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Daylight and Sunlight Assessment

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Contents

1. Executive Summary

Michael Popper Associates have been appointed to complete a daylight and sunlight assessment of the proposed residential building in the Camden area of London (WC1N).

This assessment determines the impact of the proposed development on the daylight and sunlight amenities of the neighbouring properties and assesses daylight amenities within dwellings of the development. The analysis is based on the guideline standards as defined in the BRE document, 'Site Layout Planning for Sunlight and Daylight: A Guide to Good Practice', by PJ Littlefair. The assessment has been completed using computer analysis software to provide the most detailed and accurate results, based on the architect's planning drawings dated April 2017.

The following assessments have been carried out:-

Impact on neighbouring properties

Daylight assessment:

- 25 degree line
- Vertical Sky Component (VSC) calculations

Sunlight assessment:

- Overshadowing using the annual probability of sunlight hours (APSH) annual and winter calculations
- Overshadowing of open spaces

Daylight in proposed development

- Average daylight factor (ADF) calculations in all residential habitable rooms

Results

Impact on neighbouring properties

The analysis demonstrates that, in all cases, the existing surrounding buildings are not expected to suffer limited daylight or sunlight availability as a result of the proposed building being erected.

Additionally, green spaces are expected to enjoy longer exposure to sunlight after the construction of the proposed development as it is further from the site boundary than the existing building.

Daylight in proposed development

All habitable rooms within the proposed development are expected to be adequately daylit, exceeding the relevant BRE criteria for daylight availability.

2. Introduction

The scope of this report is to assess the daylight and sunlight impact of the proposed development on nearby properties and the daylight amenities in the proposed dwellings. The report analyses the current proposals in line with the recommendations and guidelines set out in the BRE document 'Site Layout Planning for Sunlight and Daylight: A Guide to Good Practice' which is considered acceptable by Town and Country Planning authorities.

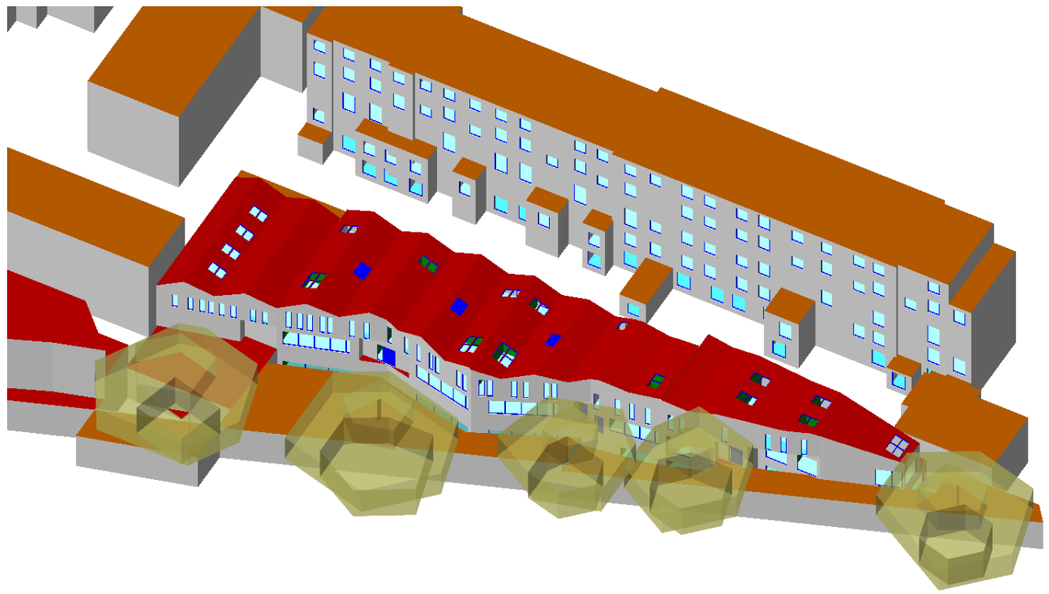
The assessment has been completed using the Ecotect software package, a modelling and analysis tool developed for both thermal and light engineering. The 3D computer model of the proposed development used in the assessment was developed by implementing the following information:-

- Architects' proposal/planning drawings
- Google maps and street view
- Existing site survey drawings

Site Description

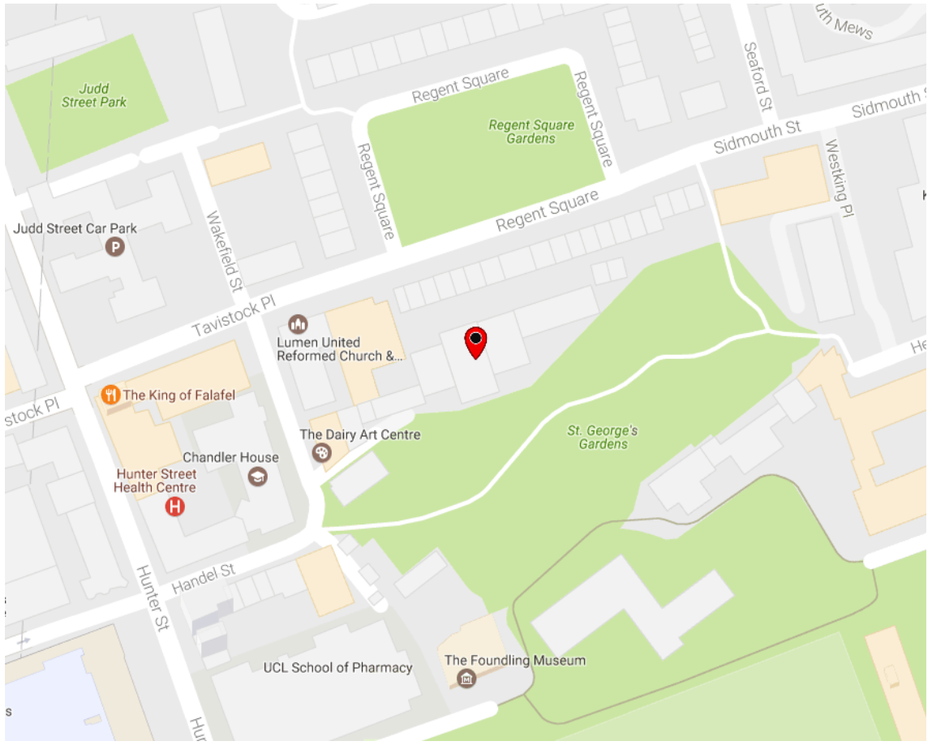
The proposed development includes the demolition of the existing building at Wakefield Street and the construction of a replacement residential building within the existing site.

The proposed building is orientated along a West/East axis. The figure below shows the computer model used in the assessment.



As illustrated in the map below, it is likely that any effect on daylight and sunlight will be most significant in the dwellings located along Regent Square.

Hence, for the purposes of this study, the effects of the proposed development upon the Regent Square dwellings have been considered.



Map showing the proposed Old Dairy building (pinned) and the neighbouring buildings.

3. Calculations

3.1. Methodology

The BRE guidelines propose an assessment methodology to consider the impact of a new development to daylight and sunlight amenities in the surrounding buildings. The BRE assessment methodology defines a set of critical parameters which, if met, demonstrate that the building will be provided with reasonable levels of daylight. The following paragraphs describe the steps to be followed as per the BRE methodology.

Impact on surrounding residences

25^{o} Line

As an initial assessment, the BRE guidelines suggest that if any part of the proposed development subtends a 25^{o} line drawn from potentially affected façades, then the proposed design might affect daylight amenities within the existing buildings.

Vertical Sky component

The second step is to calculate the Vertical Sky Component (VSC) at the centre point of the window locations. The Vertical Sky Component is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. The VSC value will indicate whether the massing of buildings is likely to cause poor daylight conditions inside rooms.

As per the BRE guidelines, the amount of daylight received in a room depends on the direct skylight falling on its vertical window. To maintain good levels of daylight, the Vertical Sky Component (VSC) of a window needs to be at least 27%. If the VSC is less than 27%, the levels of daylight are not expected to significantly change if the VSC is at least 0.8 of its former value, as per the BRE guidelines.

Annual Probable Sunlight Hours

The BRE document "Site Layout Planning for Daylight and Sunlight: a Guide to Good Practice" (2011) defines the criteria for the maximum acceptable loss of sunlight in existing buildings because of a new development.

An Annual Probable Sunlight Hour (APSH) calculation is carried out when:

- there is an obstruction within the 25^{o} line, calculated from the centre of the window and
- the window is facing within 90^{o} due south

The APSH is the total number of hours in a year in which direct sunlight reaches the unobstructed ground, allowing for average levels of cloudiness for the location. The BRE guide and British Standards document BS8206-2 define the criteria for the loss of sunlight as follows:-

For an existing living room window to receive enough sunlight:

- at least 25% of APSHs should be achieved throughout the year and 5% of APSHs during the winter months between (21st September and 21st March); *or*
- the APSH of the same window after the proposed development should be at least 0.8 times its former value; *or*
- the absolute APSH reduction should not be more than 4% of APSHs.

In dwellings, the main requirement for sunlight is in the living rooms and it is viewed as less important in the bedrooms and kitchens.

Overshadowing of open areas

For open areas, the BRE Guidance suggests that no more than 40%, and preferably no more than 25%, of any of the open spaces identified should be prevented from receiving any sunlight at all on 21st March by the proposed development.

If as a result of the new development the area which can receive direct sunlight on the 21st March is reduced to less than 0.8 times its former value, then this further loss of sunlight is significant.

Daylight in proposed development

Average Daylight Factor

The Average Daylight Factor (ADF) calculations provide a prediction of the internal daylight levels for a room as a percentage of the levels of simultaneous unobstructed daylight levels outside.

All daylight measurements are made on the working plane at 850mm above the floor level. The daylight factors are calculated under a 'standard overcast sky' - i.e. the sky is darkest at the horizon and brightest vertically overhead, thus the north and the south experience equal brightness.

The BRE guidance sets out recommendations for the ADF targets in dwellings as follows:

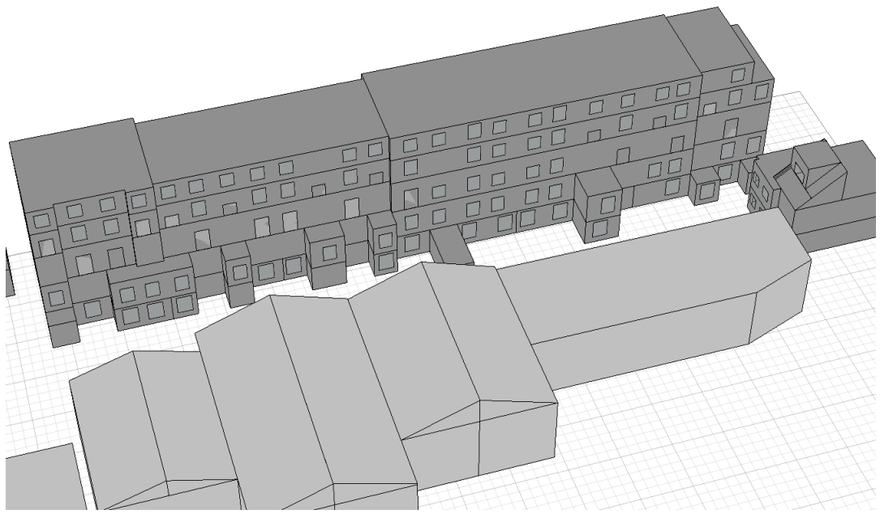
- 2% for kitchens;
- 1.5% for living rooms and study rooms;
- 1% for bedrooms.

These figures are also recommended in BS 8206 Part 2 1992 entitled 'Code of Practice for Daylighting'.

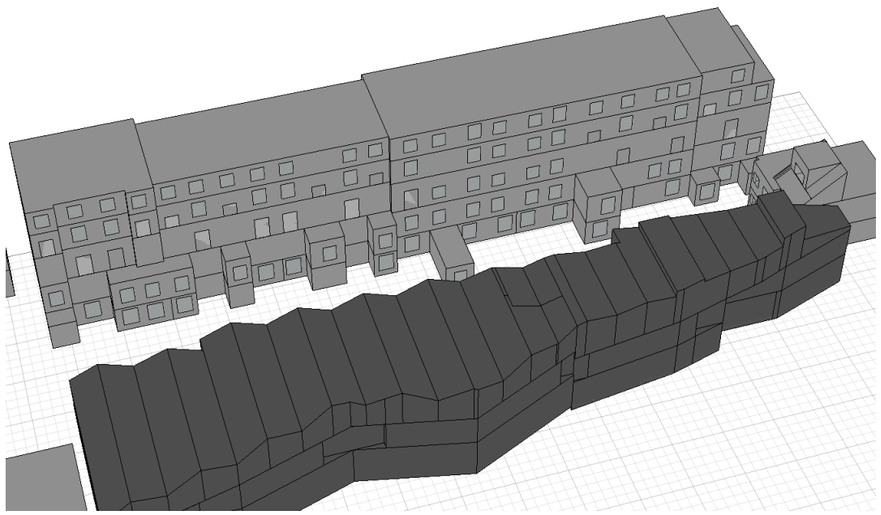
Modelling

The assessment has been completed using the Autodesk Ecotect software package, a modelling and analysis tool developed for both light and thermal engineering.

The 3D computer model of the proposed development used in the assessment has been developed as illustrated in the following images:-



Existing development (light grey) and surrounding properties (grey)



Proposed development (dark grey) and surrounding properties (grey)

Assumptions

The model of the proposed development has been created with the following design parameters:-

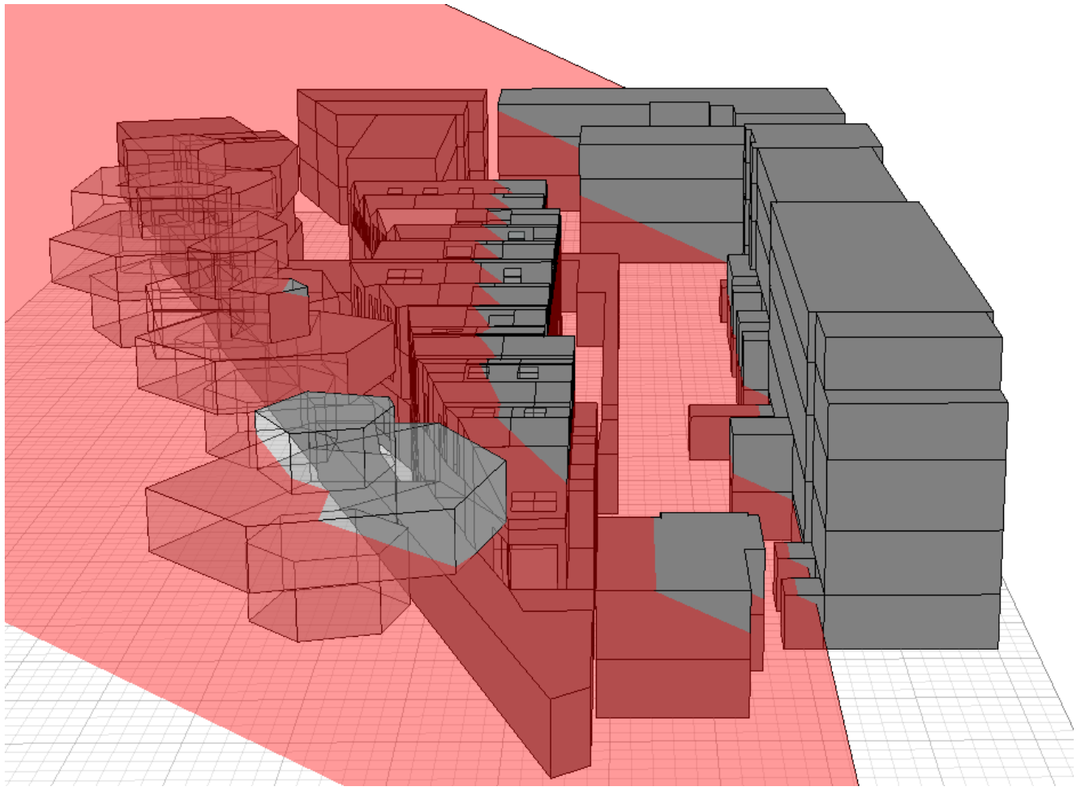
Material	Reflectance	Transmission
Glazing	-	70%
Wall	0.5	-
Floor	0.3	-
Ceiling	0.7	-
Tree	-	60%

3.2. Impact on Daylight

3.2.1. 25° Line

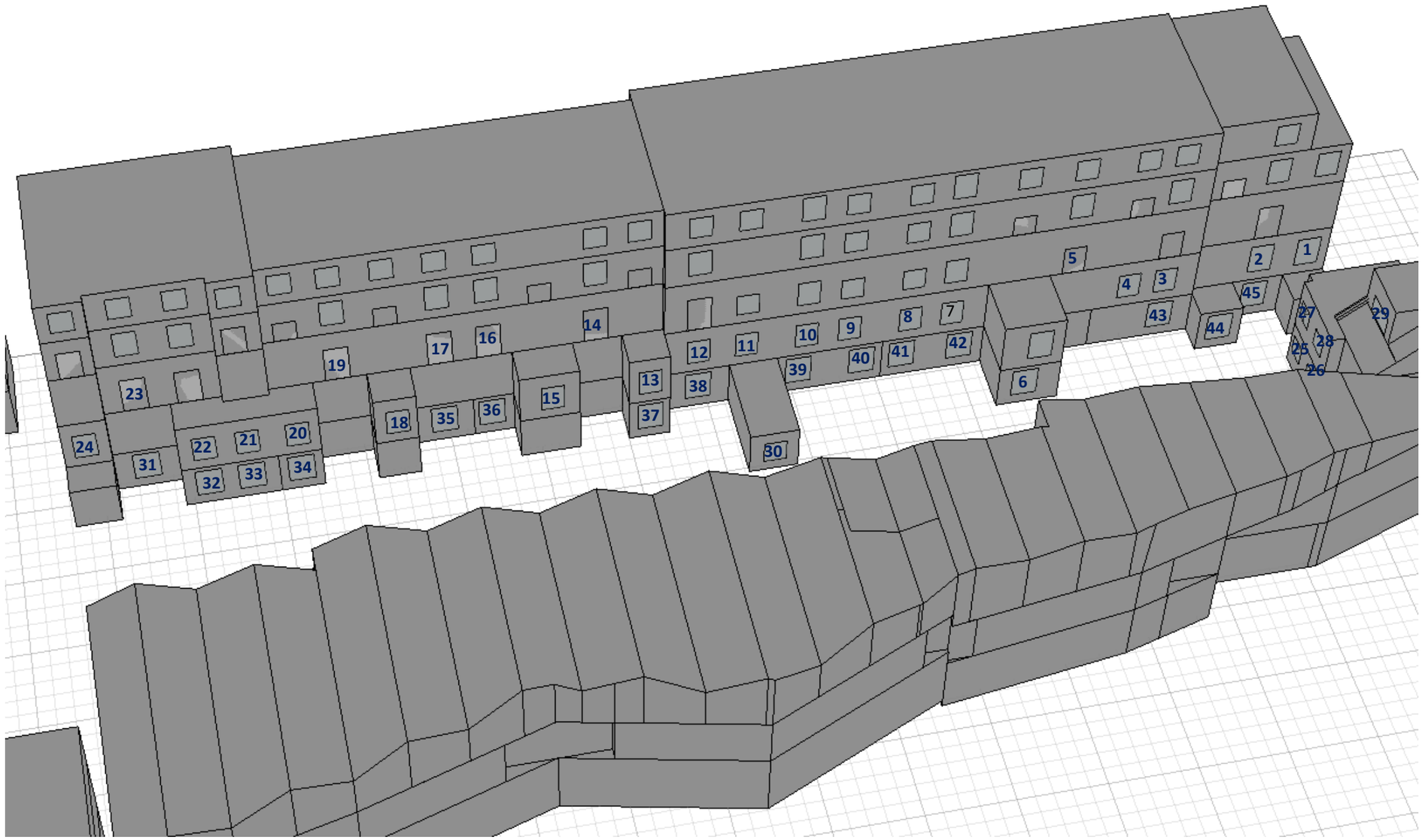
The BRE guidelines suggest that if any part of the proposed development subtends a 25° line drawn from potentially affected façades, then the proposed design might affect daylight amenities within the existing buildings.

As demonstrated in the image below, the proposed building subtends the 25° line drawn from the back façade of the terraced dwellings on Regent Square. The 25° line criterion not being met, a detailed calculation of the Vertical Sky Component of the relevant windows is required.



3.2.2. Vertical Sky Component

All the windows at the back of the residences at Regent have been modelled for the purposes of this report, as they are facing the proposed development. The windows are identified in the following 3D image of the model and subsequent results are tabulated:-



Results

Window Reference	VSC after proposed development	VSC before proposed development	Ratio Before/ After	Daylight Criterion
1	27.6%	NA	NA	OK
2	28.5%	NA	NA	OK
3	28.3	NA	NA	OK
4	27.9%	NA	NA	OK
5	33.5%	NA	NA	OK
6	16.8%	20.6%	0.82	OK
7	24.2%	28.2%	0.86	OK
8	27.0%	NA	NA	OK
9	27.7%	NA	NA	OK
10	27.7%	NA	NA	OK
11	27.7%	NA	NA	OK
12	26.0%	28.1%	0.93	OK
13	26.2%	27.4%	0.96	OK
14	33.8%	NA	NA	OK
15	26.1%	27.3%	0.96	OK
16	33.7%	NA	NA	OK
17	33.8%	NA	NA	OK
18	26.4%	27.0%	0.98	OK
19	33.6%	NA	NA	OK
20	26.7%	28.1%	0.95	OK
21	26.8%	28.4%	0.94	OK
22	26.6%	28.4%	0.94	OK
23	32.1%	NA	NA	OK
24	25.4%	26.8%	0.95	OK
25	15.9%	17.2%	0.92	OK
26	15.9%	16.7%	0.95	OK
27	20.2%	22.2%	0.91	OK
28	20.9%	23.1%	0.91	OK
29	29.9%	NA	NA	OK
30	14.2%	12.6%	1.12	OK
31	17.4%	18.2%	0.96	OK
32	21.4%	22.0%	0.97	OK
33	21.4%	21.9%	0.98	OK
34	21.3%	21.3%	1.00	OK
35	17.1%	16.9%	1.01	OK
36	15.5%	15.6%	0.99	OK
37	20.7%	20.1%	1.03	OK
38	17.9%	18.2%	0.95	OK
39	20.3%	22.6%	0.90	OK
40	21.5%	24.4%	0.88	OK
41	20.4%	23.6%	0.86	OK
42	14.9%	17.3%	0.86	OK
43	20.1%	24.1%	0.83	OK
44	17.5%	21.8%	0.80	OK
45	15.5%	18.2%	0.85	OK

All windows at the back of the dwellings located along Regent Square meet the relevant BRE guideline criteria. Therefore, it is anticipated that the proposed development shall not have a significant impact on the daylight amenities of the surrounding dwellings at Regent Square.

In more detail:

- All windows located on the 1st floor or above achieve a VSC which is greater than 27%;
- Windows in the ground and lower ground floors either achieve a VSC which is more than 27% or greater than 0.8 times the value before the proposed development.

3.3. Impact on Sunlight

3.3.1. Annual Probable Sunlight Hours

In accordance with the BRE document "Site Layout Planning for Daylight and Sunlight, a Guide to Good Practice" (2011) an Annual Probable Sunlight Hour (APSH) calculation is carried out when:

- there is an obstruction within the 25° line, calculated from the centre of the window; and
- the window is facing within 90° due south.

The BRE guideline's sunlight availability targets, apply to all windows assessed in the previous section. The following table summarises the relevant results:-

Results

Window Reference	Annual probable sunlight hours after proposed development	Annual probable sunlight hours before proposed development	Winter probable sunlight hours after proposed development	Winter probable sunlight hours before proposed development	Sunlight Criterion
1	68%	NA	15%	NA	**OK**
2	67%	NA	15%	NA	**OK**
3	72%	NA	18%	NA	**OK**
4	68%	NA	15%	NA	**OK**
5	81%	NA	27%	NA	**OK**
6	61%	NA	18%	NA	**OK**
7	64%	NA	15%	NA	**OK**
8	69%	NA	15%	NA	**OK**
9	69%	NA	16%	NA	**OK**
10	70%	NA	16%	NA	**OK**
11	69%	NA	15%	NA	**OK**
12	60%	NA	11%	NA	**OK**

13	68%	NA	14%	NA	OK
14	79%	NA	26%	NA	OK
15	68%	NA	14%	NA	OK
16	77%	NA	25%	NA	OK
17	77%	NA	25%	NA	OK
18	67%	NA	13%	NA	OK
19	75%	NA	24%	NA	OK
20	69%	NA	16%	NA	OK
21	66%	NA	12%	NA	OK
22	65%	NA	12%	NA	OK
23	69%	NA	21%	NA	OK
24	53%	NA	9%	NA	OK
25	30%	35%	0%	6%	OK
26	29%	33%	0%	0%	OK
27	46%	NA	16%	NA	OK
28	47%	NA	13%	NA	OK
29	55%	NA	20%	NA	OK
30	45%	42%	2%	2%	OK
31	39%	NA	7%	NA	OK
32	53%	NA	6%	NA	OK
33	53%	NA	6%	NA	OK
34	55%	NA	6%	NA	OK
35	33%	NA	5%	NA	OK
36	36%	NA	8%	NA	OK
37	57%	NA	6%	NA	OK
38	38%	NA	5%	NA	OK
39	44%	48%	4%	5%	OK
40	55%	NA	8%	NA	OK
41	51%	NA	8%	NA	OK
42	41%	NA	8%	NA	OK
43	50%	NA	7%	NA	OK
44	46%	NA	5%	NA	OK
45	38%	NA	7%	NA	OK

The sunlight availability calculation results demonstrate that all windows meet or exceed the BRE targets and that the proposed development does not lead to any of the surrounding living spaces receiving less sunlight.

In more detail:

- All ground floor and above windows achieve at least 25% of annual probable sunlight hours throughout the year and at least 5% of annual probable sunlight hours during the winter months between (21st September and 21st March);
- All lower ground floor but three windows achieve at least 25% of annual probable sunlight hours throughout the year and at least 5% of annual probable sunlight hours during the winter months between (21st September and 21st March);
- For three lower ground floor windows the absolute sunlight availability reduction is not more than 4%.

3.3.2. Overshadowing of open spaces

For open areas, BRE guidance suggests that:-

BRE 209: *At least half of a garden or amenity area should receive at least two hours of sunlight on 21st March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21st March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable.*

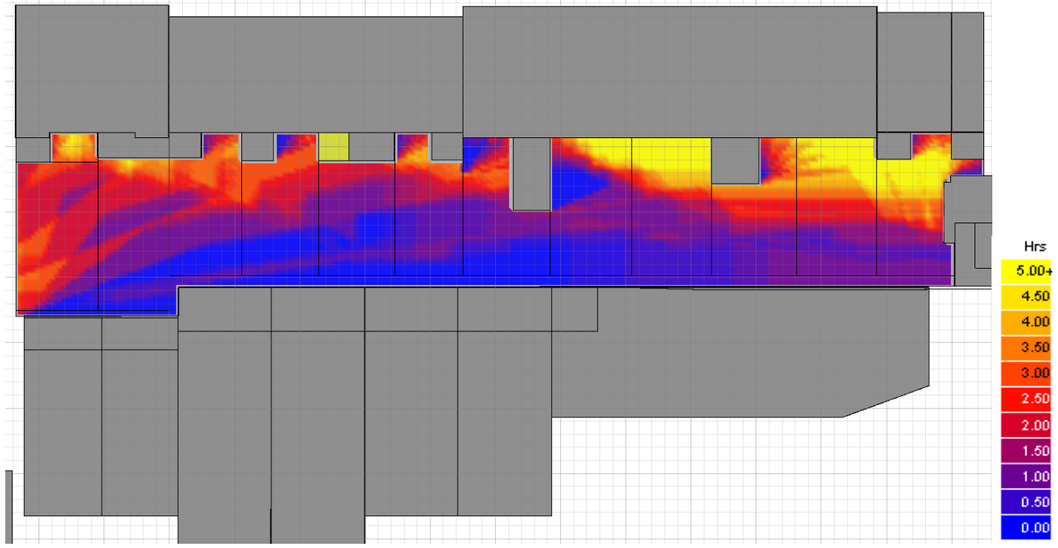
The open space areas which may be affected by the proposed development are the back gardens of the Regent Square residences.

The calculations demonstrate that 38.3% of the garden area is currently receiving at least two hours of sun on the 21st March. After the construction of the proposed development 47.5% of the garden area shall receive at least two hours of sun on the 21st March.

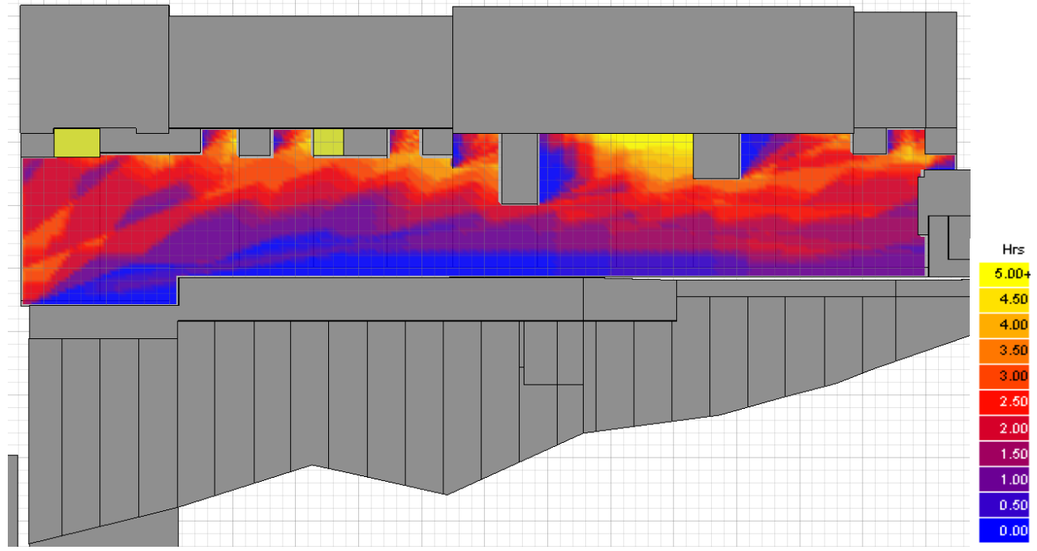
Therefore, the surrounding open spaces shall achieve better levels of sunlight after the construction of the proposed development. It should be noted that this is mainly attributed to the proposed development being set further away from the site boundary than the existing building.

Full results are tabulated below.

Property	% of gardens receiving two or more hours of sun on the 21st March
Baseline, existing building	38.3%
After construction of proposed development	47.5%



Garden overshadowing with existing Old Dairy building



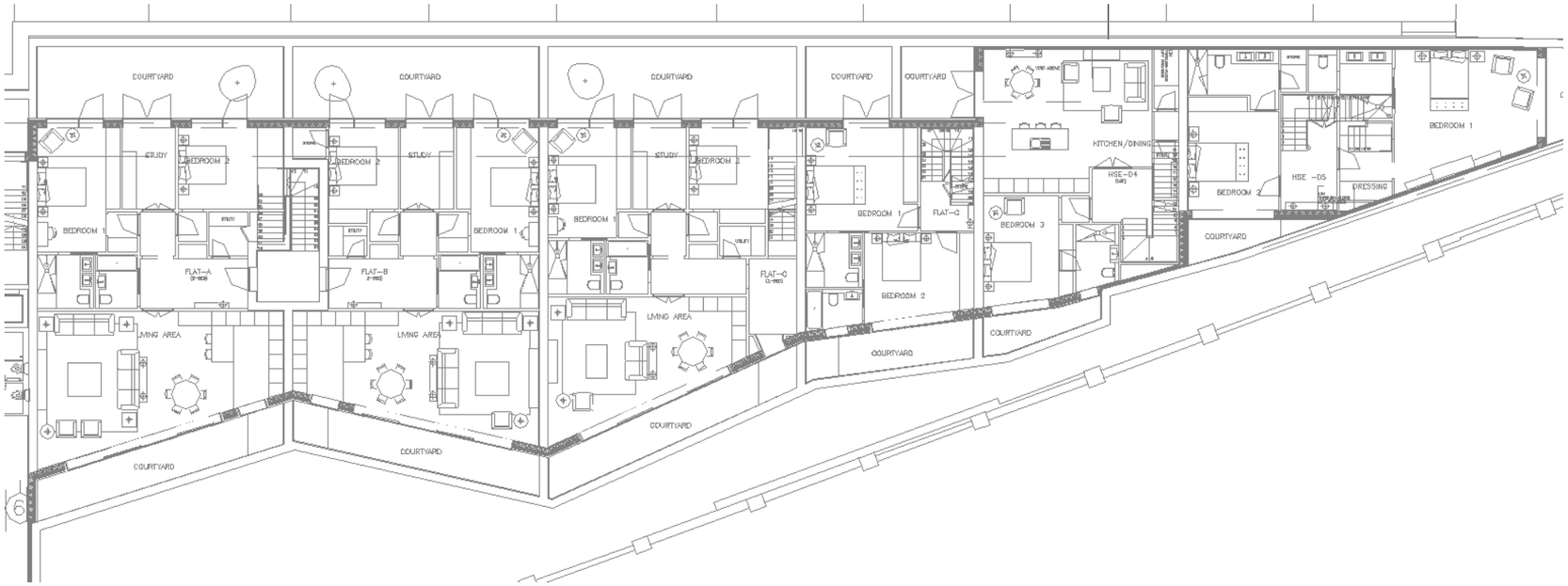
Garden overshadowing with proposed Old Dairy building

3.4. Average Daylight Factor

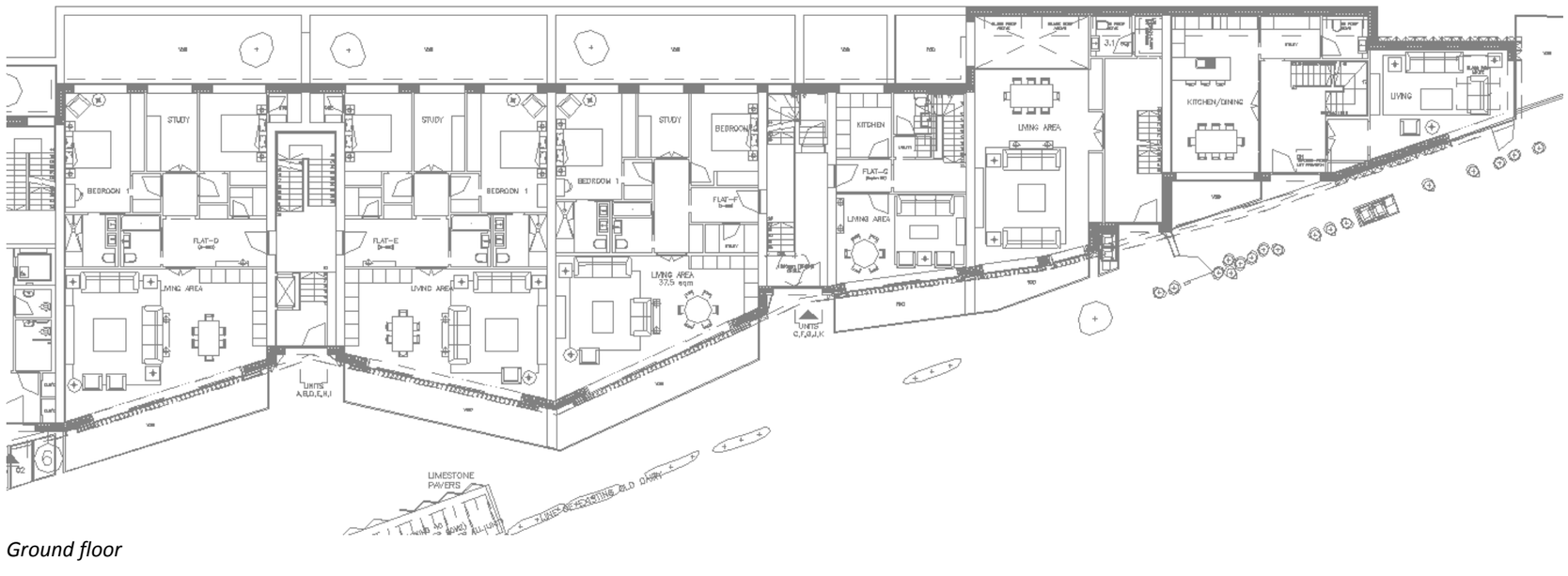
In order to make sure that the flats in the proposed development receive adequate daylight, the daylight ingress has been assessed in all habitable rooms by calculating the Average Daylight Factors (ADF).

The daylight factor depends on the window size, orientation, external obstructions and room reflectance. Calculations consider the previously described design parameters for the proposed development and the impact of existing trees in the immediate vicinity.

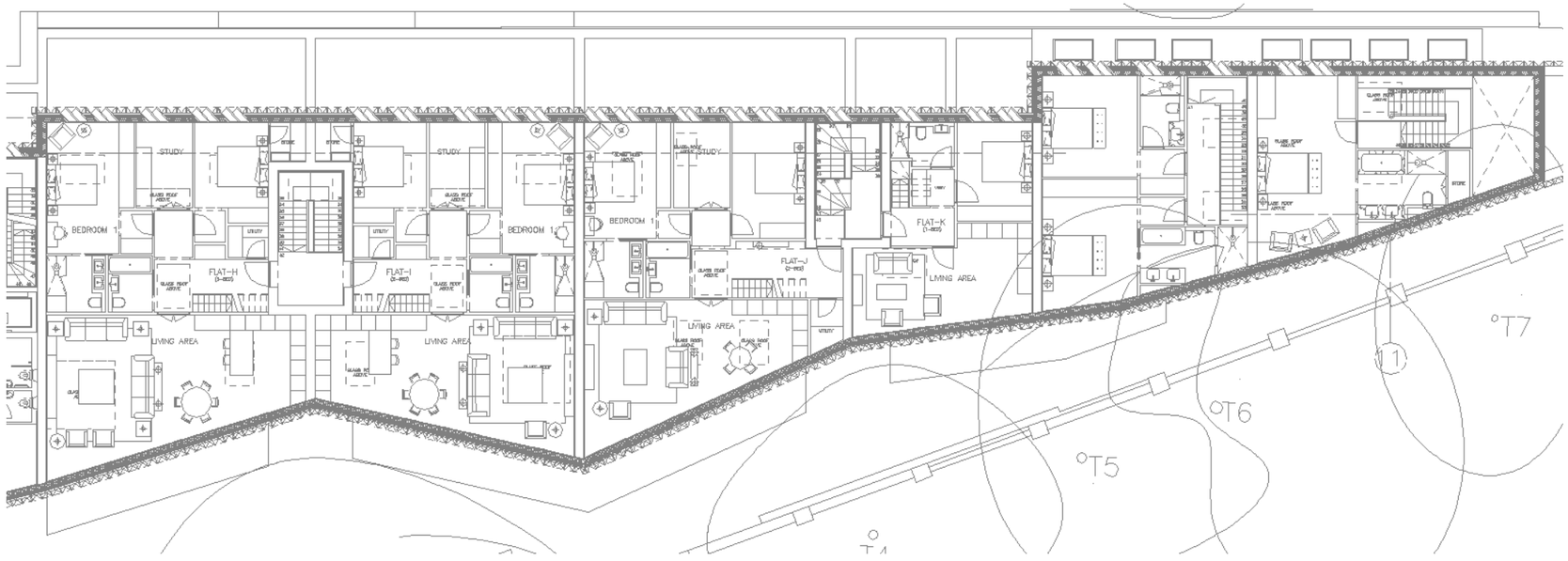
The following floor plans identify the rooms under investigation:-



Lower ground floor



Ground floor



First floor

Results

All dwellings are expected to receive adequate daylight. In more detail:

- All kitchen and open plan living/kitchen rooms exceed the BRE guideline criterion for daylight (2.0%);
- All living and study rooms exceed the BRE guideline criterion for daylight (1.5%);
- All bedrooms exceed the BRE guideline criterion for daylight (1.0%).

Results are tabulated in the following table:-

Flat	Room	ADF (%)	ADF target (%)	BRE criterion
A	Living/Kitchen	3.3	2	OK
	Bedroom 1	3.4	1	OK
	Bedroom 2	4.8	1	OK
	Study	5.8	1.5	OK
B	Living/Kitchen	3.7	2	OK
	Bedroom 1	3.5	1	OK
	Bedroom 2	5.0	1	OK
	Study	5.9	1.5	OK
C	Living/Kitchen	4.6	2	OK
	Bedroom 1	3.9	1	OK
	Bedroom 2	4.9	1	OK
	Study	5.8	1.5	OK
D	Living/Kitchen	5.2	2	OK
	Bedroom 1	4.4	1	OK
	Bedroom 2	6.6	1	OK
	Study	7.1	1.5	OK
E	Living/Kitchen	5.2	2	OK
	Bedroom 1	4.3	1	OK
	Bedroom 2	6.2	1	OK
	Study	7.2	1.5	OK
F	Living/Kitchen	6.0	2	OK
	Bedroom 1	4.9	1	OK
	Bedroom 2	6.0	1	OK
	Study	8.3	1.5	OK
H	Living/Kitchen	8.3	2	OK
	Bedroom 1	7.5	1	OK
	Bedroom 2	2.9	1	OK
	Study	2.9	1.5	OK
I	Living/Kitchen	8.2	2	OK
	Bedroom 1	7.4	1	OK
	Bedroom 2	4.4	1	OK
	Study	2.9	1.5	OK
J	Living/Kitchen	8.2	2	OK
	Bedroom 1	8.4	1	OK
	Bedroom 2	3.9	1	OK
	Study	3.5	1.5	OK
K	Living/Kitchen	5.6	2	OK
	Bedroom	3.7	1	OK
G	Bedroom 1	2.8	1	OK

	Bedroom 2	3.9	1	**OK**
	Living	6.2	1.5	**OK**
	Kitchen	7.8	2	**OK**
TH1	Kitchen/Dining	3.0	2	**OK**
	Bedroom 3	3.3	1	**OK**
	Living	2.8	1.5	**OK**
	Bedroom 1	1.7	1	**OK**
	Bedroom 2	2.9	1	**OK**
TH2	Bedroom 1	2.7	1	**OK**
	Bedroom 2	2.9	1	**OK**
	Kitchen/Dining	5.0	2	**OK**
	Living	10.5	1.5	**OK**
	Bedroom 3	2.9	1	**OK**

4. Conclusion

As derived from the modelling results of the proposed development, all surrounding dwellings are expected to maintain good daylight and sunlight levels after the construction of the proposed development.

Impact of proposed development on daylight and sunlight amenities of existing buildings

- The new development is not expected to significantly affect the daylight amenities in the dwellings located along Regent Square, as the VSC calculated for all windows is either more than 27% or greater than 0.8 times its former value;
- The new development is not expected to cause any noticeable reduction to the existing levels of sunlight received by the surrounding dwellings;
- The surrounding open spaces shall receive direct sunlight for more hours than with the existing building.

Daylight amenities of proposed development

All rooms in the proposed development are expected to receive adequate daylight, as all spaces meet or exceed the Average Daylight Factor targets as set out in BRE guidelines.