CUNDALL

AHIG Ltd
152 – 156 Kentish Town Road
Energy & Sustainability Statement

Job No: 1012395

Doc No: 1012395-RPT-0004

Latest Revision: A

Date: 3/06/2016

Cundall Johnston and Partners LLP One Carter Lane, London EC4V 5ER Tel +44 (0)20 7438 1600 www.cundall.com

CUNDALL

Document Revision History

Project Name	152-156 Kentish Town Road	Job Number
Report Name	Energy & Sustainability Statement	1012395

Revision Ref	Issue Date	Purpose of issue / description of revision
-	020/06/2016	Draft Issue for comment

Document Validation (latest issue)

Revision	Issue Date	Purpose of issue / description of revision / version			
A	3/06/2016	Updated to reflect architect's comments			
			Prepared by	Checked by	Approved by
		Initials	AY	CT	SW
		Signature	Amy Young	Chris Turner	Simon Wyatt

1. Executive Summary

Low environmental impact will be key to the design of the proposed 152 - 156 Kentish Town Road redevelopment. This sustainability and energy statement outlines the development's approach to sustainability, energy efficiency and renewable energy strategies in order to meet the sustainability targets set out by the London Borough of Camden and the GLA's planning requirements. The building is not within any conservation areas and therefore is not subject to special consideration.

To benchmark the design process, BREEAM and the Code for Sustainable Homes methodology has been applied. They consider the broad environmental concerns of climate change, pollution, impact on occupants and the wider community. They balance these with the need for a high quality, safe and healthy internal environment. These standards go beyond the requirements of the Building Regulations. 152-156 Kentish Town Road is not required to achieve any level of Code for Sustainable Homes (CfSH) standards, despite this, the CfSH method was adopted to guide the process of designing high quality dwellings*.

A number of sustainable and energy efficient measures included in the proposed design are listed below:

- The proposed strategy is to enhance the thermal insulation, air tightness and thermal bridging standards beyond the Part L standards, thereby reducing the space heating requirements to such an extent that they can be meet passively by direct solar gains and the internal heat gains.
- A low air permeability of 3.0m^3/hr/m^2 for the residential and 5.0m^3/hr/m^2 for the commercial elements will ensure heat losses through the building's fabric will be minimised;
- The dwellings will be mechanically ventilated during winter months, with heat recovery to reduce heating demand;
- Natural ventilation during summer months will prevent overheating and the use of excessive cooling in the residential units;
- Heating for the dwellings is provided by high-efficiency boilers through underfloor heating coils;
- Natural day lighting will improve occupant comfort and reduce the requirement for artificial lighting;
- All light fittings will be low energy fittings.

An extensive range of low and zero carbon technologies have been considered in terms of providing a proportion of the development's energy demand. These contribute a reduction of 22% in site CO_2 emissions in line with Policy 5.7 of the London Plan:

- As the commercial unit's heat losses have been reduced to a minimum it enables air heat pumps (ASHP) to provide the heating and cooling requirements. This results in a very low energy solution that allows heating requirements to be sourced from indoor heat gains recycled using the exhaust air heat pump.
- Solar photovoltaic (PV) panels have been considered as suitable for the site in order to supplement the electrical load. The large roof area allows for flexibility in the size and arrangement of the array as well as limiting over shading and therefore increasing efficiency;
- A 8.6 kWp array of panels (50m^2) will be installed to meet over 11% of the total residential electricity demand.

Additional sustainable measures that feature in this development include:

- All insulation materials used within the proposed development will be selected to ensure they are CFC free both in manufacture and through their composition;
- Building materials where possible will be sourced locally to reduce transportation pollution & support the local economy;
- All timber will be purchased from responsible forest sources;
- Recycling facilities will be provided on site for construction and operational waste;
- Water use will be minimised to the 105 litres per person per day target by the specification of water efficient taps, shower heads, dual flush toilets and low water use appliances;
- Water metering and leak detection alarms will be installed to monitor and minimise wastage;
- The construction site will be managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution.
- A Site Waste management Plan (SWMP) has been produced for the works.

The offices, dentist and retail spaces have been modelled as shell and core only and any fit-out works will be expected to be in line with the specification highlighted within this report in order to ensure the building as a whole meets the requirements of the Borough of Camden.

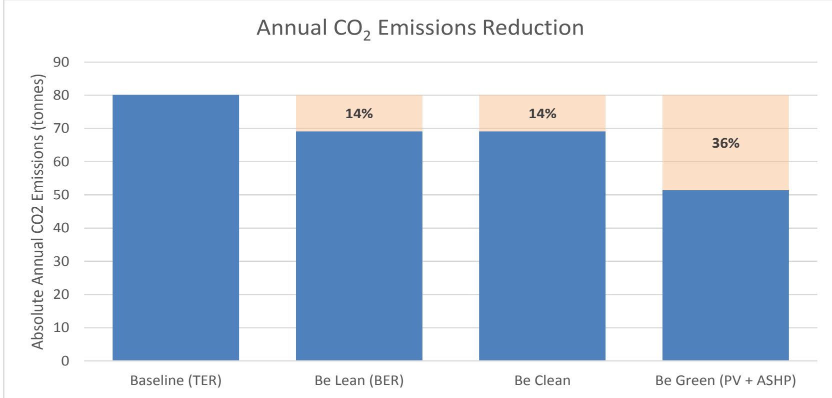


Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy	Carbon dioxide emissions (Tonnes CO_2 per annum)
	Regulated
Baseline: Part L 2013 of the Building Regulations	80
After energy demand reduction	69
After CHP	69
After renewable energy	51

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy	Regulated Carbon dioxide savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	11	14%
Savings from CHP	0	0%
Savings from PVs + ASHPs	18	22%
Total Cumulative Savings	**29**	**36%**
Total Target Savings	28	35%

By reducing the site-wide CO_2 emissions by 36% using a combination of passive design, energy efficient systems and on-site energy generation, Policy 5.2 of the London Plan for on-site carbon reduction measures has been achieved.

In line with Policy 5.6 of the London Plan, the feasibility of connecting to existing or proposed district heating networks has been investigated and discounted due to site and load constraints and lack of existing networks in a viably connectable distance.

Using a combination of Air Source Heat Pumps for the retail, office and dentist and roof-mounted PV for the residential, the site's CO_2 emissions are reduced by 22% on top of the 14% reduction demonstrated by efficient systems and passive design measures. The requirements of the London Plan Policy 5.7 are therefore achieved.

** NOTE: As part of the Government's response to the Housing Standards Review it has been confirmed that the Code for Sustainable Homes (CfSH) will be wound down, with many of its requirements consolidated into the Building Regulations. Whilst this means that a formal certification of the scheme may not be possible, the methodology and targets are still a useful tool in benchmarking the sustainable design of residential development. As such, the CfSH methodology has been used to guide and benchmark the design.*

CUNDALL

Contents

2. Introduction

This Sustainability and Energy Statement has been prepared to accompany a planning application for the proposed 152 - 156 Kentish Town Road redevelopment. It aims to meet the energy and climate change requirements of the London Borough of Camden and the Greater London Authority (GLA).

This report outlines the proposed sustainability and energy strategy for the proposed 152 - 156 Kentish Town Road redevelopment. Each of the proposed initiatives has been assessed on the relative sustainability potential, in addition to a "rule of thumb" financial pay back implication, and suitability to the site.

The structure of this report is in accordance with the 'GLA's Guidance on Preparing Energy Assessments' document, April 2015, which provides guidance on addressing the London Plan's energy hierarchy.

The principal objectives are to reduce the site's contribution to the cause of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and by providing some of the requirement by renewable/sustainable means. Issues such as water and waste, biodiversity, etc. have also been addressed in the present study. The Sustainability Statement will aim to address the aspirations of both the London Borough of Camden and the GLA.

The GLA London Plan and GLA Energy Strategy are considered to be the benchmark for local planning regulation. Together they provide a useful tool against which to undertake energy and sustainability assessments. They have been used in an advisory nature secondary to the requirements of the London Borough of Camden, to help incorporate a number of energy efficiency measures into the proposed development.

To guide and benchmark this process, the Code for Sustainable Homes (dwellings) and BREEAM (non-dwelling) methodologies have been used to inform the sustainable features of the development. The size of the development (approximately 1100m^2 retail, 400m^2 office, 84m^2 dental practice and 720m^2 residential) means that a formal sustainability assessment is not required for every element, however, at this stage these methodologies have been used as guidelines.

Figure 1 Front Elevation Perspectives. Left: existing, right: proposed

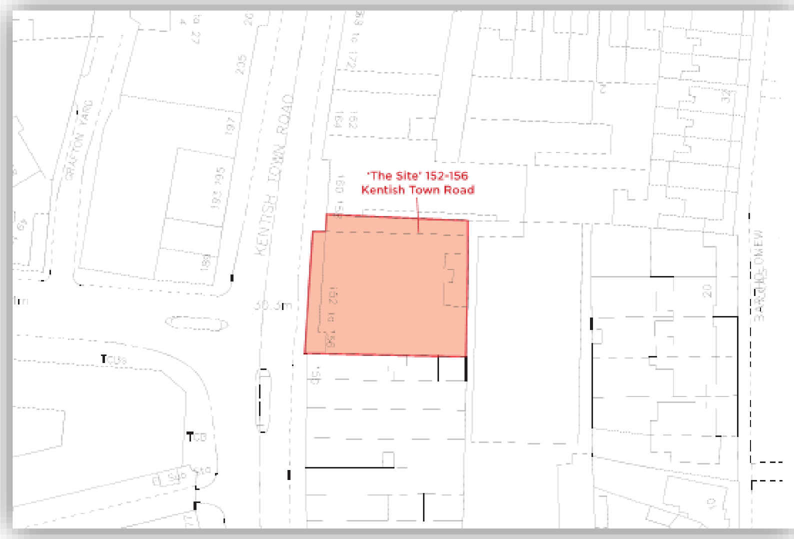


Figure 2 152 - 156 Kentish Town Road Site Plan

Figure 3 Site Context

2.1 Outline Description of Development

The existing 2 storey building accommodates 2 retail units on the ground floor with a number of office spaces and various use spaces on the first floor including a dentist. There is currently no basement and the property is not listed nor in a conservation area.

The proposed works are outlined (but not limited to) below:

- Demolition of the existing building and rebuild to enlarge footprint;
- Proposed second and third to provide 8 no. C3 residential accommodation with private terraces;
- Retention of A1 unit at ground floor level;
- Excavation of lower ground floor level to provide A1 retail accommodation;
- Provision of three office tenancies on the first floor and a small dental practice;
- Creation of terraces, windows and balconies.

The works will be assessed to be new build and be assessed against both Part L1a (for the dwellings) and Part L2a (non-domestic) of the Building Regulations.

Floor	Use	Use Class
Basement	Retail	A1
Ground Floor	Retail	A1
First Floor	Office	B1
First Floor	Dentist	D1

Table 1 Building Use Types

Unit Summary	Floor	Area (m^2)
Flat 01 – 3B4P	2nd floor	81
Flat 02 – 2B4P	2nd floor	86
Flat 03 – 3B4P	2nd floor	78
Flat 04 – 2B4P	2nd floor	100
Flat 05 – 2B3P	3rd floor	63
Flat 06 – 2B3P	3rd floor	63
Flat 07 – 3B4P	3rd floor	78
Flat 08 – 2B4P	3rd floor	75

Table 2 Schedule of Residential Accommodation

CUNDALL

3. Planning Policy

The National Planning Policy Framework (NPPF) was published in March 2012, which states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourages the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF replaces PPS22 and in Section 10 outlines its energy and climate change policies. To support the move to a low carbon future, local planning authorities should:

- Plan for new development in locations and ways which reduce greenhouse gas emissions;
- Actively support energy efficiency improvements to existing buildings; and
- When setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

In determining planning applications, local planning authorities should expect new developments to:

- comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated that this is not feasible or viable; and
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption;
- have a positive strategy to promote energy from renewable and low carbon sources;
- identify opportunities where development can draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

The key focus of the NPPF is to support local and regional planning authorities.

3.1 The London Plan

The GLA London Plan 2015 and the GLA's Guidance on Preparing Energy Assessments April 2015 document are considered to be the benchmark for local planning regulation. Together they provide a useful tool against which to undertake energy and sustainability assessments. For the purpose of this assessment they have been used in an advisory way secondary to the requirements of the London Borough of Camden, to help incorporate a number of energy efficiency measures into the proposed development.

The London Plan sets out a number of core policies for major developments with regards to reducing CO_2 emissions and providing energy in a sustainable manner.

Policy 5.2: Minimizing Carbon Dioxide Emissions - requires that major developments achieve a 35% improvement over the 2013 Building Regulation CO_2 Emission Target.

Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

Policy 5.6: Decentralised Energy - requires all major developments to evaluate the feasibility of connecting to existing or proposed district heating networks and where no opportunity existing consider a site wide Combined Heat and Power (CHP) systems.

Policy 5.7: Renewable Energy - requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible. Individual development proposals will also help to achieve these targets by applying the energy hierarchy in Policy 5.2.

3.2 London Borough of Camden

The London Borough of Camden set out their approach to sustainable development through their Core Strategy, Development Policies and Supplementary Planning Documents. Core Strategy Policy 13 sets out the overarching approach to sustainability in the Borough, with the aims of mitigating and adapting to climate change, promoting local energy generation, managing water resources and reducing carbon dioxide emissions.

The Development Policies provide further detail as to how the Core Strategy policies can be achieved. In this instance *"Development Policy 22 – Promoting Sustainable Design and Construction"* provides the details as to how the targets of CS13 will be meet and states:

"The council will require development to incorporate sustainable design and construction measures. Schemes must:

- Demonstrate how sustainable development principles, including relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and
- Incorporate green or brown roofs and green walls wherever suitable."

The council will promote and measure the sustainable design and construction by:

- Expecting non-domestic developments of 500sq m of floor space or above to achieve *"very good"* in BREEAM assessments and *"excellent"* from 2016 and encouraging zero carbon from 2019.

The council will require developments to be resilient to climate change by ensuring scheme include appropriate climate change adaption measures, such as:

- Summer shading and planting;
- Limiting run-off;
- Reducing water consumption;
- Reducing air pollution;
- No locating vulnerable uses in basements in floor-prone areas.

In addition to this policy, the Supplementary Planning Document *'Camden Planning Guidance 3 – Sustainability'* provides greater detail on the targets for developments and the approach that should be adopted in meeting these targets.

CUNDALL

4. Energy Strategy

The design has been developed to reduce its annual energy consumption, whilst providing energy in the most environmentally friendly manner to reduce its annual CO_2 footprint.

The initial focus is on passive building measures such as high levels of insulation and air tightness, followed by energy efficiency. In order to achieve this, a “Steps to Low Carbon” methodology has been applied.

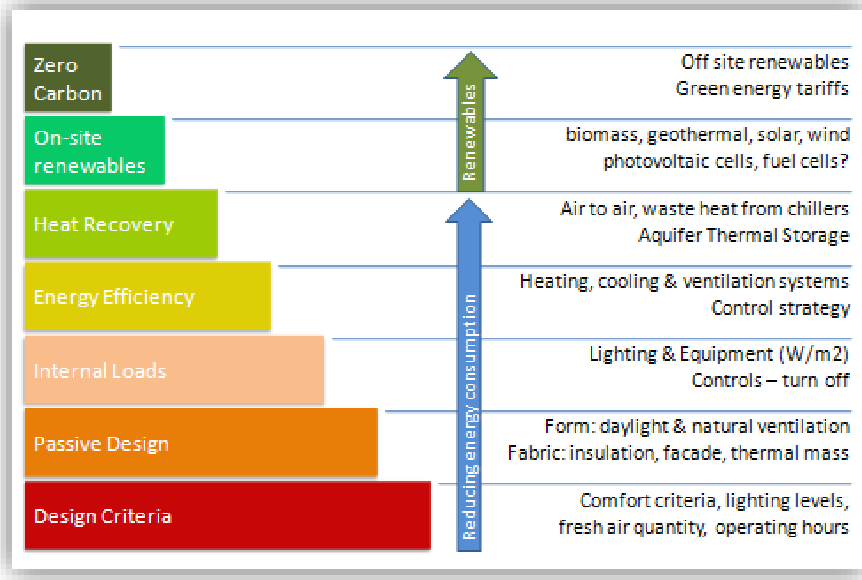
4.1 Passive Design – ‘Be Lean’

Substantial reductions in energy usage for the scheme will be achieved through the consideration of the passive elements of the design, together with improved occupant comfort. The aim is to optimise the passive building elements and hence reduce the energy consumption associated with the mechanical systems. This is balanced between a range of requirements and accounting for factors such as site constraints and acoustic considerations.

4.1.1 Passive Solar Design

Glazing types and window locations have been carefully considered, so that low angle winter solar gains and sun light are able to enter the space providing ‘free’ heating and lighting in winter. Solar gain is controlled in summer through solar coatings on the glazing to reduce the risk of ‘overheating’.

The design of the living spaces incorporate large areas of glazing to open up the building to the outside and allow light penetration, whilst in the bedroom areas the glazing areas have been reduced for privacy and reduced solar gains. The quantities of solar radiation entering the dwellings have been limited by the glazing specification, which will call for glass with high light transmission (60%), but limited solar transmission (40%).



Detail	Design	Regulations (L1a)
Ground floor average area weighted U-value	0.10W/m²K	0.25W/m²K
External wall average area weighted U-value	0.15W/m²K	0.30W/m²K
Roof average area weighted U-value	0.10W/m²K	0.20W/m²K
Window area weighted U-value (including frame)	1.40W/m²K	2.00W/m²K
Roof light area weighted U-value (including frame)	1.40W/m²K	2.00W/m²K
Window Visible Light Transmission (%)	60.0%	n/a
Roof Visible Light Transmission (%)	n/a	n/a
Glazing total solar transmission (G-value)	40.0%	n/a
External door average area weighted U-value	1.40W/m2K	2.0W/m2K
Thermal Bridging Y Value	Accredited Construction	n/a
Air permeability @ 50 Pascals	3.0m³/hr/m²	10m³/hr/m²

Figure 4 Residential Building Fabric

4.1.2 Building Envelope

Improving the thermal insulation standards beyond the minimum Building Regulation standards will help to reduce the annual CO_2 emissions associated with all of the building’s heating and cooling systems, by limiting the heat loss through the building’s fabric. All new thermal elements will therefore be specified to achieve an improvement over the minimum standards of the Building Regulations.

Detail	Design	Regulations (L2A)
Ground floor average area weighted U-value	0.15W/m²K	0.25W/m²K
External wall average area weighted U-value	0.20W/m²K	0.35W/m²K
Roof average area weighted U-value	0.10W/m²K	0.25W/m²K
Window area weighted U-value (including frame)	1.60W/m²K	2.20W/m²K
Roof light area weighted U-value (including frame)	1.60W/m²K	2.20W/m²K
Window Visible Light Transmission (%)	70%	n/a
Glazing total solar transmission (G-value)	60.0%	n/a
External door average area weighted U-value	1.60W/m2K	2.2W/m2K
Air permeability @ 50 Pascals	5m³/hr/m²	10m³/hr/m²

Figure 5 Office, Retail and Dentist Building Fabric

4.1.3 Thermal Bridging

Linear thermal bridge Ψ values if not considered carefully will have a high conductivity which will require a greater enhancement of the other elements of the building envelope to compensate. Where this is not possible, all architectural details will be in accordance with the enhanced construction details listed on the Energy Trust website or as an absolute minimum as per the requirements of Accredited Construction Details document.

Accredited Construction Details (ACD’s) have been developed to assist the construction industry to comply with the performance standards in Part L of the Building Regulations. They focus on issues concerning insulation continuity and airtightness and suggest a common approach to design, construction and testing methodology, and general improvements of the process.

4.1.4 Air Permeability

An air pressure test will be carried out in order to determine the air leakage rates and take any remedial actions to improve it. An air leakage rate of $3m^3/hr/m^2$ at 50Pa will be targeted for the dwelling elements in comparison with the Building Regulation minimum standards for new dwellings of $10m^3/hr/m^2$ at 50Pa. The commercial elements will target an air permeability of $5m^3/hr/m^2$. Good air tightness will be achieved by robust detailing of junctions and good building practices on site.

4.2 Energy Efficient Systems – 'Be Clean'

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation. On the basis of good practice the following principles will be adopted throughout the proposed development where possible:

4.2.1 Ventilation – Mechanically Ventilated

The development will be mechanically ventilated, with a high efficiency heat exchanger that will greatly reduce the heating load associated with incoming fresh air for space heating.

Historically, fresh air in dwellings was supplied through window openings and trickle vents, but as these are uncontrolled systems they result in large amounts of wasted heat. In order to minimise the heating load associated with the fresh air, a controlled Mechanical Ventilation with Heat Recovery (MVHR) system is proposed for each dwelling and commercial space. MVHR uses the heat in the extract air to pre-warm the incoming air, thereby reducing the heating load. The design of an MVHR system will need to ensure that the fan powers are minimised and that the ductwork is insulated to avoid heat losses to unconditioned spaces.

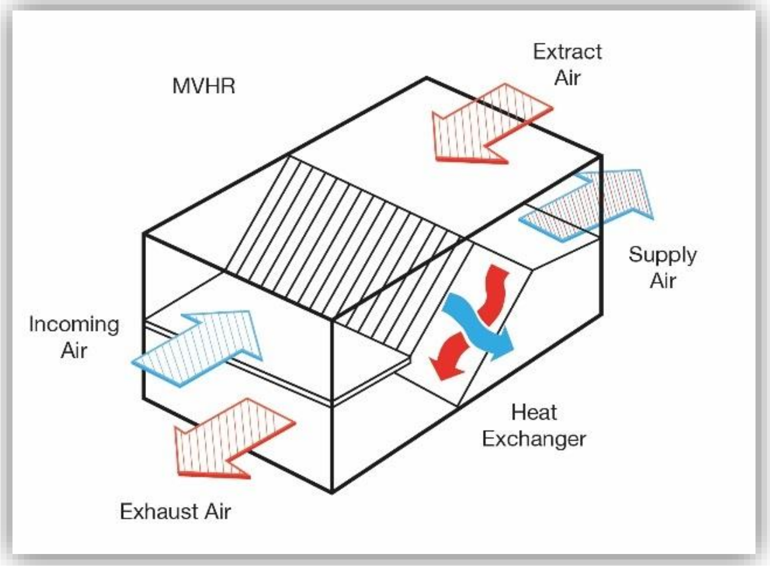


Figure 6 MVHR Unit with Plate Heat Exchanger

MVHR systems also work well in areas with local air quality concerns, as they can filter pollutants out of incoming air, improving the internal environment.

The MVHR system is designed to provide fresh air for the occupants NOT air condition the space. Therefore the units will have openable windows to enable them to be naturally ventilated in summer to avoid the risk of overheating. The initial analysis indicates that all of the occupied space will achieve the CIBSE Guide A "Environmental Design" recommended internal conditions assuming that each space has an minimum equivalent openable free area of at least 5% of the space's floor area.

Comfort cooling will be provided as part of the mechanical ventilation system, allowing occupants the choice of natural ventilation (and associated cooling effects) or mechanical cooling.

4.2.2 Eco-Labelled Goods

As lights and appliances account for about a third of the CO_2 emissions in development, where domestic appliances are installed energy efficient units will be incorporated, including A and A+ rated appliances.

Figure 7 White Goods efficiency rating

4.2.3 Low-Energy Lighting

To reduce the energy consumption associated with artificial lighting, 100% of internal lighting fittings will be energy efficient with high luminous efficacies in excess of 75 lumens/circuit Watt. The fixing must be permanently fitted to the ceiling or wall and can contain one or more lamps.

Furthermore, the development has been designed to maximise daylight into bedrooms and living rooms, reducing the need for artificial lighting in the first place.

4.2.4 HVAC System Plant Efficiencies

The design team will specify all equipment and plant to exceed the minimum requirements of the domestic HVAC guide. This provides guidance on the means of complying with the requirements of Parts L2a and L1a of the Building Regulations for conventional space heating systems, hot water systems and cooling systems.

The dwellings have been designed with individual combination boilers supplying an underfloor heating system. Each dwelling will therefore have an individual gas supply feeding each boiler. By using individual gas boilers, distribution losses have been reduced compared to a centralised solution, and the risk of overheating internal corridors has been mitigated. In addition, due to the size of the development, it would be uneconomically viable for a third party provider to operate a centralised network and hence this option has not been pursued.

4.2.5 Controls

The heating systems will be appropriately zoned, allowing fast local response to changes in loads. Appropriate lighting controls, including timers, occupancy controls and dimming shall be specified where applicable for all internal lighting.

4.2.6 Energy Metering

Metering of the energy uses within the development separately, will help the building users identify areas of increased consumption and highlight potential energy-saving measures for the future, hence reducing the associated annual CO_2 emissions from these systems. All electrical and heat supplies will be metered using smart meters to enable building users and tenant to be responsible for their own consumption and hence CO_2 emissions. There will be central display areas for tenants and utility companies to view the meter readings.

5. Estimated Annual Energy Consumption

In accordance with the NPPF and London Borough of Camden, the estimated energy consumption for the development has been calculated. The estimated energy consumption for the development has been based on the National Calculation Methodology (NCM) and calculated using the approved Standard Assessment Procedure (SAP) software Elmhurst Energy 2012 for the dwellings and IES Virtual Environment 2015 for the commercial element.

The energy assessments to follow have been carried out for the proposed scheme with the aforementioned passive and energy efficient measures. Low and zero carbon technologies (LZCs) have been explored later in this assessment.

5.1 Dwelling Annual Energy Consumption

The analysis indicates that the proposed dwellings are all performing significantly better than the minimum requirements of the Building Regulations and achieving improvements of between 3.9% and 6.6% dependant on the dwelling with an area weighted improvement for the residential development of 4.9% based on the design parameters listed in Appendix A: Be Lean Modelled Parameters - Dwellings.

In order to achieve the required reduction in annual CO_2 emissions a proportion of the development's energy requirements will need to be met by on-site energy generation and/or renewable energy technologies.

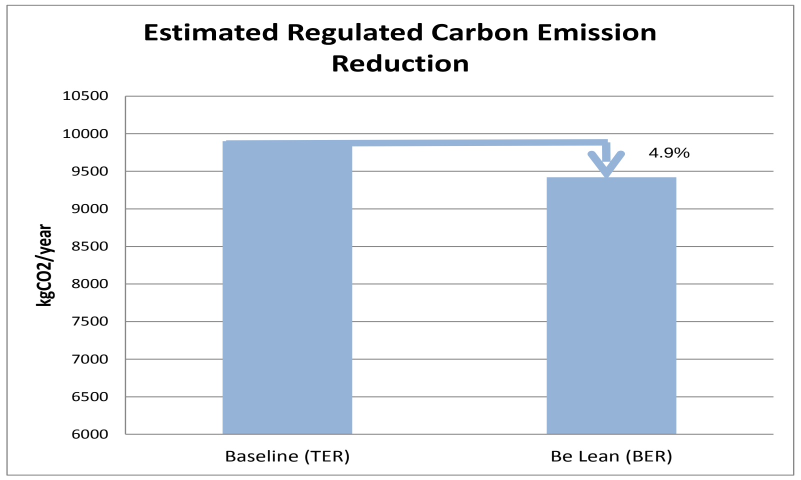


Figure 8 Residential CO_2 reduction

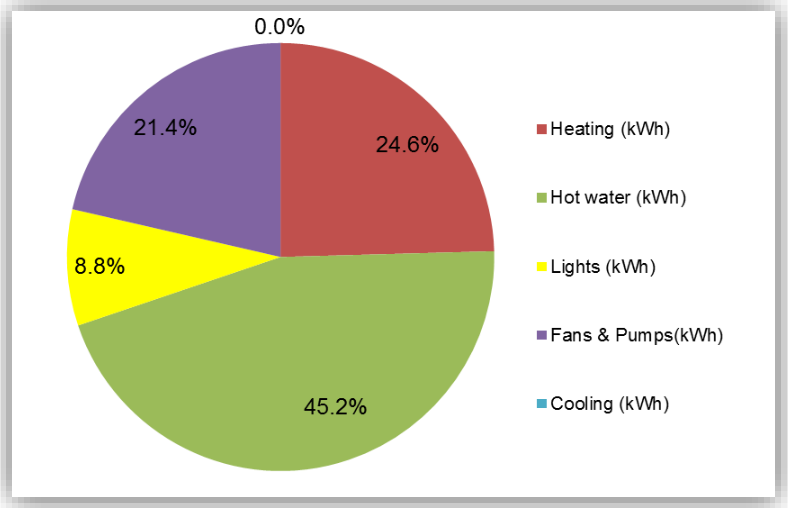


Figure 9 Residential energy savings from 'Being Lean'

5.2 Mixed Use

As the commercial and retail units are only being developed to shell and core with capped incoming services only, the good practice design parameters outlined in Appendix B: Be Lean Modelled Parameters – Retail and Appendix C: Be Lean Modelled Parameters - Office & Dentist of this report are recommended to the fit-out team. These have been used in the assessment in order to reduce the CO_2 emissions of the development.

5.2.1 Retail Annual Energy Consumption

The analysis indicates that the retail units are likely to perform significantly better than the minimum requirements of the Building Regulations and achieves an improvement of 17%. The remaining improvements will need to be met via the provision of on-site renewables or on-site power generation.

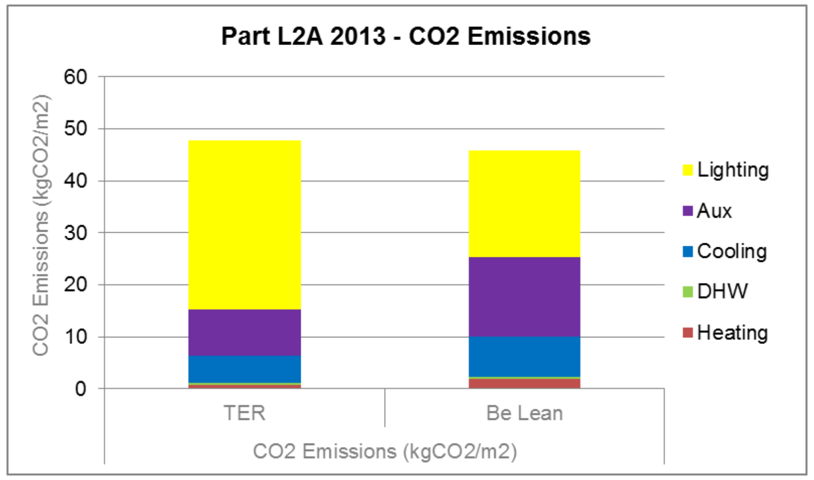


Figure 10 Retail annual CO_2 savings from 'being lean'.

5.2.2 Offices Annual Energy Consumption

The analysis indicates that the office units are likely to perform significantly better than the minimum requirements of the Building Regulations and achieves an improvement of 7%. The remaining improvements will need to be met via the provision of on-site renewables or on-site power generation.

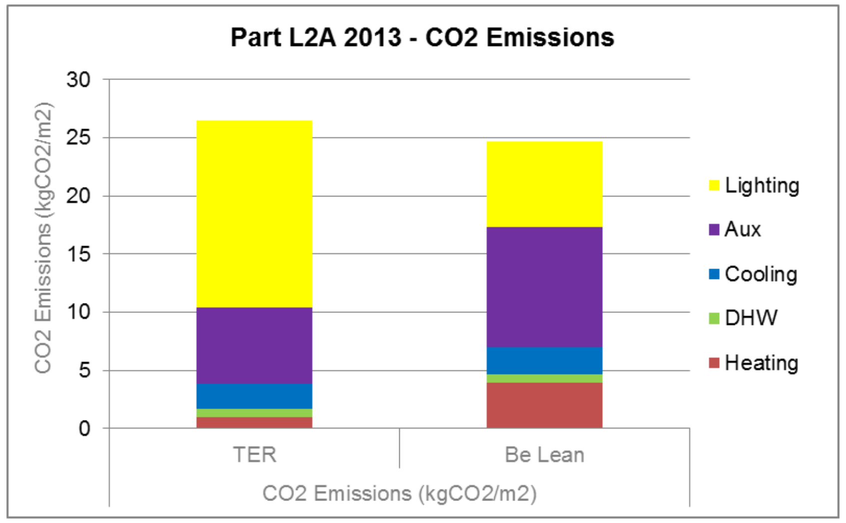


Figure 11 Office annual CO_2 savings from 'being lean'.

5.3 Dentist Annual Energy Consumption

The analysis indicates that the dental practice unit is likely to perform better than the minimum requirements of the Building Regulations and achieves an improvement of 1%. The remaining improvements will need to be met via the provision of on-site renewables or on-site power generation.

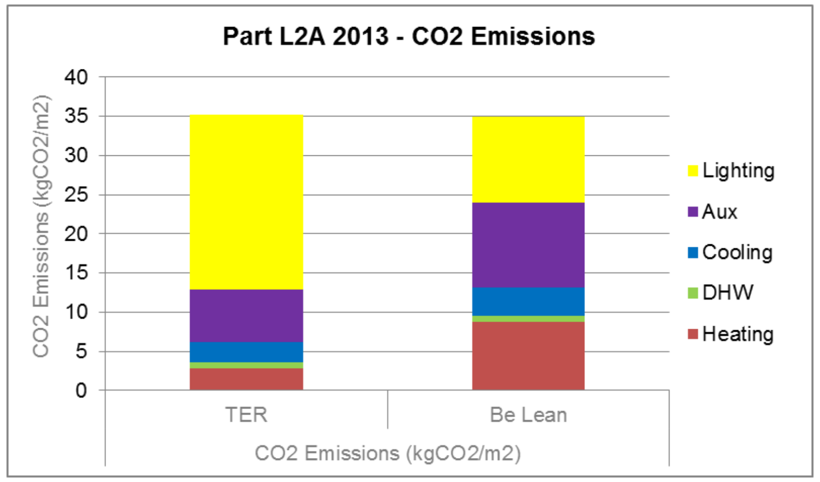


Figure 12 Dental Surgery annual CO_2 savings from 'being lean'

5.4 Site Wide CO_2 Emissions

The combined area-weighted estimated CO_2 emissions rates from the Building Regulations assessments when area weighted show a 14% reduction in CO_2 emissions on the 2013 Building Regulations Target Emissions Rate.

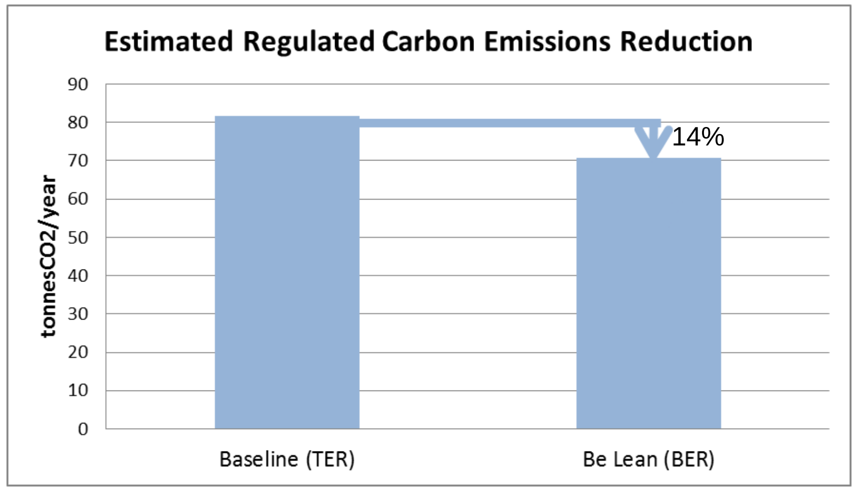


Figure 13 Whole Site CO_2 reductions

6. Decentralised Energy Networks

The feasibility of connecting to an existing or proposed district network has been investigated for the site at 152 - 156 Kentish Town Road in accordance with Policy 5.6 of the London Plan.

The London Heat Map indicates that there are no existing district heat networks within close proximity to the site. At distances greater than 500m, connections to networks becomes unviable due to the cost involved in infrastructure amendments in order to facilitate connection. The mark up below indicates that the closest network is more than double that distance away. Coupled with the fact that the development is on top of an existing building with no centralised heating systems, a decentralised energy network is not viable in this instance.

The London Borough of Camden Council has indicated that the site is within feasible connection distance of the proposed Kentish Town District Energy Network (DEN). However, information related to this DEN has not been forthcoming from the Council and therefore it is not recommended that the energy strategy is based on the unknown parameters of this network. The council has highlighted the area in a Heat Mapping Report 2015, however this is unavailable and therefore conclusions cannot be drawn.

Provision for plate heat exchangers can be set aside in the ground floor plant room that serves the office space and other non-domestic elements of the development. Therefore, the development will be future proofed in the event that the proposed Kentish Town DEN is constructed within a connectable distance.

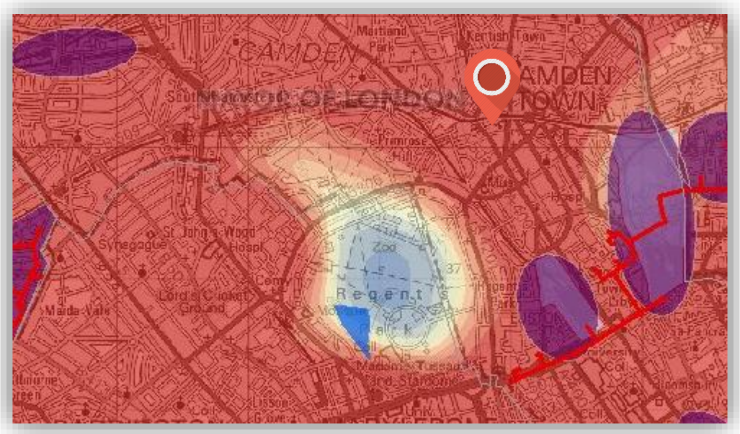


Figure 14 District Heating Networks in Proximity to the site (Yellow = installed, Red = proposed, Purple = potential)

Figure 15 Domestic and Commercial boilers (Red = Commercial, Black = Domestic)

7. Combined Heat & Power (CHP)

In accordance with the Mayor's Energy Hierarchy in Policy 5.6 the feasibility of a site wide CHP network has been investigated.

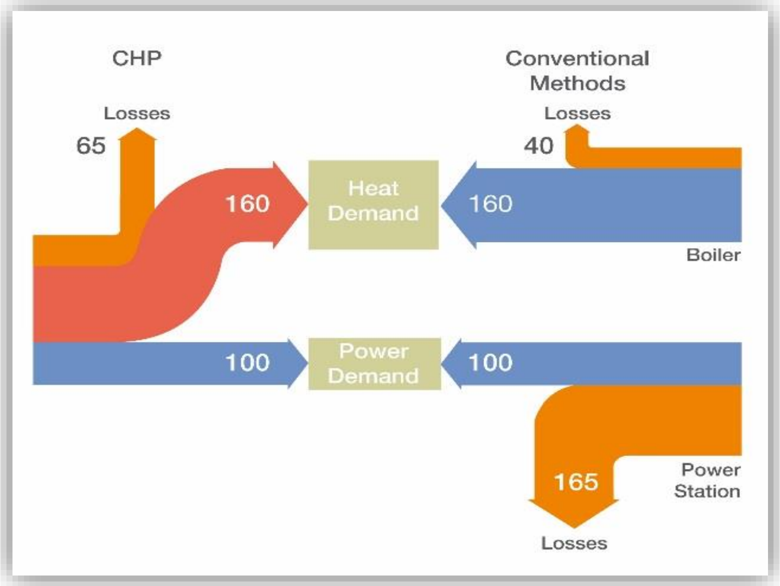


Figure 16 CHP Efficiency Diagram

CHP systems only work efficiently where there is a large and constant heating (space and water) demand. Given the limited size of the development and the high performance building fabric specified, the estimated heat demand is too low to support the use of efficient CHP scheme.

8. Low and Zero Carbon Energy Sources

Policy 5.7 of the London Plan requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible. The following technologies have been investigated to determine the feasibility of delivering a reduction in the CO_2 emissions through renewables.

The feasibility of each of the energy sources listed has been assessed with regard to the potential contribution each could make to supply a proportion of the development's delivered energy requirement, whilst considering the technical, planning, land use and financial issues.

8.1 ASHP (Air Source Heat Pump)

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems are inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

Typically there are two main types of air sourced heat pump systems, one which is refrigerant-based system (VRF) and one which is water based system (Air to water heat pumps). VRF system transfer heat from one location another using refrigerant. The volume or flow rate of refrigerant is accurately matched to the required heating or cooling loads thereby saving energy and providing more accurate control.

The analysis indicates that if the conventional heating and cooling system in the commercial units were replaced with split and multi split VRF systems then a further reduction in the development's annual CO_2 will be achieved based on installing VRF's with seasonal cooling efficiency (SEER) of 4.0 and heating seasonal efficiency (SCoP) of 4.0.

This value for seasonal heating and cooling efficiency is an achievable benchmark, with many manufacturers quoting efficiencies over 7.0.

Therefore, individual VRF heat pump system can be installed in each commercial unit with external units located on the roof of the development as per the tenant fit-out guides. If the tenant desires to install an alternative heating and cooling system, they will have to demonstrate that the performance exceeds the proposed heat pump system.

8.2 GSHP (Ground Source Heat Pumps)

Ground source heat pumps require either horizontal trenches or vertical boreholes to be excavated in order to accommodate piles or loops. As the proposed extension is on top of an existing building with no grounds it would not be possible to install any ground coupled system and hence GSHP have be discounted from this assessment.

8.3 Biomass Boilers and CHP

Biomass in the form of logs, wood chips and wood pellets are classified as a renewable source of energy due to the fact that the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants. Even allowing for emissions of carbon dioxide in planting, harvesting, processing and transporting the fuel they will typically reduce net CO_2 emissions by over 90%.

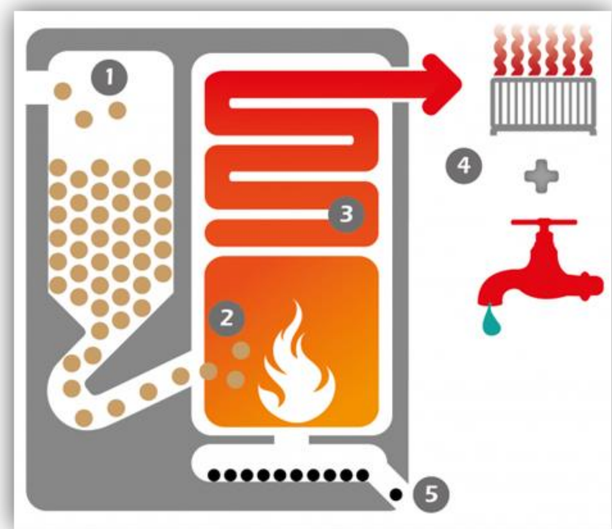


Figure 17 Biomass Boiler Process

Biomass boilers operate most efficiently when run at a constant rate with no or little throttling down of the output, hence biomass boilers should be sized to deliver a development's base heat load.

As with conventional CHP, electrical generation is most effective when the base load is being met. A catalytic converter should be fitted to all units, in order to minimise the NOx, PM10 and other emissions, if the building is located in a high value ecological area.

Biomass boilers are not considered appropriate for this development due to high running and initial capital costs.

8.4 Solar Thermal

Solar thermal collectors utilises solar radiation to heat water for use in buildings. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30º from the horizontal.

Figure 18 Solar Thermal Collector Panel

Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. For residential development these usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load.

The feasibility of installing solar thermal collectors is not considered viable due to the limited space within the dwellings for additional infrastructure.

8.5 Photovoltaic Panels

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current.

A study into the feasibility of onsite electric generation using south facing photovoltaic panels at 30º on the roof of the development to meet a proportion of the residential development's electricity demand has been undertaken and suggests that the electrical load would be suited to PV panels. 50m^2 of 8.6kWp of installed power could provide up to 6961kWh per year – a possible emissions reduction for the residential dwellings of 11%.

Figure 19 Roof Mounted Solar Photovoltaic Array

The indicative roof plan shows that there should be adequate space to mount the above panels on the roof. Based on an intensive array, the efficiency of the roof in accommodating panels is around 65%.

To generate the electricity described, the calculations have been based on a standard market ready panel efficiency of 17%, and a combined inverter efficiency of 95%.

Due to the space required for access and to avoid overshadowing, a total area for the array of approximately 75m^2 is required. The location indicated has been chosen as it does not interfere with other items of plant, nor is it overshadowed by any pieces of equipment.

As per the requirements of CPG3, the orientation, array size, efficiency and installed peak power production of the array has been described to inform the design team. Metering of the output of the panels will be provided.

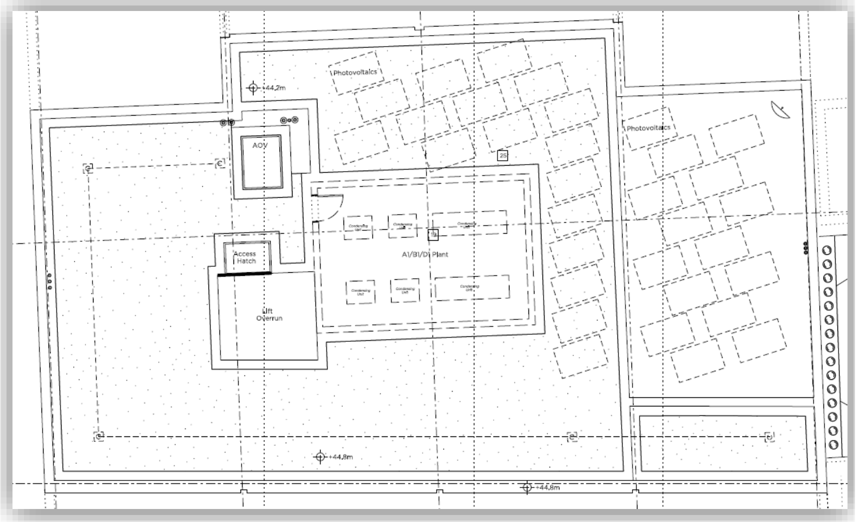


Figure 20 Proposed Roof Plan showing PV

8.6 Wind Turbines

The output from wind turbines are highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind.

The urban location of the site coupled with the adjacent buildings will result in a turbulent flow regime across the site. As such it is not proposed to include wind turbines as part of the development.

9. Proposed Energy Strategy

In accordance with the Mayor's Energy Hierarchy and the Borough of Camden's policy, the estimated energy consumption for the office and retail development has been based on the National Calculation Methodology (NCM).

9.1 Residential Energy Strategy

The analysis indicates that the proposed dwellings will perform better than the minimum requirements of the Building Regulations.

The new residential units will be insulated to high standards with accredited construction details ensuring heat losses are kept to a minimum. Mechanical Ventilation Heat Recovery (MVHR) in each apartment will provide the spaces with minimum fresh air heating requirements whilst recovering heat from the stale exhaust air. Underfloor heating from the gas boilers provides any secondary heating requirements as well as the domestic hot water demand. Solar PV panels on the roof of the property help to significantly decrease the CO_2 emissions of the dwellings by generating electricity from a renewable source of energy.

The analysis indicates that the proposed dwellings are both performing significantly better than base case achieving an area weighted improvements of 36% reduction in CO_2 emissions over 2013 Part L Building Regulations.

An outline of the building fabric and fixed systems specified in the SAP assessment can be found in Appendix A: Modelled Parameters - Dwellings.

9.2 Commercial Energy Strategy

The commercial units will be provided with capped incoming services only, meaning that only the design values relating to building fabric and air permeability will be specified. However, the remaining measures to reduce energy consumption, as outlined previously, are recommendations for the fit-out tenants to use as guidance.

The tenants will install local mechanical ventilation with MVHR and Variable Refrigerant Flow (VRF) systems to provide local comfort cooling and heating. The most important aspect of the design will be making sure the lighting systems are as efficient as possible, especially within the retail tenancies. Hot water will come from direct electric heaters.

9.2.1 Offices Energy Strategy

The analysis indicates that the proposed dwellings will perform better than the minimum requirements of the Building Regulations, achieving 38% reduction of the CO_2 emissions on the base case.

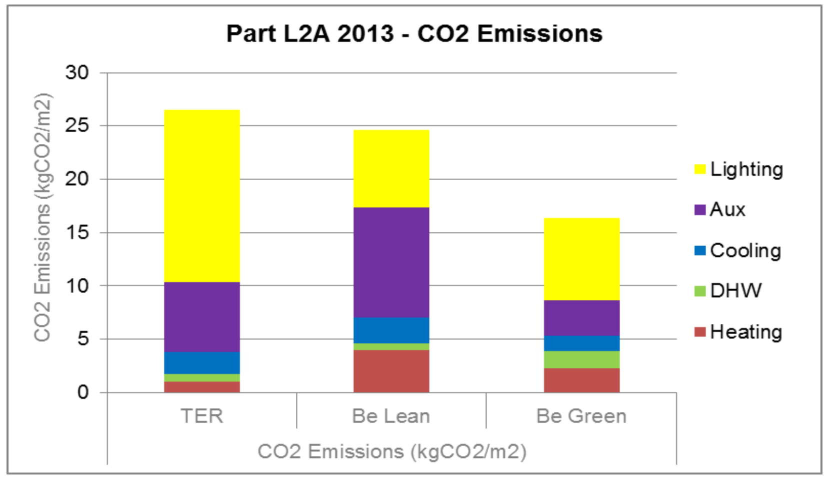


Figure 21 'Be Green' CO_2 Savings

More details of the specification used for the assessment can be found in Appendix C: Modelled Parameters – Office & Dentist.

9.2.2 Dentist Surgery Energy Strategy

The analysis indicates that the proposed dwellings will perform better than the minimum requirements of the Building Regulations, achieving 16% reduction of the CO_2 emissions on the 2013 TER.

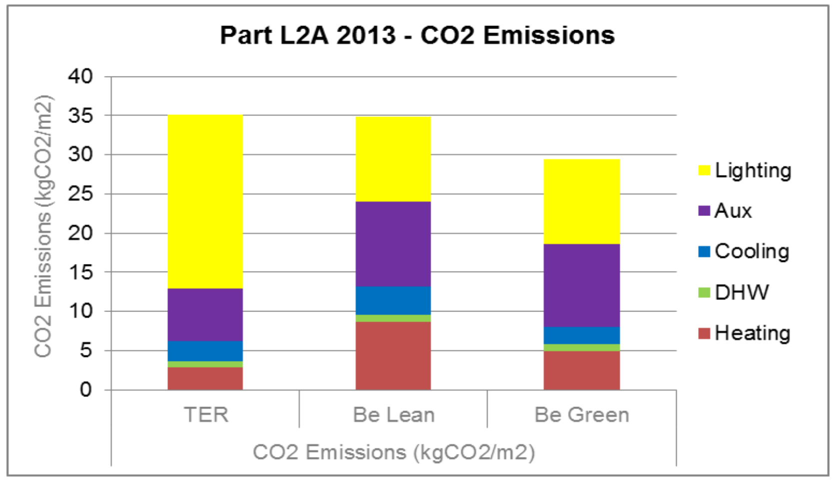


Figure 22 'Be Green' CO_2 Savings

More details of the specification used for the assessment can be found in Appendix C: Modelled Parameters – Office & Dentist.

9.2.3 Retail Energy Strategy

The analysis indicates that the proposed dwellings will perform better than the minimum requirements of the Building Regulations, achieving 35% improvement in CO_2 emissions over the base case.

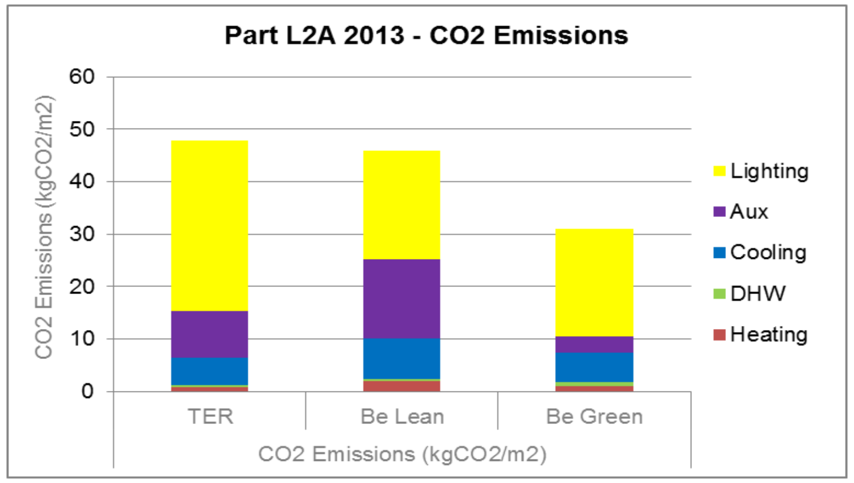


Figure 24 'Be Green' CO_2 Savings

More details of the specification used for the assessment can be found in Appendix B: Modelled Parameters – Retail.

9.2.4 Overall Energy Consumption

As an overall site, area-weighted annual CO_2 emissions are reduced by 36% over the 2013 Building Regulations Target Emissions Rate with 22% of that reduction coming from Low or Zero Carbon technologies (LZCs), thus complying with both Policy 5.2 and 5.7 of the London Plan.

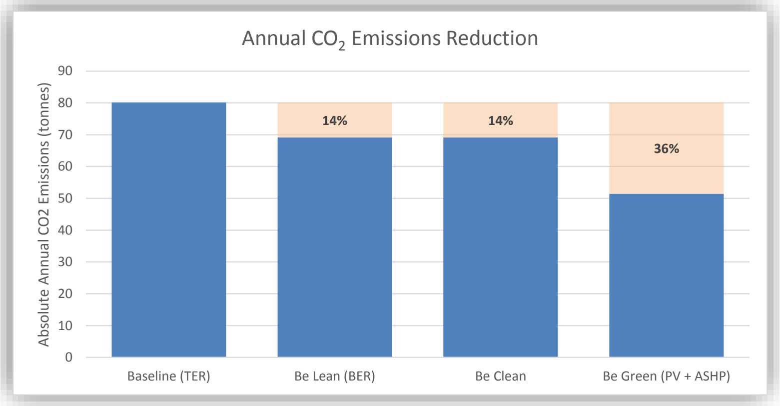


Figure 25 Whole Site CO_2 Emissions Reduction

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy	Carbon dioxide emissions (Tonnes CO_2 per annum)
	Regulated
Baseline: Part L 2013 of the Building Regulations	80
After energy demand reduction	69
After CHP	69
After renewable energy	51

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy	Regulated Carbon dioxide savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	11	14%
Savings from CHP	0	0%
Savings from PVs + ASHPs	18	22%
Total Cumulative Savings	**29**	**36%**
Total Target Savings	28	35%

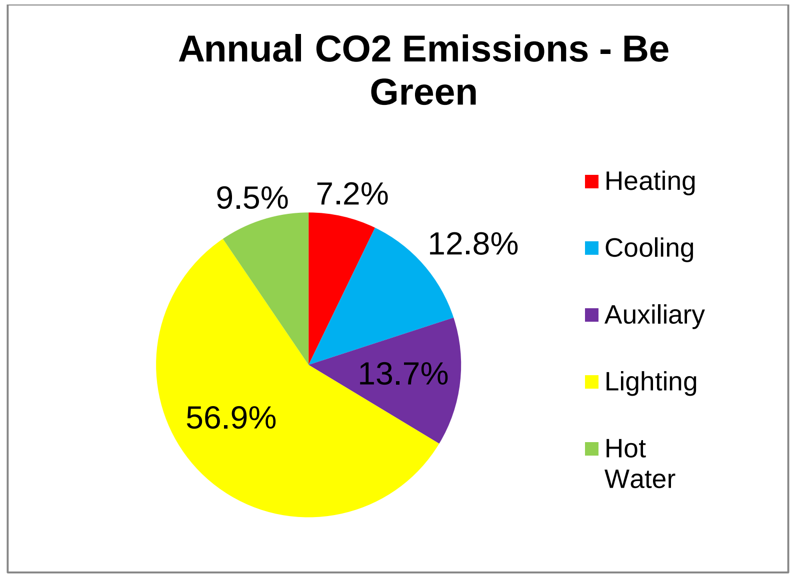


Figure 26 Annual CO_2 Emissions

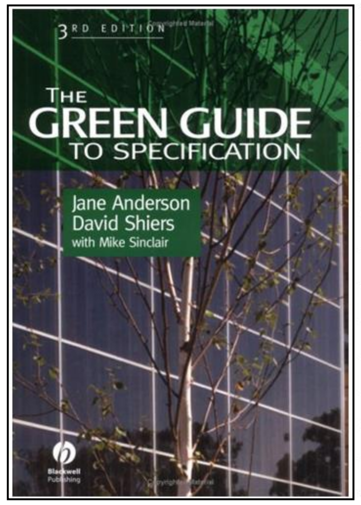
10. Materials

Building and construction activities worldwide consume 3 billion tons of raw material each year, which account for approximately 50% of total global consumption. Using green/sustainable building materials and products promotes conservation of dwindling non-renewable resources. In addition, integrating sustainable building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these source materials.

The aim for the proposed 152 - 156 Kentish Town Road development will be for its overall environmental impact to be minimised through the specification of sustainable materials. As the proposed development consists an extension to an existing building, building elements should be reused where possible.

10.1 Environmental Impact of Materials

New materials with low overall environmental impact will be chosen and advice from the Green Guide to Specification will be taken into consideration for the selection. The Green Guide rates the environmental impact of different materials and components, taking into account factors like toxicity, ozone depletion, ease of recycling, waste disposal etc. Where viable, at least 80% (by area) of the new main elements in the building, fabric & building services insulation should be specified to achieve the best performing “A” and “A+” ratings from the Green Guide.



Environmental Issue
Climate Change*
Water extraction
Mineral extraction
Stratospheric ozone depletion*
Human toxicity
Ecotoxicity to freshwater
Higher level nuclear waste
Ecotoxicity to land
Waste disposal
Fossil fuel depletion
Eutrophication*
Photochemical ozone creation*
Acidification*

Figure 27 The 13 Environmental Issues assessed by the Green Guide

10.2 Sustainable Timber

All timber used for basic or finishing building elements in the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and growing trees also absorb and fix CO_2. Forests can also provide the habitat for a wide variety of plant and animal life, preserving important ecology and promoting biodiversity.

10.3 Locally Sustainable Materials

A building that is truly sustainable must be constructed using locally sourced, sustainable materials i.e. materials that can be supplied without any adverse effect on the environment. Therefore, where practical, materials should be sourced from local suppliers, reducing the environmental impacts and CO_2 emissions associated with transportation to the site.

10.4 Recycled Materials

Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings’ life.

Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed.

10.5 Ozone Depletion and Global Warming

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth’s stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors.

All insulation materials specified for the proposed scheme will have zero Ozone Depleting Potential and low Global Warming Potential, (GWP<5) in either manufacture or composition in line with the BREEAM requirements. This will include insulation for building elements (roof, internal & external walls, and floor) as well as insulation for hot water vessels and pipe or duct work.

11. Water Conservation

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

11.1 Demand Reduction and Water Efficiency

The aim is to minimise internal and external potable water use within the development. Good water management can contribute to reducing the overall level of water consumption maintaining a vital resource and having environmental as well as cost benefits in the life-cycle of the building. The following water saving measures are being considered:

Dual Flush Cisterns on WC's - These units have the ability to provide a single flush of 4L and/or a full flush of 6L.

Flow Restrictors to Taps - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption. Low flow taps in one of the above forms will be installed in all areas.

Low Flow Showers - The average shower uses 15 litres of water a minute, by restricting the output of the showers in the development to a maximum of 9 litres/ min a 40% water saving can be achieved.

Water Meters - In 1995 approximately 33,200 million litres of water a day were extracted in England and Wales, this increased to 44,130 million litres/day in 2001, and much of this was for domestic water supply. To reduce this figure, accurate information on usage is required for management of a building's consumption. Water meters will be specified on the main supply to each dwelling.

11.2 Greywater Harvesting

All water from residential development will be discharged via individual black water stacks, meaning that it cannot be feasibly recovered and reused with an individual unit. The non-domestic elements have a low potable water usage rate and therefore greywater recycling is not a viable method due to the minimal water consumption of these elements.

It is unlikely that waste water from the dental surgery could be recycled as it may contain traces of medical liquids. Therefore, only retail and office elements could potentially make use of recycled greywater. However, their respective potable water usage rates are minimal, meaning that installing a greywater recycling system for these elements is not financially feasible.

12. Sustainable Urban Drainage

The site's drainage strategy will aim to reduce the impact of development on the natural drainage patterns, by retaining water on site by the incorporation Sustainable Urban Drainage techniques (SUDs).

As the site is currently completely impermeable with hard landscaping and building areas, the main aim for the development will be to improve the water retention of the site.

The Environment Agency's Flood Map indicates that the site is located within Flood Zone 1 and therefore there is a low risk of flooding on the site due to a great distance from the river Thames.

Figure 28 Flood Map for 152 - 156 Kentish Town Road

As a minimum, the design will ensure that the peak rate of runoff into watercourses is no worse than the existing site's run off rate. This will comply with the Interim Code of Practice for Sustainable Drainage systems (SUDS) (CIRIA, 2004) or for at least the 1 year and 100 year return period events.

12.1 Rainwater Attenuation

To reduce the run off rate from the development, several features will be integrated into the design. A 30m^3 attenuation tank and hydro brake provides a cap of 5l/s as a run off rate. The integrated green roofs with an optimised depth of growing medium will also offer a degree of attenuation.

The proposed drainage networks will be designed for the 1 in 100 year +30% storm event. No flooding or exceedance should occur for storm events up to and including this. Site levels have been specified such that any exceedance flows due to extreme storm events will flow to areas of the site which do not pose a flood risk to buildings and or end users.

Building thresholds will have threshold drains with falls away from entrances to protect against inflows of above ground flows.

12.2 Rainwater Harvesting

Incorporating rainwater harvesting in a mixed use development such as Kentish Town Road is not feasible for the same reason that greywater recycling is not a viable strategy. Each individual dwelling is a self-contained unit with little to no space to accommodate a rainwater collection vessel. Collecting rainwater from the roof and then distributing it to the non-domestic elements is also an overly complicated solution, as the non-domestic elements will have a low potable water consumption anyway.

Therefore, the residential units are too small to have individual rainwater harvesting systems, and the non-domestic elements cannot justify the small saving in potable water that may be achievable. Rainwater harvesting could be incorporated with the office space where the water could be used, however the space required for the storage is unjustifiable. For these reasons rainwater harvesting is not specified for this development.

12.3 Flood Protection

Non-return valves will be incorporated onto the final outfalls from the site to ensure that the development is protected from surcharged sewers.

13. Waste Management

Buildings and building sites produce a significant amount of waste annually. Most of the waste produced in the UK is disposed of in landfill sites and only a small percentage of it is recycled or reused.

13.1 Waste Targets

Under EU legislation the UK will have to ensure that less than a third of its waste is sent for burial in landfill sites by 2020 and the figure at present is about 80%. To achieve this target a number of measures are implemented, including landfill tax, aiming to discourage disposal of waste to landfill. Good waste management is a key component of sustainable development. Reducing waste is an important means of:

- Reducing unnecessary expenditure;
- Reducing the amount of natural resources used for production of new materials;
- Reducing energy for waste disposal;
- Reducing levels of contamination and pollution arising from waste disposal.

The proposed development will minimise the impact of waste in the environment where possible and fit-out designer for the commercial tenancies should be aware of these measures.

13.2 Demolition & Construction

During the construction phase a large amount of waste material will be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products in descending percentages are: wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products.

Prior to commencement on site a Site Waste Management Plan (SWMP) that complies with the requirements of current legislation and CSH has been prepared. This plan identifies the local waste haulers and recyclers, determines the local salvage material market, identifies and clearly labels site spaces for various waste material storage and presents a reporting system that will quantify the results and set targets. The SWMP contains:

a. The target benchmark for resource efficiency e.g. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$;
b. Procedures and commitments for minimising non-hazardous waste in line with the benchmark;
c. Procedures for minimising hazardous waste;
d. Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste;
e. Procedures for sorting, reusing and recycling construction waste into defined waste groups either on site or through a licensed external contractor;
f. The name or job title of the individual responsible for implementing the above.

As the proposed development is redevelopment on an existing slab, there is no requirement for new material to make up foundations. Opportunities for introducing more reused or reusable materials/components will be explored during detailed design.

Further detail on the Site Waste Management Plan is provided in the following section, as the SWMP covers both aspects.

13.3 Waste Management & Reporting in Operation

The detailed design phases will identify the potential waste streams that the development will produce. As a minimum, plans will be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metals. The collection points will be easily accessible to all of the users.

The main aim will be to recycle as much waste as possible; this will be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

The space allocated for waste storage should be able to accommodate containers with at least the minimum volume recommended by British Standard 5906 (British Standards, 2005) based on a maximum collection frequency of once per week. This is 170 litres volume for a two bedroom dwelling.

Large integrated recycling bin with at least 3 containers for recyclable waste and one general waste will be considered for each dwelling similar to the following image:

14. Environmental Management

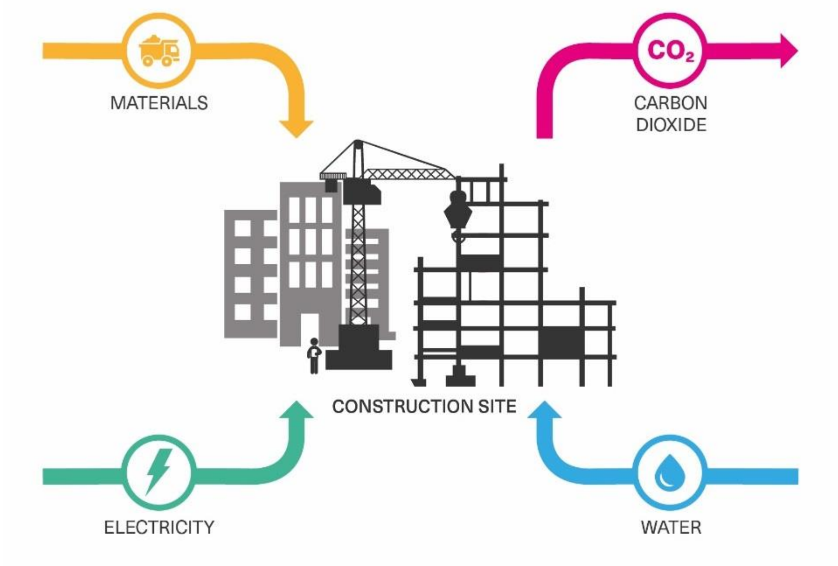
14.1 Construction

Construction sites are responsible for significant impacts, especially at a local level. These arise from noise, potential sources of pollution and waste and other disturbances. Impacts such as increased energy and water use are also significant. Therefore attention is being given to site-related parameters with the aim to protect and enhance the existing site and its ecology.

The aim is to have a construction site managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution and good neighbourliness. To achieve this, there will be a commitment to comply with the Considerate Constructors Scheme. As a minimum a score of greater than 35 of out 50 will be achieved with an aspiration to exceed 40, with no individual section achieving a score of less than 7.

Areas that can be taken into consideration in order to minimise the impact of the construction site on its surroundings and the global environment are as follows:

- Monitor, report and set targets for CO_2 or energy usage arising from site activities;
- Monitor, report and set targets for CO_2 or energy usage arising from transport to and from site;
- Monitor, report and set targets for water consumption arising from site activities;
- Monitor construction waste on site, sorting and recycling construction waste where applicable;
- Adopt best practice policies in respect of air and water pollution arising from site activities;
- Operates an Environmental Management System;
- Additionally, all timber used on site should be responsibly sourced.



A check has been undertaken in order to establish whether the site lies within any conservations areas or historic parks or gardens. Additionally, this check also provides information concerning any listed buildings, ancient monuments or details of trees covered by Tree Preservation Orders.

14.2 Site Waste Management Plan

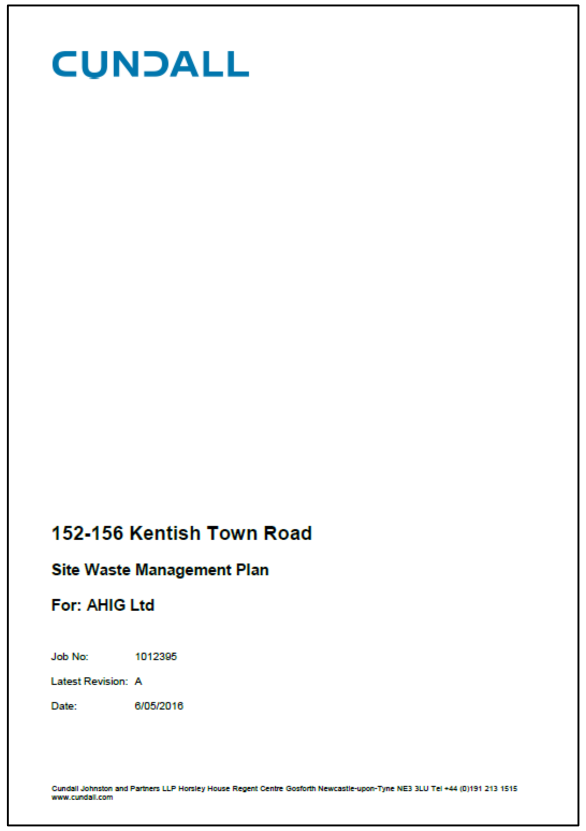
Cundall has produced a Site Waste Management Plan (SWMP) as guidance for the contractor and project manager. This document outlines the predicted volumes of each individual waste stream that will be created during demolition.

By virtue of managing and controlling the amount of waste produced, it will help reduce the potential harm to both the environment and to human health.

The report has the following roles:

1. To set out the importance of effective waste management, reviewing the existing North London joint waste documents and summarising those that are most important and relevant to the scheme; and;

2. Identify the baseline conditions and set out waste management issues at each of the three main stages; design, construction and operation, and establish a framework for further development of a Site Waste Management Plan which will be a live document throughout the process.



CUNDALL

152-156 Kentish Town Road

Site Waste Management Plan

For: AHIG Ltd

Job No: 1012395

Latest Revision: A

Date: 6/05/2016

Figure 29 - SWMP

15. Land Use and Ecology

The site currently comprises of an existing building with no green spaces, with the entire site made up of hard standing and existing building. There are no existing trees or areas of soft landscaping within the site boundaries. As there is no existing areas of biodiversity, an ecological survey is not required. Furthermore, due to the lack of habitable spaces, it is extremely unlikely that there will be any protected species on site.

As the proposed development involves areas of terrace, green roof, planters to balconies and terraces in line with planning policy DP22, the ecological value of the site is deemed to be projected to rise. The green roof will provide a natural habitat for local wildlife and will improve the ecological value of the site due to the number of new species introduced. For this kind of development, the areas of green roof, trough planters and terraces are shown below:

Figure 30 Ecological features of the building

The green roof will be designed to be as biodiverse as possible, incorporating as many of the species as outlined in CPG3. Where feasible, bat and bird boxes will be integrated into the design.

15.1 Green Roof Design

As per the guidance in CPG3, the green roof will be designed to be as biodiverse as possible. Substrate thickness will be determined by roof weight bearing capacity, but where feasible substrate depth will be maximised to promote growth of a wider variety of plant species.

The areas of green roofs have been selected as they experience a large amount of daylight, are easily accessible for maintenance and promote the use of green roofs in a visible manner within Camden. Therefore, maximum roof area for green roofs has been taken.

A green roof has not been selected for the area hosting the PV panels. The high concentration of PV panels, optimised to maximise array area, is not conducive to growing vegetation underneath. PV panels can work with sedum roofs when not installed intensively; spacing the panels out allows light to reach the greenery below the panel as the sun tracks. As the PV is concentrated on the single roof, there is no real space to integrate a green roof. Furthermore, the PV panels will prevent maintenance access to the green roof, resulting in a compromised level of care.

The proposed design has therefore been optimised to deliver the most diverse green roof possible, following the guidance as per CPG3.

CUNDALL

16. Pollution

Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design stage and on-site.

16.1 Ozone Depletion

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors. Where refrigerants are used for air-conditioning and comfort cooling they will be CFC and HCFC-free.

16.2 Internal pollutants

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as offgassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. These 'eco-friendly' paints are made from organic plant sources and also powdered milk based products.

The design team will seek to select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

16.3 NO_x emissions from boilers

Nitrous oxides (NOx) are emitted from the burning of fossil fuels and contribute to both acid rain and to global warming in the upper atmosphere. At ground level, they react to form ozone, a serious pollutant and irritant at low level. Burners in heating systems are a significant source of low-level NOx, while power stations (and therefore electric heating) are a significant source of NOx in the upper atmosphere.

The amount of NOx emissions varies between products. New gas boilers vary from 40 NOx/kWh to <70mg NOx/kWh (class 5). The proposed high efficiency gas-fired combination boilers will be specified to emit less than 50 NOx/kWh.

The City of Camden was declared an Air Quality Management Area (AQMA) in 1999 as the levels of NOx exceeded the National Air Quality Objectives. The Camden Air Quality Action Plan recommends that emissions standards for new boilers that meet the BREEAM requirements are targeted.

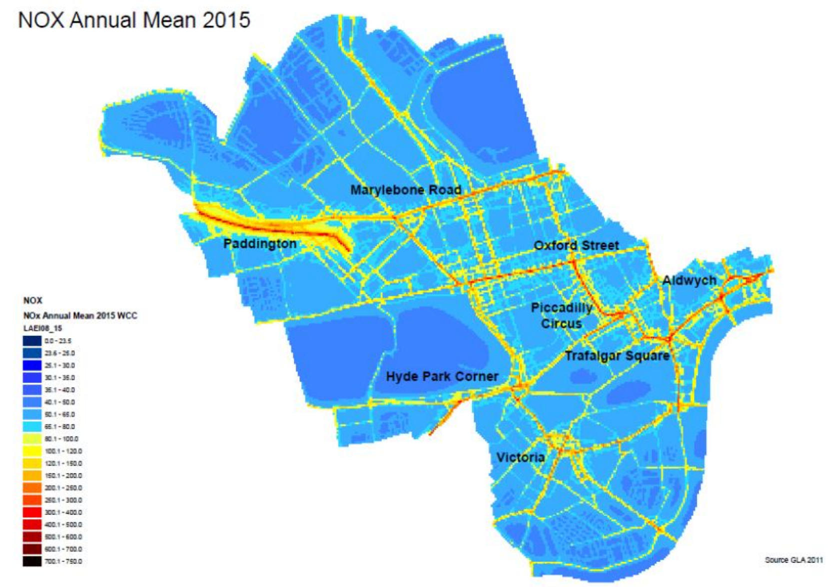


Figure 31 NO_X Levels in Mayfair

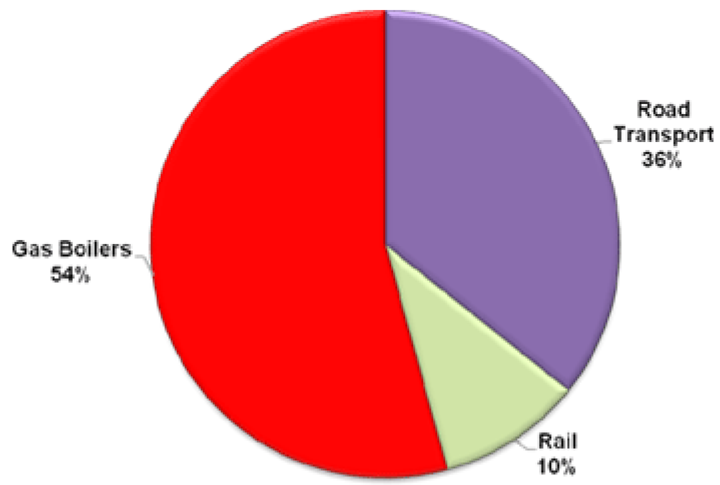


Figure 32 Breakdown of sources of NOx in the Borough of Camden (Source: London Borough of Camden)

17. Green Transport

The transport of people between buildings is the second largest source of CO_2 emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, and at the same time, the effects of climate change are becoming more severe; there will be greater pressure to control CO_2 emissions from transport and sites without good access to public transport will be at much greater risk from these controls.

17.1 Site Location

152 - 156 Kentish Town Road is located to the North of London City and North East of Regent's Park. The site has good public transport access to routes heading around and directly through the centre of London and out to other suburbs. As such it has excellent local and regional transport links within easy walking distance of the site.

Camden Town Underground Station is within 800m walk of the site, located on the Northern line. Kentish Town and Kentish Town West Overground and Thameslink stations are within 500mm of the site, offering connections through to axes and destinations throughout the city.

National Rail departs from Kings Cross and London St Pancras, 2km walk away, but also connected via underground and overground links.

The Public Transport Accessibility Level for the development is 6b, the highest rating possible, indicating that the site has excellent public transport links. This is also projected to increase as the development progresses due to the increase in people density in the area.

17.2 Cycling Facilities

There will be a number of cyclist provisions as part of the proposed scheme including secure cyclist spaces for B1, D1, A1 and C3 uses at both ground and lower ground levels.

Further afield, two Santander cycle hire scheme stands are located 700m from the site at Castlehaven Road and Bonny Street.

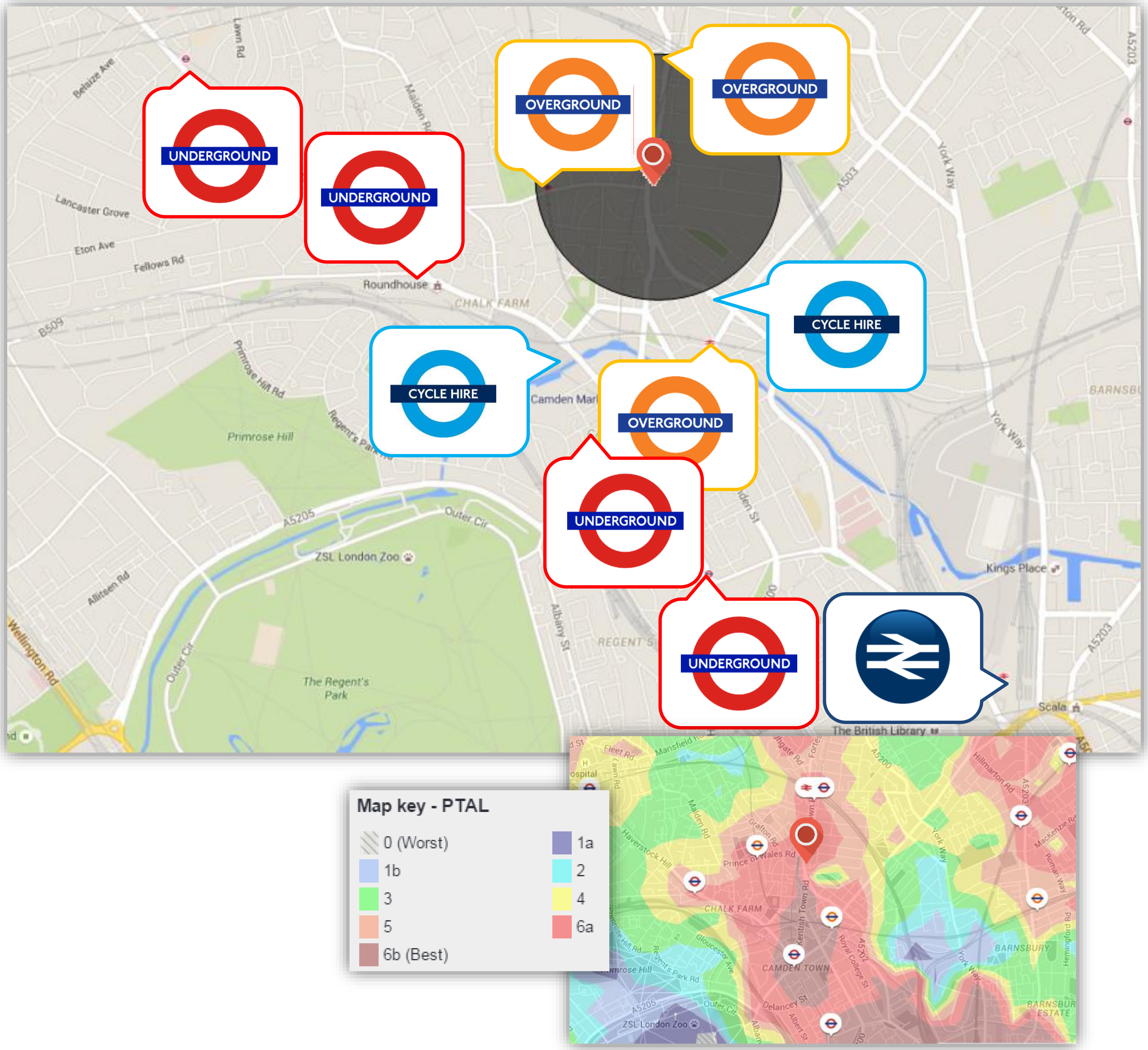


Figure 33 Public transport availability maps for 152 - 156 Kentish Town Road

Appendix A: Modelled Parameters - Dwellings

Detail	Design	Regulations (L1a)
Ground floor average area weighted U-value	0.10W/m^{2}K	0.25W/m^{2}K
External wall average area weighted U-value	0.15W/m^{2}K	0.30W/m^{2}K
Roof average area weighted U-value	0.10W/m^{2}K	0.20W/m^{2}K
Window area weighted U-value (including frame)	1.40W/m^{2}K	2.00W/m^{2}K
Roof light area weighted U-value (including frame)	1.40W/m^{2}K	2.00W/m^{2}K
Window Visible Light Transmission (%)	60.0%	n/a
Roof Visible Light Transmission (%)	n/a	n/a
Glazing total solar transmission (G-value)	40.0%	n/a
External door average area weighted U-value	1.40W/m2K	2.0W/m2K
Thermal Bridging Y Value	Accredited Construction	n/a
Air permeability @ 50 Pascals	3.0m^3/hr/m^2	10m^3/hr/m^2

Detail	Be Lean	Be Green
Heating type	Individual Combi Boilers - Underfloor and Radiators	Underfloor from DHW
Heating fuel	Natural gas	Gas - DHW System for Underfloor Electric - Underfloor to wet areas
Gross boiler seasonal efficiency	90.0%	90.0%
Heating Emitters	Underfloor	Underfloor
Boiler Compensator	Weather	Weather
Controls	Time and temperature zone control	Time and temperature zone control
Ventilation	MVHR 92% Efficiency	MVHR 92% efficiency
Extract SFP (W/L/s)	0.55	0.55
Ductwork	Semi-rigid	Semi-rigid
Hot water pipework insulated	Yes	Yes
Hot water daily usage	< 125 l/p/day	< 125 l/p/day
Hot Water System	Instantaneous Combi	Gas boiler

Appendix B: Modelled Parameters – Retail

Detail	Design	Regulations (L2A)
Ground floor average area weighted U-value	0.15W/m^{2}K	0.25W/m^{2}K
External wall average area weighted U-value	0.20W/m^{2}K	0.35W/m^{2}K
Roof average area weighted U-value	0.10W/m^{2}K	0.25W/m^{2}K
Window area weighted U-value (including frame)	1.60W/m^{2}K	2.20W/m^{2}K
Roof light area weighted U-value (including frame)	1.60W/m^{2}K	2.20W/m^{2}K
Window Visible Light Transmission (%)	70%	n/a
Glazing total solar transmission (G-value)	60.0%	n/a
External door average area weighted U-value	1.60W/m2K	2.2W/m2K
Air permeability @ 50 Pascals	5m^3/hr/m^2	10m^3/hr/m^2

Fixed Building Services - Retail

Detail	Be Lean	Be Green
Heating Type	Central boiler	VRF
Heating Fuel	Natural gas	Renewable - Heat
AHU Specific Fan Power (SFP)	1.4 W/l/s	1.4 W/l/s
AHU heat recovery sensible efficiency	89%	89%
Direct electric efficiency	100%	100%
Direct electric distribution efficiency	95%	95%
Hot Water System	Direct	Direct
VRF cooling SEER (retail)	4.00	4.00
VRF heating SCoP (retail)	4.00	4.00

Lighting - Fixed Building Services

Detail	Value
Retail area display lighting efficacy	50 lm/W
Stairs, Cupboards, Toilets and Circulation efficacy	90 lm/W
Light switching - Retail areas - Manual On/Auto Off	
Light switching - Reception/Lobby/Circulation - Auto On/Off	
Light switching - Stair Wells - Auto On/Off	
Light switching - Bathrooms - Auto On/Off	
Light switching - Plant areas - Auto On/Auto Off	
No photoelectric daylighting dimming in retail areas	
Constant illuminance control on all luminaires	

Building Details

Detail	Value
Whole site electrical power factor	<0.9

Appendix C: Modelled Parameters – Office & Dentist

Detail	Design	Regulations (L2A)
Ground floor average area weighted U-value	0.15W/m^{2}K	0.25W/m^{2}K
External wall average area weighted U-value	0.20W/m^{2}K	0.35W/m^{2}K
Roof average area weighted U-value	0.10W/m^{2}K	0.25W/m^{2}K
Window area weighted U-value (including frame)	1.60W/m^{2}K	2.20W/m^{2}K
Roof light area weighted U-value (including frame)	1.60W/m^{2}K	2.20W/m^{2}K
Window Visible Light Transmission (%)	70%	n/a
Glazing total solar transmission (G-value)	60.0%	n/a
External door average area weighted U-value	1.60W/m2K	2.2W/m2K
Air permeability @ 50 Pascals	5m^3/hr/m^2	10m^3/hr/m^2

Fixed Building Services - Office

Detail	Be Lean	Be Green
Heating Type	Central boiler	VRF
Heating Fuel	Natural gas	Renewable - Heat pumps
AHU Specific Fan Power (SFP)	1.7 W/l/s	1.7 W/l/s
AHU heat recovery sensible efficiency	89%	89%
Direct electric efficiency	100%	100%
Direct electric distribution efficiency	95%	95%
Hot Water System	Direct	Direct
VRF cooling SEER (offices)	4.00	4.00
VRF heating SCoP (offices)	4.00	4.00

Lighting - Fixed Building Services

Detail	Value
Office area lighting efficacy	90 lm/W
Stairs, Cupboards, Toilets and Circulation efficacy	90 lm/W
Light switching - Office areas - Manual On/Auto Off	
Light switching - Reception/Lobby/Circulation - Auto On/Off	
Light switching - Stair Wells - Auto On/Off	
Light switching - Bathrooms - Auto On/Off	
Light switching - Plant areas - Auto On/Auto Off	
Photoelectric daylighting dimming in office perimeter areas	
Constant illuminance control on all luminaires	

Building Details

Detail	Value
Whole site electrical power factor	<0.9