement level will accommodate 9no. suitably sized lockers to offer secured storage for cyclists as well as 1no. shower and changing facility located adjacent.

A Transport Statement has been developed by Robert West (Transport Consultants) and submitted as part of the planning application. The transport statement concludes that the area surrounding the site has an extensive network of footways, cycle routes and areas of public space. This provides an excellent opportunity for sustainable travel, and particularly walking and cycling. The site is in an area which is highly accessible by public transport (PTAL of 6b), with over 120 bus services available within five minutes' walk of the site and London Underground and National Rail stations nearby, which provide services to country-wide destinations.

A Travel Plan was produced to support this planning application and provides the development with a guidance on measures that will seek to encourage staff and visitors to travel by sustainable mode and limit car trips to disabled users only. These objectives are supported by generous provision of cycle spaces and cycle facilities proposed on-site.

5.7 HEALTH AND WELLBEING

Providing quality indoor and outdoor environments is a key aspect to create a sustainable community. A wide range of aspects regarding occupants' wellbeing has been considered and will continue to be develop during detailed design as follows:

- **Security**
  CIS Security have been appointed as suitably qualified Security Consultants for the proposed scheme and have undertaken a Security Needs Assessment. CIS Security have submitted a Security Report (32 Torrington Square Security Report, June 2017) which has been included within this planning application. The report includes a range of mandatory recommendations for the site including security access, CCTV, general arrangement and specification of glazing. The security proposals have been designed to comply with BREEAM Hea 06 Security of Site.

- **View out**
  The configuration of the proposed development ensures that at least 80% of the occupied spaces are within 7m of a window which provides an adequate view out, thereby allowing users to readjust their eyes during periods.

- **Internal and external lighting**
  Optimum lux levels will be provided in areas where computer screens will be used will be designed in accordance with CIBSE LG7 and SLL Code for Lighting 2012. External lighting will be specified in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places.

5.8 ECOLOGY AND BIODIVERSITY

During Stage 1, Hone Ecology were appointed as suitably qualified ecologists to advise on recommendations for protection and enhancement of site ecology. A copy of their report is to be included within this planning application.

The site is occupied by the existing building and vacant site to the north (comprising of a ramp and hard surfaces). As such, the site has been defined as being of "low ecological value". In accordance with the BREEAM checklist for defining land of low ecological value:

- The site is not within 2km Special Area of Conservation (SAC), Special Protection Area (SPA) or Ramsar site.
- The Site is not within 500m of a Site of Special Scientific Interest (SSSI).
- There is no broad-leaved woodland, water courses wetlands, flower-rich meadows or grasslands or heathland on or within 100m of the construction zone.

The site was also assessed fully through historic records and site inspection and no features or ecological interests were found or recorded on site or adjacent.

The current landscaping proposal developed by Landscape Architect, Wilder Associates, and includes a green roof and soft landscaped area at ground level which, in addition to the positive ecological impact, will contribute to reduce heat island effect and provide additional insulation to the development.

As the current site has zero ecological value, the proposed planting and green roof will contribute to a positive increase in ecological value.

In addition to the above, the following initiatives are proposed:

- Ensure that all relevant UK and EU legislation relating to the protection and enhancement of ecology has been complied with during the design and construction process.
- Develop a landscape and habitat management plan, covering at least the first five years after project completion to ensure long term biodiversity.

5.9 Flood risk and water run-off

According to the Environmental Agency Flood Risk map, the site has a low risk of flooding.

Webb & Yates have been appointed to undertake a civil and structural report (Stage 2 Civil and Structural Engineering Report, April 2017) which identifies that an evaluation of the surface water run-off will also be undertaken to ensure that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater post-development at the 1-year and 100-year return period events including climate change allowance.

Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS will also be in place.

Webb & Yates have been appointed as suitably qualified drainage and SUDs specialists to undertake a site-specific flood risk assessment and surface water run-off calculations to warranty that the site has a low risk of flooding from all sources.

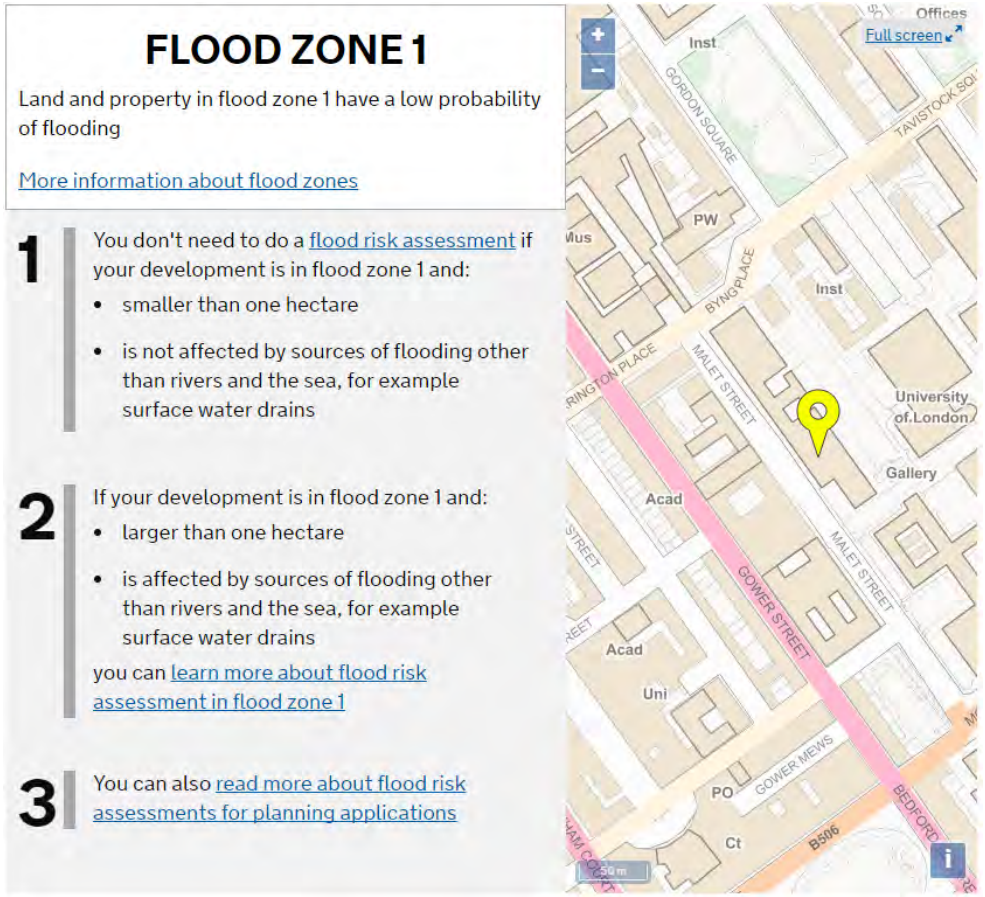

Figure 13. Environment Agency Flood Risk map (https://flood-map-for-planning.service.gov.uk/summary/520256/182618)

BREEAM PRE-ASSESSMENT

6. BREEAM PRE-ASSESSMENT

The London Borough of Camden requires that all non-domestic developments more than 500m^2 are to achieve a minimum BREEAM rating of 'Excellent'. In addition to this, all developments must meet the required un-weighted targets in each of the following BREEAM categories: energy, water and materials.

The proposed new build Annex has a Gross Internal Floor area of 444sqm and therefore falls below the threshold of the above requirement. Similarly, the refurbishment of 32 Torrington Square has a Gross Internal Floor Area (GIA) of 380 sqm. Additionally, planning policy states "Special consideration will be given to buildings that are protected e.g. listed buildings to ensure that their historic and architectural features are preserved." that would apply to 32 Torrington Square based on the Grade II listed nature of the building.

The client has however voluntarily decided to assess both buildings against BREEAM and has sought BREEAM Assessor and BREEAM Accredited Professional (AP) support from early stages to try to achieve the optimum BREEAM rating.

6.1 32 Torrington Square

As the scheme is effectively a major refurbishment, it will be assessed against the BREEAM Non-Domestic Refurbishment and Fit-Out manual v1.1 – Offices, against the following "parts":

- Part 2 Core Services
- Part 3 Local Services
- Part 4 Interior Design

A BREEAM pre-assessment has been produced with input from the design and has identified that a BREEAM score of **60.1% - 'Very Good'** rating can be achieved. Due to the Listed nature of the building and the fact that much of the fabric and structure is being retained the scheme has presented a lack of technical feasibility in achieving a higher rating.

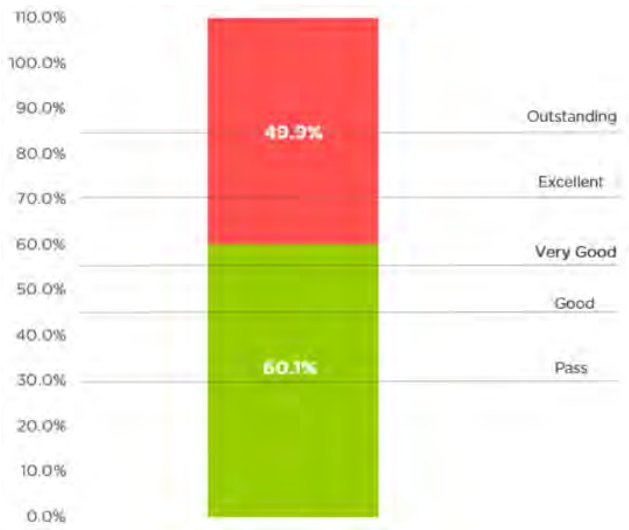

Figure 14. Summary of BREEAM performance for 32 Torrington

In addition to this, the following un-weighted scores are achieved:

	Camden Policy target	32 Torrington Square
Energy	60%	57%
Water	60%	67%
Materials	40%	38%

Table 18 Summary of BREEAM performance against Camden Policy requirements – 32 Torrington

The graph above demonstrates that the project performs well in the Management, Transport, Water, Land use and Ecology and Pollution sections.

Figure 15. Summary of BREEAM scores per category – 32 Torrington

The scheme is located within Central London and as such has excellent transport links, and well as cyclist commuter facilities on site. During the tender process Twin & Earth's BREEAM AP will work closely with the preferred Contractor to ensure that they are contractually bound to ensuring best practice construction management. All relevant CIBSE and BSRIA Commissioning Codes will be complied with, and a specialist commissioning agent will be appointed to ensure the commissionability of the proposed systems, and oversee installation, commissioning, and where relevant re-commissioning. Seasonal commissioning will also be delivered be delivered by the commissioning manager who will review the systems during periods of high occupancy and seasons.

In addition to 12 months aftercare provided by the Principal Contractor, the Client has opted to undertake a 3-year aftercare programme focused on optimising and reporting building performance based on user feedback.

The proposed scheme utilises water efficiency by specifying a combination of low flush and low flow sanitary fittings to reduce primary water consumption. A leak detection system has been specified to the building to notify the building management of any leaks, and flow control devices have been specified to each WC area to ensure the cold water supply is shut-off during periods of non-occupation. The irrigation system for the green roof and plating has been specified to rely solely on precipitation throughout the year.

The proposed scheme at 32 Torrington Square does not perform well in the Energy, Health and Wellbeing and Materials categories. Due to its Listed nature, it is not possible to undertake any major structural or fabric improvements, which inherently limits the degree of improvements in thermal comfort and energy performance. Furthermore, the size of the site has restricted opportunities to adequately space ventilation inlets and exhausts of the air handling unit. Similarly, opportunities to integrate LZC technologies such as PV have also been thwarted.

6.2 The Annex

The proposed new build Annex has a GIA of 444 sqm and therefore also falls below the planning policy threshold of 500sqm for the requirement of a BREEAM assessment; however, the client has also decided to pursue formal BREEAM certification with the highest feasible rating.

As the Annex is a new fully-fitted building, it will be assessed against the BREEAM New Construction 2014 (Offices) scheme v.5.0.

A BREEAM pre-assessment has been produced with input from the design and has identified that a BREEAM score of **72.5% - 'Excellent'** rating can be achieved.

In addition to this, the following un-weighted scores are achieved which meet the thresholds established by the LBoC:

	Camden Policy target	The Annex
Energy	60%	61%
Water	60%	67%
Materials	40%	46%

Table 19 Summary of BREEAM performance against Camden Policy requirements – The Annex

A copy of the pre-assessment checklist has been provided in Appendix H.

The graph above demonstrates that the project performs well in the Management, Transport, Water, Land use and Ecology and Pollution sections.

The Annex is a new build and as such benefits from the opportunities available to optimise building structure and fabric performance. This is evident in the Health and Wellbeing and Energy section where the improved building fabric and flexibility in building services strategy has allowed for credits to be gained for Hea 04 Thermal Comfort and Ene 04 Passive Design.

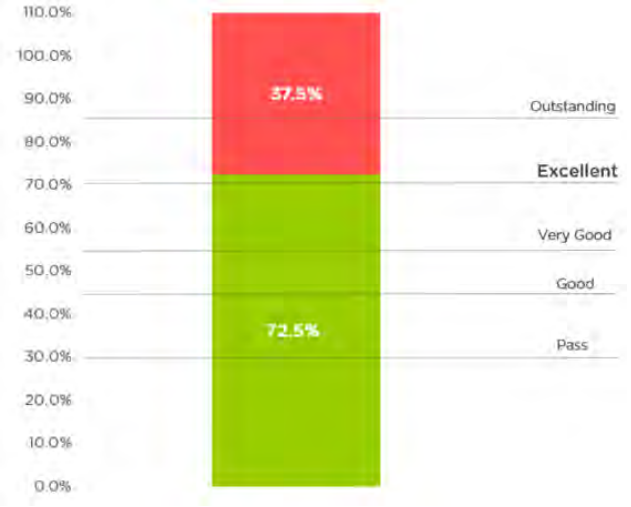

Figure 16. Summary of BREEAM performance for the Annex.

Figure 17. Summary of BREEAM scores per category – The Annex

APPENDICES

APPENDIX A: LONDON PLAN POLICIES

- **Policy 5.1: Climate change mitigation** - sets out the Mayor's strategic target for the reduction of carbon dioxide emissions across London of 60 per cent (below 1990 levels) by 2025. It expects the GLA group, the boroughs and other organisations to make a contribution towards this target and that all new development fully contributes towards the London wide reduction target.
- **Policy 5.2: Minimising carbon dioxide emissions** - sets out the Mayor's energy hierarchy which developers are to follow when designing their schemes. It also sets out carbon dioxide reduction targets that developers are to aim for from their developments over the lifetime of the Plan and that where these can't be achieved an off-site or financial contribution in lieu can be sought by the local borough.
- **Policy 5.4: Retrofitting** - encourages the retro-fitting of measures to reduce carbon dioxide emissions, improve the efficiency of resource use (such as water) and minimise generation of pollution and waste from existing building stock and states that any opportunities created by new development for retro-fitting should be identified.
- **Policy 5.5: Decentralised energy networks** - sets out the Mayor's strategic target for decentralised energy, which is that 25% of the heat and power used in London is to be from local sources by 2025. The policy sets out how plans can identify and support opportunities for decentralised energy networks.
- **Policy 5.6: Decentralised energy in proposals** - sets out a hierarchy for selecting a development's heating system and states that the feasibility of combined heat and power (CHP) should be evaluated for the proposed development as well as the potential for extending the heating network beyond the site boundary.
- **Policy 5.7: Renewable energy** - seeks to increase the proportion of energy generated from renewable sources, including through their incorporation into new developments and by identifying specific opportunities within London.
- **Policy 5.8: Innovative energy technologies** - encourages the use of innovative energy technologies that will provide an alternative energy source and reduce carbon dioxide emissions.
- **Policy 5.9: Overheating and cooling** - states that developments should be designed to limit their contribution to the heat island effect and encourages spaces to be designed to avoid overheating, including by following the cooling hierarchy set out in the policy.
- **Policy 5.10: Urban greening** - encourages the greening of London's buildings and spaces and specifically those in central London by including a target for increasing the area of green space (including green roofs etc) within the Central Activities Zone.
- **Policy 5.11: Green roofs and development site environs** - specifically supports the inclusion of planting within developments and encourages boroughs to support the inclusion of green roofs.
- **Policy 5.12: Flood risk management** - outlines the requirement for boroughs and developers to carry out flood risk assessments and that developments must comply with national planning policy on flood risk assessments and management to ensure they are designed and built to be resilient to flooding.
- **Policy 5.13: Sustainable drainage** - promotes the inclusion of sustainable urban drainage systems in developments and sets out a drainage hierarchy that developers should follow when designing their schemes.
- **Policy 5.14: Water quality and waste water infrastructure** - seeks to ensure that adequate provision is made for waste water infrastructure, and that water quality is protected.

APPENDIX B: CAMDEN'S LOCAL PLAN POLICIES

Below is a summary of local planning policies relating to energy and sustainability requirements for minor developments.

- **Policy C1 Health and wellbeing**
  Aims to improve and promote strong, vibrant and healthy communities through ensuring a high quality environment with local services to support health, social and cultural wellbeing and reduce inequalities. Developments are required to positively contribute to creating high quality, active, safe and accessible places; and b. proposals for major development schemes to include a Health Impact Assessment (HIA).
- **Policy C5 Safety and security**
  Aims to make Camden a safer place. Developments are required to:
  - Demonstrate that they have incorporated design principles which contribute to community safety and security, particularly in wards with relatively high levels of crime, such as Holborn and Covent Garden, Camden Town with Primrose Hill and Bloomsbury;
  - Incorporate appropriate security and community safety measures
- **Policy C6 Access for all**
  Aims to promote fair access and remove the barriers that prevent everyone from accessing facilities and opportunities. Developments should meet the highest practicable standards of accessible and inclusive design so they can be used safely, easily and with dignity by all.
- **Policy A3 Biodiversity**
  Aims to protect and enhance sites of nature conservation and biodiversity. Developments cannot directly or indirectly result in the loss or harm to a designated nature conservation site or adversely affect the status or population of priority habitats and species. Developments should:
  - Protect features with nature conservation value, including gardens, wherever possible.
  - Optimise biodiversity through the layout, design and materials used in the built structure and landscaping elements of a proposed development, proportionate to the scale of development proposed;
  - require the demolition and construction to avoid disturbance to habitats and species and ecologically sensitive areas, and the spread of invasive species;
  - secure management plans, where appropriate, to ensure that nature conservation objectives are met;
  - protect existing trees and aim to increase provision of trees and vegetation.
- **Policy A4 Noise and vibration**
  Aims to ensure that noise and vibration is controlled and managed. Development should have regard to Camden's Noise and Vibration Thresholds and do not generate unacceptable noise and vibration impacts.
- **Policy D1 Design**
  Aims to secure high quality design in development. Developments should:
  - Be sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation
  - Be of sustainable and durable construction and adaptable to different activities and land uses;
  - Be inclusive and accessible for all
  - Promotes health;
  - Be secure and designed to minimise crime and antisocial behaviour
  - Respond to natural features and preserves gardens and other open space;
  - Incorporate high quality landscape design (including public art, where appropriate) and maximise opportunities for greening for example through planting of trees and other soft landscaping

- **Policy CC1 Climate change mitigation**
  States that 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. Developments should:
    - Aim for Zero carbon and reduce carbon dioxide emissions through following the steps in the energy hierarchy;
    - Demonstrate how London Plan targets for carbon dioxide emissions have been met;
    - Ensure that the location and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
    - Support and encourage sensitive energy efficiency improvements to existing buildings;
    - Involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building;
    - Optimise resource efficiency.
    - Assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network – Major developments only.
    - Install appropriate monitoring equipment to ensure that the Council can monitor the effectiveness of renewable and low carbon technologies – major developments only.
- **Policy CC2 Adapting to climate change**
  Aims to ensure that development are resilient to climate change. All developments 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 d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

  Developments should also:
    - Demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
    - Achieve BREEAM Excellent and be zero carbon from 2019 – applicable to non-domestic developments of 500 sqm of floorspace or above.
- **Policy CC3 Water and flooding**
  Aims to ensure that development does not increase flood risk and reduces the risk of flooding where possible. Developments should:
    - 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 be located in flood-prone areas when of vulnerable nature.

  Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

- **Policy CC4 Air quality**
  Aims to ensure that exposure to poor air quality is reduced in the borough. Developments should consider air quality in relation to both: exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan. Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution.
  When involving significant demolition, construction or earthworks the risk of dust and emissions impacts in an AQA should be assessed and appropriate mitigation measures included in a Construction Management Plan.

- **Policy CC5 Waste**
  Aims to make Camden a low waste borough. To support this, developments should ensure that facilities for the storage and collection of waste and recycling are included.
- **Policy T1 Prioritising walking, cycling and public transport**
  Aims to promote sustainable transport by prioritising walking, cycling and public transport in the borough. Developments should:
  - Improve the pedestrian environment
  - Be easy and safe to walk and cycle through ('permeable') and adequately lit;
  - Provide high quality and suitably sized footpaths and pavements
  - Provide for and make contributions towards connected, high quality, convenient and safe cycle routes
  - Provide for accessible, secure cycle parking facilities exceeding minimum standards outlined within the London Plan (Table 6.3) and design requirements outlined within Camden Planning Guidance on transport.
  - Make provision for high quality cyclists facilities (changing rooms, showers, dryers and lockers)
- **Policy T2 Parking and car-free development**
  Aims to limit the availability of parking and require all new developments in the borough to be car-free.

Policy T4 Sustainable movement of goods and materials
Aims to promote the sustainable movement of goods and materials and to minimise the movement of goods and materials by road.

APPENDIX C: PARTL MODEL INPUT ASSUMPTIONS

Building Fabric

33 Torrington Square
Construction Details

Element	Criteria	Units	Value	Build up	Source / notes
External Wall	U-value	W/m²K	**0.15**	Outside to inside: 1. Rain screen/brick 2. Cavity 3. Insulation 4. Cement particle board 5. Plasterboard	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
External Wall (Basement)	U-value	W/m²K	**0.15**	Outside to inside: 1. London clay (temperature at 12C) 2. Cast concrete 3. Insulation 4. 13mm plasterboard	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
Ground Floor	U-value	W/m²K	**0.1**	Outside to inside: 1. Reinforced concrete 2. Insulation 3. Screed 4.Floor covering	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
Ground Floor (Basement)	U-value	W/m²K	**0.1**	Outside to inside: 1. London clay (temperature at 12C) 2. Reinforced concrete 3. Insulation 4. Screed 5. Floor covering	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
Intermediate floors	U-value	W/m²K	T&E to calculate based on build up	Outside to inside: 1. Floor covering 2. Raised floor 3. Cavity 4. Screed 5. Concrete 6. Cavity 7. Plasterboard	Calculated in IES VE Software
Internal partition wall	U-value	W/m²K	T&E to calculate based on build up	1. Plasterboard 2. Cavity 3. Plasterboard	Calculated in IES VE Software
Roof above basement	U-value	W/m²K	**0.1**	Outside to inside: 1. Stone chippings 2. Membrane 3. Insulation 4. Concrete deck 5. Cavity 6. Plasterboard	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
Pitched roof	U-value	W/m²K	**0.1**	Outside to inside: 1. Aluminium 2. Membrane 3. Insulation 4. Cavity 5. Plasterboard	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
Flat Roof	U-value	W/m2K	**0.1**	Outside to inside: 1. Stone chippings 2. Membrane 3. Insulation 4. Concrete deck 5. Cavity 6. Plasterboard	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
New Windows (including frame)	U-value g-value	W/m²K %	**1.4** 0.32	Double Glazing (Low g-value) - 10% FF - Front of the building	**Improved U-value from the Notional Building to achieve BREEAM Excellent**
New Windows (including frame)	U-value g-value	W/m²K %	**1.4** 0.4	Double Glazing (Low g-value) - 10% FF - Back of the building	**Improved U-value from the Notional Building to achieve BREEAM Excellent**

Thermal bridging

Thermal bridging allowance from cold bridges	W/m²K	10% of u-value

Air permeability

Air leakage value		m3/m2h	8.5	-

32 Torrington Square

Construction Details

Element	Criteria	Units	Value	Build up (inside to outside)	Source / notes
External Wall	u-value	W/m²K	1.6	- 13mm Plaster, dense - 340mm Brick	NCM Database: Solid brick wall, 340 mm, uninsulated Pre 1919
External Wall (Basement)	u-value	W/m²K	0.77	- 340mm Brick - 1000mm London Clay with an average 12 oC Temperature	Build up assumed. U-value calculated using IES
Ground Floor (Basement)	u-value	W/m²K	0.58	- 50mm screed - 150mm cast concrete - 1000mm London Clay with an average 12 oC Temperature	NCM Database: Solid ground floor, uninsulated
Roof (above basement)	u-value	W/m²K	2.8	- 13mm gypsum plaster - 150mm concrete deck - 19mm Asphapt - 25mm Stone chippings	Build up assumed. U-value calculated using IES
Flat Roof (Extension)	u-value	W/m²K	2.8	- 13mm gypsum plaster - 150mm concrete deck - 19mm Asphapt - 25mm Stone chippings	NCM Daabase: Flat roof, concrete deck, uninsulated, U=2.8
Pitched Roof	u-value	W/m2K	2.68	- 10mm Plasterboard - 1000mm Void - 10mm Tiles	NCM Daabase: Pitched roof, no insulation, U=2.5
Windows - Single Glazed Sash	u-value	W/m²K	4.3	6mm single glazed timber framed sash (no draft striping)	Research into the thermal performance of traditional windows: Timber sash windows (English Heritage, Oct 09). G-value based on NCM construction details for typical un-coated single glazed windows.
	g-value	%	0.85		
New Windows	u-value	W/m²K	1.4	Double glazed windows	Based on the overheating analysis
	g-value	%	0.4		

Thermal bridging

Thermal bridging allowance from cold bridges	W/m²K	10% of u-value

Air permeability

Air leakage value		m3/m2h	35	-	

33 Torrington Square
HVAC and Lighting (PROPOSED)

		Example	Office (Heating and Cooling)	Reception	Toilet	Circulation	Void
NCM profiles (for Part L / EPC)							
NCM building type	Description	**B1: Office**	B1: Office	B1: Office	B1: Office	B1: Office	B1: Office
NCM activity	Description	**Office, Toilet etc**	Office	Reception	Toilet	Circulation area	Cupboard
System settings							
HVAC - System level	-	-	HVAC-1	HVAC-3	HVAC-2	HVAC-2	Unheated
Ventilation - Zonal level	-	-	VENT-1	VENT-4	VENT-2	VENT-3	VENT-3
DHW	-	-	DHW-1	DHW-1	DHW-1	DHW-1	DHW-1
Lighting	-	-	LT-1	LT-1	LT-2	LT-2	LT-3
Building Management	-	-	BM-1	BM-1	BM-1	BM-1	BM-1
LZC Technologies	-	-	-	-	-	-	-

Heating, Cooling & Ventilation (HVAC) - SYSTEM LEVEL					
		EXAMPLE	HVAC-1	HVAC-2	HVAC-3
System description	Description	**Daikin VRF (Fan coil) - model FXAQ40PAV1**	Heating and Cooling	Heating Only	Heating Only
UK NCM type	Type	**Split, VAV etc**	Fan Coil System	Central Heating Using Water Radiators	Central Heating Using Water Radiators
Heating System					
- Heat Fuel Type	Elec/gas	**Electricty**	Gas	Gas	Gas
- Heat generator seasonal efficiency	SCOP	**90%**	0.91	0.91	0.91
- Does it Qualify for ECA?	Yes	**Yes**	Yes	Yes	Yes
Cooling System					
- Cooling system type (assumed system in model)	Description	**Air cooled/water cooled/heat pump etc**	Air Cooled Chiller	N/A	N/A
- Chiller fuel type	Description	**Elec**	Elec	-	-
- Nominal Seasonal EER	SEER	**4.00**	4.5	-	-
- Nominal EER	EER	**3.00**	3.6	-	-
- Does it Qualify for ECA?	Yes	**Yes**	Yes	-	-
System adjustment					
- Ductwork Leakage Classification	Class	**N / A**	Yes	Yes	Yes
- AHU Leakage Classification	Class	**N / A**	Yes	Yes	Yes
- Specific Fan Power (AHUs)	W/l/s	**N / A**	2	-	-
- Pump type	Description	**Constant speed / Variable speed**	Variable Speed	Variable Speed	Variable Speed
Metering Provision					
- Does the system have provision for metering?	Yes/No	**Yes**	Yes	Yes	Yes
- Does the system warn of "out of range" values	Yes/No	**Yes**	Yes	Yes	Yes
Ventilation & pumping					
- Cooling/vent mechanism	Air con / nat vent	**Air con**	Air con	Nat vent	Mech vent
- Air supply mechanism	Description	Centralised	Centralised	-	-
- Heat recovery	% efficiency or n/a	**65%**	75	No	75
System Controls					
- Central Time Control?	Yes	**Yes**	No	No	No
- Optimum start/stop control?	No	**Yes**	No	No	No
- Local Time Control?	No	**Yes**	No	No	No
- Local Temperature Control?	Yes	**Yes**	No	No	No
- Weather Compensation Control?	No	**Yes**	No	No	No

Ventilation - ZONAL LEVEL						
		EXAMPLE	VENT-1	VENT-2	VENT-3	VENT-4
System description	Description	**Local FCUs**	Air Handling Unit with thermal wheel & electric heater battery.	Exttract Only	Natural Ventilation	Supply & Extract
Specific Fan Power (Terminal units)	W/l/s	**N / A**	0.3	0.4	-	-
Specific Fan Power (central AHUs)	W/l/s	**N / A**	2	-	-	2
Fan location	Description	**Remote from room**	In zone	In zone	-	
Air change rate (if applicable)	ACH	**00:00:00**	-	10	-	
Demand Control Ventilation (DCV)	Description	**Yes**	No	No	-	No

Domestic DHW			
		EXAMPLE	DHW-1
System description	Description	Electric POU	Electric POU
Heating fuel	Elec/gas	Elec	Electricity
Heat generator seasonal efficiency	%	90%	1
Is a CHP system installed? (see below for details)	Yes/No	Yes	No
Is Solar Hot Water installed? (see below for details)	Yes/No	Yes	No
DHW delivery efficiency	%	0.95	0.95
Is the system a storage system?	Yes/No	Yes	No
Storage system size	litres	00:00:00	-
Storage system losses	kWh/(l.day)	01:55:12	Default
Does the system have secondary circulation?	Yes/No	No	No
Secondary circulation total flow & return pipe length &	m / W/m	50 / 8	-
DHW pump power / time switch?	W / Time switch?	500 / Yes	-

Lighting					
		EXAMPLE	LT-1	LT-2	LT-3
Applies to:	-	Offices	See NCM Profiles	See NCM Profiles	See NCM Profiles
Averaged lighting power density across the building OR	Lumens/circuitW	-	60	60	60
Installed lighting Power Density	W/m2/(100lx)	12:00:00	-	-	-
Design illuminance	Lux	00:00:00	-	-	-
PIR controls?	Description	Auto on/off	Auto	Auto	Off
PIR - Parasitic Power	W/m^2	Default	Default	Default	Default
PIR - Time switching?	Yes/No	Yes	No	No	-
Automatic Daylighting Control?	Yes/No	Yes	Yes	No	-
Control Type (Switching/Dimming)	Switch/Dim	Dimming	Dimming	-	-
Sensor Type (Standalone/Addressable)	Stand/Add	Addressable	Addressable	-	-
Daylight - Parasitic Power	W/m^2	Default	Default	Default	-

Building Management			
		EXAMPLE	BM-1
Electric Power Factor of the building	Power Factor Control	<0.9 (no PF correction)	<0.9
Lighting systems have provision for metering?	Yes/No	No	Yes
Lighting systems metering warns of 'out of range' values?	Yes/No	No	Yes
Does the system have provision for metering?	Yes/No	No	Yes
Does the metering warn "out of range" values?	Yes/No	No	Yes

32 Torrington Place

HVAC and Lighitng (PROPOSED)

		Office (Heating Only)	Office (Heating Only)	Meeting Room	Circulation	Storage	Void
NCM profiles (for Part L / EPC)							
NCM building type	Description	B1: Office	B1: Office	B1: Office	B1: Office	B1: Office	B1: Office
NCM activity	Description	Office	Office	Meeting Room	Circulation area	Cupboard	Cupboard
System settings							
HVAC - System level	-	HVAC-2	HVAC-3	HVAC-2	Unheated	HVAC-2	Unheated
Ventilation - Zonal level	-	VENT-3	VENT-1	VENT-3	VENT-3	VENT-3	VENT-3
DHW	-	DHW-1	DHW-1	DHW-1	DHW-1	DHW-1	DHW-1
Lighting	-	LT-1	LT-1	LT-1	LT-2	LT-3	LT-3
Building Management	-	BM-1	BM-1	BM-1	BM-1	BM-1	BM-1
LZC Technologies	-	-	-	-	-	-	-

		Toilet	Toilet Lobby	Circulation
NCM profiles (for Part L / EPC)				
NCM building type	Description	B1: Office	B1: Office	B1: Office
NCM activity	Description	Toilet	Circulation area	Circulation area
System settings				
HVAC - System level	-	HVAC-2	HVAC-2	HVAC-2
Ventilation - Zonal level	-	VENT-2	VENT-3	VENT-3
DHW	-	DHW-1	DHW-2	DHW-1
Lighting	-	LT-2	LT-2	LT-2
Building Management	-	BM-1	BM-1	BM-1
LZC Technologies	-	-	-	-

Heating, Cooling & Ventilation (HVAC) - SYSTEM LEVEL			
		HVAC-2	HVAC-3
System description	Description	Heating Only	Heating Only
UK NCM type	Type	Central Heating Using Water Radiators	Central Heating Using Water Radiators
Heating System			
- Heat Fuel Type	Elec/gas	Gas	Gas
- Heat generator seasonal efficiency	SCOP	0.91	0.91
- Does it Qualify for ECA?	Yes	Yes	Yes
Cooling System			
- Cooling system type (assumed system in model)	Description	N/A	N/A
- Chiller fuel type	Description	-	-
- Nominal Seasonal EER	SEER	-	-
- Nominal EER	EER	-	-
- Does it Qualify for ECA?	Yes	-	-
System adjustment			
- Ductwork Leakage Classification	Class	Yes	Yes
- AHU Leakage Classification	Class	Yes	Yes
- Specific Fan Power (AHUs)	W/l/s	-	-
- Pump type	Description	Variable Speed	Variable Speed
Metering Provision			
- Does the system have provision for metering?	Yes/No	Yes	Yes
- Does the system warn of "out of range" values	Yes/No	Yes	Yes
Ventilation & pumping			
- Cooling/vent mechanism	Air con / nat vent	Natural Vent	Mechanical Vent
- Air supply mechanism	Description	-	-
- Heat recovery	% efficiency or n/a	No	75
System Controls			
- Central Time Control?	Yes	No	No
- Optimum start/stop control?	No	No	No
- Local Time Control?	No	No	No
- Local Temperature Control?	Yes	No	No
- Weather Compensation Control?	No	No	No

Ventilation - ZONAL LEVEL				
		VENT-1	VENT-2	VENT-3
System description	Description	Supply & Extract	Exttract Only	Natural Ventilation
Specific Fan Power (Terminal units)	W/l/s		0.4	-
Specific Fan Power (central AHUs)	W/l/s	2	-	-
Fan location	Description	In zone	In zone	
Air change rate (if applicable)	ACH	-	10	
Demand Control Ventilation (DCV)	Description	No	No	

Domestic DHW		
		DHW-1
System description	Description	Electric POU
Heating fuel	Elec/gas	Electricity
Heat generator seasonal efficiency	%	1
Is a CHP system installed? (see below for details)	Yes/No	No
Is Solar Hot Water installed? (see below for details)	Yes/No	No
DHW delivery efficiency	%	0.95
Is the system a storage system?	Yes/No	No
Storage system size	litres	-
Storage system losses	kWh/(l.day)	Default
Does the system have secondary circulation?	Yes/No	No
Secondary circulation total flow & return pipe length & losses	m / W/m	-
DHW pump power / time switch?	W / Time switch?	-

Lighting				
		LT -1	LT -2	LT -3
Applies to....	-	See NCM Profiles	See NCM Profiles	See NCM Profiles
Averaged lighting power density across the building OR.....	Lumens/circuitW	60	60	60
Installed lighting Power Density	W/m2/(100lx)	-	-	-
Design illuminance	Lux	-	-	-
PIR controls?	Description	Auto	Auto	Off
PIR - Parasitic Power	W/m^2	Default	Default	Default
PIR - Time switching?	Yes/No	No	No	-
Automatic Daylighting Control?	Yes/No	Yes	No	-
Control Type (Switching/Dimming)	Switch/Dim	Dimming	-	-
Sensor Type (Standalone/Addressable)	Stand/Add	Addressable	-	-
Daylight - Parasitic Power	W/m^2	Default	Default	-

Building Management		
		BM-1
Electric Power Factor of the building	Power Factor Control	<0.9
Lighting systems have provision for metering?	Yes/No	Yes
Lighting systems metering warns of 'out of range' values?	Yes/No	Yes
Does the system have provision for metering?	Yes/No	Yes
Does the metering warn "out of range" values?	Yes/No	Yes

APPENDIX D: INDICATIVE BLINDS SPECIFICATION

High reflectance internal roller blinds such as the Nimbus range made by Kvadrat should be installed to ensure that dry bulb temperature will always be within the acceptable limits

Solar optical properties (%) acc. to EN 14500

	Colour number							
	101	131	201	231	541	701	791	991
Ts	5	5	5	5	6	5	4	4
Rs	59	59	59	60	58	61	60	60
As	36	36	36	35	36	34	36	36
Tvis	5	4	4	4	6	5	2	3
Tuv	4	3	3	4	5	4	3	3
O-F	2	2	2	2	2	2	2	2

Thermal performance acc. to EN 14501

	101	131	201	231	541	701	791	991
Glazing A – gtot	0.35	0.35	0.35	0.35	0.36	0.34	0.34	0.34
Glazing A – U	0.41	0.41	0.41	0.41	0.42	0.40	0.40	0.41
Glazing B – gtot	0.38	0.38	0.38	0.38	0.39	0.37	0.37	0.38
Glazing B – U	0.50	0.50	0.50	0.50	0.51	0.49	0.49	0.50
Glazing C – gtot	0.37	0.37	0.37	0.37	0.38	0.36	0.37	0.37
Glazing C – U	0.63	0.63	0.63	0.63	0.64	0.62	0.62	0.63
Glazing D – gtot	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Glazing D – U	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79

Glare control acc. to EN 14501

	101	131	201	231	541	701	791	991
Class	2	3	3	3	2	2	3	3

Lightfastness acc. to ISO 105-B02, method 2

	101	131	201	231	541	701	791	991
Note front	7	4	6-7	5-6	5	6	4-5	4
Note back	7	7	7	7	7	7	7	7

Ts Solar Transmission
Rs Solar Reflection
As Solar Absorption
Tvis Visible Light Transmission
Tuv Ultraviolet Light Transmission
O-F Openness Factor
gtot Total Solar Energy Transmittance
U Thermal Transmittance

Glazing A Clear single glazing (g=0.85 / U=5.8)
Glazing B Clear double glazing (g=0.76 / U=2.9)
Glazing C Double glazing (g=0.59 / U=1.2)
Glazing D Reflective double glazing (g=0.32 / U=1.1)

APPENDIX E: RENEWABLE TECHNOLOGIES

Photovoltaics

Figure 2. Image of a PV panel

Photovoltaics (PV) are a method of generating electrical power by converting sunlight into direct current electricity using semiconducting materials. Uses of this technology have been explored for more than 50 years and nowadays it is a well-established and reliable technology which has seen prices dramatically reduce over the last decade thanks to economies of scale and the introduction of Feed-in-Tariff's in the UK which provide an additional income from the generation of renewable power. This has resulted in typical financial payback of 8-9 years with returns on investment over 20 years typically in the order of 8-12%.

Types of PV panels

There are three basic types of PV technologies: Monocrystalline, Polycrystalline (or Mutli-crystalline) and Amorphous.

Monocrystalline cells are cut from a single crystal of silicon. In appearance, it has a smooth texture and the thickness of the slice can be easily seen. These PV cells have efficiencies of 13-17% and are the most efficient of the three types of silicon PV cell. However, they require more time and energy to produce than polycrystalline silicon PV cells, and are therefore more expensive.

Polycrystalline (or Multicrystalline) Polycrystalline silicon is produced from a molten and highly pure molten silicon, but using a casting process. The silicon is heated to a high temperature and cooled under controlled conditions in a mould. It sets as an irregular poly- or multi-crystalline form. The square silicon block is then cut into 0.3mm slices. The typical blue appearance is due to the application of an anti-reflective layer. The thickness of this layer determines the colour - blue has the best optical qualities. It reflects the least and absorbs the most light. More chemical processes and fixing of the conducting grid and electrical contacts complete the process. Mass-produced polycrystalline PV cell modules have an efficiency of 11-15%.

Amorphous silicon is non-crystalline silicon. Cells made from this material are found in pocket calculators etc. The layer of semi-conductor material is only 0.5-2.0um thick, where 1um is 0.001mm. This means that considerably less raw material is necessary in their production compared with crystalline silicon PV production. The film of amorphous silicon is deposited as a gas on a surface such as glass. Further chemical processes and the fixing of a conducting grid and electrical contacts follow. These PV cells have an efficiency of between 6-8%. Multi-junction amorphous thin film PV cells are also available which are sensitive to different wavelengths of the light spectrum. These have slightly higher efficiencies.

The favourable efficiency to cost ratio of polycrystalline silicon makes them the most commonly used form of PV. The amount of silicon waste produced during manufacture is also less compared to monocrystalline panels.

Building Integrated PV panels (BIPV)

Although often used as a visible statement of a building's 'green' credentials, the visual impact of building integrated PV can sometimes be considered a limitation. Improvements have been made to improve the aesthetical integration of the technology. Integrated solutions currently available in the market include glazing integrated PV cells, façade integrated PV systems, PV tiles and more recently PV glazing which incorporates the technology in glazed surfaces in an almost fully translucent form.

Figure 3. Image of PV glass sold by Onyx solar

Applicability to development

Whilst the use of PV panels to generate electrical power is in principle a feasible technology for the project, the visual impact of external roof features has been a key area of concern for the planners due to the location of the development and the Grade II* listed nature of number 32 Torrington Square. A copy of the pre-planning feedback letter from Camden stating the above has been included in Appendix I of this report.

Therefore, the installation of PV Panels is not feasible for the project.

Solar Hot Water

Solar water heating is a widely used technology within a number of hot and sunny countries and has also been proven a viable technology within the UK climate.

Heat is trapped by collectors usually located on the roof which in turn is used to preheat water which is typically stored in a dual coil cylinder. In order to ensure adequate hot water (particularly during the winter months), and to prevent legionella, the hot water tank is usually has a second heating coil which is heated via a gas boiler or electric immersion heater.

Types of Solar Water Heating collectors

There are two main types of solar water heating collectors: evacuated tubes and flat plate.

Evacuated tube solar thermal systems are one of the most popular solar thermal systems available and are the most efficient with an efficiency of up to 70%. Their efficiency is achieved because of the way in which the evacuated tube systems are constructed, meaning they have excellent insulation and are virtually unaffected by air temperatures. The collector itself is made up of rows of insulated glass tubes which contain a vacuum with copper pipes at their core. Water is heated in the collector and is then sent through the pipes to the water tank.

The cylindrical shape of evacuated tubes means that they are able to collect sunlight throughout the day and at all times in the year. Evacuated tube collectors are also easier to install as they are light, compact, easy to maintain - the tubes can be replaced individually if one becomes faulty – and reliable, but are also the most expensive type of collectors.

The system is efficient and durable with the vacuum inside the collector tubes having been proven to last for over twenty years. The reflective coating on the inside of the tube will also not degrade unless the vacuum is lost.

Figure 4. Image of an evacuated tubes solar thermal panel

Flat plate solar thermal systems comprise a dark coloured flat plate absorber with an insulated cover, a heat transfer liquid containing antifreeze to transfer heat from the absorber to the hot water tank, and an insulated backing. The flat plate feature of the solar panel increases the surface area for heat absorption. The heat transfer liquid is circulated through copper or silicon tubes contained within the flat surface plate.

In an area of the UK that produces an average level of solar energy, the amount of energy a flat plate solar collector generates equates to around one square foot panel generating one gallon (4.5 litres) of one day's hot water.

This design of solar panel is, overall, slightly less compact and less efficient when compared with an evacuated tube system, however this is reflected in a lower overall price. Solar thermal can typically provide up to 50% of total hot water demand (depending on the size of the system), and can have a life expectancy of over 25 years.

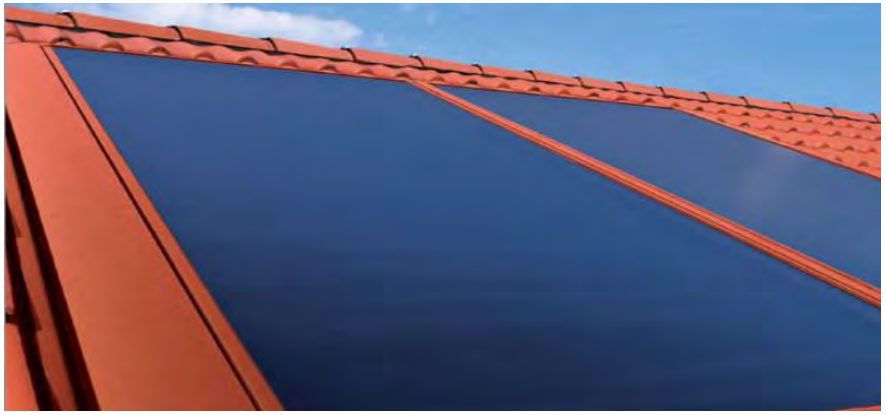

Figure 5. Image of a flat plate solar thermal panel

Applicability to development

Whilst the use of solar thermal panels to generate hot water is in principle a feasible technology for the project, the visual impact of external roof features has been a key area of concern for the planners due to the location of the development and the Grade II* listed nature of number 32 Torrington Square. A copy of the pre-planning feedback letter from Camden stating the above has been included in Appendix I of this report.

Therefore, the installation of Solar Thermal collectors is not feasible for the project.

Heat Pumps

A heat pump is a device that is able to transfer heat from one fluid (e.g. external air) which is at a lower temperature to another fluid (e.g. internal air) at a higher temperature. This is typically achieved through use of a refrigerant that is pumped around a closed circuit of pipework using a pump (compressor). Heat Pumps can be considered low or zero carbon when the heat is take from a renewable source such as ground heat or external air. The efficiency of a heat pump is termed 'coefficient of performance' or C.O.P, and is the ratio of electrical (input) energy to drive the pump to the heat or output energy of the system. A typical air source heat pump has a COP of ~2.5 which means that for every unit of electrical energy used by the pump, the system will produce 2.5 units of heat energy (of which 1.5 units comes from the air, and the other 1 unit comes from the pumping energy).

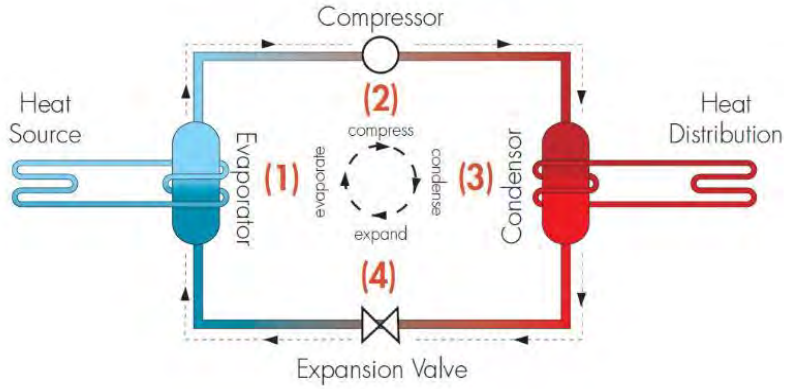

Figure 6. Heat Pump cycle

Types of Heat Pumps

HPs are categorised as follows depending on the source of heat:

A **Ground Source Heat Pump** (GSHP) uses buried coils to extract the heat from the ground into a fluid that contains a mixture of water and antifreeze. The fluid is then passed through a heat exchanger into the heat pump. The ground stays at a fairly constant temperature under the surface, so the heat pump can be used throughout the year – even in the middle of winter.

Coils can be laid down horizontally, which requires larger surface areas, vertically into 100-150m deep boreholes or can be integrated into the building piles – also called thermal piles. When there is an aquifer in close proximity to the site, boreholes can be 'open loop' and directly circulate water from the aquifer as the working fluid.

A **Water Source Heat Pump** (WSHP) produces heat in a similar way to ground source systems. Pipes are submerged in a river, stream or lake, where temperatures can remain at a relatively constant level of between 7 and 12 degrees. Fluid in the pipes absorb the heat from the open water source. This fluid in turn is passed through a heat pump which transfers the heat energy to a distribution system within the building (e.g. radiators, underfloor heating or fan coil units).

An **Air Source Heat Pump** (ASHP) takes heat directly from the external air and boosts it to a higher temperature using a heat pump. As with the above systems, the pump (compressor) needs electricity to operate. As with most Heat Pumps, ASHPs come in different sizes and configurations. One form of ASHP is called Variable Refrigerant Flow / Volume (VRF/VRV) which can deliver both heating and cooling within a building, but also recover heat from one area and transfer the heat to another area through a refrigeration circuit. This can therefore maximise the carbon emissions savings when installed in buildings that may have concurrent heating and cooling demand such as in offices.

Applicability to the development

The installation of a VRF system could make use of heat recovery between the terminal units, helping to deliver excellent heating and cooling efficiencies. In addition, high carbon savings could be achieved. **However, heat pumps cannot be considered as a viable solution**.

They would need to serve a listed building with poor infiltration and poor U-values and this would require high flow and return temperatures that cannot be efficiently provided by a heat pump.

Wind Turbines

Wind turbines use the energy of the wind to generate electricity. On-shore and off-shore wind farms are one of the most widely used technologies for large scale generation of renewable energy with a total installed capacity in the UK of over 28 gigawatts with a 60%/40% on-shore/off-shore split (as of 2014)[7]. Whilst large scale turbines (1MW+) are a financially viable technology for producing clean energy, their visual impact together with the extensive area requirements make them unsuitable for use in most city/town centre locations.

Figure 7. Image of a wind turbine

With sizes typically between 0.3 and 10kW 'Microwind', or 'Small-wind' turbines, are an alternative which can be considered for on-site use as roof mounted devices. According to the Energy Saving Trust, forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines. Whilst this statement applies to some areas, ground roughness due to the built landscape can create turbulence which quite often make the use of roof mounted turbines unfeasible. Also, it is recommended that annual wind speeds average at least 6m/s to provide significant carbon emissions savings.

Applicability to development

Large scale wind turbines can present nuisances such as noise and flicker effect which are not considered acceptable for an urban development of this nature, and are likely to face significant objection through the planning process.

With regards to roof mounted wind turbines, recent studies demonstrate that they underperform in urban environments as a result of turbulent air flows, and therefore they are not deemed suitable for a building in this location. Additionally, roof mounted turbines present issues to the currently proposed building structure due to vibration and structural loading.

Therefore, **Wind Turbines are not considered a suitable option for this development.**

[7] According to the Department of Energy and Climate Change "Digest of United Kingdom Energy Statistics 2014"

Biomass Heating

Biomass heating systems for domestic or commercial use typically burn wood pellets, chips or logs to provide warmth to a single room, or multiple rooms when the heat is delivered through a central heating system. Biomass can also be produced from non-woody fuel sources such as sugar, starch or oils, although most commercially available systems in the UK work with wood based fuel usually in the shape of wood chips or pellets. Wood, in the form of logs, can also be used in some systems, but need to be manually fed and therefore are not viable for most commercial buildings.

Figure 8. Image of wood pellets

Wood chips are typically the cheapest form of biomass (depending on the source of supply), but require larger storage space than pellets as they typically have a lower calorific value per unit volume of fuel as a result of their irregular shape and higher moisture content. On the other hand, **pellets** require more energy to manufacture and quality can significantly vary so sourcing needs careful consideration. In both cases, in addition to the storage requirements of biomass fuels, long term local reliable supply can be an issue. With limited availability in the UK, it is important to set up supply agreements when installing a biomass boiler to avoid price escalation, lack of supply or sourcing of the fuel from abroad. New sustainability criteria regarding biomass has been introduced for the Renewable Heat Incentive (RHI) which will make sure biomass meets the Government's carbon and environmental objectives, ensuring that support delivers value for money. This will affect domestic and non-domestic RHI participants; producers and traders of biomass fuels.

Biomass boilers come in a wide range of sizes and fuel storage / feed configurations. As well as heat only boilers, a limited number of manufacturers also produce biomass combined heat and power systems that can run on biomass fuel, although they are relatively expensive and are only available in a limited range of sizes (outputs).

Applicability to development

Use of biomass heating requires a large area for the supply of pellets which must be within easy reach for the pellets/chips to be blown. The development does not have any available area making the use of this technology unfeasible. In addition, the burning of biomass produces high particulate and NOx emissions which can reduce local air quality, particularly in urban settings.

For these reasons **Biomass heating is not considered a suitable option for this development.**

Biomass Combined Heat and Power

Combined heat and power (CHP) systems integrate the production of usable heat and power (electricity) in one single, highly efficient process. CHP generates electricity whilst also capturing usable heat that is produced as a by-product of the generation process. This contrasts with conventional methods of generating electricity where heat, produced as a by-product of the generation process, is simply wasted. When comparing the energy needed to generate equivalent amounts of heat and electricity via a coal powered station (for electricity) and a conventional boiler (for heat) with a CHP, the overall efficiency of the process increases from less than 50% to over 80%.

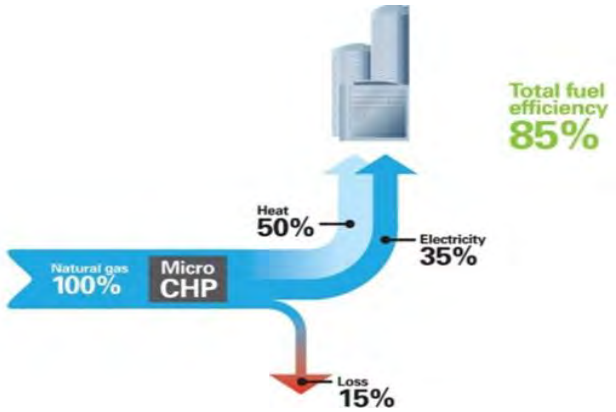

Figure 9. miniCHP typical efficiencies

Whilst CHP systems are Low Carbon Technologies, in order to be classified as renewable the need to operate on a renewable fuel, which is usually either biofuel or biomass.

In order to be financially viable, it is recommended that CHP systems operate for at least 4,500 to 5,000 hours a year which requires a year-round demand for heat.

Applicability to development

The use of a Biomass CHP can be ruled out on the same basis as Biomass Heating (see previous section). Additionally, CHP systems operating on renewable fuels (biomass/biofuel) are not as common as gas systems and therefore are only available in a limited range of sizes, generally too large for this type of developments.

Therefore, a **Biomass/Biofuel CHP is not considered the best solution for this development;**

APPENDIX F: BRUKL REPORT (The Annex)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

TE0220 - BK - 33 TORRINGTON SQUARE As designed

Date: Fri Jul 14 14:52:45 2017

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	23.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	23.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	21.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000005:Surf[0]
Floor	0.25	0.1	0.1	00000005:Surf[6]
Roof	0.25	0.1	0.1	0100002C:Surf[2]
Windows***, roof windows, and rooflights	2.2	1.38	1.4	00000005:Surf[4]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	9

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- HVAC - 2

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- HVAC - 1

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	3.6	0	2	0.75
Standard value	0.91*	2.55	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

3- HVAC - 3

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	-	0.2	0	0.75
Standard value	0.91*	N/A	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.81	-
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	**System type in Non-domestic Building Services Compliance Guide**
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
-01_Control Room (CAVE)	-	-	-	-	-	-	-	0.3	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-01_Control Room (EEG)	-	-	-	-	-	-	-	0.3	-	-	N/A
-01_Control Room (Nap)	-	-	-	-	-	-	-	0.3	-	-	N/A
00_Circulation	-	-	-	2	-	-	-	-	-	-	N/A
00_Entrance	-	-	-	2	-	-	-	-	-	-	N/A
00_Reception	-	-	-	2	-	-	-	-	-	-	N/A
01_Control Room	-	-	-	-	-	-	-	0.3	-	-	N/A
01_Home Environment Research	-	-	-	-	-	-	-	0.3	-	-	N/A
01_Waiting Room	-	-	-	-	-	-	-	0.3	-	-	N/A
02_Control Room (EEG)	-	-	-	-	-	-	-	0.3	-	-	N/A
02_Early Intervention Environ. Research	-	-	-	-	-	-	-	0.3	-	-	N/A
02_Waiting Room	-	-	-	-	-	-	-	0.3	-	-	N/A
03_Control Room	-	-	-	-	-	-	-	0.3	-	-	N/A
03_Pre-School Environ. Research	-	-	-	-	-	-	-	0.3	-	-	N/A
03_Waiting Room	-	-	-	-	-	-	-	0.3	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-01_Circulation	-	60	-	40
-01_Control Room (CAVE)	60	-	-	400
-01_Control Room (EEG)	60	-	-	260
-01_Control Room (Nap)	60	-	-	233
-01_Corridor & Stairs	-	60	-	123
00_Circulation	-	60	15	197
00_Entrance	-	60	15	156
00_Reception	-	60	15	77
01_Circulation	-	60	-	50
01_Circulation	-	60	-	75
01_Control Room	60	-	-	173
01_DDA WC	-	60	-	81
01_Home Environment Research	60	-	-	405
01_Waiting Room	60	-	-	206
02_Control Room (EEG)	60	-	-	236
02_Corridor	-	60	-	40
02_Corridor	-	60	-	68
02_Early Intervention Environ. Research	60	-	-	372
02_Waiting Room	60	-	-	177
03_Control Room	60	-	-	101
03_Corridor	-	60	-	62
03_Corridor	-	60	-	36
03_Pre-School Environ. Research	60	-	-	361
03_Waiting Room	60	-	-	152
03_WC	-	60	-	81

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-01_Control Room (CAVE)	N/A	N/A
-01_Control Room (EEG)	N/A	N/A
-01_Control Room (Nap)	N/A	N/A
00_Circulation	NO (-96.9%)	NO
00_Entrance	NO (-80.7%)	NO
00_Reception	NO (-35.2%)	NO
01_Control Room	N/A	N/A
01_Home Environment Research	NO (-62.3%)	NO
01_Waiting Room	NO (-90.3%)	NO
02_Control Room (EEG)	N/A	N/A
02_Early Intervention Environ. Research	NO (-77%)	NO
02_Waiting Room	NO (-93.6%)	NO
03_Control Room	N/A	N/A
03_Pre-School Environ. Research	NO (-80.9%)	NO
03_Waiting Room	NO (-78.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	455.1	455.1
External area [m^2]	842.1	842.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	9	3
Average conductance [W/K]	175.26	368.21
Average U-value [W/m^2K]	0.21	0.44
Alpha value* [%]	10.12	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	15.92	26.46
Cooling	2.58	2.84
Auxiliary	10.01	9.7
Lighting	20.16	22.4
Hot water	2.02	1.71
Equipment*	26.55	26.55
TOTAL**	**50.69**	**63.12**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	80.4	120.93
Primary energy* [kWh/m^2]	126.17	138.78
Total emissions [kg/m^2]	21.5	23.9

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	37.1	61.1	12.3	4.9	15.5	0.84	3.43	0.91	4.5
	Notional	61.8	74.5	19.9	5.5	16.1	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	71	0	23.1	0	2.6	0.85	0	0.91	0
	Notional	103.4	0	33.3	0	2.6	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	34.7	0	11.3	0	7.8	0.85	0	0.91	0
	Notional	106.4	0	34.3	0	2.9	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.15	00000005:Surf[0]
Floor	0.2	0.1	0100002C:Surf[3]
Roof	0.15	0.1	0100002C:Surf[2]
Windows, roof windows, and rooflights	1.5	1.1	SH000007:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	9

APPENDIX G: BRUKL REPORT (32 TORRINGTON SQUARE)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

TE0220 - BK - 32 TORRINGTON SQUARE As designed

Date: Fri Jul 14 13:31:49 2017

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.7

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.7

BRUKL compliance check version: v5.3.a.0

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	16.2
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.2
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	34.8
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	1.49	1.6	RM00000B:Surf[3]
Floor	0.25	0.9	0.9	0100000B:Surf[6]
Roof	0.25	0.54	2.81	0100000D:Surf[7]
Windows***, roof windows, and rooflights	2.2	4.33	4.33	RM00000B:Surf[1]
Personnel doors	2.2	2.2	2.2	RM00000B:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	35

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- HVAC - 2

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- HVAC - 3

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	-	0.2	0	0.75
Standard value	0.91*	N/A	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	**System type in Non-domestic Building Services Compliance Guide**
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
01_Toilet	-	-	0.4	-	-	-	-	-	-	-	N/A
-01 Equipment and Analysis Room	-	-	-	2	-	-	-	-	-	-	N/A
-01_Desk Office (3P)	-	-	-	2	-	-	-	-	-	-	N/A
-01_Toilet	-	-	0.4	-	-	-	-	-	-	-	N/A
00_Toilet	-	-	0.4	-	-	-	-	-	-	-	N/A

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
00_Circulation	-	60	-	84

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
01_Circulation	-	60	-	51
02_Office_1P	60	-	-	143
02_Circulation	-	60	-	54
02_Storage	60	-	-	9
03_Office_1P	60	-	-	127
03_Circulation	-	60	-	25
03_Office_1P	60	-	-	115
01_Toilet	-	60	-	38
-01 Equipment and Analysis Room	60	-	-	308
-01_Cleaner	60	-	-	14
-01_Desk Office (3P)	60	-	-	177
-01_Toilet	-	60	-	42
-01_Store	60	-	-	6
-01_Circulation	-	60	-	38
-01_Store	60	-	-	5
-01_Toilet Lobby	-	60	-	52
00_Office_8P	60	-	-	326
00_Office_3P	60	-	-	202
01_Seminar Room	60	-	-	389
01_Circulation	-	60	-	35
01_Kitchen	-	60	-	237
02_Office_7P	60	-	-	236
02_Circulation	-	60	-	27
02_Office_4P	60	-	-	162
03_Office_7P	60	-	-	220
03_Circulation	-	60	-	22
03_Office_4P	60	-	-	147
00_Toilet	-	60	-	36
00_Toilet Lobby	-	60	-	19
00_Storage	60	-	-	9
01_Storage	60	-	-	8
01_Toilet Lobby	-	60	-	18

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02_Office_1P	NO (-11.3%)	NO
03_Office_1P	NO (-25.7%)	NO
03_Office_1P	NO (-56.9%)	NO
-01 Equipment and Analysis Room	NO (-40.4%)	NO
-01_Desk Office (3P)	NO (-63.5%)	NO
00_Office_8P	YES (+6.1%)	NO
00_Office_3P	NO (-47.7%)	NO
01_Seminar Room	YES (+27.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02_Office_7P	NO (-40.7%)	NO
02_Office_4P	NO (-57%)	NO
03_Office_7P	NO (-48.8%)	NO
03_Office_4P	NO (-62.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	349.7	349.7
External area [m^2]	417.5	417.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	35	3
Average conductance [W/K]	787.29	214.72
Average U-value [W/m^2K]	1.89	0.51
Alpha value* [%]	9.21	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	110.44	21.82
Cooling	0	0
Auxiliary	2.03	1.4
Lighting	16.7	20.02
Hot water	2.3	1.95
Equipment*	31.09	31.09
TOTAL**	**131.48**	**45.18**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	339.82	67.72
Primary energy* [kWh/m^2]	199.32	92.87
Total emissions [kg/m^2]	34.8	16.2

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	431	0	140.1	0	1.5	0.85	0	0.91	0
	Notional	93.1	0	30	0	1.5	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	335.2	0	108.9	0	8.5	0.85	0	0.91	0
	Notional	23.6	0	7.6	0	3.1	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.78	0100000B:Surf[5]
Floor	0.2	0.9	0100000B:Surf[6]
Roof	0.15	0.12	03000003:Surf[3]
Windows, roof windows, and rooflights	1.5	4.33	RM00000B:Surf[1]
Personnel doors	1.5	2.2	RM00000B:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	35

APPENDIX H: BREEAM CHECKLIST

BREEAM PRE-ASSESSMENT CHECKLIST - 32 Torrington Square and Annex

A = Available
A=Achievable
U=Unobtainable
Minimum Requirements

	MANAGEMENT - Requirements	The Annex (New Extension) A	A	U	32 Torrington Square (Refurb) A	A	U
MAN 01 - Project Brief and Design	**One credit-Stakeholder consultation (project delivery)** 1. A clear sustainability brief is developed prior to Concept Design which sets out: Client requirements, Sustainability objectives and targets including target BREEAM rating, business objectives etc., Timescales and budget, List of consultees and professional appointments that may be required and Constraints for the project. 2. Project delivery stakeholders (client, the building occupier -where known-, the design team and the principal contractor)are met no later than RIBA Stage 2 to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery. 3. Defining the roles and responsibilities for each key phase of the project, including (but not limited to): end user requirements, occupiers budget and technical expertise in maintaining any proposed systems, maintainability and adaptability requirements for training and aftercare support. 4. Demonstrate how the outcomes of the consultation process have influenced or changed the Initial Project Brief, including if appropriate, the Project Execution Plan, Communication Strategy, and the Concept Design.	1	1		1	1	
	One credit-Stakeholder consultation (third party) Prior to completion of the Concept Design stage, all relevant third party stakeholders have been consulted by the design team and this covers the minimum consultation content. The project must demonstrate how the stakeholder contributions and outcomes of the consultation exercise have influenced or changed the Initial Project Brief and Concept Design.Consultation must be undertaken by Concept Design, feedback must be incorporated into the proposal and consultation feedback must be given to and received by, all relevant parties no later than detailed Design (RIBA Stage 4).	1	1		1	1	
	One credit-Sustainability Champion (design) 1. A Sustainability Champion (BREEAM AP) is appointed no later than RIBA Stage 1. 2. BREEAM Rating Target is set by the Sustainability champion and agreed by client and design team no later than RIBA Stage 2 3. The targeted BREEAM rating is achieved.	1	1		1	1	
	One credit-Sustainability Champion (monitoring) 1. The credit above is achieved. 2. The Sustainability Champion is appointed to monitor and report progress throughout the project. As a minimum must attend key project/design team meetings during the Concept Design, Developed Design and Technical Design stages and reporting during, and prior to, completion of each stage.	1	1		1	1	
MAN 02 - Life cycle cost and service life planning	**Two credits-Elemental life cycle cost (LCC)** 1. An elemental life cycle cost (LCC) analysis has been carried out, at RIBA Stage 2 together with any design option appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865:2008. 2. The LCC analysis shows options for basic structure and envelope also covering multiple cash flow scenarios e.g. 20, 30, 50+ years; It must also include a fabric and servicing strategy for the project outlining services component and fit-out options (if applicable) over a 15-year period.	2		2	2		2
	One credit-Component level LCC Plan 1. A component level LCC plan has been developed by the end of RIBA Stage 4 in line with PD 156865:2008 and includes: Envelope, Services, Finishes and External spaces. 2. Demonstrate, how the LCC plan has influenced building and systems design/specification to minimise life cycle costs and maximise critical value. - Part 1 assessments, including components within scope of works. - Envelope, e.g. cladding, windows, and/or roofing - Part 2 & 3 assessments including newly specified local and core services. - Newly specified local and/or core service equipment, e.g. boiler, air-conditioning, air handling unit, and/or controls etc. - Parts 1 – 4, where finishes are within scope of works. - Finishes, e.g. walls, partitions, floors and/or ceilings etc. - Where external spaces are within scope of works. - External spaces, e.g. alternative hard landscaping, boundary protection	1		1	1		1
	One credit-Capital Cost Reporting 1. Report the capital cost for the building in pounds per square metre (£k/ m2), via the BREEAM Assessment Scoring and Reporting tool, Assessment Issue Scoring tab, Management section. Data will be treated as confidential and will only be used anonymously. Data for Design Stage compliance can be based on predicted capital cost, including contingencies.	1	1		1	1	
MAN 03 - Responsible Construction Practices	**Pre-requisite** All timber and timber based products used on the project is 'Legally harvested and traded timber'.						
	One credit-Environmental management 1. The principal contractor operates an environmental management system (EMS) covering their main operations (ISO 14001/EMAS) or equivalent standard; or have a structure that is in compliance with BS 8555:2003 and has reached phase four of the implementation stage, 'implementation and operation of the environmental management system', and has completed phase audits one to four, as defined in BS 8555. 2. The principal contractor implements best practice on-site in accordance with Pollution Prevention Guidelines, Working at construction and demolition-sites: PPG61.	1	1		1	1	
	One credit-Sustainability Champion 1. A Sustainability Champion (like the contractor's environmental manager) to monitor environmental performance and ensure implementation of relevant measures during the Construction, Handover and Close Out stages 2. Will ideally be site based or will visit the site regularly to carry out spot checks (and record evidence including photos), with the relevant authority to do so and require action to be taken to address shortcomings in compliance, which should be reported at relevant project team meetings. 3. The BREEAM target rating forms a requirement of the principal contractor's contract and the rating is achieve at PC.	1	1		1	1	
	Two credits-Considerate construction 1. One credit: a CCS score between 25 and 34 with at least 5 points achieved per section. 2. Two credits: a CCS score between 35 and 39 with at least 7 points achieved per section. **1 credit minimum requirement for Excellent rating.** **2 credits minimum requirement for Outstanding rating.**	2	2		2	2	
	EXEMPLARY CRITERIA - Considerate construction A CCS score of 40 or more with at least 7 points achieved per section is achieved.						
	Two credits-Monitoring of refurbishment or fit-out-site impacts 1. One credit: monitoring of water and energy consumption. 2. Two credits: monitoring of transport of construction materials to site and waste from site. Specific requirements apply depending on the parts being assessed. Contractor to liaise with BREEAM assessor.	2	2		2	2	

MAN 04 - Commissioning and handover	**One credit-Commissioning and testing schedule and responsibilities** 1. Commissioning schedule covering commissioning and re-commissioning of building services and control systems and testing. 2. The schedule will identify the appropriate standards such as current Building Regulations, BSRIA and CIBSE guidelines. Specific requirements apply to BMS commissioning. 3. An appropriate project team member(s) is appointed to monitor and programme pre-commissioning, commissioning, testing and, where necessary, re-commissioning activities on behalf of the client. 4. The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and main programme of works.	1	1		1	1	
	One credit-Commissioning Building Services 1. The above credit is achieved. 2. A specialist commissioning manager is appointed for complex building systems during the design stage (by either the client or the principal contractor) with responsibility for: - Undertaking design reviews and giving advice on suitability for ease of commissioning. - Providing commissioning management input to construction programming and during installation stages. - Management of commissioning, performance testing and handover/post-handover stages.	1	1		1	1	
	One credit-Testing and inspection building fabric 1. Where the fabric of the building is being upgraded, a thermographic survey as well as an airtightness test and inspection is undertaken by a Suitably Qualified Professional in accordance with the appropriate standard. 2. Any defects identified are rectified prior to building handover and close out.	1	1				
	One credit-Handover 1. A Building User Guide (BUG) is developed **This is a minimum requirement for Excellent and Outstanding ratings.** 2. A training schedule is prepared for building occupiers/premises managers, timed appropriately around handover and proposed occupation plans, which includes the following content as a minimum: - The building's design intent - The available aftercare provision and aftercare team main contact(s), including any scheduled seasonal commissioning and post occupancy evaluation - Introduction to, and demonstration of, installed systems and key features, particularly building management systems, controls and their interfaces - Introduction to the Building User Guide and other relevant building documentation, e.g. design data, technical guides, maintenance strategy, operations and maintenance (O&M) manual, commissioning records, log book etc. - Maintenance requirements, including any maintenance contracts and regimes in place.	1	1		1	1	
MAN 05 - Aftercare	**One credit-Aftercare support** 1.The following will be provided: - A meeting between the aftercare team/individual and the building occupier/management (prior to initial occupation, or as soon as possible thereafter) to introduce the aftercare team and support (BUG and training schedule/content) AND Present key information about the building to ensure it operates as efficiently and effectively as possible. - On-site facilities management training. - Aftercare support for at least the first month of building occupation - on-site attendance on a weekly basis (flexible) to support building users and management. - Aftercare support provision for occupants for at least the first 12 months from occupation (helpline, nominated individual, etc.). 2. Collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is occupied.	1	1		1	1	
	One credit-Seasonal commissioning Seasonal commissioning activities will be completed over a minimum 12-month period, once the building becomes substantially occupied (building services testing, interview with occupants ,etc.). **This is a minimum requirement for Excellent and Outstanding ratings for Parts 2 & 3.**	1	1		1	1	
	One credit-Post occupancy evaluation (POE) 1. A POE is undertaken by the client or building occupant one year after initial building occupation. The POE can be carried out by a team member if evidence is provided that robustly demonstrates the independence of the consultation process. 2. Post occupancy performance information is disseminated internally and externally via case study publicly available (website, publicly available literature, press release etc.) unless confidentiality issues are demonstrated, in which case internal distribution only would be accepted.	1	1		1	1	
	EXEMPLARY CRITERIA Provision of the following at quarterly intervals for the first three years of building occupation: - Collection and analysis of occupant satisfaction, energy consumption and water consumption data. - Setting targets for reducing water and energy consumption and monitor progress towards these. - Feedback any 'lessons learned' to the design team and developer. - Provision of the actual annual building energy, water consumption and occupant satisfaction data to BRE.		1			1	
HEALTH & WELLBEING - Requirements		A	A	U	A	A	U
	One credit-Glare control 1. Designing out glare out of all relevant building areas (workstations, projector screens etc.) through building form and layout and/or building design measures. Measures include: low eaves, occupant controlled blinds - transmittance value is < 0.1 (10%), external shading. 2. The strategy must avoid increasing lighting energy consumption, by taking daylight access into consideration and ensuring that the use or location of shading does not conflict with the operation of lighting control systems.	1	1		1	1	
	Three credits -Daylighting Credits are awarded on a sliding scale as follows: Option 1 - 1 credit if 40% of the areas achieve a DF of 2% - 2 credits if 60% of the areas achieve a DF of 2% - 3 credits if 80% of the areas achieve a DF of 2% AND The areas achieve a uniformity ratio of at least 0.3 or a minimum point daylight factor of at least 0.3 times the relevant average daylight factor below. For spaces with glazed roofs, such as atria, a 0.7 figure should be taken instead of 0.3. OR At least 80% of the room has a view of sky from desk or table top height (0.85m in multi-residential buildings, 0.7m in other buildings) and the depth criteria is met. Option 2 - 1 credit if 40% if the occupied spaces achieve average daylight illuminance of at least 300 lux for 2000 hours per year or more and a minimum illuminance at the worst lit point of at least 90 lux for 2000 hours per year or more. - 2 credits if 60% of the areas achieve a DF of 2% - 3 credits if 80% **Two credits -Daylighting** Daylighting provision, averaged over all relevant spaces, has improved after refurbishment or fit-out by 30% or more and there is a minimum glazing to floor area ratio of either: 5% glass to floor area ratio for side windows; OR 2.5% glass to floor area ratio for roof lights; **One credit -Daylighting** When it achieves 15% improvement.				3		3

HEA 01 - Visual Comfort	**One credit-Daylighting** **ROUTE 1** When 80% of the occupied areas achieve an Average Daylight Factor (ADF)≥2% AND one of the following: A uniformity ratio of at least 0.3 or a minimum point daylight factor of at least 0.3 times the above ADF. Glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7 or a minimum point daylight factor of at least 0.7 times the ADF. OR **ROUTE 2** When 80% of the other occupied areas achieve an average daylight illuminance of a least 300 lux for 2000 hours per year and a minimum daylight illuminance at worst lit point of at least 90 lux for 2000 hours per year.	1		1				
	EXEMPLARY CRITERIA-Daylighting When daylighting levels in compliance with BREEAM exemplary performance criteria are achieved.							
	Two credits-View out 1. 95% of the floor area in relevant building areas(areas with workstations/benches or where close work will be undertaken or visual aids will be used) is within 7m of a wall with an adequate view out. **One credit-View out** 1. Where 80% of the floor area achieved compliance with Criterion 1 above. 2. The window/opening is ≥ 20% of the surrounding wall area. Where the room depth >7m, compliance is only possible where the %window/opening ≥ values in table 1.0 of BS 8206. It must be noted that specific criteria applies to the type of view out depending on the building use. Additional criteria applies to Prison, Multi-residential and Healthcare buildings.					2		2
	One credit-View out 1. 95% of the floor area in relevant building areas(areas with workstations/benches or where close work will be undertaken or visual aids will be used) is within 7m of a wall with an adequate view out. 2. The window/opening is ≥ 20% of the surrounding wall area. Where the room depth >7m, compliance is only possible where the %window/opening ≥ values in table 1.0 of BS 8206.	1	1					
	One credit-Internal and external lighting levels, zoning and control **INTERNAL LIGHTING** - All fluorescent and compact fluorescent lamps are fitted with high frequency ballasts. - Illuminance levels in accordance with the SLL Code for Lighting 2012 and any other relevant industry standard. - Compliance with CIBSE LG7 for areas where computer screens are regularly used **EXTERNAL LIGHTING** Must be specified in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places. **ZONING AND OCCUPANT CONTROL** - Independent occupant control of areas including -but not limited to-: office zones of no more than four workplaces, workstations adjacent to windows/atria, presentation and audience areas in seminar and lecture rooms, zoning of seating areas, circulation space and lectern area in auditoria, servery and seating/dining areas in dining restaurant and café areas, bar and seating areas in bar areas.	1	1		1	1		
HEA 02 - Indoor air quality	**One credit-Indoor air quality (IAQ) plan** An indoor air quality plan has been produced which considers: removal of contaminant sources, dilution and control of contaminant sources, procedures for pre-occupancy flush out, protection of HVAC systems, procedures for protecting areas outside of the refurbishment zone that may be affected, third party testing and analysis and commitments for maintaining indoor air quality in-use.	1	1		1	1		
	One credit-Ventilation 1. Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation. 2. The building's air intakes and exhausts are over 10m apart and intakes are over 20m from sources of external pollution (unless relative position is designed in accordance with BS EN 13779:2007 Annex A2). 3. In naturally ventilated buildings/spaces: openable windows/ventilators are over 10m from sources of external pollution. 4. HVAC systems incorporate filtration as defined in BS EN 13779:2007 Annex A3. 5. Areas of the building subject to large and unpredictable or variable occupancy patterns (such as Auditoria, gyms, retail stores or malls, cinemas and waiting rooms) have carbon dioxide (CO2) or air quality sensors specified which are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space. **In naturally ventilated buildings/spaces:** sensors either have the ability to alert the building owner or manager when CO2 levels exceed the recommended set point, or are linked to controls with the ability to adjust the quantity of fresh air, i.e. automatic opening windows/roof vents.	1		1	1		1	
	One credit-Volatile organic compound (VOC) emission levels (products) **1.** All decorative paints and varnishes specified meet the criteria established by BREEAM. 2. At least five of the seven remaining product categories meet the criteria established by BREEAM.	1	1		1		1	
	One credit-Volatile organic compound (VOC) emission levels (post construction) 1. Formaldehyde and total volatile organic compound (TVOC) concentration level are measured post construction (but pre-occupancy) and comply with BREEAM maximum levels. 2. If levels are not met, the project team confirms the measures that have, or will be taken, in accordance with the IAQ plan, to reduce the levels to within these limits.	1	1		1			
	EXEMPLARY CRITERIA - VOC **One credit** 1. All seven product categories meet the testing requirements and emission levels criteria. 2. Tested product formaldehyde emission levels are ≥ 0.06mg/m3 air. Two credits 1. As above plus tested product formaldehyde emission levels are ≥ 0.01mg/m3 air.							
	One credit-Adaptability - Potential for natural ventilation Occupied spaces of the building are designed to be capable of providing fresh air entirely via a natural ventilation strategy. This is demonstrated when: - Room depths are designed in accordance with CIBSE AM10 (section 2.4) and the openable window area in each occupied space is equivalent to 5% of the gross internal floor area of that room/floor plate. OR - Cross ventilation is demonstrated via design tools recommended in CIBSE AM10. For fit-out projects (Part 3 assessments), local services are designed to provide fresh air via a natural ventilation strategy and are appropriately designed according to the room depth in accordance with CIBSE AM10. The natural ventilation strategy is capable of providing at least two levels of user-control on the supply of fresh air.	1		1	1		1	
	One credit-Thermal modelling 1. Thermal modelling is carried out using CIBSE AM11 compliant software. 2. The modelling demonstrates compliance with CIBSE Guide A summer and winter operative temperatures for A/C buildings or compliance with CIBSE Guide A winter temperature and compliance with CIBSE TM52 for summer temperatures. 3. For air conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool. Note: Where undertaking a Part 4 assessment a competent person (e.g. chartered building services engineer) must assess the suitability of existing building services and controls to identify any changes that may be required as a result of fit-out works.	1	1		1		1	

HEA 04 - Thermal comfort	**One credit-Adaptability - for a projected climate change scenario** 1. The above credit is achieved. 2.The thermal modelling demonstrates compliance with the requirements of the thermal comfort credit for a projected climate change environment. 3. Where criteria 2 is not met, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements . 4. For air conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.	1	1		1		1
	One credit-Thermal zoning and controls 1. The thermal comfort credit is achieved. 2. The thermal modelling analysis has informed the temperature control strategy for the building and its users. 3. The strategy for proposed heating/cooling system(s) has addressed the following: - Zones within the building and how the building services could efficiently and appropriately heat or cool these areas (for example different requirements for the central and perimeter areas). - Degree of occupant control (based on discussions with the end user or alternatively design guidance, case studies, feedback) considers: User knowledge of building services, Occupancy type, patterns and room functions, How the user is likely to operate or interact with the system(s), The user expectations and degree of individual control, How the proposed systems will interact with each other and how this may affect the thermal comfort of the building occupants and The need or otherwise for an accessible building user actuated manual override for any automatic systems.	1	1		1		1
HEA 05 - Acoustic performance	**One credit-Sound Insulation** The sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014 - summary of key limits below. Pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures established by BREEAM. **One credit-Internal indoor ambient noise levels** Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014. A programme of acoustic measurements is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures established by BREEAM. **One credit-Reverberation** Achieve reverberation times compliant with Section 2 of APS. In addition, or alternatively, if relevant to the assessed building; classrooms, seminar rooms and lecture theatres achieve reverberation times compliant with section 2 of APS. Where undertaking a partial refurbishment or fit-out, the performance standards and testing requirements defined above for the following principles are applicable to each assessment part: - Part 1: criteria for sound insulation and indoor ambient noise levels - Part 2: criteria for indoor ambient noise levels only - Part 3: criteria for sound insulation and indoor ambient noise levels - Part 4: sound insulation and reverberation control	3	3		3	3	
HEA 06 - Safety & Security	**One credit-Safe access** 1. Dedicated cycle paths provide direct access from off-site cycle paths or the site entrance(s) to any cycle storage provided. 2. Footpaths on-site provide direct access from public footpaths off-site or the site entrance(s) to the building entrance(s). 3. Drop-off areas are designed off/adjoining to the access road and provide direct access to pedestrian footpaths avoiding the need for the pedestrian to cross vehicle access routes. 4. Dedicated pedestrian crossings provided where pedestrian routes cross vehicle access routes, and appropriate traffic calming measures are in place to slow traffic down at these crossing points. 5. For large developments with a high number of public users or visitors, pedestrian footpaths must be signposted to other local amenities and public transport nodes off-site (where existing). 6. The lighting is compliant with BS 5489-1:20131. 7. Delivery areas are not directly accessed through general parking areas and do not cross or share pedestrian and cyclist routes and other outside amenity areas accessible to building users and general public. 8. There is a dedicated parking/waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking. 9. Parking and turning areas are designed for simple manoeuvring. 10. There is a dedicated space for the storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff/visitor car parking.	1		1			
	One credit-Security of site and building 1. A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA) and develops a set of recommendations no later than RIBA Stage 2. 2. The recommendations are implemented.	1	1		1	1	
ENERGY - Requirements		A	A	U	A	A	U
ENE 01 - Reduction of energy use and carbon emissions	**Up to fifteen credits** achieved depending on the energy performance of the building using whole Energy Modelling. Up to twelve credits achieved depending on the energy performance of the building using Elemental Level Energy Modelling. 6 **credits minimum requirement for Excellent rating for full assessments** **10 credits minimum requirement for Outstanding rating for full assessments** **Minimum requirements vary for different assessment types**	12	7	5	15	7	8
	EXEMPLARY CRITERIA **Up to four credits - Zero regulated carbon** An equivalent percentage of the building's modelled 'regulated' operational energy consumption, is generated by carbon neutral on-site or near-site sources and used to meet energy demand from 'unregulated' building systems or processes. **Five credits - Carbon negative** The building is 'carbon negative' in terms of its total modelled operational energy consumption, including regulated and unregulated energy.						

ENE 02 - Energy monitoring	**One credit-Sub-metering of major energy consuming systems** 1. Energy metering systems are installed that enable at least 90% of the estimated annual energy consumption of each fuel. 2. Buildings with a total useful floor area > 1,000m2 are metered using an appropriate energy monitoring and management system (BMS or equivalent). 3. The end energy consuming uses are identifiable to the building users (labelling or data outputs). **This credit is a minimum requirement for Very Good, Excellent and Outstanding rating for Parts 2, 3 and 4.** **One credit - 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. NOTE: Space heating and domestic hot water may be combined with a single heat or gas meter per tenanted area/function area/department, where it is impractical to sub-meter these items separately. **NOTE: A compliant Energy and Monitoring System must be capable of the following:** • One or more meters or sensors (transducers) that measure energy use for metering purposes. • Systems to automatically capture, retrieve and store energy metering data electronically. • Software to automatically analyse metered energy data, the key factors that influence energy use and produce reports on **energy consumption.**	2	1	1	2	1	1
ENE 03 - Ext. lighting	**One credit-External lighting** The average initial luminous efficacy of the external light fittings is > 60 luminaire lumens per circuit Watt. All external light fittings are automatically controlled (timer or photocell).	1	1		1	1	
ENE 04 - Low carbon design	**One credit-Passive design analysis** 1. The thermal comfort credit has been achieved. 2. A passive design analysis is undertaken no later than RIBA Stage 2 or equivalent) 3. total heating, cooling, mechanical ventilation and lighting load reductions result in at least 5% of overall building energy demand and/or CO2 emissions savings.	1	1		1		1
	One credit-Free cooling 1. The above credit has been achieved. 2. The passive design analysis reviews opportunities for the implementation of free cooling solutions. 3. Free cooling is provided. Free cooling includes: Night time cooling, Ground coupled air cooling, Displacement ventilation, Ground water cooling, Surface water cooling, Evaporative cooling, direct or indirect, Desiccant dehumidification and evaporative cooling using waste heat, Absorption cooling using waste heat and natural ventilation.	1		1	1		1
	One credit-Low zero carbon feasibility study 1. A feasibility study is carried out by an energy specialist no later than RIBA Stage 2. 2. LZC technologies are specified in line with the recommendations of the report and result on at least 5% of overall building energy demand and/or CO2 emissions savings.	1	1		1	1	
ENE 06 - Energy efficient transportation systems	**One credit-Energy consumption** 1. An analysis of the transportation demand and usage patterns for the building has been carried out to determine the optimum number and size of lifts, escalators and/or moving walks. 2. The energy consumption has been calculated in accordance with BS EN ISO 25745 for one of the following: At least two types of system, An arrangement of systems or A system strategy which is 'fit for purpose'. 3. Regenerative drives are specified where they save more energy than the additional standby energy used to support the drives (usually for high travel and high intensity use). 4. The transportation system with the lowest energy consumption is specified.	1	1				
	One credit-Energy efficient features 1. The first credit is achieved. 2. Standby condition during off-peak periods, energy efficient lift car lighting and display lighting (> 55 lamp lumens/circuit Watt) and variable speed, variable-voltage, and variable-frequency (VVVF) controllers are specified. 3. Regenerative drives are specified is demonstrated to save energy. NOTE: other criteria apply to escalators which must be considered if specified.	2	2				
ENE 08 - Energy efficient equipment	**Two credits-Energy efficient equipment** 1. Identify which of the following is the highest unregulated building energy demand: Small power & plug-in equipment, Swimming pool, Communal laundry facilities with commercial sized appliances, Data centres, IT-intensive operating areas, Residential areas with domestic scale appliances (individual and communal facilities), Healthcare and Kitchen and catering facilities. 2. Specify the energy efficiency measures established by BREEAM for that energy consumption. Small Power - plug-in equipment Office equipment, other small powered equipment and supplementary electric heating have an Energy Star1 rating OR has been procured in accordance with the Government Buying Standards. Additional requirements apply for domestic scale white goods. Data centres Design is in accordance with the 'Best practices for the EU Code of Conduct on Data Centres' principles with the data centre achieving at least the 'Expected minimum practice' level (as defined in the Code of Conduct). Temperature set points are not less than 24°C, as measured at the inlet of the equipment in the rack. IT-Intensive operating areas - Uses a natural ventilation and cooling strategy as standard, with forced ventilation only to be used when the internal temperature exceeds 20°C and active cooling only when the internal temperature exceeds 22°C. - There is a mechanism to achieve automatic power-down of equipment when not in-use, including overnight.	2		2	2	2	2
TRANSPORT - Requirements		A	A	U	A	A	U
TRA 01 - Public transport	**Up to three credits- Accessibility to public transport** Achieved depending on the Accessibility Index of the site.	3	3		3	3	
TRA 02 - Proxim	**One credit-Proximity to amenities** At least two of the following amenities must be found within 500m of the building entrance: food outlet(required), access to cash (required), access to an outdoor open space, access to a recreation/leisure facility for fitness/sports.	1	1		1	1	
TRA 03 - Cyclist facilities	**One credit-Cycle storage** Provide 1 accessible cycle racks per 20 building occupants.	1	1		1	1	
	One credit-Cyclist facilities At least two of the following types of compliant cyclist facilities are provided - Showers - 1 per 10 cycle racks - Changing facilities (Toilet/shower cubicles cannot be counted as changing facilities) - Lockers - 1 per cycle rack - Dedicated drying spaces .	1	1		1	1	

TRA 04 - Maximum car parking	**Two credits-Car parking capacity** Up to two credits can be achieved for limiting the car park provision to the BREEAM requirements. Requirements vary depending on the building's accessibility index.	2	2				
TRA 05 - Travel plan	**One credit-Travel plan** Achieved when a BREEAM compliant site specific travel plan is developed and the recommendations are implemented.	1	1		1	1	
	WATER - Requirements	A	A	U	A	A	U
WAT 01 - Water consumption	**Up to three credits-Water consumption** Achieved for reducing the water consumption on site via water efficient fittings and/or water recycling systems. The water consumption (L/person/day) is calculated based on the following 'domestic scale' water-consuming components: WCs, Urinals, Taps, Showers, Baths, Dishwashers (domestic and commercial sized) and Washing machines (domestic and commercial or industrial sized). Any greywater systems must be specified and installed in compliance with BS 8525-1:2010. **One credit minimum requirement for Very Good and Excellent ratings.** **Two credits minimum requirement for Outstanding rating.** **Note: Systems applicability depends on the scope of works of the project and needs to be discussed in detail with the assessor.**	5	3	2	5	3	2
	EXEMPLARY CRITERIA One credit when a 65% water reduction over the BREEAM base case is achieved.						
WAT 02 - Water monitoring	**One credit-Water monitoring** 1. A water meter on the mains water supply to each building is specified. **This is a minimum requirement for Good rating and above for Part 2 assessments.** 2. Water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with easily accessible sub-meters or have water monitoring equipment integral to the plant or area. 3. Each meter (main and sub) has a pulsed output and is connected to the BMS is present. If the refurbishment or fit-out zone is within a building that is leasehold, the pulsed/digital water meter(s) for the refurbishment or fit-out zone must be connected to the incoming water supply for water using equipment in tenanted areas. NOTE: On sites with multiple units or buildings, e.g. shopping centres, industrial units, retail parks etc. separate sub meters are fitted on the water supply to the following areas (where present): - Each individual unit supplied with water - Common areas (covering the supply to toilet blocks) - Service areas (covering the supply to outlets within storage, delivery, waste disposal areas etc.) - Ancillary/separate buildings to the main development with water supply.	1	1		1	1	
WAT 03 - Major leak detection	**One credit-Leak detection system** A system is installed which is able to detect any leak within the building as well as between the building and the site boundary and which is also: - Audible when activated - Activated when the flow of water passes through the water meter/data logger at a flow rate above a pre-set maximum for a pre-set period of time - Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods - Programmable to suit the owner/occupiers' water consumption criteria - Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.	1	1		1	1	
WAT 03 - Major leak detection	**One credit-Flow control device** A time controller, a programmed time controller, a volume controller, a presence detector and controller or a central control unit is installed to regulate the supply of water to each WC area/facility according to demand. NOTE: In freehold properties where the refurbishment or fit-out is being undertaken by the building owner, this credit is still assessed if there are no installed fittings within the refurbishment or fit-out zone. In these instances the facilities likely to be used by the future occupants of the building must meet the criteria e.g. washrooms and changing rooms to be used by the occupants in the nearest accessible part of the building. In the case of leasehold properties where the refurbishment or fit-out is being undertaken by the tenant and there are no installed fittings within the refurbishment or fit-out zone, this issue is not assessed.	1	1		1	1	
WAT 04 - Water efficient equipment	**One credit-Water efficient equipment** 1. The design team has identified all unregulated water demands that could be realistically mitigated or reduced (typically irrigation and/or process water). 2. System(s) or processes have been identified to achieve a meaningful reduction of the unregulated water demand.	1		1	1		1
	MATERIALS - Requirements	A	A	U	A	A	U
MAT 01 - Life cycle impacts	**Up to four credits-Elemental assessment of environmental performance information** Achieved for using materials with an A/A+ rating in the Green Guide to Specification for main materials including the following: - Part 1 includes elements of the fabric and structure - Part 2 and 3 includes elements used for core and local services - Part 4 includes interior fit-out elements - Hard landscaping and boundary protection are included where within scope of works	5		3	6		4
	EXEMPLARY CRITERIA-Life cycle impact One credit can be achieve following any of the two routes above for demonstrating that an exemplary performance number of points has been achieved.						
MAT 02-Hard landscaping and boundary	**One credit-Hard landscaping and boundary protection** Where at least 80% of all external hard landscaping and 80% of all boundary protection (by area) in the construction zone achieves an A or A+ rating, as defined in the Green Guide to Specification. NOTE: If there are no external areas within the project boundary the credit can be achieved by default.	1	1				
ble sourcing of materials	**Pre-requisite** All timber and timber based products used on the project is 'Legally harvested and traded timber' (see **This is a minimum requirement for achieving any BREEAM rating.**						
	One credit - Sustainable procurement plan The principal contractor sources materials for the project in accordance with a documented sustainable procurement plan covering: 1. Risks and opportunities are identified against a broad range of social, environmental and economic issues. BS 8902:2009 guidance. 2. Aims, objectives and targets to guide sustainable procurement activities. 3. The strategic assessment of sustainably sourced materials available locally and nationally. There should be a policy to procure materials locally where possible. 4. Procedures are in place to check and verify that the plan is being implemented/adhered to (KPI's).	1	1		1	1	

MAT 03 - Responsib	**Up to three credits-Responsible sourcing of materials (RSM)** Credits can be achieved by ensuring that materials are responsibly sourced (BES 6001 certification, EMS/ISO14001 certification etc.). Availability of responsible sourcing certification should be checked with the manufacturer prior to procurement.	3	1	1	3	1	1
	EXEMPLARY CRITERIA-Responsible sourcing of materials (RSM) When high levels of responsible sourcing (achievement of 70% of the available points) are achieved.						
MAT 04 - Insulation	One credit - Embodied impact Insulation specified for Building envelope and building services has an Insulation index no lower than 2.5. The Insulation Index is a parameter created by the BRE to measure Embodied Impact of materials which depends on the thermal properties of the insulation, the amount of insulation and the Green Guide rating of the product. Materials selected should have low thermal conductivity and a Green Guide rating of A or A+.	1	1		1	1	
MAT 05 - Designing for durability and resilience	Protecting vulnerable parts of the building for damage Measures to prevent damage to vulnerable parts of the internal and external building and landscaping elements are specified including: - Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc.). - Protection against any internal vehicular/trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. - Protection against, or prevention from, any potential vehicular collision where vehicular parking and manoeuvring occurs within 1m of the external building façade for all car parking areas and within 2m for all delivery areas.	1	1		1	1	
	Protecting exposed parts of the building from material degradation Measures prevent from environmental factors and biological factors are implemented to prevent degradation from: Corrosion, dimensional change, fading/discolouration, rotting, leaching, blistering, melting, salt crystallisation and abrasion.						
MAT 06 - Material efficiency	**One credit-Material efficiency** 1. Opportunities have been identified, and appropriate measures investigated and implemented, to optimise the use of materials in building design, procurement, construction, maintenance and end of life. Example measures are: reusing existing demolition/strip-out materials, procuring materials with higher levels of recycled content, off-site manufacture or use of pre-assembled service pods. 2. Review is carried out by the design/construction team in consultation with the relevant parties at: Preparation and Brief, Concept Design, Developed Design, Technical Design and Construction.	1	1		1	1	
WASTE - Requirements		A	A	U	A	A	U
WST 01 - Construction waste management	**One credit - Pre-refurbishment Audit** 1. A pre-refurbishment audit is carried out at the Concept Design Stage (equivalent to RIBA stage 2) prior to strip-out or demolition works by a competent person (see Relevant Definitions) who is independent of the project. 2. Actual waste arising and waste management routes used should be compared with those forecast from the audit and barriers to achieving targets should be investigated. 3. The audit must be referenced in the resource management plan and cover: Identification and quantification of the key materials where present on the project, Potential applications and any related issues for the reuse and recycling of the key materials in accordance with the waste hierarchy, Identification of local reprocessors or recyclers, Identification of overall recycling rate for all key materials, Identification of reuse targets where appropriate and Identification of overall landfill diversion rate for all key materials.				1		1
	Two credits - Reuse and direct recycling of materials Credits are achieved when waste materials are either directly re-used on-site or off-site or are sent back to the manufacturer for closed loop recycling. one credit is achieved when 50% of the materials achieve comply with the above and 2 credits when compliance is achieved for 75% of the materials.				2		2
	Up to three credits - Construction resource efficiency 1. A Resource Management Plan (RMP) has been developed covering the non-hazardous waste related to on-site construction and dedicated off-site manufacture or fabrication (including demolition and excavation waste) generated by the building's design and construction. 2. Where construction waste related to on-site construction and dedicated off-site manufacture/fabrication (excluding demolition and excavation waste) meets or is lower than the following: - One credit ≤11.3m3 or ≤3.5 tonnes - Two credits ≤4.5m3 or ≤1.2 tonnes - Three credits ≤2.1 or ≤0.4 tonnes 3. Where existing buildings on the site will be demolished a pre-demolition audit of any existing buildings, structures or hard surfaces is completed and referenced in the RMP. **1 credit minimum requirement for Outstanding rating.** Pre-Demolition Audit (pre-requisite) 3. Where existing buildings on the site will be demolished a pre-demolition audit of any existing buildings, structures or hard surfaces is completed to determine if, in the case of demolition, refurbishment/reuse is feasible and, if not, to maximise the recovery of material from demolition for subsequent high grade/value applications. The audit must be referenced in the RMP and cover: a. Identification of the key refurbishment/demolition materials. b. Potential applications and any related issues for the reuse and recycling of the key refurbishment and demolition materials in accordance with the waste hierarchy.	3	2	1	3	2	1
	One credit - Diversion of resources from landfill 1. The following percentages of non-hazardous construction (on-site and off-site manufacture/fabrication in a dedicated facility), demolition and excavation waste (where applicable) generated by the project have been diverted from landfill: - One credit: 85% by volume or 90% by weight of the construction waste and 90% by volume or 95% by weight of the demolition waste.	1	1		1	1	
	EXEMPLARY CRITERIA When the above targets are increased as follows: - ≤1.4m3 or ≤0.3 tonnes -95% by volume or 97% by weight of the construction waste, 95% by volume or 97% by weight of the demolition waste.						
WST 02 - Recycled aggregates	**One credit-Recycled aggregates** 1. At least 25% (by weight or volume) of the high grade aggregate specified is recycled or secondary aggregate. In addition to this, there are minimum % for each application that must be met. 2. The recycled or secondary aggregates must be either: Construction, demolition and excavation waste obtained on-site or off-site or secondary aggregates obtained from a non-construction post-consumer industrial by product source.	1		1			
	EXEMPLARY CRITERIA-Recycled aggregates 1. In addition to the above, the total high grade recycled aggregate specified is 35% (by weight or volume) and the contributing recycled or secondary aggregate are not be transported more than 30 km by road transport.						

WST 03 - Operational waste	**One credit-Operational waste** 1. A dedicated, clearly labelled, and accessible area is provided for the storage of recyclable materials compliant with the following size: - At least 2m2 per 1000m2 of net floor area for buildings < 5000m - A minimum of 10m2 for buildings ≥5000m2 - An additional 2m2 per 1000m2 of net floor area where catering is provided (with an additional minimum of 10m2 for buildings ≥5000m2). The net floor area should be rounded up to the nearest 1000m 2. Where the consistent generation in volume of the appropriate operational waste streams is likely to exist, the following facilities are provided: - Static waste compactor(s) or baler(s); - Vessel(s) for composting OR adequate space(s) for storing segregated food waste and compostable organic material. - Where organic waste is to be stored/composted on-site, a water outlet is provided adjacent to or within the facility. **This credit is a minimum requirement for Excellent and Outstanding ratings.**	1	1		1	1	
WST 04 - Speculative finishes	**One credit-Speculative Floors and ceilings** For tenanted areas (where the future occupant is not known), prior to full fit-out works, interior finishes (including carpets, other floor finishes, ceiling finishes and any other interior finishes) have been installed in a show area only. In a building being refurbished or fitted out for a specific occupant, that occupant has selected (or agreed to) the specified interior finishes	1	1				
WST 05 - Adaptation to climate change	One credit-Adaptation to climate change – structural and fabric resilience Conduct a climate change adaptation strategy appraisal for structural and fabric resilience no later than RIBA Stage 2 or equivalent. The strategy should be based on an iterative 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 and, where feasible, mitigate against these impacts. The assessment should cover the following stages: Hazard identification, Hazard assessment, Risk estimation, Risk evaluation and Risk management.	1	1				
	EXEMPLARY CRITERIA In addition to the above, the following credits have been achieved: - HEA 04 thermal comfort credit - At least 8 credits under ENE 01 - The passive design credit of ENE 04 - A minimum of 3 credits under WAT 01 - Material degradation credit of MAT 05 - One flood risk credit and two surface run-off credits under POL 03			1			
WST 06 - Functional adaptability	**One credit-Functional adaptability** 1. A building-specific functional adaptation strategy study has been undertaken by the client and design team no later than RIBA Stage 2, which includes recommendations for measures to be incorporated to facilitate future adaptation. the strategy should consider: - The potential for major refurbishment, including replacing the façade. - Replacement of all major plant within the life of the building - Adaptability of the internal environment to accommodate changes in working practices. - Adaptability to change in-use. - Accessibility to local services. 2. Measures are adopted no later than RIBA Stage 4 unless unfeasibility is demonstrated.	1	1		1	1	
LAND USE AND ECOLOGY - Requirements		A	A	U	A	A	U
LE 01 - Site Selection	**One credit-Previously occupied land** At least 75% of the proposed development's footprint is on an area of land which has previously been occupied by industrial, commercial or domestic buildings or fixed surface infrastructure.	1	1				
	One credit-Contaminated land 1. The site is deemed contaminated by a land specialist's site investigation, risk assessment and appraisal identifying: the degree of contamination, the contaminant sources/types and the options for remediating sources of contamination which present an unacceptable risk. 2. Remediation is undertaken.	1		1			
LE 02 - Ecological value of site and protection of	**One credit-Ecological value of the site** The BREEAM checklist for defining land of low ecological value.	1	1				
	One credit-Ecological value of the site 1. All existing features of ecological value are adequately protected from damage in line with BS42020: 2013 2. The principal contractor constructs ecological protection recommended by the SQE, prior to any preliminary site construction or preparation works.	1	1		1	1	
LE 03 - Minimising impact on existing site ecology	**Up to two credits-Improving the biodiversity of the site** - One credit when the change in ecological value of the site is no worse than minus 9 plant species. - Two credits when the change in ecological value of the site is equal to or greater than zero plant species. **1 credit minimum requirement for Very good and above ratings.** NOTE: Where it is not possible to implement ecological enhancements within the construction zone due to overriding security issues, or where space for ecological enhancements within the zone is severely limited, ecological enhancements made to other areas of the site can be taken into account and used to determine the number of BREEAM credits achieved. These enhancements must be made within the boundary of the wider existing development and be planned and commissioned on a similar timescale to the assessed development.	2	2				
LE 04 - Enhancing site ecology	**One credit-Ecologist's report and recommendations** A suitably qualified ecologist (SQE) is appointed no later than RIBA Stage 1 an Ecology Report based on a site visit/survey by the SQE is developed no later than RIBA Stage 2 and the recommendations are implemented.	1	1				
	One credit-Increase in ecological value 1. The above criteria is met. 2. An increase of six plant species or greater is achieved.	1					

LE 05 - Long term impact on biodiversity	**Up to two credits-Long term impact on biodiversity** 1. A Suitably Qualified Ecologist (SQE) is appointed prior to commencement of activities on-site and they confirm that all relevant UK and EU legislation relating to the protection and enhancement of ecology has been complied with during the design and construction process. 2.A landscape and habitat management plan, is produced covering at least the first five years after project completion in accordance with BS 42020:2013 Section 11.1. 3.Where in addition to the above the below is implemented (2 measures - 1 point; 4 measures - 2 points). - The contractor nominates a Biodiversity Champion. - The contractor trains the site workforce on how to protect site ecology during the project. - The contractor records actions taken to protect biodiversity and monitor their effectiveness throughout key stages of the construction process. - Where a new ecologically valuable habitat appropriate to the local area is created. - Where flora and/or fauna habitats exist on-site, the contractor programmes site works to minimise disturbance to wildlife.	2	2		2	2	
	POLLUTION Requirements	A	A	U	A	A	U
POL 01 - Impact of refrigerants	**Pre-requisite** All systems (with electric compressors) comply with the requirements of BS EN 378:2008 (parts 2 and 3) and where refrigeration systems containing ammonia are installed, the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice.						
	Up two credits - Impact of refrigerant - Two credits - the Direct Effect Life Cycle CO2 equivalent emissions (DELC CO2e) ≤ 100 kgCO 2e /kW cooling/heating capacity or if GWP ≤10. - One credit - the DELC CO2e ≤ 1000 kgCO 2e /kW cooling/heating capacity.	2	1		2	1	
POL 01 - Impact of refrigerants	**One credit-Leak detection** 1. A permanent automated refrigerant leak detection system or an in-built automated diagnostic procedure for detecting leakage is installed. 2. The system must be capable of continuously monitoring for leaks and of automatically isolating and containing the remaining refrigerant(s) charge in response to a leak detection incident.	1		1	1		1
POL 02 - NOx emissions	**Up to three credits-Nox emissions** Where NOx emissions associated to heating and hot water demand under normal operating conditions are as follows: - One credit ≤100 mg/kWh - Two credits ≤70mg/kWh - Three credits ≤40mg/kWh	3			3		
POL 03 - Surface water run-off	**Up to two credits-Flood resilience** **Two credits - Low flood risk** 1. A site-specific flood risk assessment (FRA) confirms low annual probability of flooding from all sources. **One credit - Medium/high flood risk** 2. A site specific FRA confirms medium or high annual probability of flooding the is not in a functional floodplain and one of the following is achieved: - The ground level of the building and access to both the building and the site, are designed at least 600mm above the design flood level - The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in section 5 of BS 8533:2011.	2	2		2	2	
	Two credits - Surface water run-off **One credit - neutral impact on surface water** 7. There is no increase in the impermeable surfaces as a result of the refurbishment works; OR 8. If there is an increase in the impermeable surface as a result of the refurbishment works but: a. Hard standing areas - permeable area or on-site SuDS to allow full infiltration of the additional volume are provided in any extended hardscape areas, to achieve the same end result. b. Building extension - any additional run-off is caused by the area of the new extension is managed on-site using an appropriate SuDS technique for rainfall depths up to 5mm. **Two credits - reducing run-off** 9. An Appropriate Consultant has been used to design an appropriate drainage strategy for the site and either of the following criteria are met: a. There is a decrease in the impermeable area by 50% or more, from the pre-existing impermeable hard surfaces; OR b. The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 50% from the existing site, the total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 50% and an allowance for climate change must be included for all of the above calculations; this should be made in accordance with current best practice planning guidance.						
	Two credits - Surface water run-off Pre-requisite An Appropriate Consultant is appointed to confirm compliance with the credit requirements. One credit 1. The peak rate of run-off from the site to the watercourses (natural or municipal) is no greater post-development at the 1-year and 100-year return period events including climate change allowance. 2. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place. One credit 1. Flooding will not occur in the event of local drainage system failure. 2. Post development run-off volume, over the development lifetime, is no greater than for the 100-year 6-hour event, including an allowance for climate change and any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other Sustainable Drainage System (SuDS) techniques. If the above is not feasible: -Justification from the Appropriate Consultant is provided and post development peak rate of run-off is reduced to the limiting discharge (the highest flow rate from: the pre-development 1-year peak flow rate (for 1-year return period event), the mean annual flow rate Qbar or 2L/s/ha.	2	2				
	One credit-Minimising watercourse pollution 1. There is no discharge from the developed site for rainfall up to 5mm. 2. Where suitable pollution prevention measures are put in place (or already exist) for the different sources of pollution present on the assessed site, in accordance with compliance note 3. A comprehensive and up to date drainage plan of the site will be made available for the building/site occupiers. 4. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.						
	One credit-Minimising watercourse pollution 1. There is no discharge from the developed site for rainfall up to 5mm. 2. Low risk source of watercourse pollution areas have appropriate SuDS techniques. 3. High risk areas have petrol and oil separators. 4. A means of containment is fitted to the site drainage system for chemical/liquid gas storage areas. 5. ll water pollution prevention systems have been designed and installed in accordance with Pollution Prevention Guideline 3 (PPG 3). For vehicle washing areas systems comply with Pollution Prevention Guidelines 13 6. A comprehensive and up-to date drainage plan is developed. 7. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place. 8. All external storage and delivery areas designed and detailed in accordance with the current best practice planning guidance.	1	1				

POL 04 - Reduction of night time light	**One credit - Reduction of night time light pollution** 1. External lighting complies with Table 2 (and its accompanying notes) of the ILP Guidance notes for the reduction of obtrusive light, 2011. 2. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. 3. Safety or security lighting used between 23:00 and 07:00, complies with the lower levels of lighting in Table 2 of the ILP's Guidance notes. 4. Illuminated advertisements comply with ILE Technical Report 5 – The Brightness of Illuminated Advertisements.	1	1		1	1	
POL 05 - Reduction of noise pollution	**One credit-Reduction of noise pollution** 1. The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development (within 800m radius), is no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level. The noise impact assessment must be undertaken by a suitably qualified acoustic consultant and must have been developed in compliance with BS 7445.	1	1				
	INNOVATION Requirements	A	A	U	A	A	U
Inn.	Additional credits are available for Approved Innovations not currently recognised by an existing BREEAM issue.	1			1		

APPENDIX I: CAMDEN PRE-PLANNING LETTER

Date: 29 March 2017
Our Ref: 2017/0611/PRE
Contact: Tania Skelli-Yaoz

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Rachel Hearne
Turley
The Charlotte Building
17 Gresse Street
London
W1T 1QL

BY E-MAIL

Dear Ms Hearne,

Re. Planning Pre-application advice ref. 2017/0611/PRE - 32 Torrington Square, London WC1E 7JL

Development proposal: Refurbish 32 Torrington Square together with an extended basement and rear extension and the construction of a 5 storey building on the site of the former 33 Torrington Square as a Centre for Brain and Cognitive Development (Use Class D1).

Thank you for meeting me on site on 14th March 2017. I refer to your pre-application enquiry for the above proposal, received on 31st January 2017. Since our meeting I have also discussed your proposals with our internal Design Review Panel which consists of Conservation and Urban Design Officers.

You have submitted site location plans, existing & proposed drawings of your proposal, a design statement, a heritage appraisal and a cover letter.

The proposal

It is proposed to refurbish the Grade II listed building at no. 32 Torrington Square, extend its basement and extend to the rear. To the gap between no. 32 and the Warburg Institute, fronting Torrington Square it is proposed to construct a 4/5-storey building plus half-basement. The proposal incorporates a vehicular access at street level to allow passage through the site to the rear of the Warburg Institute. The proposal also includes an upper ground rear terrace and front roof terrace to no. 32.

The wider area (Torrington Square) consists of a mix of the large post-war buildings, mostly in educational use. To the south east of the site is the only remaining 4-storey original terrace (nos. 27-32 cons) which is Grade II listed, and range between 4-8 storeys high. The buildings front the large designated public space, known as Torrington Square. The building, No. 32, is a 4 storey plus basement vacant terraced house, most recently in use for education/ research purposes (Class D1). It sits on the north east corner of the Square, adjacent to Warburg Institute (mostly facing Byng Place and Gordon Square) and the Clore Management Centre at nos. 25-26, both identified as positive contributors to the Bloomsbury Conservation Area, which

the site sits within. The building is in a poor state of repair with several elements of the façade currently supported by specialist scaffolding for health & safety reasons.

The site is within Sub Area 2 of the Bloomsbury Conservation Area – Gordon Square/ Woburn Square/ Byng Place - and is identified as making a positive contribution to the character of the area. The site is also located within the Central London Area. The site is not listed as one of the University of London (UoL) masterplan sites but lies adjacent to the identified Byng Place site. This submission is made by Birkbeck University. The site is proposed to be developed as an expansion to the BabyLab, located in the Henry Wellcome Building (previously at no. 32 Torrington Square), by establishing the ToddlerLab, a Centre for Brain and Cognitive Development, to undertake research into developmental studies to children ages 1-5 (Class use D1).

History of site

The most relevant recent history is as follows:

2015/5575/L Internal and external alterations including partial rebuild of the upper part of the existing elevation, strengthening of existing ceilings, levelling floors, repointing of existing brickwork and other localised repairs to the front elevation. Granted 08/12/2015.

Policy Context

NPPF 2012

The London Plan 2016

The relevant policies that would apply to this proposal are taken from the London Borough of Camden Local Development Framework (LDF) Core Development Strategy and Development Plan Policies adopted November 2010 and the revised London Plan adopted 2015. The LDF is accompanied by the Camden Planning Guidance (CPG) which was adopted April 2011 and partly revised since in 2015. These can all be viewed online at www.camden.gov.uk/planning.

The Camden Local Plan will replace the Core Strategy and Development Policies in 2017. Consultation on proposed modifications to the Submission Draft Local Plan will take place from 30 January to 13 March 2017. The modifications have been proposed in response to Inspector's comments during the examination and seek to ensure that the Inspector can find the plan 'sound' subject to the modifications being made to the Plan. The formal adoption of the plan is envisaged to be in early 2017. The weight of emerging policies is therefore significant for the consideration of proposals at pre-application stage.

The main issues under consideration with this proposal are land use, design & conservation, amenity, basement considerations, transport, sustainability and planning obligations.

Other policy documents/ guidance:

Bloomsbury Conservation Area Appraisal and Management Strategy dated April 2011

Camden Planning Guidance (CPG) 2015 – CPG 1, 3, 4, 8
Camden Planning Guidance (CPG) 2011 – CPG 6 and 7

Land use

Policy G1 (Delivery and location of growth) promotes efficient use of land and buildings in Camden and supports growth in the emerging local plan. Policy DP2 (Making full use of Camden's capacity for housing) considers housing a priority land use and the Council will seek to maximise the supply of additional homes in new build schemes. Policy H1 (Maximising the supply of self-contained housing from mixed use schemes) is the emerging housing policy in the new local plan. Policy C2 (Community facilities, culture and leisure) of the emerging local plan encourages the modernisation of university facilities, its retention and expansion within the Central London Area.

The proposal includes the provision for 44 staff and 10 visitors. The proposal would result in the retention and refurbishment of the existing D1 facility (307.7sqm as existing) at no. 32 Torrington Square and the extension of it (72.5sqm) together with the infill of the gap as mentioned above at 443.78sqm (new total D1 space: 823.2sqm), resulting in an uplift of 515.5sqm. The principle of the provision of additional educational/ research facilities at this location is considered to be acceptable subject to the justification of need and benefit to society and local community, in line with that submitted in your proposal and in accordance with the London Plan.

Policy DP1 states that the Council will require a mix of uses in development where appropriate, in particular in the Central London Area. However the policy allows for exceptions where secondary uses, such as housing, are not appropriate. In particular, the supporting text (para 1.23) states that secondary uses may not be sought where they would be precluded by *"the operational requirements of a specialised use, such as a hospital or healthcare facility, or an academic, research or educational institution."* In this instance the creation of a new research facility in association with the existing academic facility is considered to justify an exception to the policy requirement for mixed use. Given that the proposal involves the improvement and expansion of the existing facilities of the University of London within its campus, policies as listed above which normally trigger the requirement for affordable housing, are unlikely to be applicable.

Design & Conservation

The Council's policy position on promoting high quality places which ensures Camden's places are safe, healthy and easy to use is set out in Policies CS14 (Promoting high quality places and conserving our heritage) and DP24 (Securing high quality design) DP25 (Conserving Camden's Heritage). Policy DP24 of the LDF expects all developments to be of the highest standard and to consider the character, the setting and context of neighbouring buildings. Policy DP24 also expects developments to consider the quality of materials that are used. Policy DP25 expects developments to only permit developments that preserve and enhance the character and appearance of the conservation area.

Policy D1 (Design) of the emerging Local Plan states that high quality design is essential for all buildings. All new buildings should be designed to high standard, inclusive and sustainable. New proposals should take CPG1 (Design) into account. Policy D2 (Heritage) discusses developments and their impact on nearby conservation areas.

The building has suffered structural movement over a sizeable period, resulting in its vacancy in recent years. The proposed laboratory and research use, requiring a

number of cellular spaces for a range of functions, may be sympathetic to the character and internal layout of the historic townhouse.

The principle of building in the gap between No 32 Torrington Square and the southern flank wall of the Warburg Institute is considered acceptable in principle in heritage and design terms. This is in relation to the impact on the Bloomsbury Conservation Area, the setting of the Grade II listed terrace lining the eastern side of Torrington Square and upon the Warburg Institute, a positive contributor designed by Charles Holden.

The aim of the proposal is to create a toddler research laboratory facility for Birkbeck College, which has been identified to be of national and international importance, and is therefore likely to prove to be of extensive public benefit. The option proposed is thus to combine the existing four-storey townhouse with a new extension or infill building of up to five storeys attached to its flank wall. The existing historic building combined with a state-of-the-art extension will have the flexibility to offer a number of different types of spaces required by the facility.

Top floor/ roof:

Concerns are also raised about the erection of a roof storey, of a rectilinear and somewhat boxy feel, which would be a departure from the pitched roof seen along the full width of the historic terrace. It is suggested that an alternative design be explored, which fits in with the established pitched roof form, and is not so dominant as seen from Torrington Square, Byng Place, etc. A revised design should not include a terrace with a glazed balustrade, which is out-of-keeping with the conservation area. The rear first floor balcony Juliet balcony railings along with all other remaining original architectural external features should be conserved and retained in place.

Listed building:

The intention is to sympathetically restore the listed building, including rectification of structural failings and minimal intervention to existing spaces and layouts. Surviving historic features will be retained and restored, for example ceiling cornices and joinery work. However, opening up works will be necessary to establish the extent of historic fabric in the building. The building will need new services, likely to be a combination of traditional wiring and heating and future-proofed power sources. Externally it is intended to remove non-original features such as steel windows in the closet wing, which is considered to be a benefit subject to detailed design.

It is currently proposed to raise the first-floor level of the closet wing to provide level access WCs for those using both existing and proposed buildings. Although the raising in floor level will remove the link to the half landing of the historic house, it will not involve the loss of historic fabric due to the post-war date of the upper floor of the closet wing. The upwards extension of the closet wing will be by a moderate amount, and will not involve the loss of a historic roof structure due to the post-war rebuilding of much of this element.

It is proposed to retain a number of internal corridors within the listed building, which will serve as links for the planned lateral conversion at ground, first and second floors. Whilst it is not widespread practice to allow lateral conversions or puncturing of openings in flank walls of listed terraced houses, the potential public benefit from the laboratory may justify this intervention. However, concerns are raised regarding the construction of a glazed walkway link to the rear of the listed building creating a step-free route between the proposed extension and the closet wing WCs. This link is not only a departure in policy terms as a three-storey extension at the back of the listed building (with potential negative impacts on both the listed building and

conservation area), but will internalise the rear rooms of the property which is likely to have an adverse impact. It is therefore advised that alternative WC arrangements are explored for both the existing and new-build element of the scheme. The rear first floor balcony Juliet balcony railings along with all other remaining original architectural external features should be conserved and retained in place.

Infill/ new building:

The current proposals for the new infill or extension building comprise four/five storeys of accommodation with level access directly off the street. The pre-application submission suggests a neutral architectural approach, with a simple front façade picking up on the floor-to-floor levels of the adjacent terrace of townhouse, emphasised by horizontal banding. To give the front façade a neutral character, bridging the terrace and the much larger Warburg Institute, the front façade is not characterised by conventional window openings, rather full-width glazing with a metal mesh screening, which will give privacy and filter sunlight. Although this approach is appreciated, we consider that it would not be the appropriate design to pursue in the context of the surrounding buildings. There is a danger that the façade could have a bland and impermeable feel, which could detract from the setting of the listed terrace and the surrounding conservation area.

The wider area is considered to be of a calm composition, largely comprising masonry/ brick rather than glass. It is recommended to revise your proposal to include a simple and crisp modern brick building of quality detailing (windows and other architectural elements) that would complement and highlight the architectural quality and importance of the listed adjacent terrace. More verticality is also encouraged to connect the ground floor façade with the upper levels, to reflect the verticality of the townhouses and counter the effect of the gap's width, which is larger than each of the townhouses. This also leads to comments made by design officers, with regards to the proposed building line; this seems to be proposed in line with the townhouses but forward of the Warburg Institute. This together with the gap's width is thought to contribute to an unproportioned appearance. The building line could be experimented with, to include a staggered line toward the Warburg Institute, to differentiate the site and its history, in particular given the vehicular access. In any case, it should form part of a detailed revised rationale.

The rear elevation should be revisited and forms a close relationship with the design to the front. Render is discouraged and ideally the rear should be treated to respect the rear elevation of the historic terrace.

On site, you have mentioned that your intentions with regards to the vehicular access are not final and that this access may be omitted. I would strongly advise the removal of the vehicle access to ensure the ground and upper levels of the building integrate well with each other and the wider terrace. The removal of this would also improve amenities to the rear generally. However, should this element be retained, there are concerns about the current design and how it relates to the elevations above, I would advise you to explore similar historic mews designs and configurations in the locality for inspiration of architectural detailing.

Construction methods and impact:

To construct the infill extension, major ground works will be necessary to remove the existing ramp which serves the Warburg Institute. Such works are likely to impact on the brick boundary wall of the back garden of No 32 (which will be used as an external space for children and their families). It would appear that this wall was largely rebuilt in the twentieth century, and along its length behind the terrace has suffered movement, in part derived from tree roots. It is therefore considered

acceptable in principle to rebuild large parts of this wall, subject to further investigation and the detailed design of the replacement.

To summarise, whilst the principle of the refurbishment, extensions and infill are acceptable, this is subject to the quality of design and conservation of the listed building. The proposed design of the front elevation must be dramatically overhauled in line with the above advice and should include a significant amount of additional details and larger scale drawings and a statement with a clear architectural rationale set out.

Bloomsbury Conservation Area Advisory Committee (CAAC): you are encouraged to consult this group independently at an early stage in order to maximise and benefit from local input on conservation/ design aspects.

Impact on neighbouring amenity

Policy CS5 seeks to protect the amenity of Camden's residents by ensuring the impact of development is fully considered. Policy DP26 supports this, by seeking to ensure that development protects the quality of life of occupiers and neighbours by only granting permission to development that would not harm the amenity of neighbouring residents. This includes privacy, outlook and impact on daylight and sunlight. Policy A1 (Managing the impact of development) addresses this in the emerging local plan. The Council's adopted planning guidance provides further advice on the application of the Council's policies, such as CPG1 (Design) and CPG6 (Amenity).

The location of the extension would be unlikely to result in any detrimental privacy impact upon the surrounding dwellings on Torrington Square and Woburn Square due to its orientation and distance from residential properties, the nearest of which is recorded at no. 30 Torrington Square to the south-east and no. 24 Woburn Square to the east of the site. All occupiers directly to the rear and sides of the site are within D1 use and as such would not be afforded high levels of protection with regards to daylight & sunlight loss, in accordance with the BRE guidelines. It is considered that the main impact would be during construction, which would be proposed to be mitigated by a Construction Management Plan, discussed below.

To summarise, the proposal would comply with policy DP26 and emerging policy A1, subject to a CMP.

Basement considerations

Policy DP27 requires that the impacts of basement excavation on drainage, flooding and groundwater conditions are assessed and mitigated against in accordance with CPG4 in order to maintain structural stability, avoid run-off and drainage damage and adverse impacts on the water environment. The policy also seeks to consider impacts on amenity, open space, trees and townscape, archaeology, landscaping, architectural character and heritage assets. Policy A4 (Basements and lightwells) of the emerging plan repeats this.

The proposal includes part basement excavation within the infill site. Whilst historically the infill site may have included a basement similar to that at no. 32 Torrington Square, this has now been infilled. An application for basement excavation will therefore require the submission of a Basement Impact Assessment, in accordance with guidelines set in CPG4. The BIA will need to be assessed independently at cost to the developer.

The site is located within the Crossrail Contribution Zone, which will require consultation with Crossrail.

Transport

Car parking:

Development policy DP18 states that the Council seeks to ensure that developments provide the minimum necessary car parking provision. The Council expects development to be car free in the Central London Area. The site is located in the Central London area and has a PTAL rating of 6b which means it is highly accessible by public transport. A car-free development therefore must to be secured as a Section 106 planning obligation if planning permission is granted. This would allow the proposal to be in accordance with Core Strategies CS11 and CS19 and Development Policies DP18 and DP19. The emerging policy T2 is relevant. Please details in your Design & Access Statement how additional trips will be managed. Please confirm if the site will have shared vehicular access to the rear yard and if so, how it will be used.

Cycle Parking:

Development Policy DP18 (Paragraphs 18.12 and 18.13) requires development to provide cycle parking facilities in accordance with the minimum requirements of our cycle parking standards (Refer to Appendix 2 of Camden Development Policies document). Policy T1 will replace this policy in the new local plan. We also expect development to provide cycle parking facilities in accordance with the minimum requirements of the London Plan. The London Plan 2016 cycle parking standards (Table 6.3) sets standards for staff and visitors for long and short stays (quantity). Long stay cycle parking must be accessible, in a secure and fully enclosed location within the new building. Short stay cycle parking must be not be located within the same store as the long stay cycle parking and should be within the site boundary. Additional space for adaptive cycles is required and staff lockers and showers must be provided. Please refer to CPG7 (Camden's transport guidance) for details on the quality of storage required. A Pedestrian, cycling and environmental (PCE) financial contribution may be required subject to the details of final uplift figures and cycle provision within the site.

Managing the impacts of construction on the surrounding highway network:

Camden Development Policy DP20 (and T4 in the merging local plan) states that Construction Management Plans should be secured to demonstrate how a development will minimise impacts from the movement of goods and materials during the construction process (including any demolition and excavation works). Camden Development Policy DP21 relates to how a development is connected to the highway network. For some development this may require control over how the development is implemented (including demolition and construction) through a Construction Management Plan (CMP).

Our primary concern is public safety but we also need to ensure that construction traffic does not create (or add to existing) traffic congestion in the local area. The proposal is also likely to lead to a variety of amenity issues for local people (e.g. noise, vibration, air quality). The Council needs to ensure that the development can be implemented without being detrimental to amenity or the safe and efficient operation of the highway network in the local area. A Construction Management Plan (CMP) would be necessary, to be secured by S106 Agreement. A substantial CMP should be submitted (in pro-forma form) at the application stage to help inform the public consultation responses. Please see CPG7 for more details. The

associated assessment and monitoring of its implementation during the Construction Phase would be detailed at full planning stage on receipt of the draft CMP.

Highway and Public Realm Improvements directly adjacent to the site:

The summary page of Development Policy DP21 states that 'The Council will expect works affecting Highways to repair any construction damage to transport infrastructure or landscaping and reinstate all affected transport network links and road and footway surfaces following development'. The footway and vehicular crossover directly adjacent to the site is likely to be damaged as a direct result of the proposed works. We would therefore need to secure a financial contribution for highway works as a section 106 planning obligation if planning permission is granted. This would allow the proposal to comply with Development Policy DP21. A cost estimate for highway works would be requested and forwarded.

Some highway licenses may be required to facilitate the proposed works. This might include a temporary parking bay suspension, a skip licence, a hoarding licence, and a scaffolding licence. The applicant would need to obtain such highway licences from the Council prior to commencing work on site.

Approval in principle (AIP):

With regards to the potential basement works included in this scheme and depending on the extent of excavation on the public highway elevation, there may be a requirement for an AIP and associated assessment fee of £1,800.

Local consultation:

You are strongly encouraged to engage with the existing and neighbouring occupiers at an early stage in the process, given the likely concerns residents will have with the comings and goings of construction / delivery vehicles. Although adjoining occupiers will be notified of any application by us, initial consultation may help offset any concerns neighbours have before any application is submitted.

Sustainability

London Plan policy 5.3 'Sustainable design and construction' removes requirements for the Code for Sustainable Homes but continues to require development to demonstrate that sustainable design standards are integral to the proposal, including its construction and operation. Camden considers sustainable design and construction as integral and our policy ambitions relating to sustainable design and construction are set out in Policies CS13 (Tackling climate change through promoting higher environmental standards) and DP22 page 104 (Promoting sustainability and tackling climate change).

A statement would need to be submitted to address the development in accordance with CPG3 (Chapter 9) and Chapter 8 of the emerging local plan, demonstrating that the proposed development has been designed to achieve the relevant BREEAM standards to refurbishment of non-residential new buildings. The listed status on the host site will be taken into consideration with regards to limitations in achieving the required standard; however, best efforts should be made to achieve the highest standard.

A sustainability plan would be secured via a Section 106 for a post-construction review to ensure the development would achieve the sustainability targets.

Other

Refuse and Recycling:

Adequate space should be designed in for waste and recyclables which are sensitively located. Chapter 10 of Camden Planning Guidance 1 (Design) sets out Camden's requirements for waste and recycling storage in detail. It is considered that adequate provision will be made for refuse and recycling, details of this should be submitted with the application.

Birkbeck Masterplan:

During our meeting you mentioned this is one of 4 sites that the University intend on bringing forward for development as part of their campus strategy. Given the Council's previous discussions with the University of London Masterplan we would be very keen to enter into discussions with you on your proposals for the campus and would encourage discussions at an early stage on the remaining 3 sites. We would be interested to know more about where these sites are, what the development would entail, what your timescales are for bringing them forward and how they would fit within the context of the University of London Masterplan.

Access:

The proposal has been assessed by the Council Building Control/ Access Officer who advises on how the buildings would need to comply with the relevant building regulations, as follows:

- The glass entrance doors would need to meet table 2 of AD M volume 2.

- The door weight would need to be in line with AD M volume M 2.13a.

- The glass doors would need manifestation at the two levels prescribed in AD K.

- An accessible changing room should measure 2200mm by 2200mm and that is without a WC incorporated. The facility at basement level is therefore not big enough for both functions. As new facilities are being provided in 33 Torrington Square a wheelchair accessible WC and changing area should be provided that meets the recommended size.

Additional details would need to be provided on the location of the accessible baby change facilities and ambulant disabled person's cubicles it was also advised that the new reception desk should be fitted with an induction loop.

Planning obligations

To summarise the planning obligations that need to be addressed under this proposal I hereby list:

- CMP: as advised above.
- BREEAM statement
- Highway works contribution: sought in order to fund the repairs of the highway. To be confirmed at application stage.

CIL

This application would be exempt from both the Mayoral and Camden CIL as the proposal includes a development that would be used wholly or mainly for the provisions of medical services and education in association with an institute of higher education. For further information please visit the CIL pages of the Camden website.

Summary

The proposed development is considered unacceptable due to the design approach and detailed materials. The principle of its refurbishment, extension and infill of gap is acceptable and some of the alterations to the listed building's layout are acceptable in the context of the benefit to the public by the provision of a high quality higher education research facility to expand the existing facilities of the Birkbeck College. However, the design concept of the front façade, its materials and detailing lack architectural merit and would not be considered to preserve or enhance the Bloomsbury Conservation Area, nor preserve the historic integrity of the adjacent listed building/s. as such, it is recommended to revise your proposal accordingly and re-submit a second pre-application submission.

Building Control Service

For further information about this separate process and any implication it may have the configuration of the project in planning terms please contact Nassar Rad on 020 7974 2387 or Nasser.Rad@camden.gov.uk

How to submit your application (for future information):

As advised an application to follow up this pre-application submission is not encouraged; however, applications would be submitted via the planning portal at:

http://www.planningportal.gov.uk/planning/

When submitting a planning application, the following information will be required:

- Appropriate fee
- Site location plan
- Existing and proposed elevations and plans, sections and roof plan
- Planning Statement with policy H2 justification
- Detailed design statement with clear design rational
- Heritage statement
- Energy & Sustainability report
- BIA
- Construction management plan (pro-forma draft)

Please be aware it is your responsibility to compile the necessary documentation in accordance with the requirements of the national and local list. Details are available at:

> http://camden.gov.uk/ccm/navigation/environment/planning-and-built-environment/planning-applications/making-an-application/supporting-documentation--requirements-/

I hope this advice is useful. This response represents an initial view of your proposals based on the information available to us at this stage which is limited. Please be aware that addressing these matters does not necessarily mean that the application will be approved and is without prejudice to the assessment of any future application and the final decision of the council.

Thank you for using Camden's pre-application advice service.

Yours sincerely,

Tania Skelli-Yaoz
Senior Planning Officer

Telephone: 020 7974 6829

APPENDIX J: Water Consumption Preliminary Calculations

BREEAM 2014 Wat 01 Water consumption: Water efficiency calculator for new non domestic office buildings

Water consumption calculation results

	Litres/person/day	m³/person/yr
Water consumption - modelled baseline performance benchmark (excludes fixed uses)	37.57	9.50
Microcomponent water consumption - modelled performance (excludes fixed uses)	20.65	5.23
Modelled water demand met via greywater and rainwater sources	0.00	0.00
If greywater/rainwater systems specified has the minimum % efficiency improvement for component specifications been met	System not specified	
Net modelled water consumption (excludes fixed uses)	20.65	5.23
Percentage improvement	45.02%	
Total Wat 01 BREEAM credits achieved	3 credits	
Total Wat 01 BREEAM innovation credits achieved	Exemplary level not achieved	
Key performance indicator - use of freshwater resource (includes fixed uses)	22.23	5.62

BREEAM UK Refurbishment and Fit-out 2014 Wat 01 Water consumption: Water efficiency calculator

Water consumption calculation results

	Litres/person/day	m³/person/yr
Water consumption - modelled baseline performance benchmark (excludes fixed uses)	39.92	10.10
Microcomponent water consumption - modelled performance (excludes fixed uses)	19.52	4.94
Modelled water demand met via greywater and rainwater sources	0.00	0.00
If greywater/rainwater systems specified has the minimum % efficiency improvement for component specifications been met	Yes	
Net modelled water consumption (excludes fixed uses)	19.52	4.94
Percentage improvement	51.11%	
Total Wat 01 BREEAM credits achieved	4 credits	
Total Wat 01 BREEAM innovation credits achieved	Exemplary level not achieved	
Key performance indicator - use of freshwater resource (includes fixed uses)	21.10	5.34