Internal Daylight and Sunlight Report

Camden Lock Village / Hawley Wharf - Area E
Project No: 2801

March 26, 2015

DAYLIGHT+SOLAR DESIGN

Client	Stanley Sidings Ltd
Architect	AHMM
Project Title	Camden Lock Village / Hawley Wharf - Area E
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Report Title	Internal Daylight and Sunlight Report
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	A	26.03.15	Comments review	GL

1. Executive Summary

The aim of this report is to ascertain whether the proposed Area E development will provide future accommodation considered acceptable in terms of daylight and sunlight. GIA has worked alongside AHMM in order to maximise the levels of daylight enjoyed by future occupants. Area E has been designed as an annex building to Area D and a non material amendment application has been submitted in respect of this building.

All habitable rooms within Area E have been assessed for Average Daylight Factor (ADF), No Sky Line (NSL) and Room Depth Criterion (RDC).

The assessments have shown very good levels of daylight within this building with all but two of the habitable rooms meeting or exceeding BRE's recommendations for ADF and 100% meeting or exceeding the NSL criteria.

The only two rooms falling short of BRE's recommendation are Living/Kitchen/Dining rooms which see 1.7% ADF and 1.9% ADF respectively, where 2% is the suggested minimum.

BRE states that sunlight is most appreciated in living areas and therefore an assessment of Annual Probable Sunlight Hours (APSH) has been undertaken on all living rooms facing within 90 degrees of due south.

The results have shown that overall very good levels of sunlight are achieved within Area E. Only the living rooms located on the southwest corner of the building will see reduced levels of APSH throughout the year due to their recessed location, however these main habitable rooms will see good levels of APSH in winter.

Overall we therefore find that the proposed design of Area E performs very well in terms of daylight and sunlight.

2. Introduction and Objective

GIA has been instructed to provide a report upon the potential availability of Daylight and Sunlight to the proposed accommodation within the residential scheme prepared by AHMM. GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon drawings prepared by AHMM.
- Carry out a daylight assessment using the methodologies set out in the BRE guidelines for Average Daylight Factor, No-Sky Line and Room Depth Criterion.
- Carry out a sunlight assessment using the methodologies set out in the BRE guidelines for Annual Probable Sunlight Hours (APSH) to the fenestration facing within 90 degrees of due south.
- Prepare a report setting out the analysis and our findings.

3. BRE guidelines

The Building Research Establishment (BRE) have set out in their handbook *Site Layout Planning for Daylight and Sunlight a Guide to Good Practice (2011)*, guidelines and methodology for the measurement and assessment of daylight and sunlight within proposed buildings. This document states that it is also intended to be used in conjunction with the interior daylight recommendations found within the *British Standard BS8206-2:2008* and *The Applications Manual on Window Design* of the Chartered Institution of Building Services Engineers (CIBSE).

The guide also provides advice on site layout planning to determine the quality of daylight and sunlight within open spaces between buildings.

It is important to note, however, that this document is a guide whose stated aim *"is to help rather than constrain the designer".*

The document provides advice, but also clearly states that it *"is not mandatory and this document should not be seen as an instrument of planning policy."* The report acknowledges also in its introduction that *"in special circumstances the developer or planning authority may wish to use different target values. For example, in a historic City centre a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings."*

It is an inevitable consequence of the built up urban environment that daylight and sunlight will be more limited in these areas. It is well acknowledged that in such situations there may be many other conflicting and potentially more important planning and urban design matters to consider other than just the provision of ideal levels of daylight and sunlight.

3.1. Daylight

The BRE set out various methods for assessing the daylight within a proposed building within section 2.1 and Appendix C of the handbook. The summary of this, given at the end of section 2.1 of the guide, states as follows:

> *"In general, a building will retain the potential for good interior diffused daylighting provided that on all its main faces:*
>
> *A. No obstruction, measured in a vertical section perpendicular to the main face, from a point two metres above ground level, subtends an angle of more than 25 degrees to the horizontal;*
>
> *Or*
>
> *B. If (A) is not satisfied, then all points on the main face on a line two metres above ground level are within four metres (measured sideways) of a point which has a vertical sky line component of 27% or more."*

3.1.1. Vertical Sky Component (VSC)

This method of assessment can be undertaken using a skylight indicator or a Waldram diagram. It measures from a single point, at the centre of the window if known at the early design stage, the quantum of sky visible taking into account all external obstructions. Whilst these obstructions can be either other buildings or the general landscape, trees are usually ignored unless they form a continuous or dense belt of obstruction.

The VSC method is a useful 'rule of thumb' but has some significant limitations in determining the true quality of daylight within a proposed building. It does not take into account the size of the window, any reflected light off external obstructions, any reflected light within the room, or the use to which that room is put. Appendix C of the guide goes into more detail on these matters and sets forward alternative methods for assessment to overcome these limitations.

Appendix C of the BRE guide: Interior Daylighting Recommendations, states:

> *"The British Standard for daylighting, and the CIBSE Applications manual: window design, contain advice and guidance on interior daylighting. This guide to good practice is intended to be used in conjunction with them, and its guidance is intended to fit in with their recommendations.*
>
> *For skylight, the British Standard and the CIBSE manual put forward three main criteria, based on the average daylight factor, room depth, and the position of the no skyline."*

These assessments are set out below.

3.1.2. Average Daylight Factor (ADF)

> *"If a predominantly daylit appearance is required, then df should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings, of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These last are minimum values of Average Daylight Factor, and should be attained even if a predominantly daylit appearance is not required."*

This method of assessment takes into account the total glazed area to the room, the transmittance quality of the glazing proposed, the total area of the room surfaces including ceilings and floors, and the internal average reflectance for the room being assessed. The method also takes into account the Vertical Sky Component and the quantum of reflected light off external surfaces.

This is, therefore, a significantly more detailed method of assessment than the Vertical Sky Component method set out above.

3.1.3. Room Depth Criterion (RDC)

Where it has access to daylight from windows in one wall only, the depth of a room can become a factor in determining the quantity of light within it. The BRE guidance provides a simple method for examining the ratio of room depth to window area. However, whilst it does take into account internal surface reflections, this method also has significant limitations in that it does not take into account any obstructions outside the window and therefore draws no input from the quantity of light entering the room.

3.1.4. No Sky Line (NSL)

This third method of assessment is a simple test to establish where within the proposed room the sky will be visible through the windows, taking into account external obstructions. The assessment is undertaken at working plane height (850mm above floor level) and the method of calculation is set out in Appendix D of the BRE handbook.

Appendix C of the BRE handbook states *"if a significant area of the working plane lies beyond the no skyline (i.e., it receives no direct skylight), then the distribution of daylight in the room will look poor and supplementary electric lighting will be required."* To guarantee a satisfactory daylight uniformity, the area which does not receive direct skylight should not exceed 20% of the floor area, as quantified in the BS 8206 Part2 2008.

3.1.5. Summary

The Average Daylight Factor gives a more detailed assessment of the daylight within a room and takes into account the highest number of factors in establishing a quantitative output.

However, the conclusion of Appendix C of the BRE guide states:

> *"All three of the criteria need to be satisfied if the whole of the room is to look adequately daylit. Even if the amount of daylight in a room (given by the Average Daylight Factor) is sufficient, the overall daylight appearance will be impaired if its distribution is poor."*

In most urban areas it is important to recognise that the distribution of daylight within a room may be difficult to achieve, given the built up nature of the environment. Consequently, most local authorities seek to ensure that there is sufficient daylight within the room as determined by the Average Daylight Factor calculation. However, the additional recommendations of the BRE and British Standard for residential accommodation, set out above, ought not to be overlooked.

3.2. Sunlight

The BRE provide guidance in respect of sunlight quality for new developments within section 3.1 of the handbook. It is generally acknowledged that the presence of sunlight is more significant in residential accommodation than it is in commercial, and this is reflected in the BRE document.

It states, *"in housing, the main requirement for sunlight is in living rooms, where it is valued at any time of the day, but especially in the afternoon. Sunlight is also required in conservatories. It is viewed as less important in bedrooms and in kitchens where people prefer it in the morning rather than the afternoon."*

The BRE guide considers the critical aspects of orientation and overshadowing in determining the availability of sunlight at a proposed development site.

The guide proposes minimizing the number of dwellings whose living room face solely north unless there is some compensating factor such as an appealing view to the north, and it suggests a number of techniques to do so. Further to this it discusses massing solutions with a sensitive approach to overshadowing, so as to maximize access to sunlight.

At the same time it acknowledges that the site's existing urban environment may impose orientation or overshadowing constraints which may not be possible to overcome.

So as to quantify sunlight access for interiors where sunlight is expected, it refers to the BS 82606-2 criterion of Annual Probable Sunlight Hours. APSH is defined as *"the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness at the location in question."* In line with the recommendation, APSH is measured from a point on the inside face of the window, should the locations have been decided. If these are unknown, sunlight availability is checked at points 1.6m above the ground or the lowest storey level on each main window wall, and no more than 5m apart. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken into account. If a room has two windows on opposite walls, the APSH due to each can be added together.

The summary of section 3.1 of the guide states as follows:

"In general, a dwelling or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided that:

At least one main window faces within 90 degrees of due south;

and

The centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March. "

In paragraph 3.1.11 the BRE guidance suggests that if a room faces significantly North of due East or West it is unlikely to meet the recommended levels proposed by the BS 8206-2. As such, it is clear that only windows facing within 90 degrees of due South can be assessed using this methodology.

It is also worth noting how paragraph 5.3 of the BS 8206-2 suggests that with regards to sunlight duration "the degree of satisfaction is related to the expectation of sunlight if a room is necessarily north facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary".

3.3. Overshadowing

The BRE guidance in respect of overshadowing of amenity spaces is set out in section 3.3 of the handbook. Here it states as follows:

> *"Sunlight in the spaces between buildings has an important impact on the overall appearance and ambiance of a development. It is valuable for a number of reasons:*
>
> - *To provide attractive sunlit views (all year)*
> - *To make outdoor activities, like sitting out and children's play more pleasant (mainly during the warmer months)*
> - *To encourage plant growth (mainly in spring and summer)*
> - *To dry out the ground, reducing moss and slime (mainly during the colder months)*
> - *To melt frost, ice and snow (in winter)*

- *To dry clothes (all year)"*

Again, it must be acknowledged that in urban areas the availability of sunlight on the ground is a factor which is significantly controlled by the existing urban fabric around the site in question and so may have very little to do with the form of the development itself. Likewise there may be many other urban design, planning and site constraints which determine and run contrary to the best form, siting and location of a proposed development in terms of availability of sun on the ground.

The summary of section 3.3 of the guide states as follows:

> *"3. 3 .17 It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 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 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March."*

3.4. Further relevant information

Further information can be found in *The Daylight in Urban Areas Design Guide* (Energy Saving Trust CE257, 2007) which provides the following recommendation with regards to VSC levels in urban areas:

> *"If 'theta' (Visible sky angle) is greater than 65º (obstruction angle less than 25º or VSC at least 27 percent) conventional window design will usually give reasonable results.*
>
> *If 'theta' is between 45º and 65º (obstruction angle between 25º and 45º, VSC between 15 and 27 percent), special measures such as larger windows and changes to room layout are usually needed to provide adequate daylight.*
>
> *If 'theta' is between 25º and 45º (obstruction angle between 45º and 65º, VSC from 5 to 15 percent), it is very difficult to provide adequate daylight unless very large windows are used.*
>
> *If 'theta' is less than 25º (obstruction angle more than 65º, VSC less than 5 percent) it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed."*

4. Methodology

In order to undertake the daylight and sunlight assessments set out above, we have prepared a three dimensional computer model and used specialist lighting simulation software.

The three dimensional representation of the proposed development has been modelled using the scheme drawings provided to us by AHMM. This has been placed in the context of its surrounding buildings which have been modelled from survey information, photogrammetry, OS and site photographs. This allows for a precise model, which in turn ensures that analysis accurately represents the amount of daylight and sunlight available to the building facades, internal and external spaces, considering all of the surrounding obstructions and orientation.

4.1. Simulation assumptions

Where no values for reflectance, transmittance and maintenance factor were specified by the designer the following values from *BS 8206-2:2008, Annex A, tables A.1-A.6* were used for the calculation of Average Daylight Factor values. These values are shown in table 1.

Reflectance values:	
Surrounding	0.2
Pavement	0.2
Grass	0.1
Yellow brick	0.3
Red brick	0.2
Concrete	0.4
Internal walls (light grey)	0.68
Internal ceiling (white paint)	0.85
Internal floor (medium to light veneer)	0.3
Transmittance values:	
Double glazing:	
Pilkington K Glass 4/16/4 Argon filled 90%	Tv= 0.75
Single glazing:	
Pilkington Optifloat Clear, Annealed, 4mm	Tv=0.90
Translucent glazing:	
Pilkington Optifloat Opal - 4mm K /16/4mm Opal	Tv= 0.74

Maintenance factors:	Tv(normal)	A.3	A.4	A.5	A.6	Tv(total)
Double Low-E (frames modelled)	0.75	8	1	1	1	0.69
Double Low-E (frames not modelled)	0.75	8	1	1	0.8	0.55
Double Low-E (inclined, frames modelled)	0.75	8	2	1	1	0.63
Double Low-E (inclined, frames not modelled)	0.75	8	2	1	0.8	0.50
Double Low-E (horizontal, frames modelled)	0.75	8	3	1	1	0.57
Double Low-E (horizontal, frames not modelled)	0.75	8	3	1	0.8	0.46
Single (frames modelled)	0.9	8	1	1	1	0.83
Single (frames not modelled)	0.9	8	1	1	0.8	0.66
Single (inclined, frames modelled)	0.9	8	2	1	1	0.76
Single (inclined, frames not modelled)	0.9	8	2	1	0.8	0.60
Single (horizontal, frames modelled)	0.9	8	3	1	1	0.68
Single (horizontal, frames not modelled)	0.9	8	3	1	0.8	0.55
Double Translucent Low-E (frames modelled)	0.74	8	1	1	1	0.68
Double Translucent Low-E (frames not modelled)	0.74	8	1	1	0.8	0.54
Double Translucent Low-E (inclined, frames modelled)	0.74	8	2	1	1	0.62
Double Translucent Low-E (inclined, frames not modelled)	0.74	8	2	1	0.8	0.50
Double Translucent Low-E (horizontal, frames modelled)	0.74	8	3	1	1	0.56
Double Translucent Low-E (horizontal, frames not modelled)	0.74	8	3	1	0.8	0.45

Table 1: Typical reflectance, transmittance and maintenance factors

5. Conclusions

5.1. Conclusion on Daylight

In order to ascertain the levels of daylight within Area E of the Camden Lock Village development, technical assessments of Average Daylight Factor (ADF), No Sky Line (NSL) and Room Depth Criterion (RDC) have been undertaken within all proposed habitable rooms. The results can be seen in pages 9 to 13 of this report.

As the development faces the typical constraints of a densely built environment, GIA has worked alongside AHMM in order to maximise the levels of daylight enjoyed by future occupants. Area E has been designed as an annex building to Area D and a non material amendment application has been submitted in respect of this building.

The assessments have shown very good levels of daylight within this building with all but two of the habitable rooms meeting or exceeding BRE's recommendations for ADF and all meeting or exceeding the NSL criterion.

The only two rooms falling short of BRE's recommendation for ADF are Living/ Kitchen/Dining 14 and 28 which see 1.7% ADF and 1.9% ADF respectively. With levels of ADF above the 1.5% recommendation for living rooms and the living areas at the front of the rooms achieving good levels of daylight, these rooms can be considered acceptably daylit living areas. The kitchen areas, located at the rear, will be more reliant on supplementary artificial lighting on darker days. Also, both L/K/Ds exceed the 80% NSL criteria.

All habitable rooms within this building have been designed in accordance with the RDC where applicable.

Overall we therefore find that the proposed design of Area E performs very well in terms of daylight.

5.2. Conclusion on Sunlight

An assessment of Annual Probable Sunlight Hours (APSH) has been undertaken on all windows serving living areas facing within 90 degrees of due south.

The results, presented on pages 14 and 15 of this report, have shown that overall very good levels of sunlight are achieved within Area E. Only the living rooms located on the southwest corner of the building will see reduced levels of APSH throughout the year due to their recessed location, however these main habitable rooms will see good levels of APSH in winter. In addition, the balconies's balustrades have also been tested for APSH and the results show that in these units good levels of sunlight can be enjoyed during the whole year through the use of the private amenity areas.

Overall we consider that the proposed design will provide future occupants with very good levels of sunlight.

Site Overview

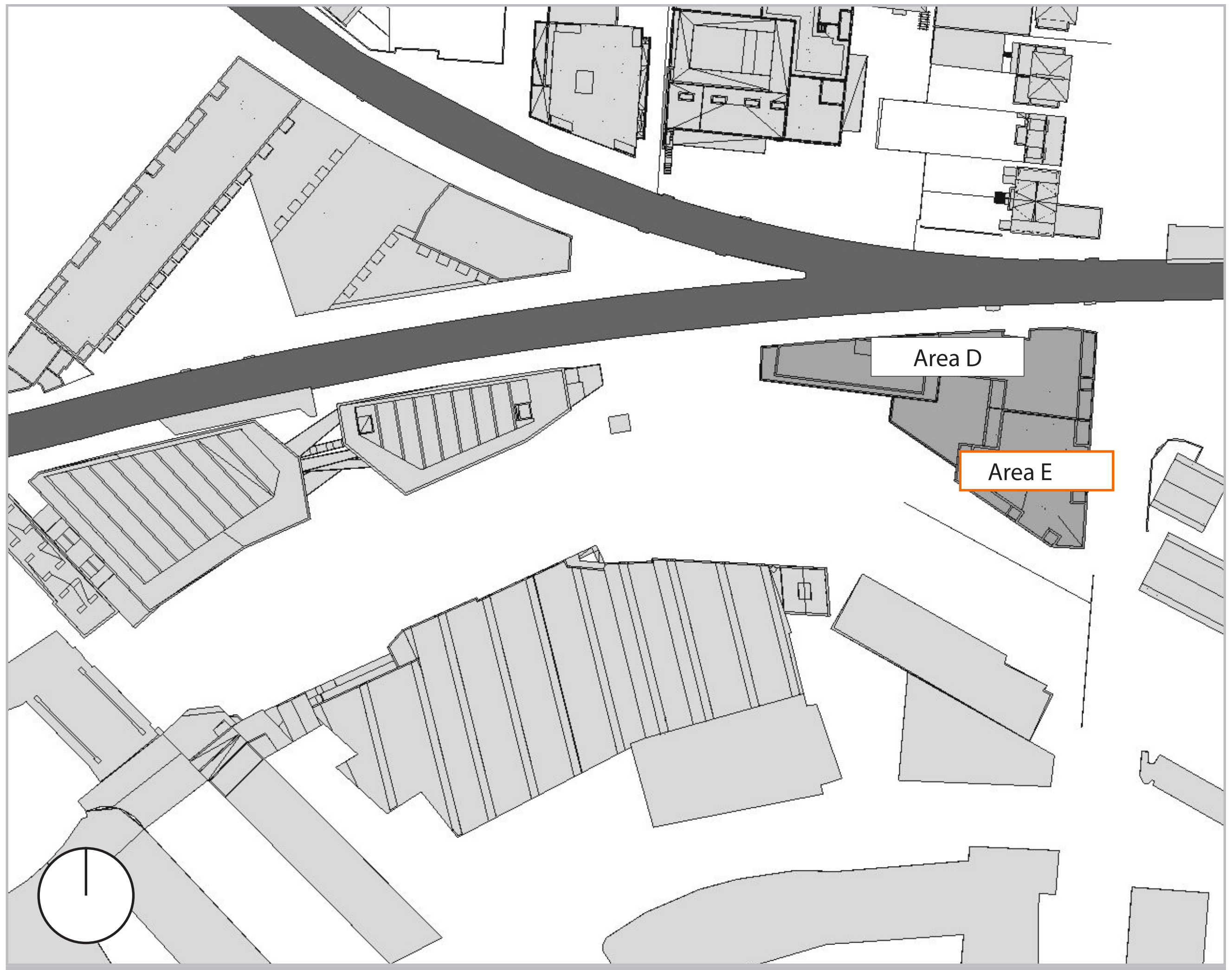


Figure 1: Top View

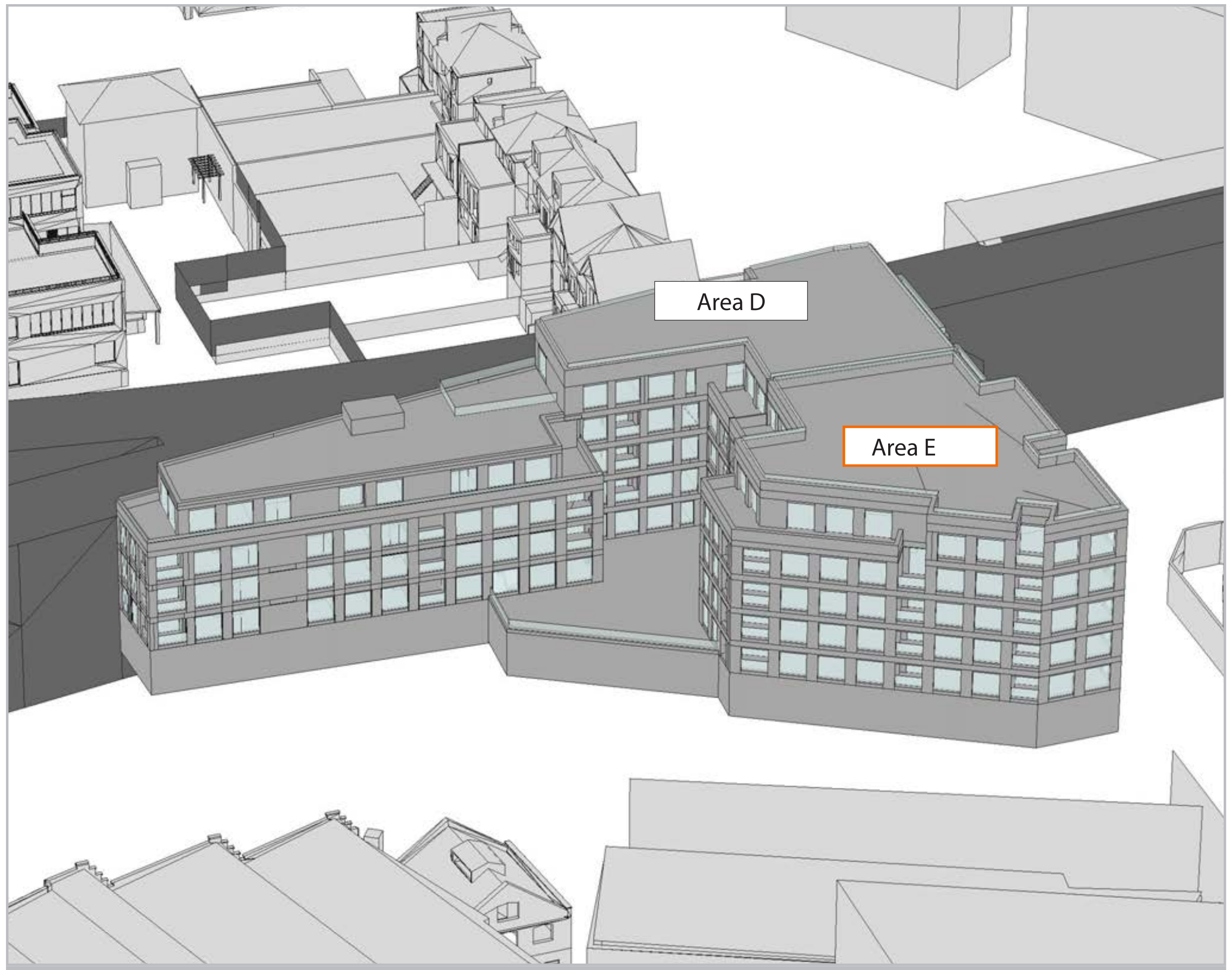


Figure 2: Top View

Room Ref.	Room Use	Daylight Quantum ADF (%)	Distribution of Daylight NSL (%)	RDC
1st floor				
0	L/K/D	2.1	100	Met
1	Bedroom	1.5	100	Met
2	Bedroom	1.0	90	Met
3	L/K/D	2.7	100	N/A
4	Bedroom	3.5	99	N/A
5	Bedroom	4.2	100	N/A
6	L/K/D	6.0	100	N/A
7	Bedroom	3.7	99	Met
8	L/K/D	2.8	98	N/A
9	Bedroom	4.6	100	Met
10	Bedroom	4.8	99	Met
11	Bedroom	5.3	100	N/A
12	L/K/D	2.3	100	N/A
13	Bedroom	2.9	98	Met

Table 2: Assessment Data

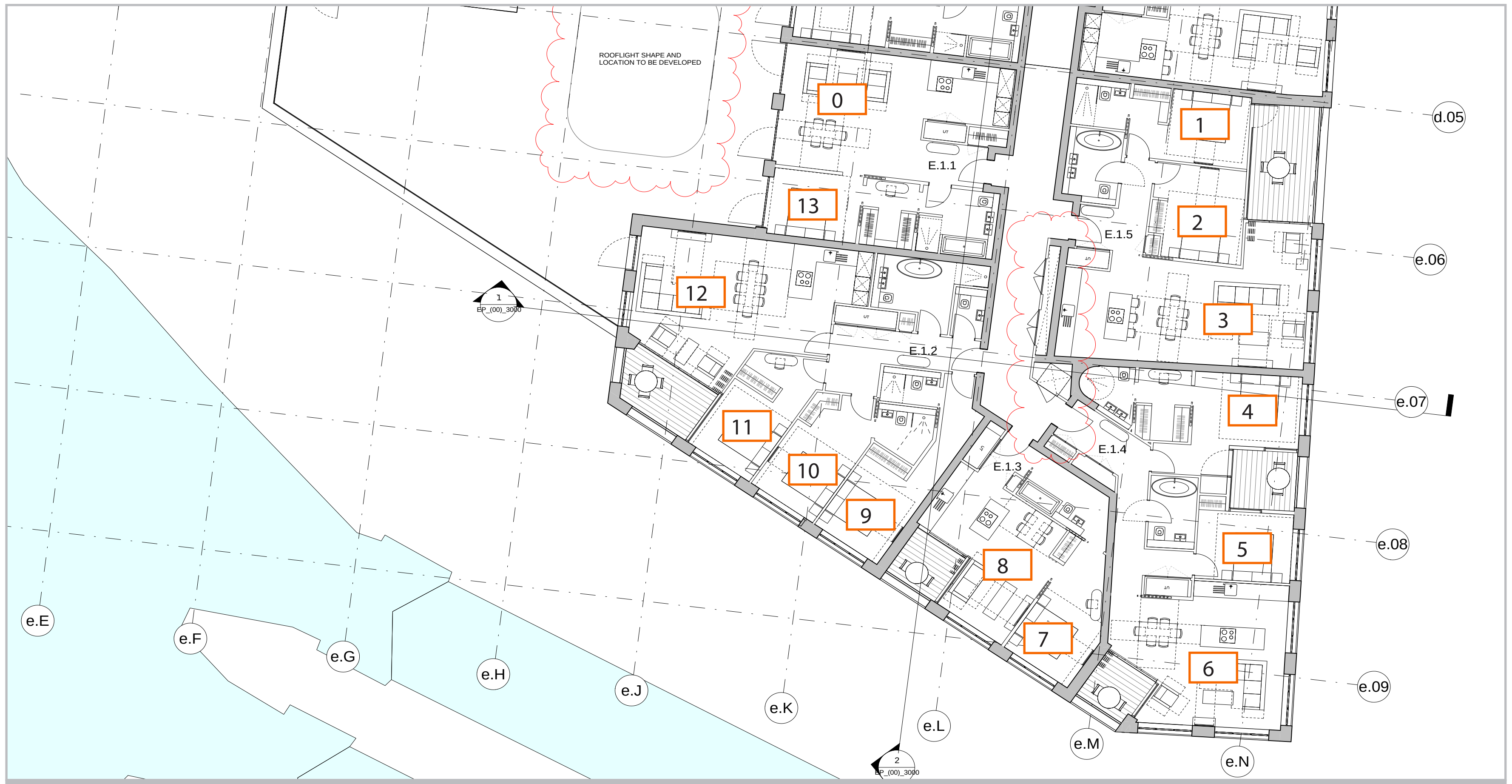
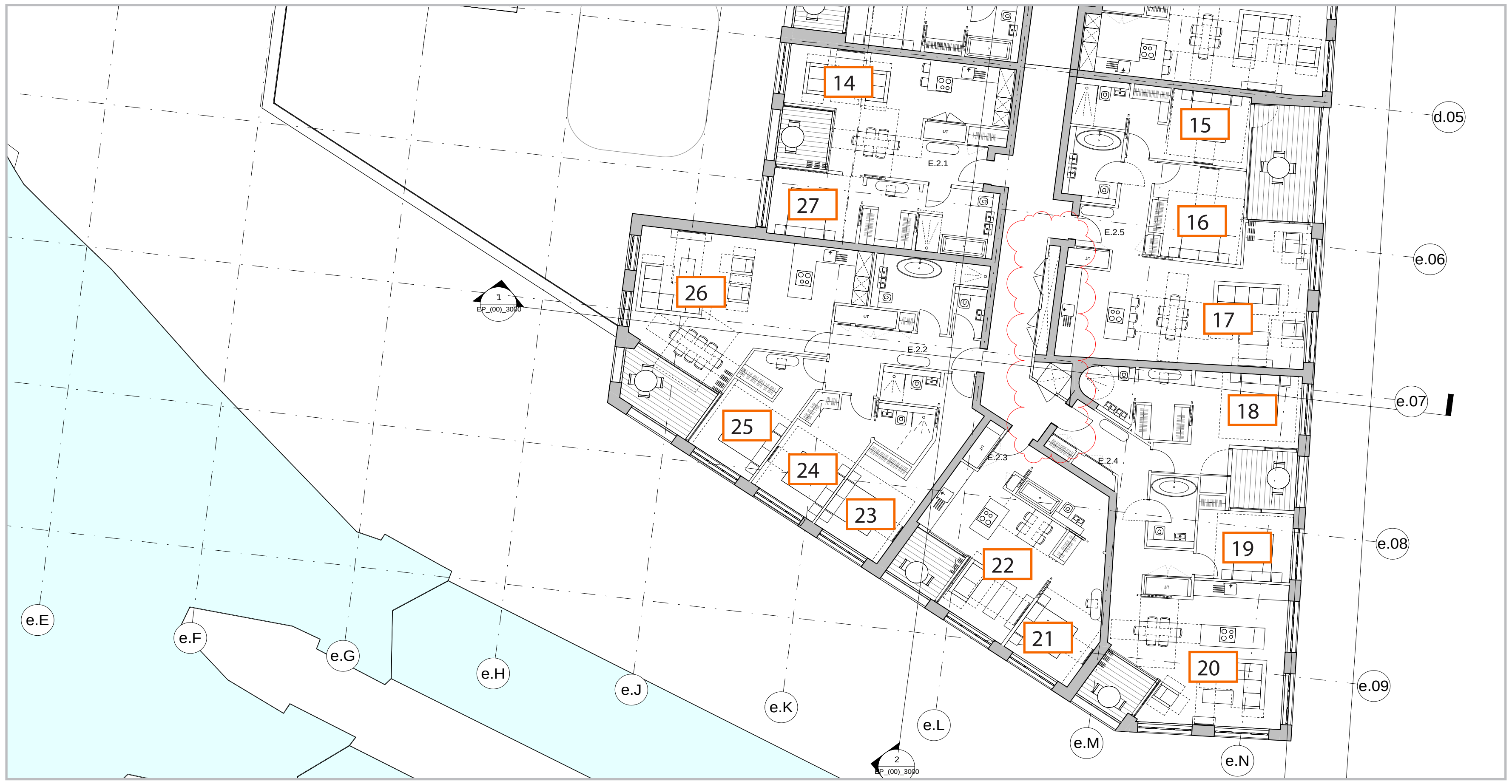


Figure 3: Floor Plan

Room Ref.	Room Use	Daylight Quantum ADF (%)	Distribution of Daylight NSL (%)	RDC
2nd floor				
14	L/K/D	1.7	100	N/A
15	Bedroom	1.6	99	Met
16	Bedroom	1.1	90	Met
17	L/K/D	2.7	100	N/A
18	Bedroom	3.7	99	N/A
19	Bedroom	4.4	100	N/A
20	L/K/D	6.3	100	N/A
21	Bedroom	3.8	99	Met
22	L/K/D	2.9	98	N/A
23	Bedroom	4.7	100	Met
24	Bedroom	4.9	99	Met
25	Bedroom	5.4	100	N/A
26	L/K/D	2.3	100	N/A
27	Bedroom	3.4	99	N/A

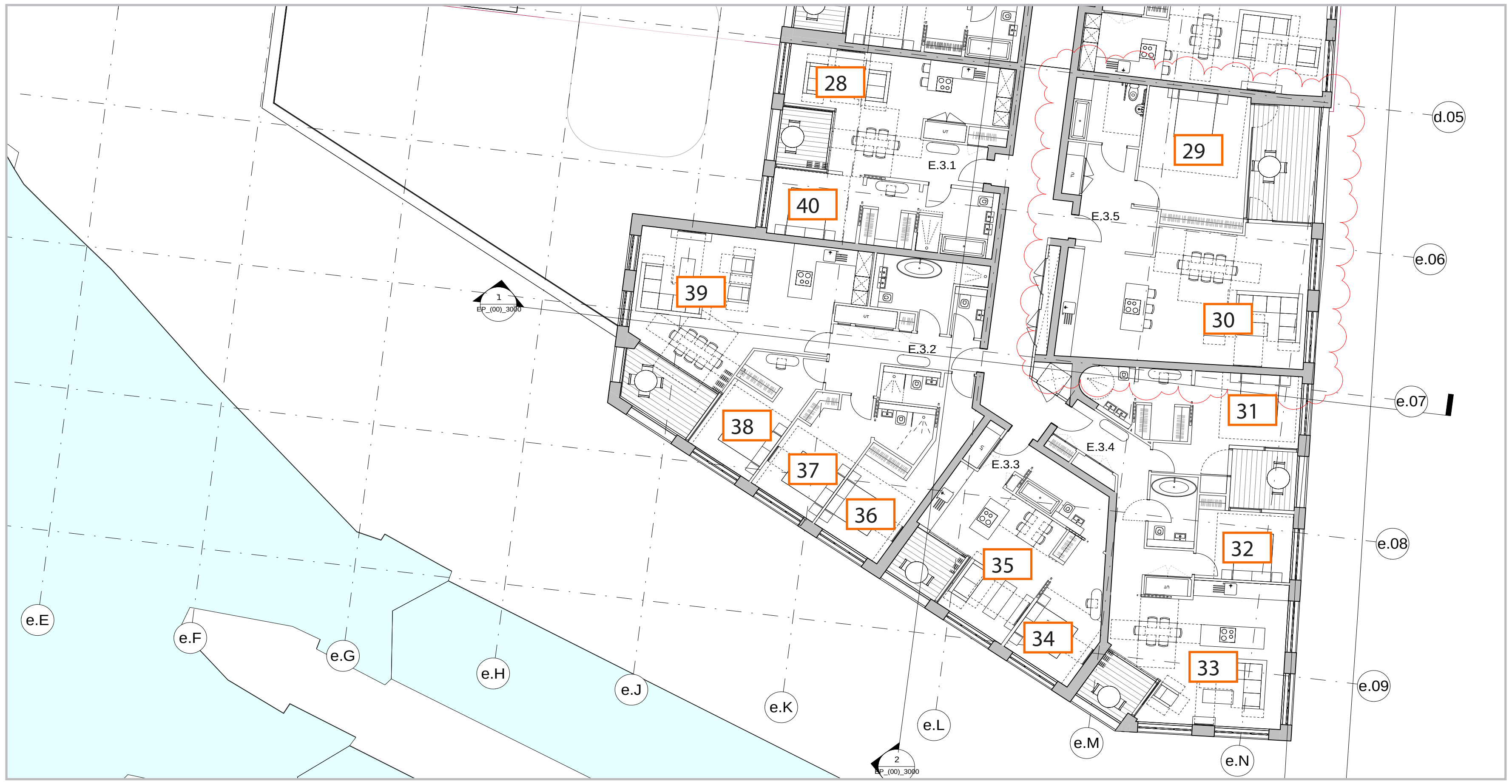
Table 3: Assessment Data



Daylight Assessments - 3rd Floor

Room Ref.	Room Use	Daylight Quantum ADF (%)	Distribution of Daylight NSL (%)	RDC
3rd floor				
28	L/K/D	1.9	100	N/A
29	Bedroom	1.6	100	N/A
30	L/K/D	2.5	100	N/A
31	Bedroom	3.8	99	N/A
32	Bedroom	4.5	100	N/A
33	L/K/D	6.4	100	N/A
34	Bedroom	3.9	99	Met
35	L/K/D	3.0	98	N/A
36	Bedroom	4.7	100	Met
37	Bedroom	4.9	99	Met
38	Bedroom	5.5	100	N/A
39	L/K/D	2.4	100	N/A
40	Bedroom	3.8	99	N/A

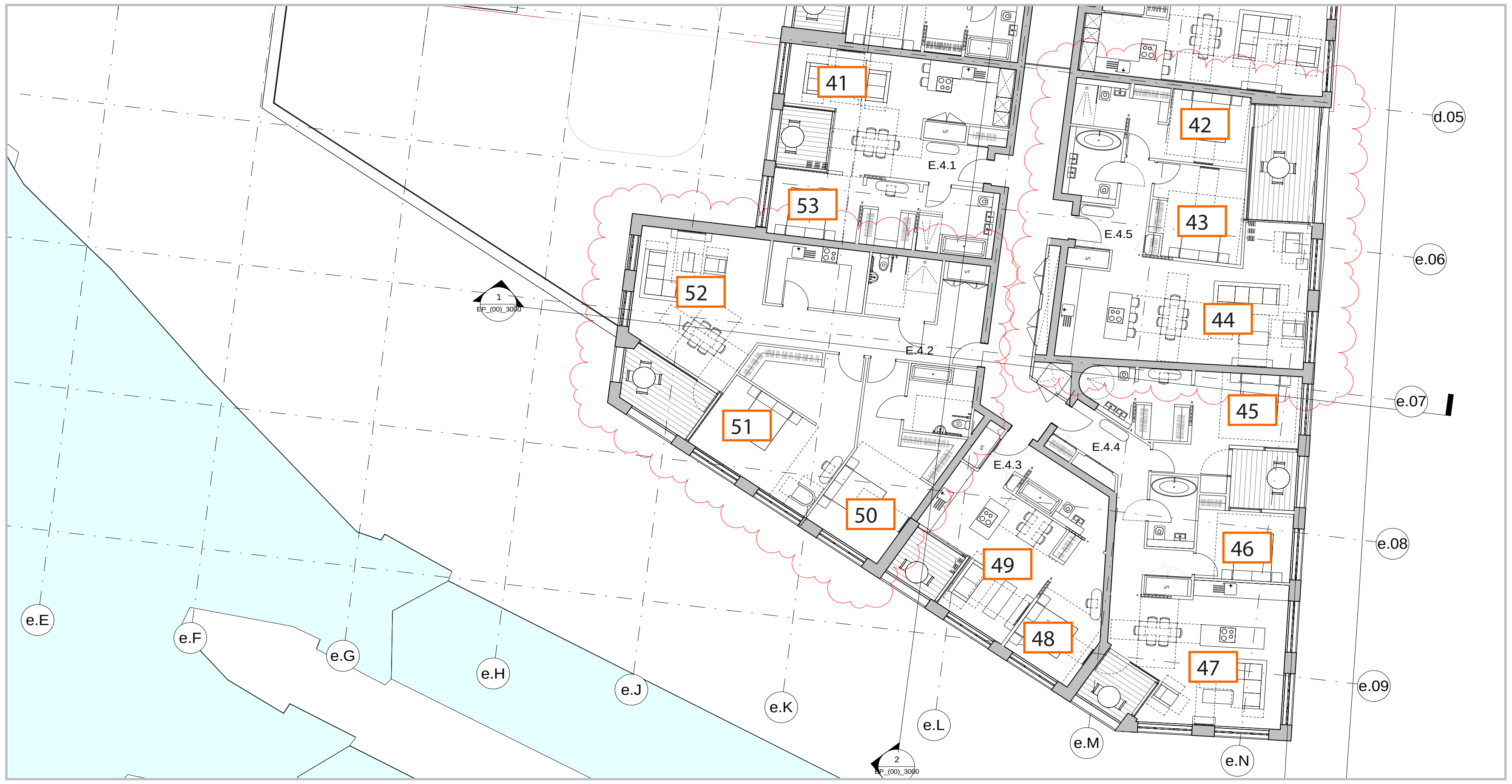
Table 4: Assessment Data



Daylight Assessments - 4th Floor

		Daylight Quantum	Distribution of Daylight	
Room Ref.	Room Use	ADF (%)	NSL (%)	RDC
4th floor				
41	L/K/D	4.1	100	N/A
42	Bedroom	1.5	99	Met
43	Bedroom	1.1	90	Met
44	L/K/D	5.4	100	N/A
45	Bedroom	4.2	99	N/A
46	Bedroom	4.8	100	N/A
47	L/K/D	8.5	100	N/A
48	Bedroom	3.9	99	Met
49	L/K/D	6.3	98	N/A
50	Bedroom	3.8	99	Met
51	Bedroom	5.7	100	N/A
52	L/K/D	3.5	100	N/A
53	Bedroom	5.0	100	N/A

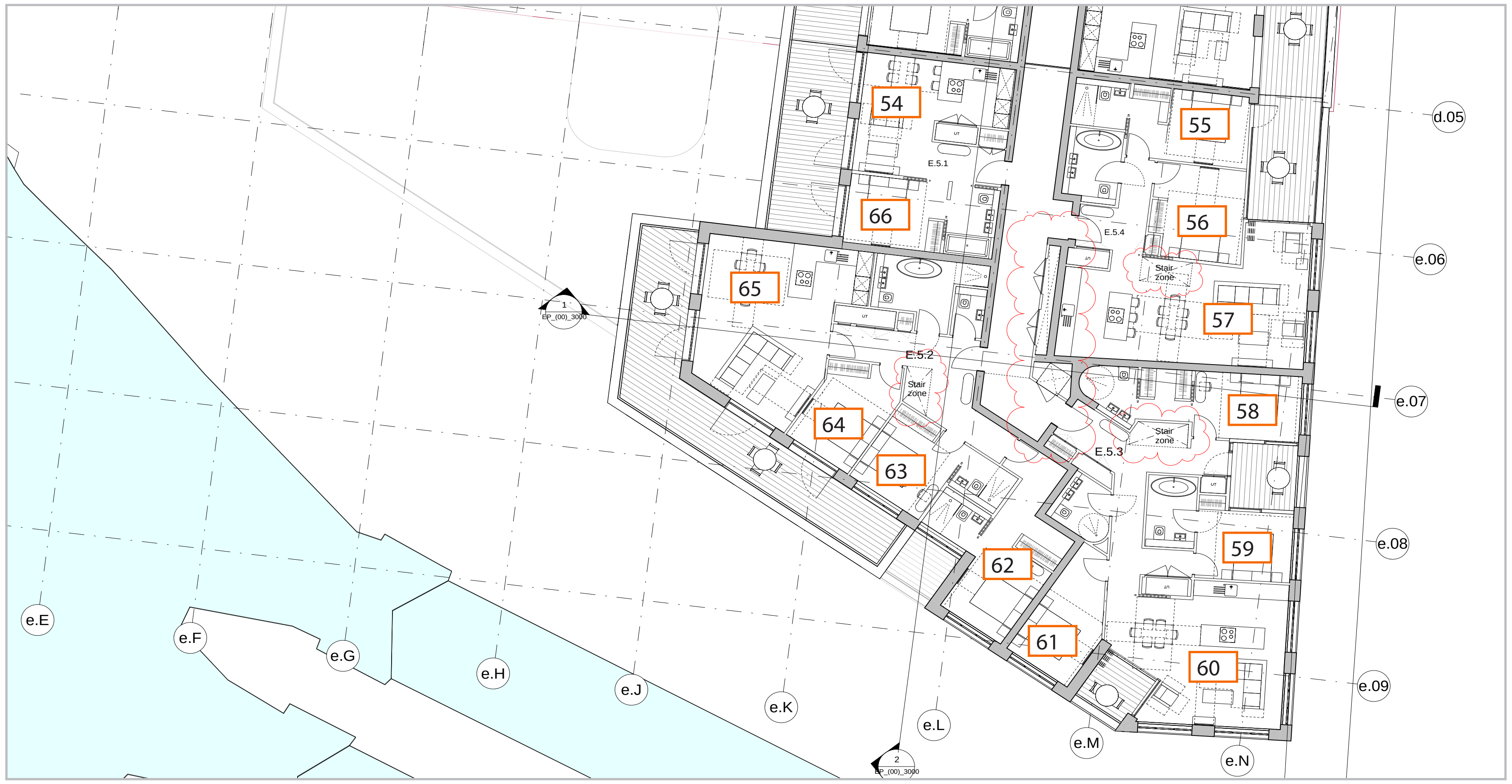
Table 5: Assessment Data



Daylight Assessments - 5th Floor

Room Ref.	Room Use	Daylight Quantum ADF (%)	Distribution of Daylight NSL (%)	RDC
5th floor				
54	L/K/D	4.1	100	Met
55	Bedroom	7.2	100	Met
56	Bedroom	3.6	99	Met
57	L/K/D	3.5	100	N/A
58	Bedroom	5.2	100	N/A
59	Bedroom	5.5	100	N/A
60	L/K/D	7.5	100	N/A
61	Bedroom	4.0	99	Met
62	Bedroom	4.7	99	Met
63	Bedroom	5.0	99	Met
64	Bedroom	4.5	100	Met
65	L/K/D	4.8	100	N/A
66	Bedroom	4.0	99	Met

Table 6: Assessment Data



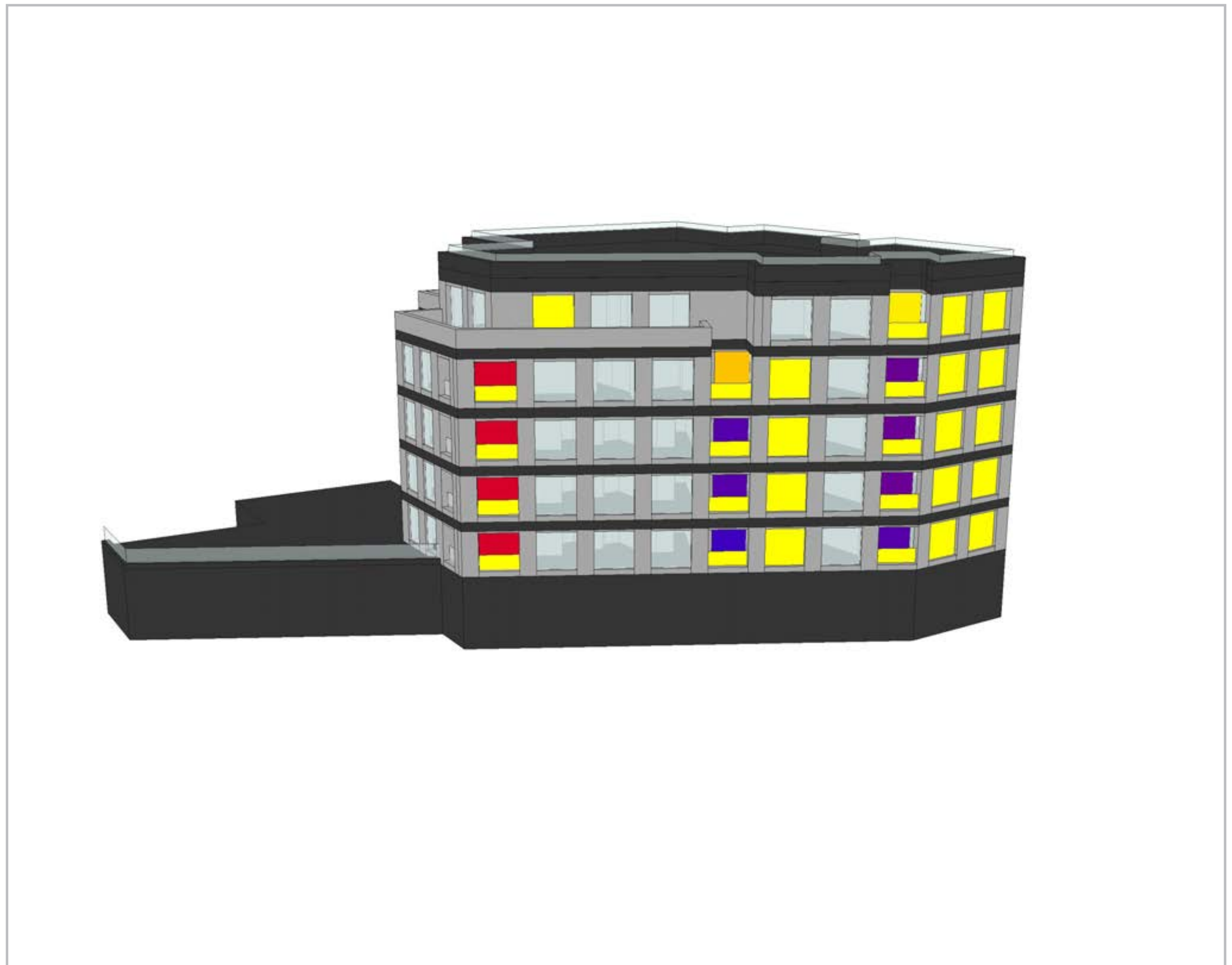


Figure 4: Annual Probable Sunlight Hours - Total

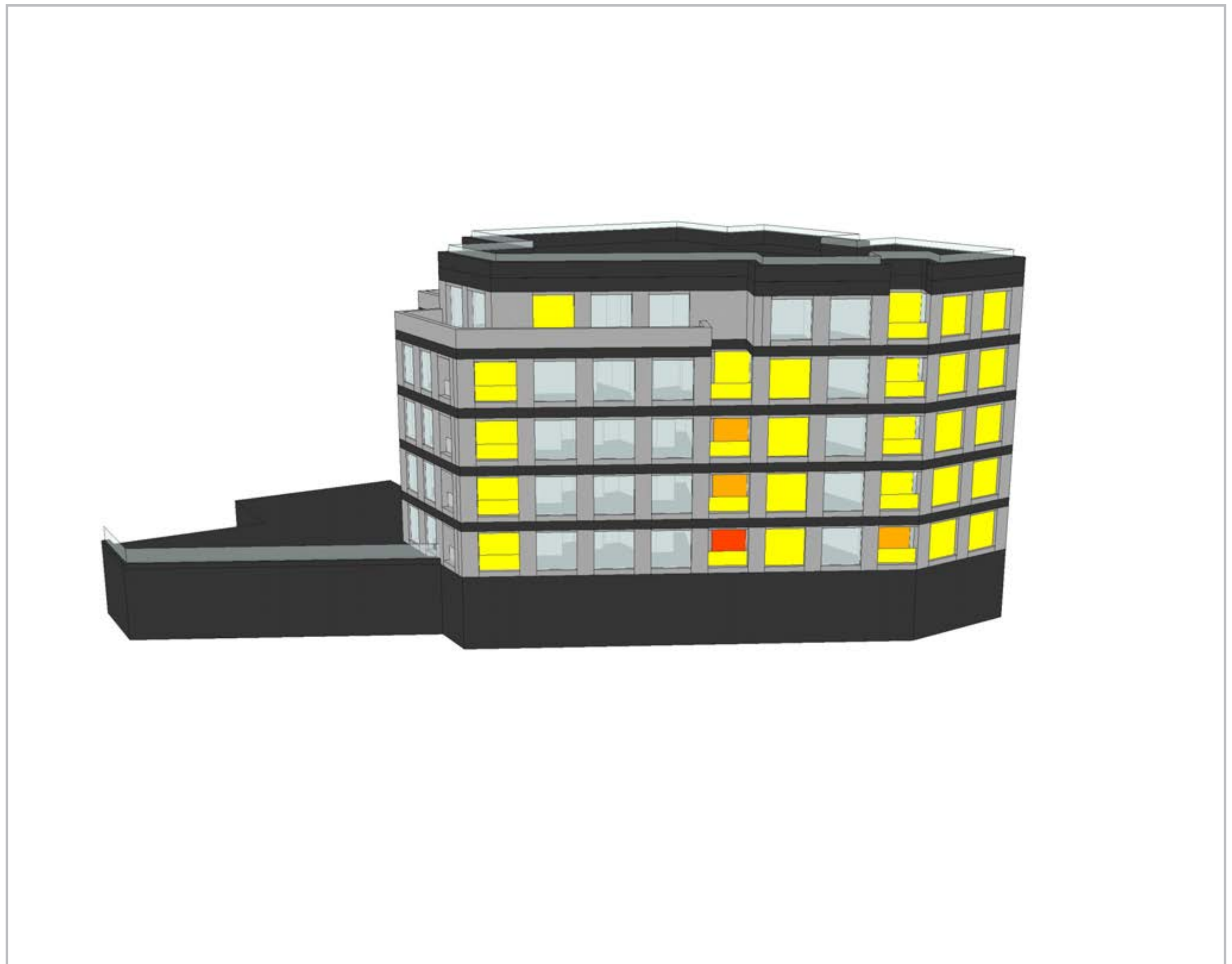
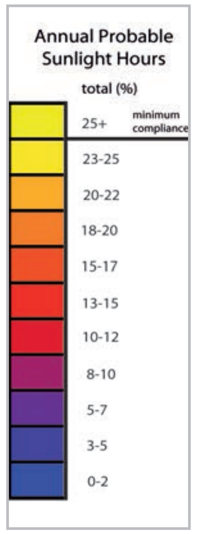


Figure 5: Annual Probable Sunlight Hours - Winter



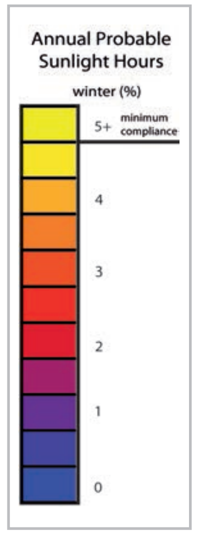


Figure 6: Annual Probable Sunlight Hours - Total

Figure 7: Annual Probable Sunlight Hours - Winter