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CHARTERED SURVEYORS

THE DAYLIGHT DEPARTMENT

INTERNAL DAYLIGHT, SUNLIGHT AND OVERSHADOWING REPORT

Twickenham Riverside

27 October 2022

GIA No: **17085**

PROJECT DATA:

Client	**London Borough Richmond Upon Thames (LBRUT)**
Architect	**Hopkins Architects**
Project Title	**Twickenham Riverside**
Project Number	**17085**

REPORT DATA:

Report Title	**Internal Daylight, Sunlight and Overshadowing Report**
GIA Department	**The Daylight Department**
Dated	**27 October 2022**

Prepared by	**FC**
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CONTENTS

1 EXECUTIVE SUMMARY

The purpose of this report is to ascertain whether the proposed development will offer acceptable daylight and sunlight amenity for the enjoyment of future occupants, according to the 2022 edition of the BRE Guidelines.

The proposed scheme at Twickenham Riverside was previously assessed by GIA in July 2021. Following an update of the BRE Guidelines in June 2022, the internal daylight and sunlight assessments have been updated to reflect the latest methodology.

All habitable rooms within the scheme have been technically assessed for daylight through the illuminance method, all units have been assessed for their access to sunlight and the outdoor communal amenity areas have been assessed for overshadowing.

Overall, the results show that the proposal will provide future occupants with acceptable levels of daylight, with 87% of habitable rooms achieving levels of daylight in line with or above recommendation when assessed against the UK National Annex targets, 91% of units meeting or exceeding the recommended sunlight exposure and all outdoor communal amenity areas being well sunlit throughout the year.

These results are comparable to those based on the 2011 BRE Guidelines and discussed within GIA's July 2021 report.

Overall, the proposed design is considered to perform acceptably in relation to natural light. Further details on the results achieved can be found in Section 5 of this report.

2 INTRODUCTION

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 Hopkins Architects. GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon drawings prepared by Hopkins Architects.
- Carry out a daylight assessment using the methodologies set out in the BRE guidance for Spatial Daylight Autonomy (sDA).
- Carry out a sunlight assessment using the methodologies set out in the BRE guidance for Solar Exposure.
- Carry out an overshadowing assessment using the methodology set out in the BRE guidance for Sun Hours On Ground (SHOG) for all relevant amenity areas.
- 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 (BR 209 2022)', guidelines and methodology for the measurement and assessment of daylight and sunlight within proposed buildings.

The BRE published the new edition of 'Site layout planning for daylight and sunlight: a guide to good practice' in June 2022 (BR 209), This is to be read in conjunction with BS EN 17037:2018 "Daylight in buildings", the UK National Annex of the British Standard and the CIBSE publication LG 10 'Daylighting – a guide for designers'.

The BR 209 new edition contains amended methodologies for appraising the daylight and sunlight quality within new developments. Nonetheless, the main aim of the guidance is maintained: *"to help rather than constrain the designer"* as stated in Paragraph 1.6 of the new guidance.

The report provides advice, but also clearly states that it *"is not mandatory and the guide should not be seen as an instrument of planning policy."* The guidance also acknowledges in its introduction that *"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high-rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings."* (Paragraph 1.6)

2.1 BS EN 17037:2018 AND THE UK ANNEX

The British Standard BS8206-2:2008 was superseded by the new European Standard on daylight BS EN 17037:2018 "Daylight in buildings".

Following a review of the European Standard by a dedicated commission of UK experts, the British Standard Institution concluded that the targets suggested *"may not be achievable for some buildings, particularly dwellings"*. In particular, the UK committee believed this could be the case for *"dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings"*

As a consequence, a UK National Annex was appended to BS EN 17037:2018 which suggested alternative targets, in line with those of the former BS8206-2:2008 and the previous (2011) BR209. These lower targets were then incorporated into the 2022 publication of BR209.

With this site being located within central London, a dense urban environment, the relevant targets are considered to be those contained within the UK National Annex as outlined and discussed further in Section 3.2 adjacent. It is important here to re-emphasise though that these UK targets were designed to be in line with those from the previous British Standard and BR209 publications and so utilising them does not represent a weakening of standards, rather it enables continuity in the understanding of daylight levels within residential developments.

The BS EN 17037 includes four criteria: daylighting, views, sunlight access and glare. However, daylighting and sunlight access are the only criteria considered relevant for residential buildings and therefore discussed within this report.

View out and Glare are mostly relevant in offices and schools, where occupants are more fixed to a certain location within a room. In residential habitable rooms, occupants tend to move more freely and therefore view out and glare are not assessed within residential buildings.

2.2 DAYLIGHT

The BRE set out the methods for assessing daylight within a proposed building within section 2.1 and Appendix C of the handbook. This is based on the methods detailed in the BS EN 17037.

BS EN 17037 suggests two possible methodologies for appraising daylight:

- Illuminance Method
- Daylight Factor Method

These methodologies are discussed in more detail below.

Whilst Vertical Sky Component (VSC) is no longer directly used to calculate the levels of daylight indoors, this is still referenced within the BRE guidance as a metric to appraise the level of obstruction faced by a building and the potential for good daylight indoors.

This method of assessment may also be used to appraise the daylight quality in the early stages of the design, when room layouts or window locations are still undecided.

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.

Illuminance method

Climate Based Daylight Modelling (CBDM) is used to predict daylight illuminance using sun and sky conditions derived from standard meteorological data (often referred to as climate or weather data). This analytical method allows the prediction of absolute daylight illuminance based on the location and building orientation, in addition to the building's daylight systems (shading systems, for example). Annex A within the BS EN 17037 proposes values of target illuminances and minimum target illuminances to exceed 50 % of daylight hours.

This is considered to be the most accurate approach when using climate data, however, it provides a very large amount of data for each assessed room, which then needs to be interrogated. One of the methodologies that can be used to interrogate this data is Spatial Daylight Autonomy (sDA).

<u>Spatial Daylight Autonomy (sDA)</u>

The sDA assessment is designed to understand how often each point of the room's task area sees illuminance levels at or above a specific threshold.

BS EN 17037 sets out minimum illuminance levels (300lx) that should be exceeded over 50% of the space for more than half of the daylight hours in the year. It also includes recommendations for medium and high daylighting levels within a space (500lx and 700lx respectively). It should be noted here, however, that these targets are specified irrespective of a space's use or design.

As discussed within Section 3.1, the National Annex suggests that these targets can be challenging to achieve within residential settings, particularly in areas of higher density and so suggests lower targets can be considered in this situation. It should be noted here that the reduced targets suggested within the BS EN 17037:2018 National Annex are provided so as to be comparable with the previous BR209's recommendations for ADF. These targets, considered relevant for this application, are:

- 100 lux for bedrooms
- 150 lux for living rooms
- 200 lux for living/kitchen/diners, kitchens, and studios.

It is however stated in paragraph C17 of the BRE that: "*Where a room has a shared use, the highest target should apply. For example in a bed sitting room in student accommodation, the value for a living room should be used if students would often spend time in their rooms during the day. Local authorities*

could use discretion here. For example, the target for a living room could be used for a combined living/dining/kitchen area if the kitchens are not treated as habitable spaces, as it may avoid small separate kitchens in a design".

Daylight Factor method

This method involves calculating the median daylight factor on a reference plane (assessment grid).

"The daylight factor is the illuminance at a point on the reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The CIE standard overcast sky is used, and the ratio is usually expressed as a percentage."

This method of assessments considers an overcast sky, and therefore the orientation and location of buildings is not relevant. In order to account for different climatic conditions, Annex A within the BS EN 17037 sets equivalent daylight factor targets (D) for various locations in Europe.

The median daylight factor (MDF) should meet or exceed the target daylight factor relative to a given illuminance for more than half of daylight hours, over 50% of the reference plane.

2.3 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 properties, 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 minimising 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. Furthermore, 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.

To quantify sunlight access for interiors where sunlight is expected, it refers to the BS EN 17037 criterion that the minimum duration of sunlight exposure in at least one habitable room of a dwelling should be 1.5 h on March 21st. Table A.5 also establishes medium and high sunlight targets (3 and 4 hours).

This is to be checked at a reference point located centrally to the window's width and at the inner surface of the aperture (façade and/or roof). For multiple apertures in different facades it is possible to cumulate the time of sunlight availability if not occurring at the same time. The reference point is minimum 1.2 m above the floor and 0.3 m above the window sill if present.

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*

- *a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. This is assessed at the inside centre of the window(s); sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted.. "*

2.4 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 and around buildings has an important impact on the overall appearance and ambience of a development. It is valuable for a number of reasons, to:

- *provide attractive sunlit views (all year)*
- *make outdoor activities like sitting out and children's play more pleasant (mainly warmer months)*
- *encourage plant growth (mainly spring and summer)*
- *dry out the ground, reducing moss and slime (mainly in colder months)*
- *melt frost, ice and snow (in winter)*
- *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 that can receive two hours of sun on 21 March is less than 0.80 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.."

2.5 FURTHER RELEVANT INFORMATION

CIBSE LG 10 'Daylighting – a guide for designers'.

This guide details the process of designing for daylighting. It outlines considerations of form, orientation, and other aspects involved in designing the building envelope to optimise natural light.

The guidance in this document is written primarily for buildings located within the UK, and will be most applicable to projects in northern hemisphere. However, the principles are universal, and can be applied to other locations if the appropriate weather data is used and local standards and regulations are respected

4 METHODOLOGY

In order to undertake the daylight and sunlight assessments set out in the later pages, 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 Hopkins Architects. 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

The weather file recorded at Hemsby was considered the most relevant for this assessment.

Surfaces reflectance

Reflectance values applied to surfaces in the computational modelling follow the BR 209 Annex C, unless specified by the design team.

Reflectance values: -

- Interior walls - 0.70
- Ceilings - 0.80
- Exterior ceilings - 0.60
- Floors - 0.30
- Exterior walls - 0.70
- Exterior ground and external obstructions - 0.20

Glazing transmittance

Visible light trasmittances applied to surfaces in the computational modelling follow the BR 209 Annex C, unless specified by the design team.As per the design team's recommendation, a visible light transmittance of 0.65 (direct normal) has beenadopted for the windows and a maintenance factor of 8% applied. The frames were modelled as per the architect's design and so no framing factor was applied to the light transmittance.

Glazing transmission and maintenance factors have been calculated and are detailed in Table 01.

Assessments grid

For the daylight assessments, an analysis 'grid' is located within each room at working plane height (850 mm from FFL) and offset by 0.30m from the walls as recommended by BR 209.

Grid points are spaced by 0.20m.

GLAZING TYPE AND MAINTENANCE FACTORS:	TV (Normal)	DIRT FACTOR	POSITION	SHELTERED	FRAMING FACTOR	TV (Total)
TYPE 01	0.65	8	1	1	1.00	0.60
TYPE 02	0.65	8	2	1	1.00	0.55
TYPE 03	0.65	8	1	3	1.00	0.49

Table 01: Typical reflectance, transmittance and maintenance factors

Fig. 01: Water Lane Building - eastern elevations

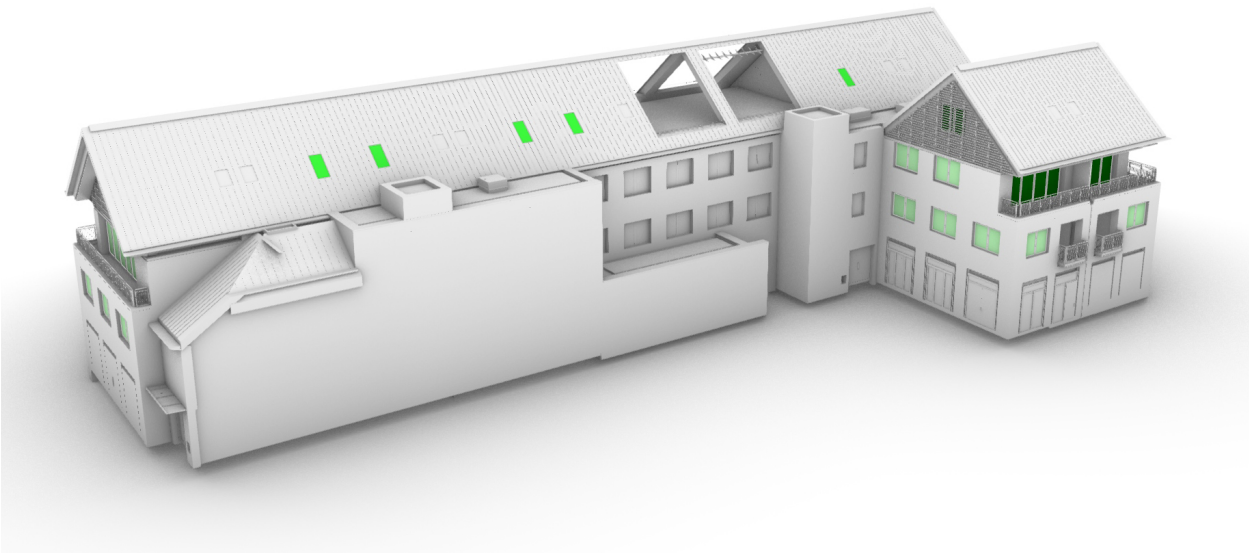

Fig. 02: Water Lane Building - western elevations

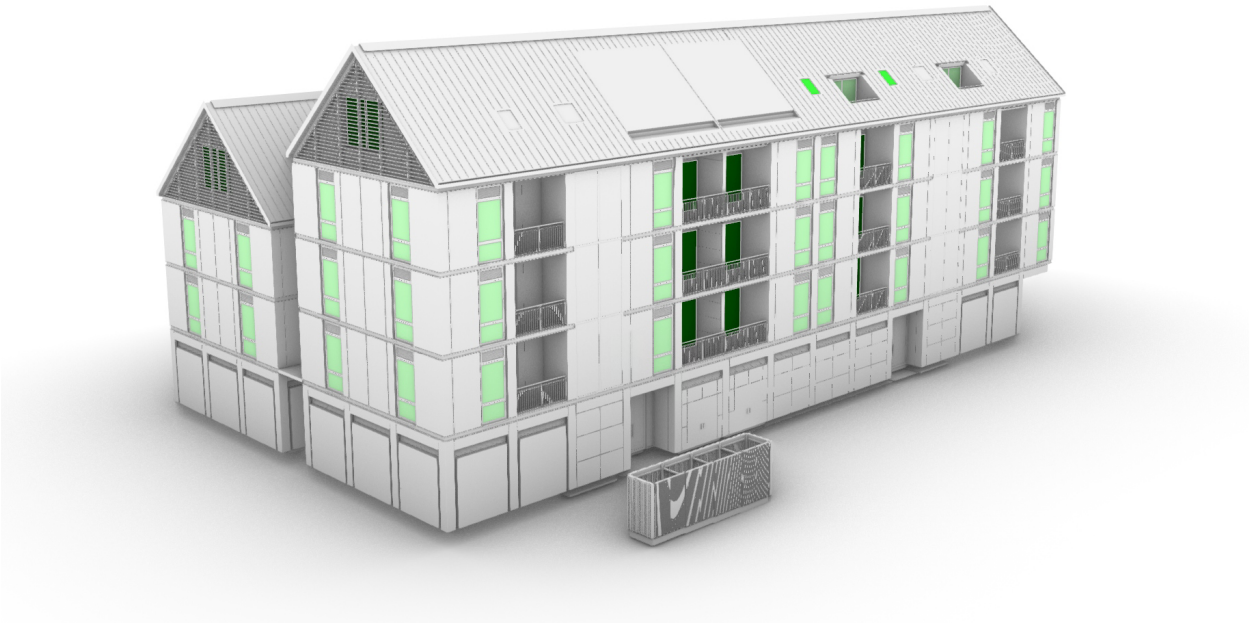

Fig. 03: Wharf Lane Building - western elevations

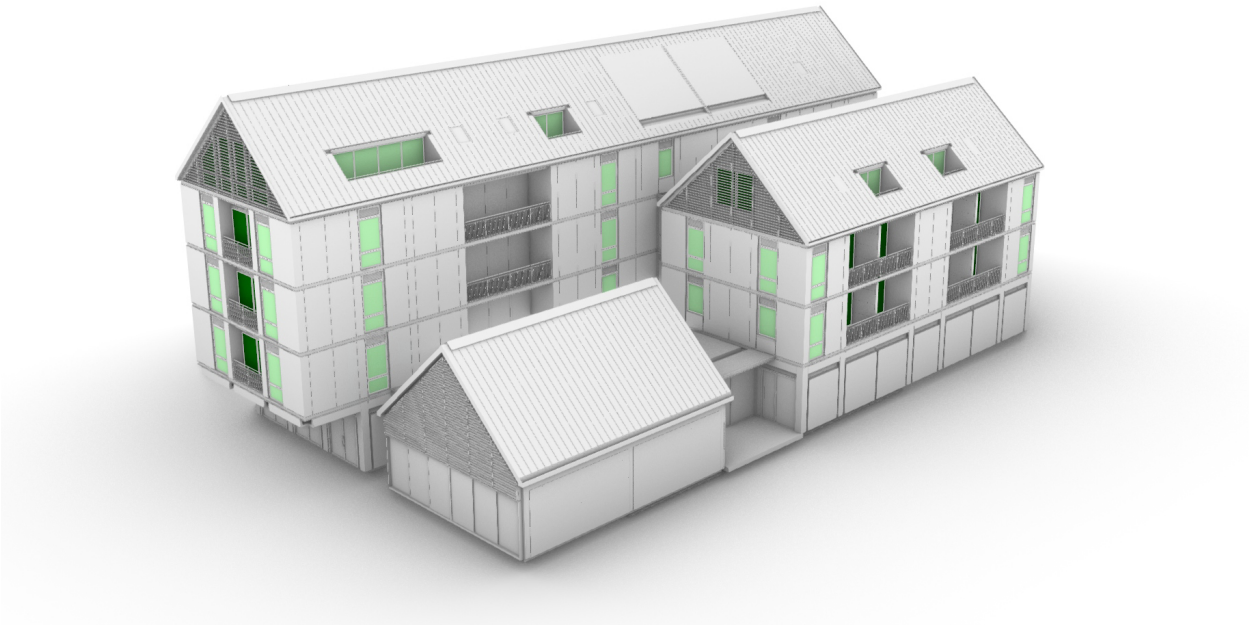

Fig. 04: Wharf Lane Building - eastern elevations

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5 CONCLUSIONS

5.1 CONCLUSIONS ON DAYLIGHT AND SUNLIGHT

The proposed development is comprised of two buildings, Wharf Lane Building to the south and Water Lane Building to the north, surrounding the external shared amenity space of the Diamond Jubilee Gardens.

Overall, the results show that the scheme performs acceptably in relation to daylight and sunlight, with:

- 87% of habitable rooms meeting or exceeding the relevant recommendations for Spatial Daylight Autonomy (sDA), when assessed against the targets set out within the UK National Annex;
- 64% of residential units provided with at least one window facing within 90° of due south;
- 73% of residential units seeing their living room receive at least 1.5 hours of direct sunlight on 21st March; and
- 91% of residential units seeing at least one habitable room receive at least 1.5 hours of direct sunlight on 21st March.

The above results demonstrate that the great majority of habitable rooms and units will provide good levels of daylight and sunlight for the enjoyment of future occupants.

It should also be noted that the majority of proposed rooms see levels of both daylight and sunlight well in excess of recommendation.

Of the 14 rooms falling short of the sDA recommendations, 10 are combined living/kitchen/dining rooms (LKDs), two are bedrooms and two are studios.

The 10 LKDs that see lower sDA levels than suggested are generally generously sized, and therefore receive good daylighting at the front of the room, with the rear relying more on supplementary artificial lighting. This is a common occurrence in contemporary accommodation, where open-plan LKDs are preferred to separate kitchens.

Furthermore, where balconies are provided, they tend to reduce the daylight ingress to the rooms below or behind them. This is a trade-off of different types of amenity (daylight amenity vs. outdoor private amenity space) which is generally considered acceptable.

As such, the daylight levels within these rooms are an expected consequence of locating large rooms behind balconies. Whilst lower levels of light will be seen within these units' living areas, occupants will still be able to enjoy good levels of light in the front of their living areas as well as on their balconies and within their bedrooms.

The two bedrooms falling short of recommendation are located on the third floor of the Water Lane building and see their daylight ingress constrained by the brise-soleils. These have been placed to mitigate overheating as well as to provide the architectural feature suggested by the local authority, however they will inherently affect the light seen in the rooms.

The two studio flats seeing lower sDAs than recommended are located on the first floor of the Wharf Lane building. As explained above for LKDs, the daylight levels within these studio flats are a consequence of their generously sized layouts and provision of balconies.

In conclusion, the levels of light seen within the proposed units are generally very good with lower levels of light only seen in a few instances. Overall, the proposed design is considered to perform acceptably in relation to daylight and sunlight.

5.2 CONCLUSIONS ON OVERSHADOWING

The three outdoor communal amenity spaces provided at ground level within the site have been assessed against BRE's recommendation.

All three areas are shown to well exceed BRE's recommendation of 50% seeing at least two hours of sunlight on the equinox, with Area 3 area achieving 99% and the remaining two areas 100%

In the summer, when outdoor space ware most likely to be utilised, the sunlight availability continues to be excellent with all the areas receiving direct sunlight for six hours or more.

Given the above, the proposed development will offer excellent access to sunlight in all areas of amenity provided.

5.3 COMPARISON WITH THE AUGUST 2021 SCHEME

The performance of the previously proposed scheme is illustrated in GIA's Internal Daylight, Sunlight and Overshadowing Report dated 28th July 2021.

The report concluded that:

- 83% of habitable rooms met or exceeded the recommended levels of internal daylight, as measured by the Average Daylight Factor (ADF) metric;
- All south-facing living areas met or exceeded the recommended levels of sunlight both annually and in winter; and
- All proposed areas of outdoor public or communal amenity were well sunlit throughout the year.

As the methodology for assessing internal daylight and sunlight has changed with the release of the 2022 BRE Guidelines, the results are not directly comparable. However, the overall performance of the currently proposed scheme is comparable to the August 2021 scheme. This is illustrated in the table below.

	Percentage of habitable rooms/units/areas meeting or exceeding recommendation		
	Daylight	**Sunlight**	**Overshadowing**
August 2021 scheme	**83%** of habitable rooms	**100%** of living areas with a southerly aspect	**100%** of outdoor areas of public/communal amenity
Current scheme	**87%** of habitable rooms	**91%** of all residential units	**100%** of outdoor areas of public/communal amenity

Table 02: Comparison with the August 2021 scheme

6 SITE OVERVIEW

Fig. 05: Top view

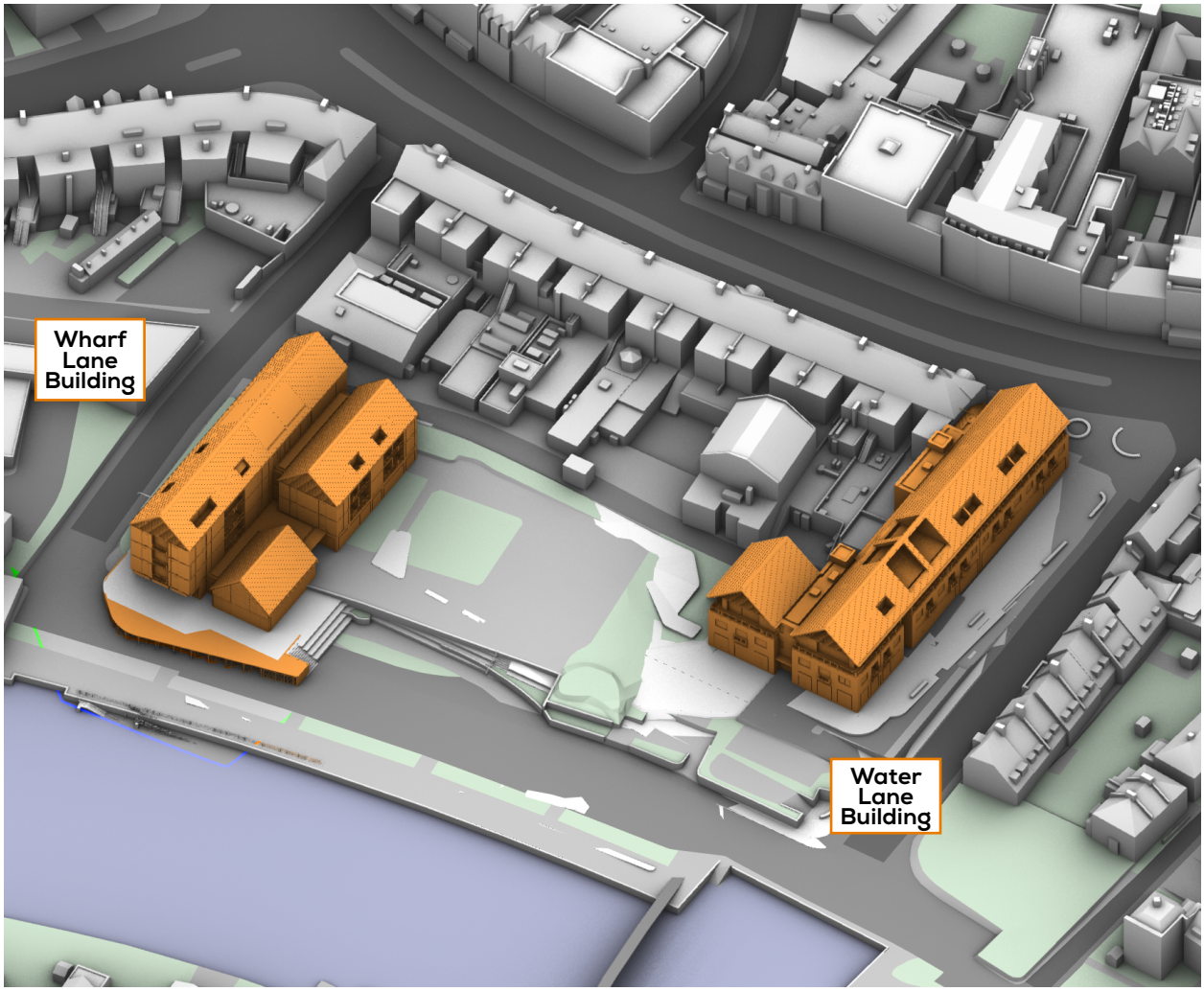


Fig. 06: Perspective view

7 INTERNAL DAYLIGHT AND SUNLIGHT ASSESSMENTS

Water Lane Building - First Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WSTER LANE BUILDING - FIRST FLOOR								
1	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:21	01:06
2	L/K/D	100.0	100.0	100.0	100.0	00:00	01:05	02:59
3	L/K/D	30.3	15.0	6.9	6.9	00:00	00:00	00:00
4	BEDROOM	100.0	100.0	93.3	100.0	00:00	00:40	01:49
5	BEDROOM	100.0	100.0	98.4	100.0	00:00	00:41	01:49
6	L/K/D	32.4	17.9	8.4	8.4	00:00	00:00	00:00
7	L/K/D	32.3	17.8	8.1	8.1	00:00	00:00	00:00
8	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:50	01:55
9	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:56	01:51
10	L/K/D	33.4	19.1	9.4	9.4	00:00	00:00	00:00
11	L/K/D	33.8	20.1	9.4	9.4	00:00	00:00	00:00
12	BEDROOM	100.0	100.0	100.0	100.0	00:00	01:01	01:52
13	L/K/D	30.4	18.6	10.8	10.8	00:00	00:00	00:00
14	BEDROOM	100.0	100.0	100.0	100.0	00:00	01:01	02:12
15	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:00	00:00
16	BEDROOM	100.0	100.0	100.0	100.0	00:00	01:01	02:13
17	L/K/D	38.5	24.3	13.8	13.8	00:00	00:00	00:00
18	L/K/D	100.0	100.0	100.0	100.0	06:26	06:59	07:34
19	BEDROOM	100.0	98.1	93.4	100.0	06:26	06:59	07:34
20	BEDROOM	100.0	98.8	93.8	100.0	06:26	06:59	07:34
21	L/K/D	100.0	100.0	100.0	100.0	08:19	10:04	11:29
22	L/K/D	100.0	100.0	100.0	100.0	05:32	06:06	06:31
23	BEDROOM	100.0	100.0	99.0	100.0	00:00	00:19	00:37

Table 03: Assessment Data

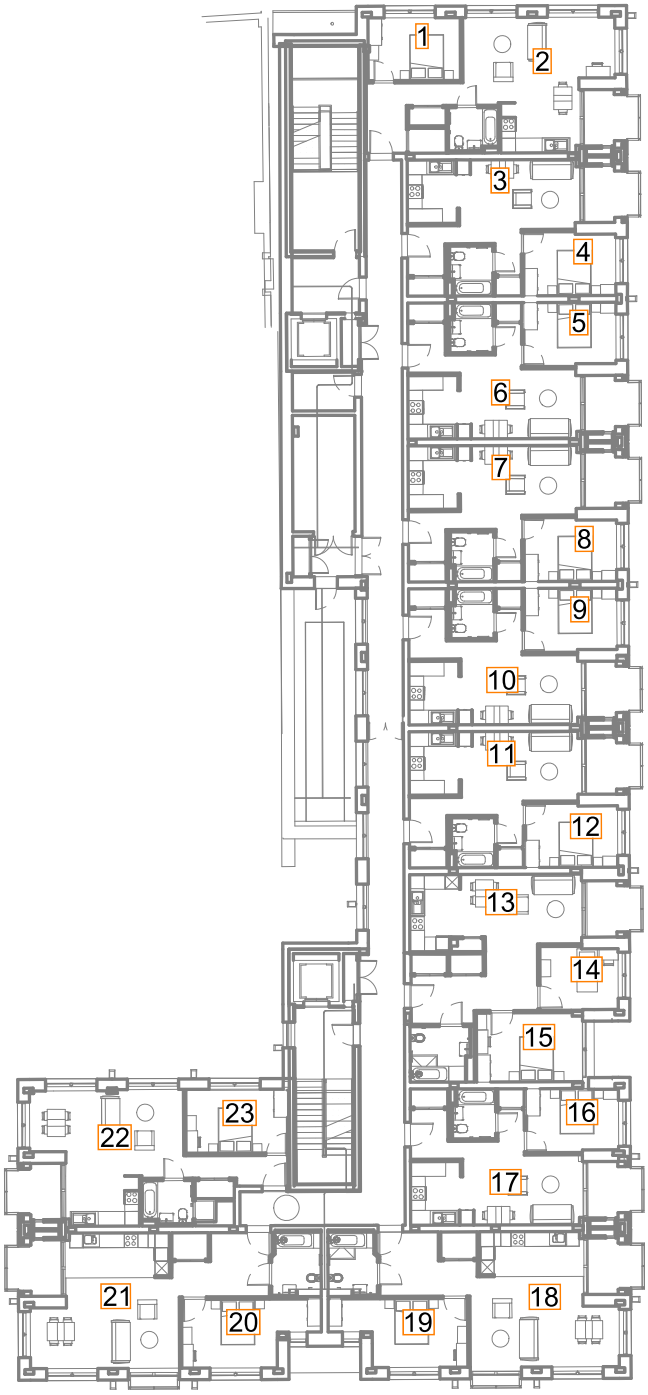


Fig. 07: Floor Plan

Water Lane Building - Second Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WSTER LANE BUILDING - SECOND FLOOR								
24	L/K/D	100.0	100.0	100.0	100.0	00:00	01:07	03:30
25	L/K/D	100.0	100.0	84.5	84.5	00:00	01:04	01:55
26	L/K/D	100.0	100.0	91.5	91.5	00:00	01:04	01:55
27	L/K/D	100.0	100.0	86.5	86.5	00:00	01:04	01:55
28	L/K/D	100.0	100.0	96.3	96.3	00:00	01:04	01:55
29	BEDROOM	100.0	100.0	99.6	100.0	00:06	01:13	01:51
30	BEDROOM	100.0	100.0	100.0	100.0	00:06	01:13	01:55
31	BEDROOM	100.0	100.0	100.0	100.0	00:00	01:04	01:55
32	L/K/D	93.9	70.3	58.5	58.5	00:00	00:00	01:04
33	L/K/D	100.0	100.0	100.0	100.0	00:00	01:07	01:56
34	L/K/D	100.0	100.0	100.0	100.0	06:20	06:53	07:21
35	BEDROOM	100.0	90.7	58.9	100.0	04:58	05:39	06:23
36	BEDROOM	100.0	87.6	58.1	100.0	04:56	05:37	05:09
37	L/K/D	100.0	100.0	100.0	100.0	08:48	10:11	11:24
38	L/K/D	65.1	52.7	45.6	45.6	05:00	04:38	04:04

Table 04: Assessment Data

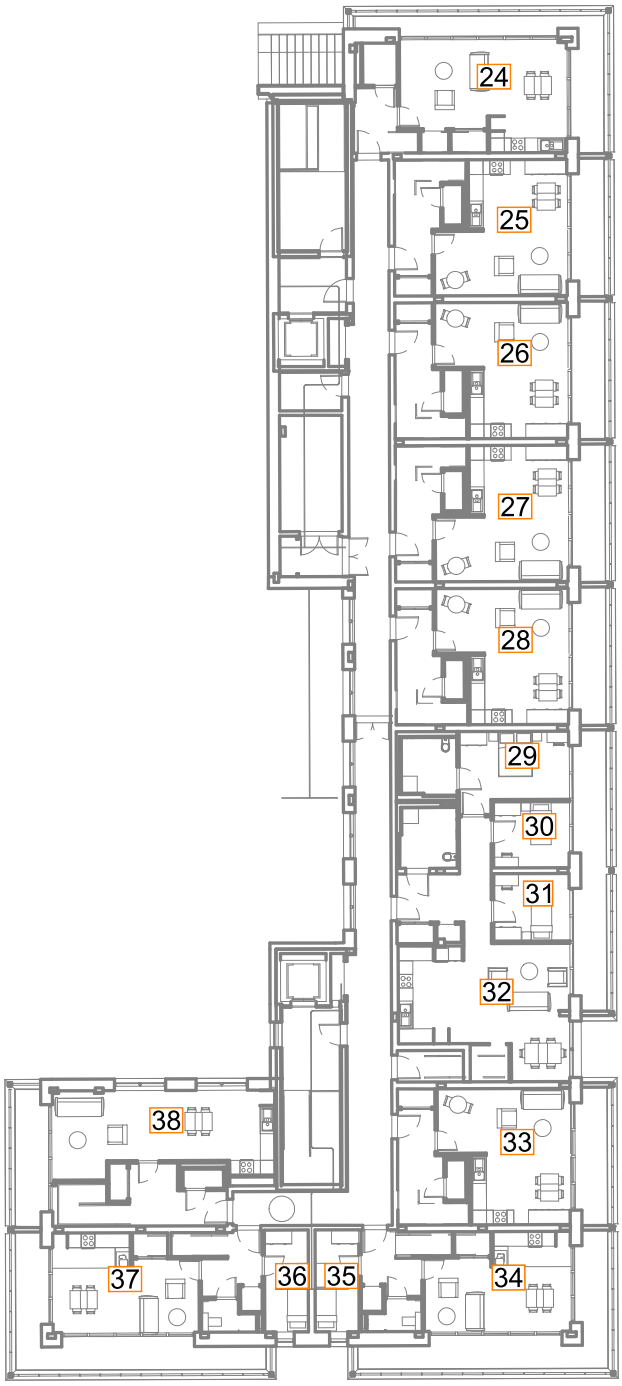


Fig. 08: Floor Plan

Water Lane Building - Third Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WSTER LANE BUILDING - THIRD FLOOR								
39	BEDROOM	51.9	22.3	5.8	51.9	00:00	00:12	00:17
40	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:00	02:22
41	BEDROOM	95.7	86.3	77.0	95.7	05:46	06:46	08:16
42	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:00	00:26
43	BEDROOM	97.5	89.4	78.9	97.5	05:49	06:56	07:40
44	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:00	02:21
45	BEDROOM	96.3	87.0	77.0	96.3	05:54	06:50	08:08
46	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:00	00:23
47	BEDROOM	98.1	88.8	77.0	98.1	05:55	07:02	08:03
48	BEDROOM	100.0	100.0	100.0	100.0	00:00	00:00	00:33
49	BEDROOM	87.6	75.2	66.5	87.6	04:00	06:38	08:06
50	BEDROOM	82.4	63.5	48.2	82.4	02:50	02:40	02:12
51	BEDROOM	74.4	57.0	44.2	74.4	02:47	02:40	02:12
52	BEDROOM	32.5	9.7	3.4	32.5	00:00	00:00	00:06
53	BEDROOM	38.3	10.7	4.1	38.3	00:00	00:27	00:22

Table 05: Assessment Data

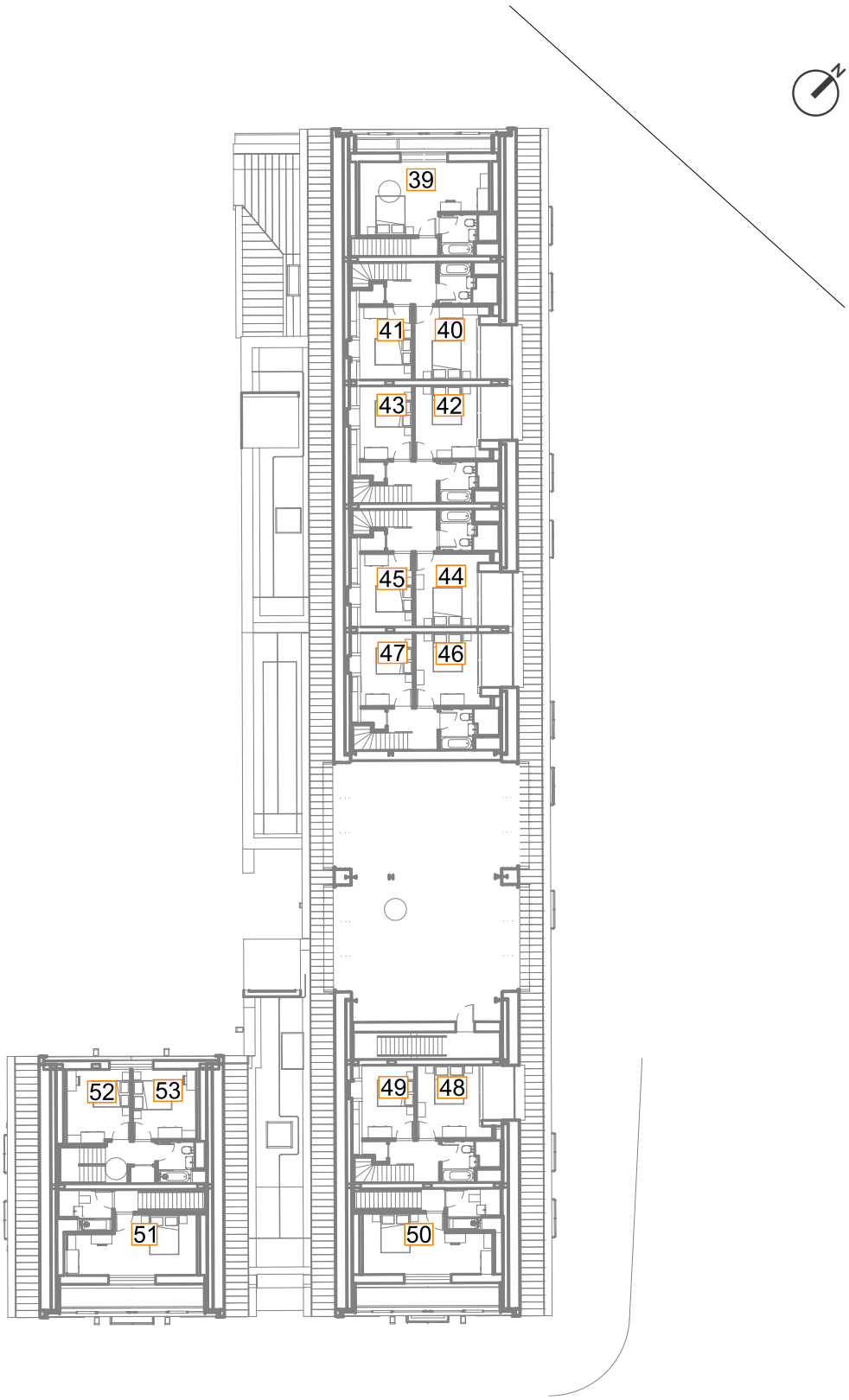
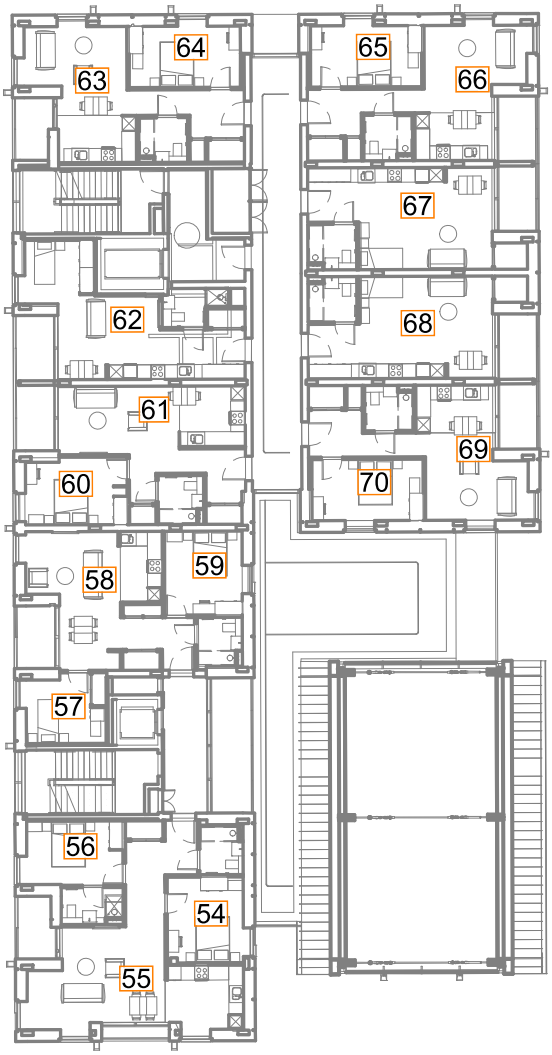


Fig. 09: Floor Plan

Wharf Lane Building - First Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WHARF LANE BUILDING - FIRST FLOOR								
54	BEDROOM	96.3	83.1	45.2	96.3	00:08	01:14	02:26
55	L/K/D	100.0	100.0	100.0	100.0	09:00	10:14	11:33
56	BEDROOM	100.0	100.0	100.0	100.0	05:58	06:22	06:46
57	BEDROOM	100.0	100.0	100.0	100.0	05:53	06:18	06:43
58	L/K/D	100.0	100.0	91.9	91.9	05:51	06:12	06:41
59	BEDROOM	96.8	67.4	36.2	96.8	00:00	00:00	00:46
60	BEDROOM	100.0	100.0	100.0	100.0	05:48	06:06	06:40
61	L/K/D	78.5	58.2	48.0	48.0	04:09	04:37	04:34
62	STUDIO	86.9	78.5	73.0	73.0	05:46	06:01	06:36
63	L/K/D	100.0	100.0	96.9	96.9	05:28	05:55	06:31
64	BEDROOM	100.0	93.3	78.6	100.0	00:00	00:09	01:16
65	BEDROOM	100.0	93.7	79.4	100.0	00:00	00:12	01:25
66	L/K/D	100.0	100.0	100.0	100.0	00:07	01:23	03:52
67	STUDIO	70.0	38.6	25.5	25.5	00:00	00:00	00:28
68	STUDIO	78.4	48.8	30.0	30.0	00:00	00:00	00:46
69	L/K/D	100.0	100.0	100.0	100.0	02:16	05:09	07:02
70	BEDROOM	75.4	61.6	45.5	75.4	01:04	01:42	03:01

Table 06: Assessment Data



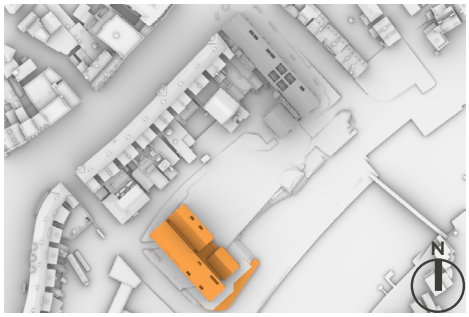
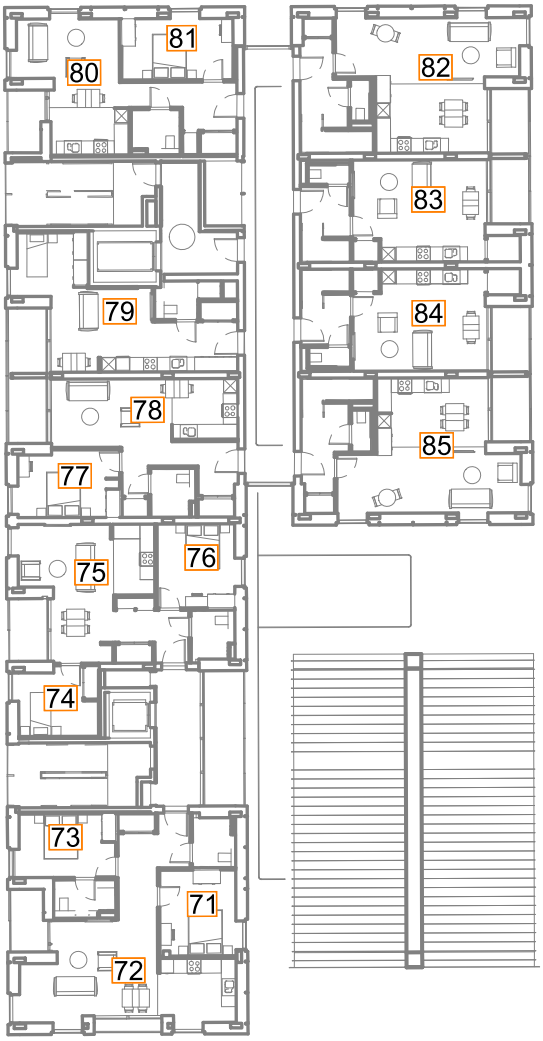


Fig. 10: Floor Plan

Wharf Lane Building - Second Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WHARF LANE BUILDING - SECOND FLOOR								
71	BEDROOM	100.0	96.7	86.0	100.0	00:08	01:14	02:26
72	L/K/D	100.0	100.0	100.0	100.0	09:00	10:27	11:46
73	BEDROOM	100.0	100.0	100.0	100.0	06:05	06:37	07:00
74	BEDROOM	100.0	100.0	100.0	100.0	06:05	06:25	06:55
75	L/K/D	100.0	98.9	94.8	94.8	06:03	06:21	06:57
76	BEDROOM	100.0	98.2	81.2	100.0	00:07	01:13	02:24
77	BEDROOM	100.0	100.0	100.0	100.0	05:57	06:21	06:56
78	L/K/D	100.0	62.8	50.3	50.3	04:28	04:48	04:51
79	STUDIO	85.8	76.0	69.6	69.6	05:59	06:18	06:54
80	L/K/D	100.0	100.0	99.8	99.8	05:42	06:15	06:51
81	BEDROOM	100.0	95.0	82.9	100.0	00:00	00:27	01:34
82	L/K/D	100.0	100.0	100.0	100.0	00:07	01:43	04:09
83	L/K/D	99.6	95.8	49.3	49.3	00:00	00:00	00:29
84	L/K/D	99.8	97.5	54.2	54.2	00:00	00:00	00:46
85	L/K/D	100.0	100.0	100.0	100.0	04:10	06:05	07:37

Table 07: Assessment Data



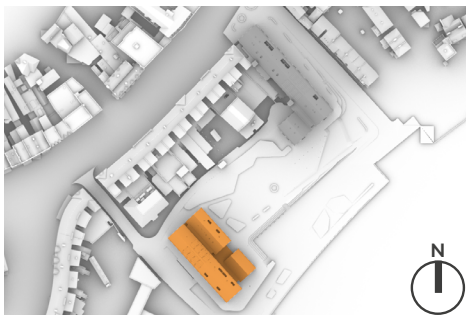
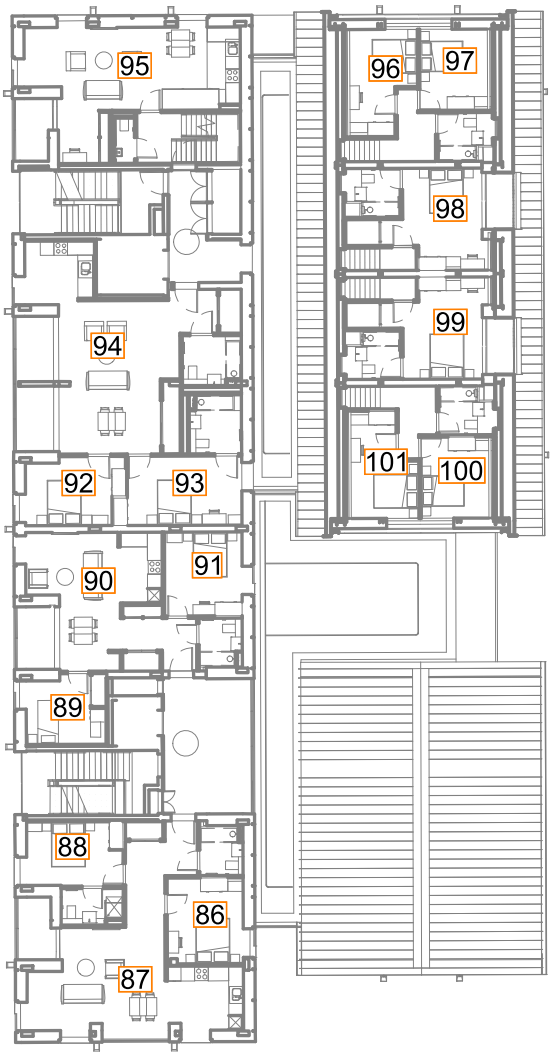


Fig. 11: Floor Plan

Wharf Lane Building - Third Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WHARF LANE BUILDING - THIRD FLOOR								
86	BEDROOM	100.0	99.5	93.2	100.0	00:08	01:14	02:26
87	L/K/D	100.0	100.0	100.0	100.0	09:00	10:28	11:59
88	BEDROOM	100.0	100.0	100.0	100.0	06:05	06:40	07:14
89	BEDROOM	100.0	100.0	100.0	100.0	06:05	06:37	07:14
90	L/K/D	100.0	100.0	100.0	100.0	06:05	06:35	07:12
91	BEDROOM	100.0	99.1	97.2	100.0	00:07	01:13	02:25
92	BEDROOM	100.0	100.0	100.0	100.0	06:05	06:37	07:09
93	BEDROOM	58.1	40.4	27.4	58.1	00:00	00:55	02:08
94	L/K/D	100.0	100.0	100.0	100.0	05:52	06:22	06:59
95	L/K/D	100.0	100.0	100.0	100.0	06:01	06:36	07:03
96	BEDROOM	75.1	37.3	24.9	75.1	00:00	00:05	00:27
97	BEDROOM	97.2	73.3	23.3	97.2	00:00	00:35	00:29
98	BEDROOM	100.0	97.7	87.5	100.0	00:00	00:00	01:07
99	BEDROOM	100.0	97.7	91.7	100.0	00:00	00:00	01:06
100	BEDROOM	100.0	86.3	61.1	100.0	02:48	02:33	02:13
101	BEDROOM	100.0	66.5	38.8	100.0	02:49	02:34	02:14

Table 08: Assessment Data



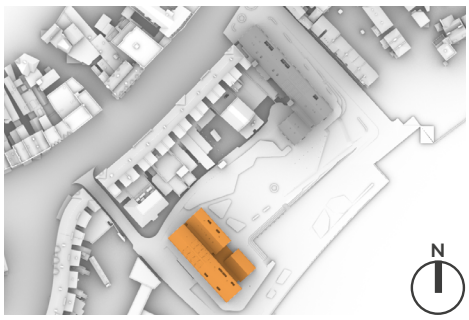
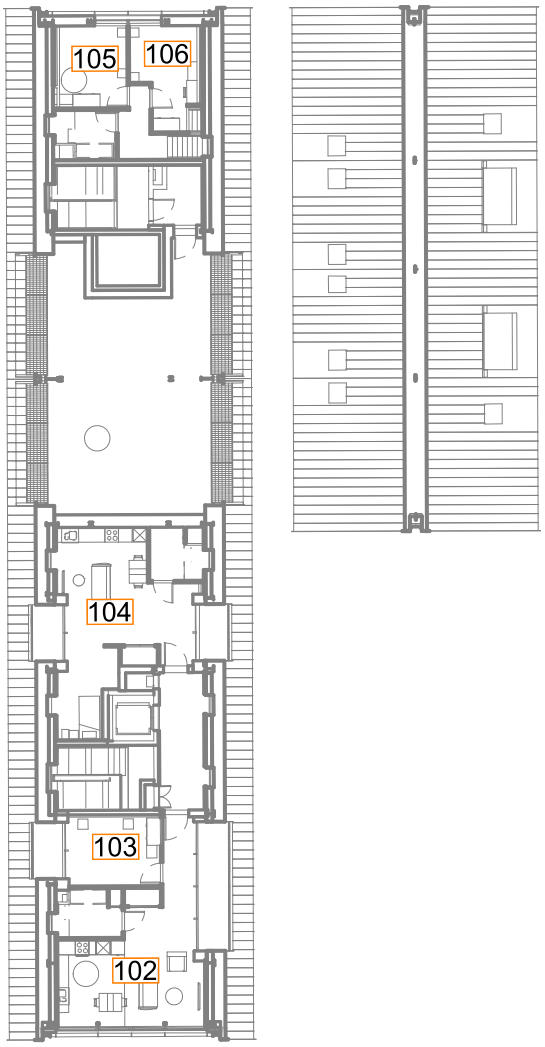


Fig. 12: Floor Plan

Wharf Lane Building - Fourth Floor

ROOM REF.	ROOM USE	DAYLIGHT				SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours				HOURS:MIN		
		100	150	200	RELEVANT ENSDA [lux]	1 FEB	25 FEB	21 MAR
WHARF LANE BUILDING - FOURTH FLOOR								
102	L/K/D	100.0	100.0	100.0	100.0	05:22	04:53	04:20
103	BEDROOM	100.0	100.0	100.0	100.0	05:43	08:01	09:51
104	STUDIO	89.3	86.0	83.9	83.9	06:04	07:06	09:21
105	BEDROOM	97.8	77.5	26.4	97.8	00:00	00:06	00:27
106	BEDROOM	98.6	63.9	41.0	98.6	00:00	00:38	00:29

Table 09: Assessment Data



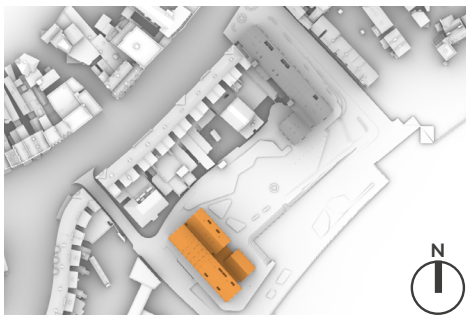
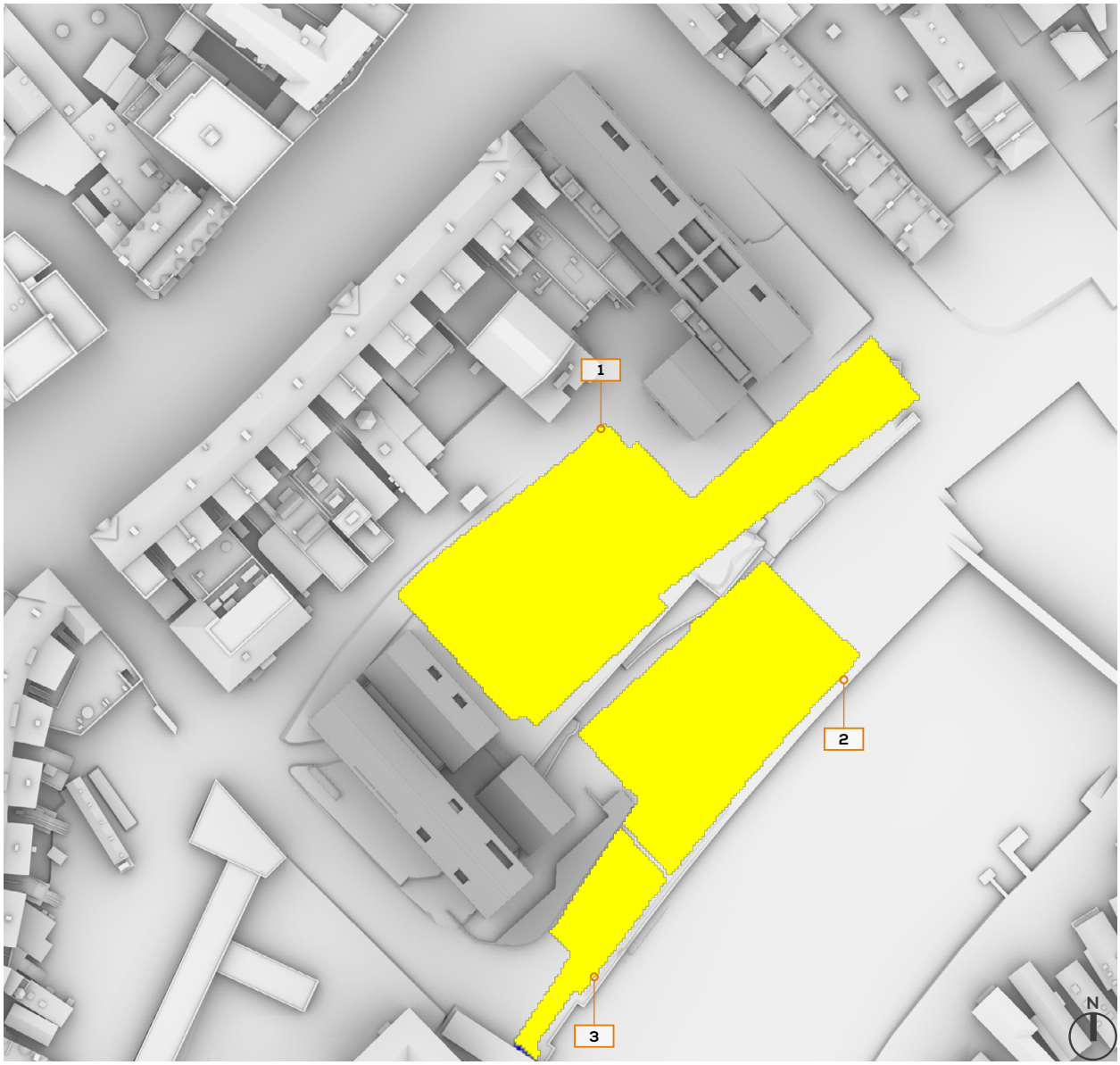


Fig. 13: Floor Plan

8 OVERSHADOWING ASSESSMENTS

OVERSHADOWING ASSESSMENT - EXTERNAL COMMUNAL AMENITY AREAS
SUN HOURS ON GROUND - BRE TEST - 21ST MARCH

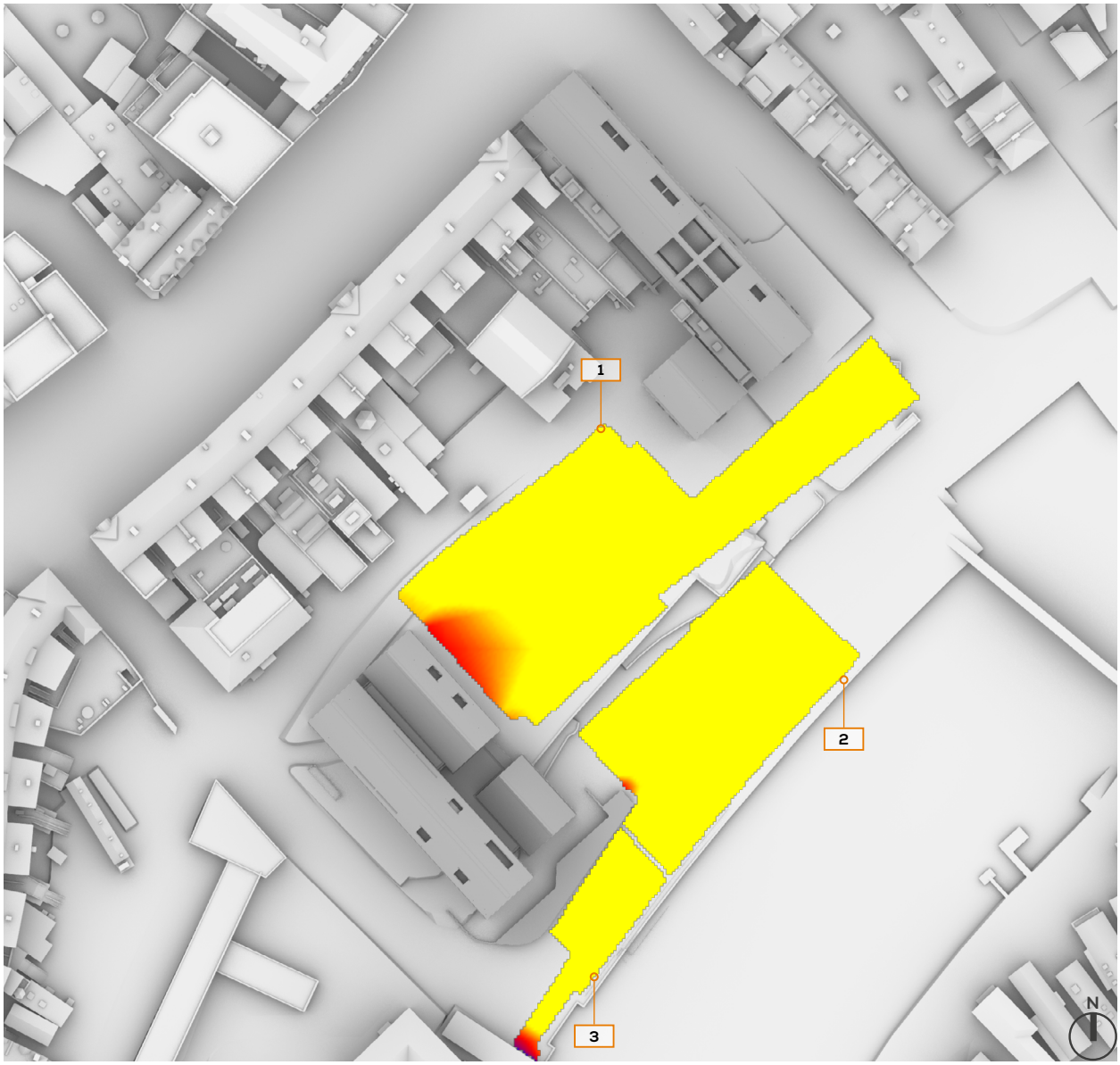


(BRE RECOMMENDS 2+ HOURS OF SUNLIGHT ON 21ST MARCH FOR AT LEAST 50% OF THE OPEN SPACE)

SUN HOURS ON GROUND
BRE TEST - 21ST MARCH

AREA	% AREA SEEING 2+ HRS OF SUNLIGHT ON 21ST OF MARCH
1	100
2	100
3	99

OVERSHADOWING ASSESSMENT - EXTERNAL COMMUNAL AMENITY AREAS
SUN EXPOSURE ON GROUND - 21ST MARCH



SUN EXPOSURE
TOTAL HOURS

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5 5.5 6.0+

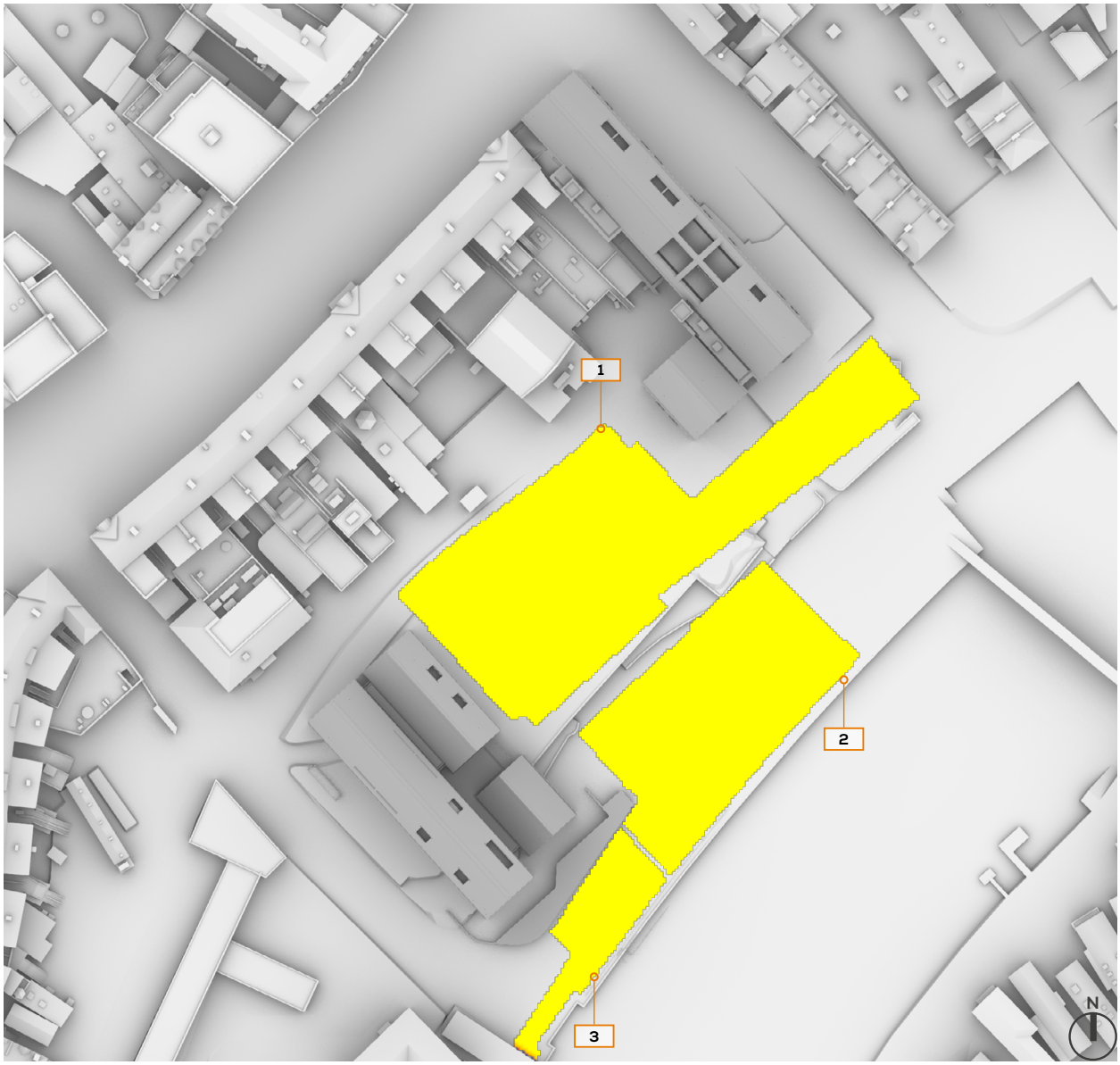
21st MARCH (SPRING EQUINOX)

LONDON

Latitude:	51.4
Longitude:	0.0
Sunrise:	06:02 GMT
Sunset:	18:14 GMT

Total Available Sunlight:
12hrs 12mins

OVERSHADOWING ASSESSMENT - EXTERNAL COMMUNAL AMENITY AREAS
SUN EXPOSURE ON GROUND - 21ST JUNE



SUN EXPOSURE
TOTAL HOURS

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5 5.5 6.0+

21st JUNE
(SUMMER SOLSTICE)

LONDON

Latitude:	51.4
Longitude:	0.0
Sunrise:	04:43 BST
Sunset:	21:21 BST

Total Available Sunlight:
16hrs 38mins

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gia
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