Sceaux Gardens

Energy Statement

Date: **18th May 2021**
Ref. **4114C-4-2-2-ENG-01 Rev A**

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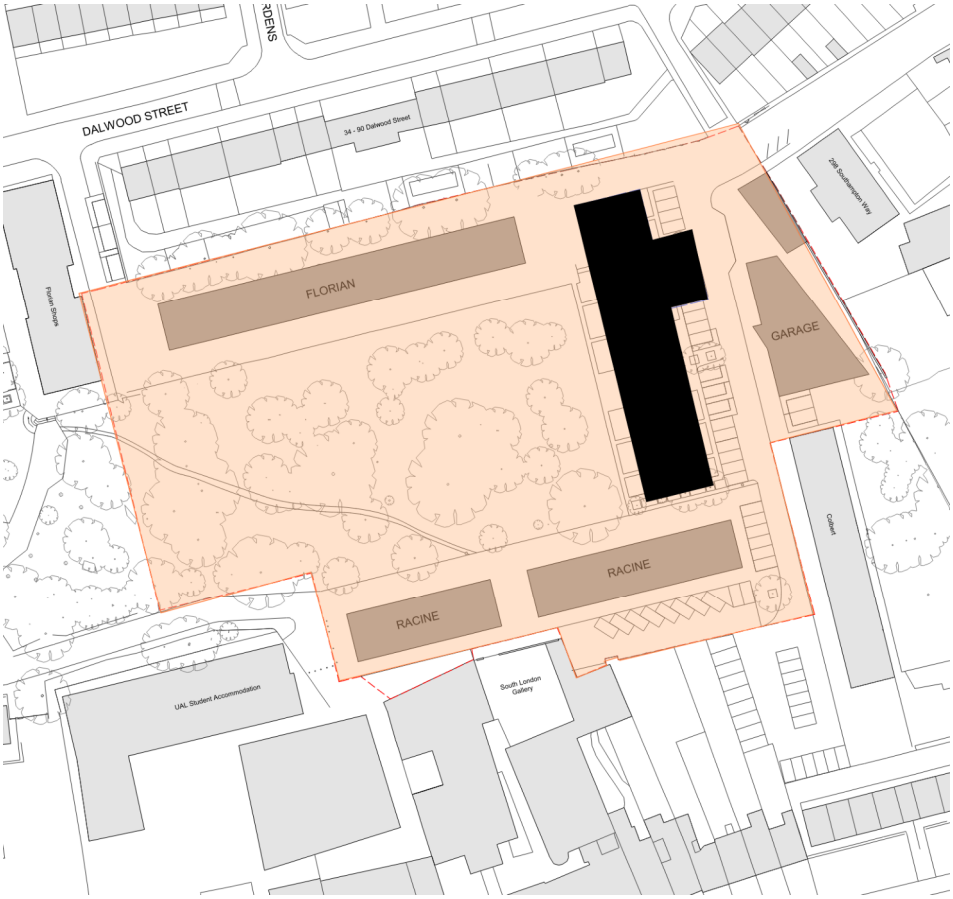
INTRODUCTION

1.1. Vector Design

Vector Design Consultancy Ltd have been appointed to prepare and energy statement in support of the planning application for the development at Bell Gardens. Vector Design are a Building Services, Low Energy and Sustainability design consultancy, established in 1995 and BREEAM assessors.

1.2. The Development

The proposal is for the redevelopment of existing single storey bungalows at Racine and Florian and an existing garage site to create 79No. new homes for social rent with associated landscaping and children's play space.



2. EXECUTIVE SUMMARY

2.1. Energy Assessment

The energy strategy for this site has been developed to meet and exceed the current national and regional targets as described in the National Planning Framework. In addition the proposed energy strategy has been developed to comply with the requirements of:-

1) New Southwark Plan 2018-2033 (August 2020)

With reference made throughout to the following documentation:-

2) GLA Energy Assessment Guidance
3) The Publication London Plan 2020

In accordance with the requirements of the of the "Energy Assessment Guidance" SAP 10 carbon factors have been used for the energy assessment rather than the SAP 2012 carbon factors which are still used in the current calculation procedures for ascertaining Part compliance. Therefore the carbon factors used throughout this document are:-

1) Mains Gas 0.210 kgCO_2 per kWhr
2) Electricity 0.233 kgCO_2 per kWhr

The energy strategy has been carried out in accordance with the 3-step Energy Hierarchy as described in the London Plan:-

Step 1 – "Be Lean"
Step 2 – "Be Clean"
Step 3 – "Be Green"

All residential areas have been assessed using the Standard Assessment Procedure (SAP) (41No. sample SAPs have been carried out to provide a representative sample for the whole site).

SAP calculations have been carried out using Elmhurst Energy Systems, SAP2012 Calculator (Design System) version 4.10r08

Part L 2013 compliant Baseline figures are as follows:-

Part L 2013 Baseline Energy Demand (MWhrs/year)							
	Space Heating	Hot Water	Lighting	Auxiliary	Cooling	Unregulated Electricity	Unregulated Gas
Residential	270.89	163.06	27.59	5.93	0	156.29	0

Part L 2013 Baseline CO_2 Emissions (Using SAP10 Carbon Factors)	
Residential	98.9 Tonnes CO_2 per year

2.2. Step 1 – "Be Lean"

It is expected that all developments are to exceed Building Regulation requirements (Part L 2013 Baseline figures for carbon emissions) though passive and active demand reduction measures alone. The GLA require the following:-

1) Domestic developments should achieve at least a 10 percent improvement on Building Regulations from demand reduction measures.
2) Non-domestic developments should achieve at least a 15 percent improvement on Building Regulations from demand reduction measures.

The passive and active demand reduction measures are summarised in the tables below:-

Part L 2013 (SAP 10 Carbon Factors) – Be Lean – Passive Enhancements	
Item	**Residential Proposed U-values**
External Wall	0.15 W/(m^2.K)
Party Wall	0.00 W/(m^2.K)
Windows / Doors	1.30 W/(m^2.K)
Exposed Floor	0.10 W/(m^2.K)
Exposed Roof	0.10 W/(m^2.K)
Air Leakage Rate	3.5 m^3/m^2.hr@50Pa

Be Lean –Active Enhancements	
Item	**Description**
Communal Heating	Connection to communal heating system, comprising high efficiency gas fired boilers Boiler efficiency 89% (Seasonal 95%)
Ventilation	Mechanical ventilation with heat recovery c/w summer by-pass.
Lighting	100% low energy lighting

2.3. Step 2 – "Be Clean"

The next stage of the energy hierarchy is to consider review whether connection to an area wide heat network is available or if not then the provision of a single energy centre at the site.

In 2013 , the initial SELCHP District Heating network was agreed between Southwark Council and Veolia. Southwark Council have carried out studies that have highlighted the strategic value of the SELCHP facility as a source of low-carbon wates heat in the area.

The London Heat Map indicates a route for the extension to the SELCHP District Heat Network proposed to commence later this year will run adjacent to the site, therefore it is proposed that a connection will be made to this network. Should the connection not be available at time of completion of the project then temporary gas boilers will be provided to serve the communal heating system on site until such time as the connection becomes available.

2.4. Step 3 – "Be Green"

The final stage of the energy hierarchy is to incorporate renewable energy technology onsite to further reduce emissions to zero carbon for the residential element. At least a 35% reduction is to be achieved for both the residential and non-residential elements with the introduction of renewable systems and the remaining carbon offset to zero to be by way of cash in-lieu contribution.

Further to the review of possible renewable technologies, it is recommended that photovoltaic panels will be provided to the roofs of each of the blocks on the site.

Be Green – Residential Enhancements	
Item	**Description**
Photovoltaic Panels	Racine – 15.12kWp system Florian – 13.440kWp system

2.5. Summary of Results

The final stage of the energy hierarchy is to incorporate renewable energy technology onsite to further reduce emissions to zero carbon for the residential element. At least a 35% reduction is to be achieved with the introduction of renewable systems and the remaining carbon offset to zero to be by way of cash in-lieu contribution.

Residential Carbon Emissions Savings Summary			
	Regulated Emissions Tonnes CO_2 per yr	**Savings Tonnes CO_2 per yr (%)**	**Unregulated Emissions Tonnes CO_2 per yr**
Baseline	98.9	0 (0%)	36.42
Be Lean	86.0	12.9 (14%)	36.42
Be Clean	22.1	63.9 (63%)	36.42
Be Green	22.1	5.0 (5%)	36.42
Cumulative Savings		**81.8 (82.7%)**	

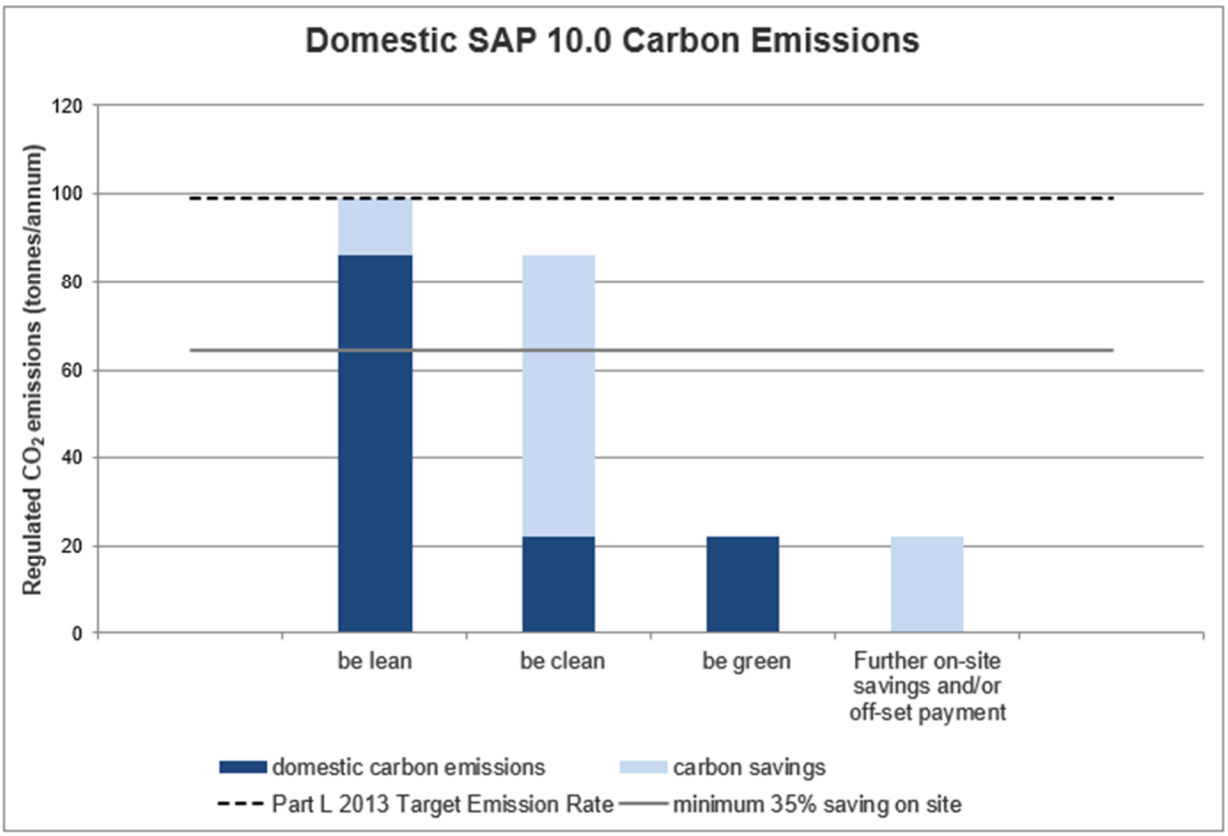
2.6. Site Carbon Savings and Cash In-lieu contribution

Following the full implementation of the energy hierarchy, the site achieves a 78% reduction on Part L 2013 baseline emissions using SAP10 carbon factors, achieving and bettering all energy targets provided in the steps of the energy hierarchy.

Cash in-lieu contribution required £63,045 (Before savings associated with the Photovoltaics are considered).

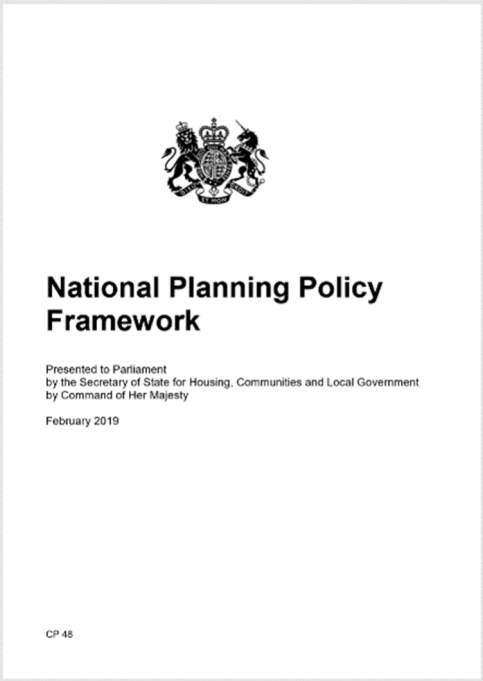
(Please refer to GLA summary spreadsheet in Appendix A for all figures used in these tables)

Cash in-lieu contribution required based on connection to SELCHP and after Photovoltaics are taken into consideration £48,890 (Before savings associated with the Photovoltaics are considered).


Domestic SAP 10.0 Carbon Emissions
Regulated CO_2 emissions (tonnes/annum)
120
100
80
60
40
20
0
be lean
be clean
be green
Further on-site savings and/or off-set payment
domestic carbon emissions
carbon savings
Part L 2013 Target Emission Rate
minimum 35% saving on site

3. Planning Policy

3.1. National Planning Policy Framework (February 2019)



The National Planning Policy Framework (NPFF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development cane be produced.

The NPFF states that the purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

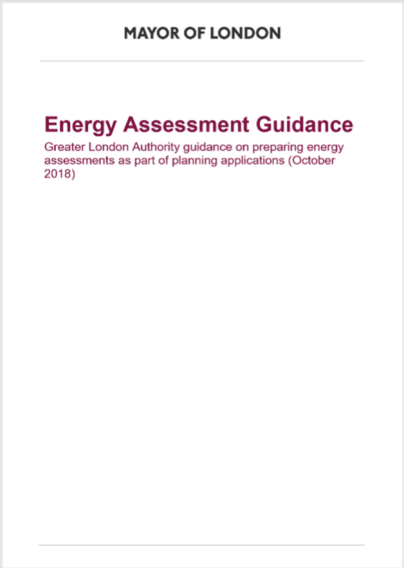
An economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

A social objective – to support strong, vibrant and healthy communities by ensuring that a sufficient number and range of homes can be provided to meet the needs of the present and future generation; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

An environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

At the heart of the NPFF is a presumption in favour of sustainable development, so that sustainable development is pursued in a positive way.

3.2. Energy Assessment Guidance



This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor1 as set out in London Plan Policy 5.2. It is for anyone involved in, or with an interest in developing energy assessments including developers, energy consultants and local government officials. The purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

The energy assessment must fully comply with Policies 5.2 to 5.9 inclusive and, recognising the integrated nature of London Plan policies, take account of relevant design, spatial, air quality, transport and climate change adaptation policies in the Plan.

The energy assessment must clearly outline the applicant's commitments in terms of CO_2 savings and measures proposed to reduce energy demand. It is also important to consider and mitigate any potential air quality impacts arising as a result of the technologies proposed.

Grid electricity has significantly decarbonised since the last update of Part L in April 2014 and in July 2018 the Government published updated carbon emission factors (SAP 10) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations. The impact of these new emission factors is significant in that technologies generating on-site electricity (such as gas-engine CHP and solar PV) will not achieve the carbon savings they have to date. It is therefore anticipated that developments will need to utilise alternative or additional technologies to meet the 35 per cent on-site carbon reduction target, including using zero emission or local secondary heat sources.

The GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO2 emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation. This approach will remain in place until Government adopts new Building Regulations with updated emission factors.

3.3. The Publication London Plan (December 2020)

The Mayor has formally approved a new London Plan, the "Publication London Plan" It is expected that the Secretary of State will be content for the for the Publication London Plan to be published as the Spatial Development Plan for London and will be part of the statutory Development Plan for Greater London. Chapter 9 Sustainable Infrastructure include Policies SI 2 Minimising greenhouse gas emissions, SI 3 Energy Infrastructure and SI 4 Managing heat risk will supersede Policies 5.2 through to 5.9 of the current London Plan.

Policy SI 2 minimising greenhouse gas emissions

Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation.
2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
4) be seen: monitor, verify and report on energy performance.

Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or
2) off-site provided that an alternative proposal is identified and delivery is certain.

Policy SI3 Energy Infrastructure

Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

Development Plans should:

identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure

identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
   a) connect to local existing or planned heat networks
   b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
   e) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
   f) use ultra-low NOx gas boilers.

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI1 Part B

3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

Policy SI 4 Managing Heat risk

Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

2) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

2) minimise internal heat generation through energy efficient design

3) manage the heat within the building through exposed internal thermal mass and high ceilings

4) provide passive ventilation

5) provide mechanical ventilation

6) provide active cooling systems.

3.4. New Southwark Plan 2018-2033 (August 2020)

P69 Energy.

Energy Hierarchy

1. Development must minimize carbon emissions on site in accordance with the following energy hierarchy:

Be lean (energy efficient design and construction: then
Be clean (low carbon energy supply); then
Be green (on site renewable energy generation and storage).

Targets for major development

2. Major development must reduce carbon dioxide emissions on site by:

100% on 2013 Building Regulations Part L standards for residential development; and

A minimum of 40% on 2013 Building Regulations Part L and zero carbon (100%) for non-residential developments.

Any shortfall against carbon emissions reduction requirements must be secured off site through planning obligations or as a financial contribution.

Decentralised energy

3. Major development must be designed to incorporate decentralized energy in accordance with the following hierarchy:

Connection to an existing decentralized energy network; then

Be future-proofed to connect to a planned decentralized network; then

Implement a site-wide low carbon communal heating system; and

Explore and evaluate the potential to oversize the communal heating system for connection and supply to adjacent sites, and where feasible be implemented.

4. Energy Hierarchy

4.1. Setting the baseline

The energy assessment has been carried out in accordance with the 3-step Energy Hierarchy as described in the London Plan:-

Step 1 – "Be Lean"

Step 2 – "Be Clean"

Step 3 – "Be Green"

The three steps above must all be compared a Building Regulations 2010 Part L 2013 edition carbon emissions compliant baseline figure.

All residential areas have been assessed using the Standard Assessment Procedure (SAP)

SAP calculations have been carried out using Elmhurst Energy Systems, SAP2012 Calculator (Design System) version 4.10r08

It is expected that SAP 10.0 carbon emission factors will be used for referable applications unless the application is in a Heat Network Priority Area and there is a potential to connect to an existing network using gas-engine CHP or a new network using low-emission CHP

If the application is a non-referable development, the it will be down to the borough's discretion to decide which emission factors are used.

SAP calculations have been carried out on all the apartments within the development using the 'Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.10r08' software, to ascertain the regulated carbon emissions for the site at each stage of the hierarchy. The output data produced by the software has been used to calculate the carbon dioxide emissions using the new SAP 10 carbon factors in line with the GLA recommendations.

As described above, it should be noted that the current Building Regulations do not include the new carbon factors yet. Therefore, the SAP and BRUKL documents presented at the end of this document and all associated results generated by the approved software show compliance with Building Regulations using the current carbon factors but do not include a comparison with the new factors.

The GLA provided spreadsheet calculation tool has been completed (See Appendix A) to give adjusted (SAP 10) energy usage and emission rates.

Regulated carbon emissions covered under the SAP calculations and Part L1A of the Building Regulations comprise of Space Heating and Cooling, Hot Water, Lighting and Auxiliary Energy (Pumps and Fans). In addition, unregulated carbon emissions relating to cooking, electrical appliances and small power must also be calculated and included with the Mayor's hierarchy of reducing carbon emissions.

The unregulated emissions have been calculated as a total **36.42 Tonnes CO_2 per Annum**, using the BREDEM-12 methodology which is based on the occupancy rate of the dwellings.

The following measures will be adopted to try and minimise the unregulated emissions:

Installation of Energy Efficient appliances (where applicable)

The provision of Energy Efficient lifts

A leaflet on saving power and reducing energy will be provided as part of the Tenants Guide.

Although these measures can reduce unregulated emissions via their implementation, it is impossible to predict by how much as this relies on usage outside of the control of the developer. Therefore, the emissions as noted will remain the same through all stages of the hierarchy.

'Baseline'

From the SAP results included within Appendix E, the baseline regulated carbon emissions for a Part L 2013 compliant development (Target Emission Rate), based on a communal gas boiler system serving the apartments and non-residential areas is **106.2 Tonnes CO_2 per Annum**.

Building Use	Baseline Energy Demand (MWh/year)						
	Space Heating	Hot Water	Lighting	Auxiliary	Cooling	Unregulated Electricity	Unregulated Gas
Residential	270.89	163.06	27.59	5.93	0	156.29	0

Part L 2013 (Using SAP 10 Carbon Factors) - Baseline	
	(Tonnes CO_2 per annum)
Residential	98.9

4.2. Be Lean:

As stated in the GLA guidance on preparing energy assessments it expected that all developments are to exceed Building Regulations Requirements (Part L 2013) through demand reduction measures alone. These measures include passive design measures (ie architectural and building fabric) and active design measures (energy efficient services). It is a requirement that:-

1. Domestic developments should achieve at least a 10 percent improvement on Building Regulations from energy efficiency
2. Non-domestic developments should achieve at least a 15 percent improvement on Building Regulations from energy efficiency.

Passive Design Measures

Building Orientation

The blocks and apartments have been developed to make best use of the site and to be in-keeping with the surroundings. Emphasis has been placed on maximising the number of rooms that receive direct sunlight but also balancing this with considering the quantity of North facing glazing to minimise heat loss but maximising South facing glazing to benefit from winter solar gain but being mindful of the requirement to shade from the high summer sun to help mitigate against overheating. Enhance G-values (solar control) has been introduced to the South facing glazing systems to help balance between achieving beneficial winter solar gain and mitigate against the overheating risk in the summer months.

Building Fabric Performance

Focus has been placed on targeting improvement to the building fabric and therefore reducing U-values. All blocks will have high performing glazing and enhanced insulation to external walls. There will also be enhanced insulation to exposed floors and roofs and internal communal corridor walls (communal corridors will be unheated). In addition to betterment of general U-values, approved construction details will be followed to reduce heat loss due to thermal bridging.

Part L 2013 (SAP 10 Carbon Factors) – Be Lean – Passive Enhancements			
Item	**Part L Limiting fabric parameters.**	**Part L notional specification**	**Proposed U-values**
External Wall	0.30 W/(m².K)	0.18 W/(m².K)	0.15 W/(m².K)
Party Wall	0.20 W/(m².K)	0.00 W/(m².K)	0.00 W/(m².K)
Windows / Doors	2.00 W/(m².K)	1.40 W/(m².K) g-value 0.63	1.30 W/(m².K) g-value 0.45
Exposed Floor	0.25 W/(m².K)	0.13 W/(m².K)	0.10 W/(m².K)
Exposed Roof	0.20 W/(m².K)	0.20 W/(m².K)	0.10 W/(m².K)
Air Leakage Rate	10 m³/m².hr@50Pa	5 m³/m².hr@50Pa	3.5 m³/m².hr@50Pa

Part L 2013 (SAP 10 Carbon Factors) – Be Lean – Passive Enhancements			
SAP Ref	**Thermal Bridge type**	**SAP Default**	**Proposed Psi Value**
E1	Steel lintel with perforated steel base plate	1.000 W/mK	0.500 W/mK
E3	Sill	0.080 W/mK	0.040 W/mK
E4	Jamb	0.100 W/mK	0.050 W/mK
E7	Party floor between dwellings (in blocks of flats)	0.140 W/mK	0.070 W/mK
E16	Corner (normal)	0.180 W/mK	0.090 W/mK
E18	Party wall between dwellings	0.120 W/mK	0.060 W/mK

Active Design Measures

Building Orientation

Following the introduction of passive design measures, active design measures are to be incorporated to further reduce energy demand. The following active design measures are to be incorporated:-

Heating system

High efficiency, low NOx boilers will be provided to serve the heating network. The heating network is to be designed to be in accordance with the guidance provided in the London Heat Network Manual

Ventilation system

All dwellings are to be provided with mechanical ventilation with heat recovery. In addition, all dwellings will have openable windows to assist with overheating mitigation and to provide purge ventilation as required.

Lighting systems

All external lighting and all fixed lighting within the apartments and associated communal areas will be provided by LED luminaires. External lighting will be controlled via a combination of photocell and time clock arrangement, lighting to communal areas will be by presences detectors and local switching will be provided within the apartments and to plantrooms.

Tables summarising active design measures.

Domestic – Active Design Measures	
Item	**Description**
Communal Heating	Connection to communal heating system, comprising high efficiency gas fired boilers. Boiler efficiency 89% (Seasonal 95%)
Ventilation	Mechanical Ventilation with heat recovery c/w summer by-pass (to assist with overheating mitigation measures) Openable windows for purge ventilation.
Lighting	100% low energy lighting

Other Active design measures that will reduce energy demand within the residential elements of the development but are not reflected in the energy calculations are:-

Water Efficiency

The requirement G2 and Regulation 36 of AD Part G 2015 (with 2016 amendments) of the current Building Regulations requires reasonable provision be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water. Therefore careful selection of appliances, sanitary ware and fittings will be undertaken to reduce water consumption to better the optional requirement of Part G to not exceed 110 litres per person per day. The measures will include:-

Low volume dual flush WCs
Low flow taps / mixers (for basins and baths)
Low flow shower mixers and heads
Fill limitation on baths
Low water consumption Washing machines
Low water consumption Dishwashers (where fitted).

Appliance Efficiency

Where provided, white goods will be selected with an EU Energy Efficiency Rating equal to (or better than) the following:-

Fridges and fridge-freezers	Rating of A+
Washing machines	Rating of A++
Dishwashers	Rating of A+
Washer-dryers	Rating of A
Tumble-dryers	Rating of A

Be Lean Savings Summary

Further to the passive and active design enhancements the carbon emissions predicted for the site are as follows:-

Carbon Dioxide Emissions		
	Regulated (Tonnes CO_2 per annum)	**Unregulated (Tonnes CO_2 per annum)**
Baseline (Part L 2013 of the Building Regulations Compliant Development (Using SAP 10 carbon factors)	98.9	36.4
After energy demand reduction "Be Lean"	86.0	36.4

Regulation Carbon Dioxide Emission Savings		
	Regulated (Tonnes CO_2 per annum)	**Percentage Savings (%)**
Be lean: savings from energy demand reduction	12.9	13%

4.3. Be Clean:

Once energy demand and has been reduced during the "Be Lean" stage, the next stage of the energy hierarchy is to demonstrate how energy systems will supply energy efficiency.

The hierarchy for selection of an energy system is as follows:-

1) Connection to an area wide heat network – this option is considered suitable due to plan for the SELCHP District Heat Network to be expanded and will run adjacent to the site. (Figures 01 & 02 below)

2) Communal heating system – A site wide heat network is to be developed where a heat network does not currently exist. A single heat substation connected to SELCHP will be provided at the site which will serve a communal heating network distributing to each of the new blocks. Should the SELCHP expansion not be completed before the heat is required at the site, then temporary gas fired boilers will be provided to serve the communal network. These will then be replaced by the SELCHP as soon as this does become available.

3) Individual heating system – Appropriate for low density individual housing, where no district heating networks are planned or feasible and where evidence is provided that a site-wide heat network is uneconomic. This option is not considered appropriate for the Sceaux Gardens Site due to the expansion of SELCHP

The London Heat Map indicates that the Sceaux Gardens development is adjacent to the proposed future route for the SELCHP District Heat Network (See figure 02 below).

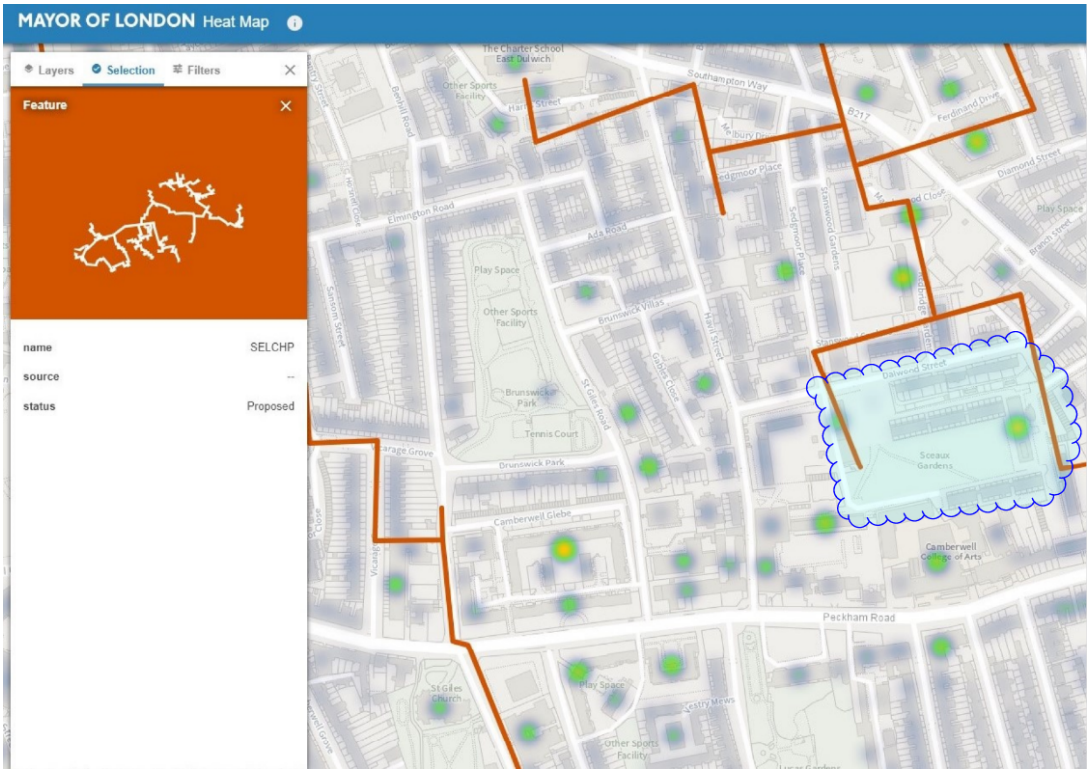


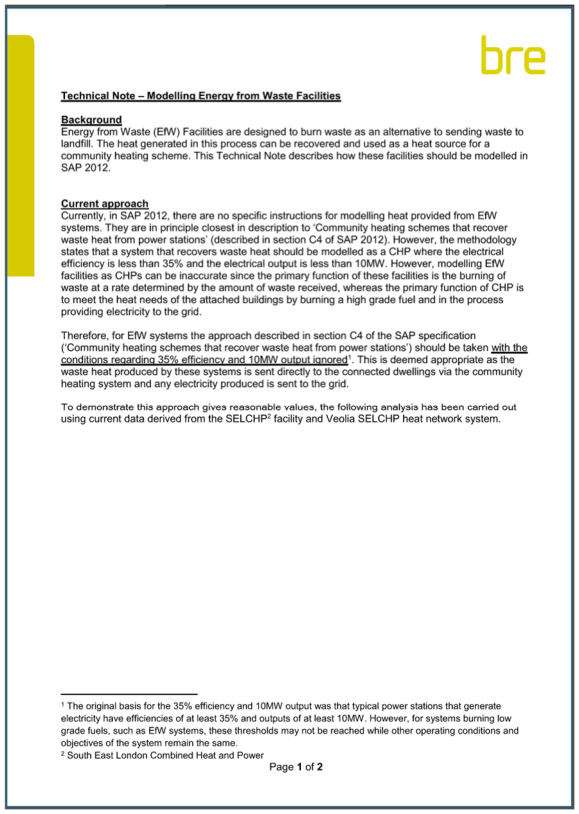
Figure 01 – London Heat Map

Figure 02 – SELCHP District Heating Network proposed expansion

The Veolia SELCHP District Heating Network Information for developers, Southwark Council 16.01.20 Rev 06 Section 9.0 Proposed SAP approach for SELCHP ERF states that SAP 2012 continue to be used for any new development connecting to SELCHP until new building regulations come into place.

The document states "*Recently after a meeting with BRE, it was understood and agreed that waste heat from a power station is the most appropriate solution to model SELCHP ERF even though the plant does not comply with the 35% power efficiency threshold. There remains ambiguity as to whether SELCHP should be considered a power plant in SAP 10 or if a bespoke calculation should be introduced, given that the carbon intensity factor most likely will drop following the trend of carbon intensity of the grid.*"

The following is the BRE Technical Note – Modelling Energy from Waste Facilities



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Technical Note – Modelling Energy from Waste Facilities

Background
Energy from Waste (EfW) Facilities are designed to burn waste as an alternative to sending waste to landfill. The heat generated in this process can be recovered and used as a heat source for a community heating scheme. This Technical Note describes how these facilities should be modelled in SAP 2012.

Current approach
Currently, in SAP 2012, there are no specific instructions for modelling heat provided from EfW systems. They are in principle closest in description to 'Community heating schemes that recover waste heat from power stations' (described in section C4 of SAP 2012). However, the methodology states that a system that recovers waste heat should be modelled as a CHP where the electrical efficiency is less than 35% and the electrical output is less than 10MW. However, modelling EfW facilities as CHPs can be inaccurate since the primary function of these facilities is the burning of waste at a rate determined by the amount of waste received, whereas the primary function of CHP is to meet the heat needs of the attached buildings by burning a high grade fuel and in the process providing electricity to the grid.

Therefore, for EfW systems the approach described in section C4 of the SAP specification ('Community heating schemes that recover waste heat from power stations') should be taken with the conditions regarding 35% efficiency and 10MW output ignored[1]. This is deemed appropriate as the waste heat produced by these systems is sent directly to the connected dwellings via the community heating system and any electricity produced is sent to the grid.

To demonstrate this approach gives reasonable values, the following analysis has been carried out using current data derived from the SELCHP[2] facility and Veolia SELCHP heat network system.

[1] The original basis for the 35% efficiency and 10MW output was that typical power stations that generate electricity have efficiencies of at least 35% and outputs of at least 10MW. However, for systems burning low grade fuels, such as EfW systems, these thresholds may not be reached while other operating conditions and objectives of the system remain the same.
[2] South East London Combined Heat and Power

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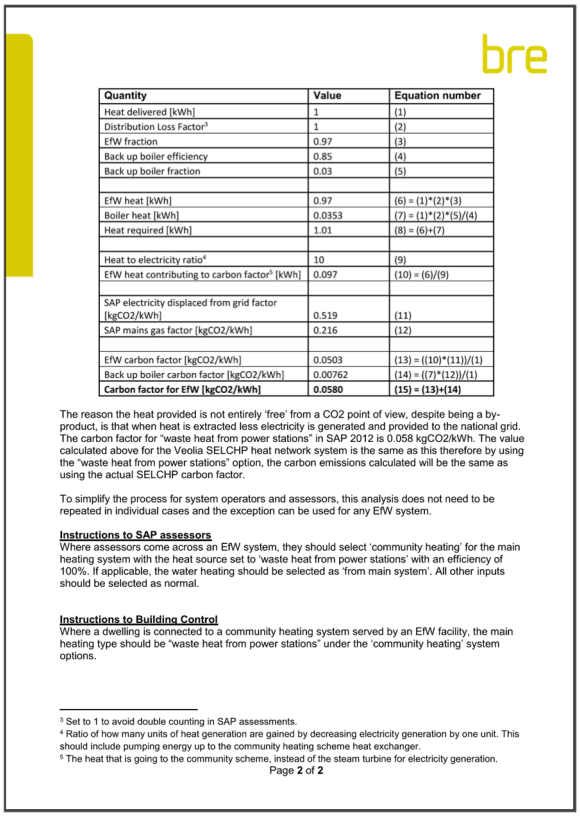

bre

Quantity	Value	Equation number
Heat delivered [kWh]	1	(1)
Distribution Loss Factor[3]	1	(2)
EfW fraction	0.97	(3)
Back up boiler efficiency	0.85	(4)
Back up boiler fraction	0.03	(5)
EfW heat [kWh]	0.97	(6) = (1)*(2)*(3)
Boiler heat [kWh]	0.0353	(7) = (1)*(2)*(5)/(4)
Heat required [kWh]	1.01	(8) = (6)+(7)
Heat to electricity ratio[4]	10	(9)
EfW heat contributing to carbon factor[5] [kWh]	0.097	(10) = (6)/(9)
SAP electricity displaced from grid factor [kgCO2/kWh]	0.519	(11)
SAP mains gas factor [kgCO2/kWh]	0.216	(12)
EfW carbon factor [kgCO2/kWh]	0.0503	(13) = ((10)*(11))/(1)
Back up boiler carbon factor [kgCO2/kWh]	0.00762	(14) = ((7)*(12))/(1)
Carbon factor for EfW [kgCO2/kWh]	**0.0580**	**(15) = (13)+(14)**

The reason the heat provided is not entirely 'free' from a CO2 point of view, despite being a by-product, is that when heat is extracted less electricity is generated and provided to the national grid. The carbon factor for "waste heat from power stations" in SAP 2012 is 0.058 kgCO2/kWh. The value calculated above for the Veolia SELCHP heat network system is the same as this therefore by using the "waste heat from power stations" option, the carbon emissions calculated will be the same as using the actual SELCHP carbon factor.

To simplify the process for system operators and assessors, this analysis does not need to be repeated in individual cases and the exception can be used for any EfW system.

Instructions to SAP assessors
Where assessors come across an EfW system, they should select 'community heating' for the main heating system with the heat source set to 'waste heat from power stations' with an efficiency of 100%. If applicable, the water heating should be selected as 'from main system'. All other inputs should be selected as normal.

Instructions to Building Control
Where a dwelling is connected to a community heating system served by an EfW facility, the main heating type should be "waste heat from power stations" under the 'community heating' system options.

[3] Set to 1 to avoid double counting in SAP assessments.
[4] Ratio of how many units of heat generation are gained by decreasing electricity generation by one unit. This should include pumping energy up to the community heating scheme heat exchanger.
[5] The heat that is going to the community scheme, instead of the steam turbine for electricity generation.

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From the BRE technical note it can be seen that the carbon factor for the Veolia SELCHP heat network (in SAP 2012) is 0.058.

Applying SAP 10 carbon factors for electricity and gas into the formulae provide by the BRE above yields a carbon factor for the Veolia SELCHP heat network (in SAP 10) of 0.030 This factor has therefore been used in the Spreadsheet provided in Appendix A

	SAP 2012		SAP10	
Heat delivered (kWh)	1	(1)	1	(1)
Distribution Loss Factor	1	(2)	1	(2)
Efw Fraction	0.97	(3)	0.97	(3)
Back up boiler efficiency	0.85	(4)	0.85	(4)
Basck up boiler fraction	0.03	(5)	0.03	(5)
EfW heat (kWh)	0.97	(6)	0.97	(6)
Boiler heat (kWh)	0.035294	(7)	0.035294	(7)
Heat required (kWh)	1.005294	(8)	1.005294	(8)
Heat to electricity ratio	10	(9)	10	(9)
EfW heat contributing to carbon factor (kWh)	0.097	(10)	0.097	(10)
SAP electricity displaced carbon factor ($kgCO_2$/kWh)	0.519	(11)	0.233	(11)
SAP mains gas factor ($kgCO_2$/kWh)	0.216	(12)	0.21	(12)
EfW carbon factor ($kgCO_2$/kWh)	0.050343	(13)	0.022601	(13)
Back up boiler carbon factor ($kgCO_2$/kWh)	0.007624	(14)	0.007412	(14)
Carbon factor for EfW ($kgCO_2$/kWh)	**0.057967**	**(15)**	**0.030013**	**(15)**

Be Clean Savings Summary

The connection to the SELCHP district heating system

Carbon Dioxide Emissions – Domestic Buildings		
	Regulated (Tonnes CO_2 per annum)	Unregulated (Tonnes CO_2 per annum)
Baseline	98.9	36.4
After energy demand reduction "Be Lean"	86.0	36.4
After supply energy efficiently "Be Clean"	22.1	36.4

Regulation Carbon Dioxide Emission Savings – Domestic Buildings		
	Regulated (Tonnes CO_2 per annum)	Percentage Savings (%)
Be lean: savings from energy demand reduction	12.9	13%
Be clean: savings from heat network	63.9	65%

4.4. Be Green:

Once energy demand and has been reduced during the "Be Lean" stage and consideration has been made to supply energy efficiently and to connect to a DHN, the final step of the energy hierarchy is to incorporate renewable energy to further reduce emissions.

The following technologies have been considered:-

- Wind turbines
- Solar Thermal Water Heating
- Photovoltaics
- Ground Source Heat Pumps (GSHPs)
- Air Source Heat Pumps (ASHPs)

Further to the review of possible renewable technologies, it is recommended that photovoltaic panels will be provided to the roofs of each of the blocks on the site.

The following arrangement is proposed:-

Florian – 13.44 kWp system (based on 48No. 280W PV panels connected to the landlords electrical system).

Racine – 15.12 kWp system (based on 54No. 280W PV panels connected to the landlords electrical system).

The combined Photocell arrays will save 4967 kgCO_2 per year

Summary of energy systems for the "Be Green" stage

Domestic	
Item	**Description**
Communal Heating	Connection to SELCHP District Heat Network
Ventilation	Mechanical Ventilation c/w summer by-pass (to assist with overheating mitigation measures) Openable windows for purge ventilation.
Lighting	100% low energy lighting
Renewable Energy	Photovoltaic Panels connected to the landlord systems serving Racine and Florian

Be Green Savings Summary

Carbon Dioxide Emissions – Domestic Buildings		
	Regulated (Tonnes CO_2 per annum)	**Unregulated (Tonnes CO_2 per annum)**
Baseline	98.9	36.4
After energy demand reduction "Be Lean"	86.0	36.4
After heat network connection "Be Clean"	22.1	36.4
After renewable energy "Be Green"	17.1	36.4

Regulation Carbon Dioxide Emission Savings – Domestic Buildings		
	Regulated (Tonnes CO_2 per annum)	**Percentage Savings (%)**
Be Lean: Savings from energy demand reduction	12.9	13%
Be Clean: Savings from heat network	63.9	65%
Be Green: Savings from renewable energy	5.0	5%
Cumulative on site savings	**81.8**	**83%**
Cumulative savings for off-set payment (£95 per tonne for 30 years)	515 tonnes CO_2	
Cash In-lieu contribution	£48,890	

5. Overheating Mitigation

5.1. Overheating mitigation design and dynamic thermal modelling.

The cooling hierarchy from Policy 5.9 of the London Plan has been considered in the development of the design for the site.

Consideration has been made to minimise heat generation through energy efficient design, this has been done by allocating risers to central core areas to reduce the size of lateral pipework in the communal corridors. The heat network distribution temperature is being kept as low as possible, whilst still being sufficient to deliver hot water at "safe" temperatures to all apartments. Enhanced levels of insulation will be proposed to the horizontal distribution pipework with specific care required with the installation and continuity of such insulation. High efficiency / low energy LED lighting will be utilised throughout the whole development to reduce heat load from lighting. In addition to the type of luminaire selected, presence detection will be used for switching luminaires in communal areas to ensure lighting is only on when such spaces are occupied.

Existing trees and balconies are all methods that have been incorporated to help reduce the amount of heat entering the building. In addition high efficiency facades and windows are being provided which have low U-values therefore reducing the rate of heat transfer from outside to in during the summer months. The window are to also be provided with a lower G-value (0.45) to reduce solar gains. Lighter colours are also being introduced to the facades of the blocks

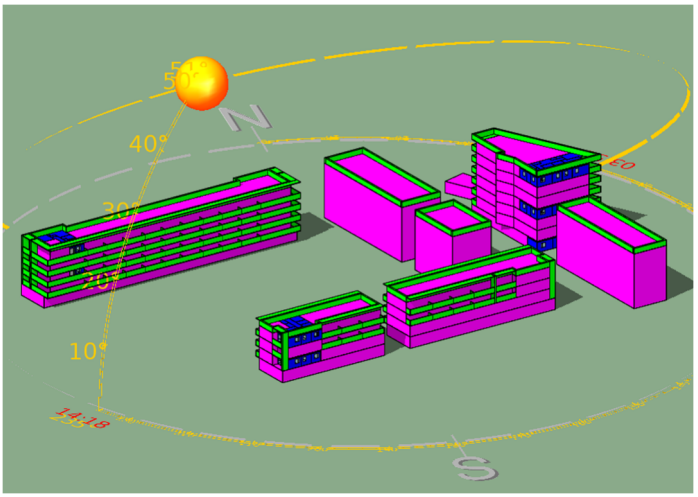
Consideration has been made on using a concrete fame method of construction for the blocks, the high thermal mass will assist in absorbing heat from the communal areas.

The number of dual aspect apartments has been maximised in each of the buildings to facilitate cross-flow ventilation.

Mechanical ventilation with heat recovery and a summer by-pass is to be provided to all apartments to make use of "free cooling" when the outside air temperature is lower than the internal temperatures during the summer months.

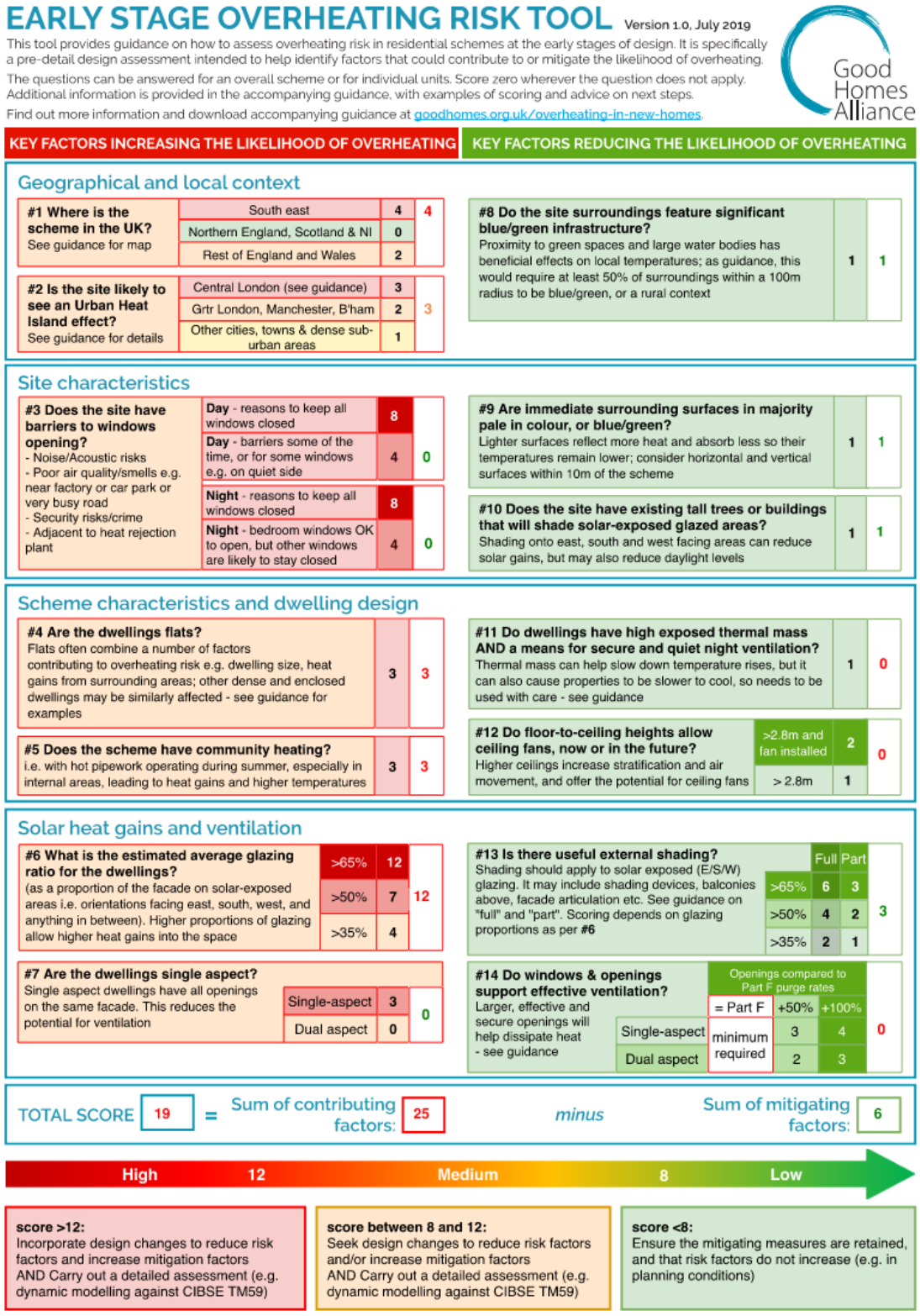
The shape of the site has had the most affect on the nature of the development, but as can be seen on the whole the longer facades of the buildings are generally facing more East

A full dynamic thermal model has been produced for the whole site. This has been carried out using IES Virtual Environment (2019.1.0.0). A sample number of apartments and corridors have then been fully simulated to check and inform the design so that compliance with CIBSE TM59 can be achieved.



5.2. Early Stage Overheating Risk Tool.

The Good Homes Alliance Early Stage Overheating Risk Tool has been completed and also dynamic thermal modelling against CIBSE TM59:-



EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.

Good Homes Alliance

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING	KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING

Geographical and local context

#1 Where is the scheme in the UK? See guidance for map	South east	4	4
	Northern England, Scotland & NI	0	
	Rest of England and Wales	2	
#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	3	3
	Grtr London, Manchester, B'ham	2	
	Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context	1	1

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	**Day** - reasons to keep all windows closed	8	0
	Day - barriers some of the time, or for some windows e.g. on quiet side	4	
	Night - reasons to keep all windows closed	8	0
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme	1	1
#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels	1	1

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples	3	3
#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures	3	3

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance		1	0
#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2	0
	>2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	12
	>50%	7	
	>35%	4	
#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	3	0
	Dual aspect	0	

		Full	Part	
#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**	>65%	6	3	3
	>50%	4	2	
	>35%	2	1	

		Openings compared to Part F purge rates			
#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance		= Part F	+50%	+100%	0
	Single-aspect	minimum required	3	4	
	Dual aspect		2	3	

TOTAL SCORE **19** = Sum of contributing factors: **25** *minus* Sum of mitigating factors: **6**

High 12 Medium 8 Low

score >12: Incorporate design changes to reduce risk factors and increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score between 8 and 12:** Seek design changes to reduce risk factors and/or increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score <8:** Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)

5.3. CIBSE TM59 Check

The areas studied have been assessed against following criteria for homes predominantly naturally ventilated using the profiles contained within CIBSE TM59: 2017 'Design methodology for the assessment of overheating risk in homes'.

1) Criterion a)- For living rooms, kitchens and bedrooms: The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K (1 °C)or more during the occupied hours of a typical non-heating season, from 1 May to 30 September. (CIBSE TM52 Criterion 1: Hours of exceedance).

   Note: the operative temperature shall not exceed the threshold comfort temperature by more than 1 K (1 °C) for more than 3% of the annual hours.

   Living rooms and kitchens annual hours = 1989 hours per year, 13 hours a day for 153 days for the period of 1 May to 30 September. So 60 hours at 1 K (1 °C) above the threshold comfort temperature will be recorded as a fail.

   Bedroom annual hours = 3672 hours per year, 24/7 for the period of 1 May to 30 September. So 111 hours at 1 K (1 °C) above the threshold comfort temperature will be recorded as a fail.

2) Criterion b) - For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours.

   Note: 1% of the annual hours between 10 pm and 7 am for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail. Bedroom annual hours = 3672 hours per year, 24/7 for the period of 1 May to 30 September.

3) For communal corridors: the overheating test for corridors should be based on the number of annual hours for which an operative temperature of 28 °C is exceeded. Whilst there is no mandatory target, if an operative temperature of 28 °C is exceeded for more than 3% of total annual hours, this should be flagged as a significant risk within the report.

Modelling Input

The dynamic thermal modelling has been carried out using the latest CIBSE design summer year (DSY) weather files as described in CIBSE TM49 "Design Summer Years of London" and the building are to be tested against DSY1 for the 2020s, high emissions, 50% profile. The GLA guidance states that it is expected that the CIBSE compliance criteria is met for the DSY1 weather scenario.

CIBSE TM49 provides weather year data for three different locations. London Weather Centre; the Greater London Authority Central Activity Zone (CAZ) and other high density urban areas has been used.

A total of 14 Apartments (with a southerly aspect) have been modelled in across the three blocks to provide a representation of the whole development.

Additional testing has also been carried out using the 2020 versions of the following 2No. more extreme design weather years, these being:-

1) DSY2 – Based on 2003 (which was a year with a very intense single warm spell)
2) DSY3 – Based on 1976 (which was a year with a prolonged period of sustained warmth)

The table below shows the criteria used in the thermal model for the DSY1 assessment.

M59 – London_LWC_DSY1_2020High50			
	Living Rooms	**Bedrooms & Studios**	**Communal Corridors**
Building Fabric			
External Walls	0.15 W/m²K		
Floors	0.10 W/m²K		
Roofs	0.10 W/m²K		
Windows	1.30 W/m²K (G-value of 0.45)		
External Doors	1.30 W/m²K		
Air Leakage Rate	3.5 m³/m².hr@50PA		
External Shading	Windows set back within wall construction Large external balconies with balustrades.		
Openings			
Window Balcony Doors	Side hung windows openable up to a maximum of 90 degrees. Side hung door openable up to a maximum of 90 degrees.		
Hours of operation	(09:00 – 22:00)	(09:00 – 22:00)	N/A
Opening parameter	Open when internal temp exceeds 21˚C but closed if external temp exceeds internal temperature	Open when internal temp exceeds 21˚C but closed if external temp exceeds internal temperature	N/A
Hours of operation	(22:00 – 09:00)	(22:00 – 09:00)	
Opening parameter	Open when internal temp exceeds 21˚C	Open when internal temp exceeds 21˚C	

TM59 – London_LWC_DSY1_2020High50 (continued)			
Mech Ventilation Type Rate	 MVHR with summer bypass. 0.80 ACH	 MVHR with summer bypass. 0.80 ACH	 Via AOV (Smoke shaft)
Internal Gains Lighting Heat Interface Unit Equipment Pipework Occupancy	 2W/m² 68W From Table 2 TM59 From CIBSE Guide C From Table 2 TM59	 2W/m² 68W From Table 2 TM59 From CIBSE Guide C From Table 2 TM59	 2W/m² 68W None From CIBSE Guide C None

The results achieved are as follows:-

CIBSE TM59 – DSY 1			
	Criterion a) The temperature shall not exceed the threshold comfort temp by more than 1 °C for more than 3% of the annual hours.	Criterion b) For bedrooms only: to guarantee comfort during the sleeping hours the temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours.	For communal corridors: the overheating test for corridors should be based on the number of annual hours for which an operative temperature of 28 °C is exceeded
No. Of Rooms Assessed/Passed Kitchen/Living/Dining Bedrooms Corridors	 **14 / 14 pass (100%)** **14/ 14 pass (100%)** N/A	 N/A **14 / 14 pass (100%)** N/A	 N/A N/A **N/A**

Following the DSY1 assessment, the same apartments have been assessed using the weather data files for DSY2 and DSY3 and are provided in Appendix D

Appendix A

GLA Carbon Emission Reporting Spreadsheet

Appendix B

SELCHP District Heating Network, Information for Developers

Appendix C

Renewable Energy Technologies Considered

Appendix D

Overheating Results Summaries

Appendix E

SAP Results Sheets