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DAYLIGHT & SUNLIGHT

INTERNAL DAYLIGHT, SUNLIGHT AND OVERSHADOWING REPORT

Proposed Apartment Development at Seatown Road, Swords

09 December 2022

GIA No: **19096**

PROJECT DATA:

Client	**Fingal County Council**
Architect	**FCC Architects' Department**
Project Title	**Proposed Apartment Development at Seatown Road, Swords**
Project Number	**19096**

REPORT DATA:

Report Title	**Internal Daylight, Sunlight and Overshadowing Report**
GIA Department	**Daylight & Sunlight**
Dated	**09 December 2022**

Prepared by	**LG**
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SOURCES OF INFORMATION:

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OS Data	**FIND Maps**

Map data

CONTENTS

1 EXECUTIVE SUMMARY

The purpose of this report is to ascertain whether the Proposed Development will provide residential accommodation considered acceptable in terms of daylight, sunlight and overshadowing. The Proposed Development contains two sites at the junction of Seatown Road and St Columcille's Drive, Swords, Co Dublin. The Housing Department of Fingal County Council proposes to develop 36 apartments & associated site works, across the two sites to meet a social housing demand.

Conclusions on Daylight and Sunlight

In order to ascertain the levels of daylight within the Proposed Development, all habitable rooms in the 36 apartments have been assessed for illuminance using the spatial daylight autonomy (sDA) methodology.

The results given on pages 12-27 have shown that all 108 rooms see levels of sDA that either meet or exceed the BRE recommendation for their room use (100 lux in bedrooms and 200 lux in L/K/Ds, to be exceeded over at least 50% of the assessment points in the room for at least half of the daylight hours). As such, all habitable rooms within the proposed development are considered well-daylit.

In terms of sunlight, BRE states that in housing, the main requirement for sunlight is in living rooms and that it is viewed as less important in bedrooms and in kitchens. The guidelines then go on to say that *"a habitable room, preferably a main living room"* should meet the criteria and that *"Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations"*. Therefore, whilst all rooms have been assessed for sunlight, greatest importance ought to be given to the performance of living spaces.

The results given on pages 12-27 have shown that of the 108 proposed habitable rooms 62 see levels of sun exposure on 21st March that either meet or exceed the BRE recommendation of 1.5hrs.

Of the 36 living spaces proposed, 18 would see at least 1.5 hours of sunlight on the 21st March and all 36 living spaces would meet the criteria on one of the alternative dates proposed by EN17037, 1st February or 25th February, this is predominantly due to the balcony overhead incepting the higher-angle sunlight on 21st March. As such, all 36 living spaces are considered to receive acceptable sunlight levels.

Conclusions on Overshadowing

Sun Hours on Ground assessments have been undertaken for the areas of communal open space provided for future occupants and visitors to the proposed scheme. The results from these assessments are shown on pages 28-32 of this report.

The technical assessments have shown that 76% open sapce of the Site No.1 and 82% of the Site No.2 meet the BRE criteria of two or more hours of direct sunlight within half of its area on 21st March and so are considered to be adequately sunlit throughout the year.

We therefore conclude that the scheme provides future occupants and visitors to the site with good access to sunlit open spaces to enjoy throughout the year.

Overall Conclusions

Overall, we conclude that the Proposed Development provides future occupants with well daylit and sunlit accommodation as well as sunlight within the proposed open space throughout the year.

2 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.

2.1 INTRODUCTION

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 1.5 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)

2.2 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.

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.

In relation to sunlight access, the assessment considers the hours of sunlight reaching a window on the 21st March.

2.3 DAYLIGHT (BR209:2022)

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).

Spatial Daylight Autonomy (sDA)

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.

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 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.

2.4 SUNLIGHT (BR209:2022)

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 façades 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. "*

2.5 OVERSHADOWING (BR209:2022)

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."

2.6 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

3 METHODOLOGY

In order to undertake the daylight and sunlight assessments set out in the previous 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 FCC Architects' Department. 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.

3.1 SIMULATION ASSUMPTIONS

The weather file recorded at Dublin, Ireland was considered the most relevant for this assessment.

Assessment Grids

For the daylight assessments, an analysis 'grid' is located within each room at working plane height (850 mm from FFL) and offset by 0.3m from the walls as recommended by BR 209.

Grid points are spaced by 0.2m .

Assessment Resolution

The climate-based daylight assessments have been undertaken on an hourly basis whilst the sunlight exposure assessment has been undertaken for every minute on the relevant days.

Surfaces reflectance

In general, reflectance value to be applied to surfaces in the computational modelling follows the BR 209 Annex C, unless specified by the design team.

The client and design team have confirmed that the following materials will be used within the proposed dwellings:

- Interior walls - White Paint Finish - 0.7
- Ceilings - White Paint Finish - 0.8
- Floors - Light Timber Veneer (or similar) - 0.4

The following surface reflectance assumptions as per BR 209 have been used:

- Exterior ground and external obstructions -0.2

Glazing transmittance

A glazing transmittance of 75% has been suggested by the design team for double glazing. Framing factors have been taken from the elevations supplied and are outlined in the table below.

Maintenance factors have been applied as per BR209 with 0.96 selected for windows not beneath an overhang and 0.88 for those overhung by the building's massing.

The final transmittance values are shown in the table below.

	TV (NORMAL)	FRAMING FACTOR	MAINTENANCE FACTOR	TV (TOTAL)
Window Type 1	0.75	0.71	0.96	0.51
Window Type 2 (obstructed)	0.75	0.75	0.88	0.50
Window Type 3 (obstructed)	0.75	0.76	0.88	0.50
Window Type 4	0.75	0.77	0.96	0.55
Winodw Type 4a (obstructed)	0.75	0.77	0.88	0.51
Window Type 5	0.75	0.78	0.96	0.56
Window Type 5a (obstructed)	0.75	0.78	0.88	0.51

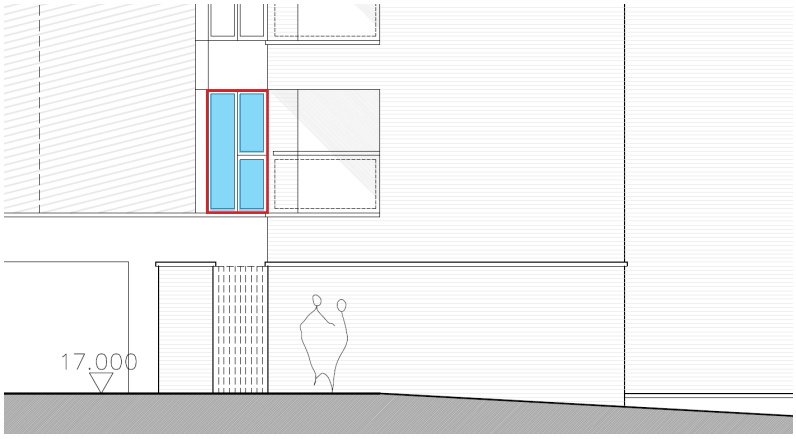


Fig. 01: Typical Window Type 1

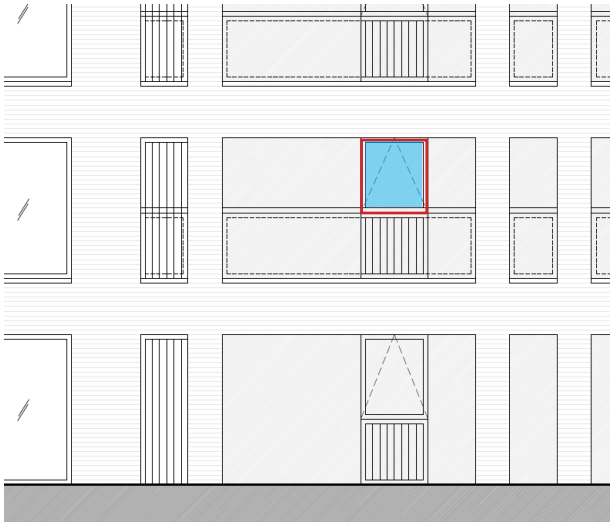


Fig. 02: Typical Window Type 2

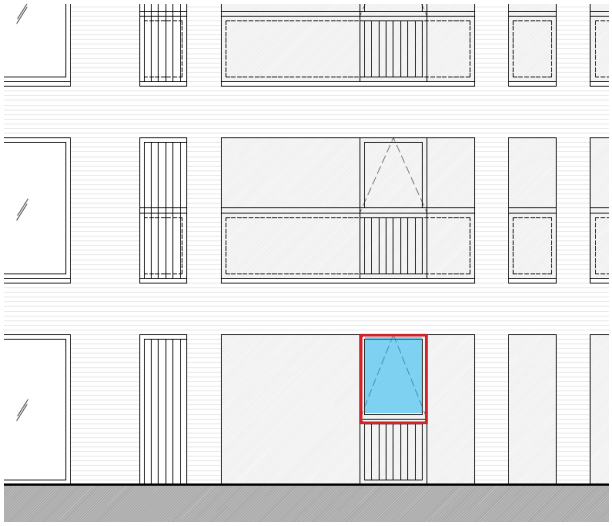


Fig. 03: Typical Window Type 3

Fig. 04: Typical Window Type 4

Fig. 05: Typical Window Type 5

4 SITE OVERVIEW

Fig. 06: Top view

Fig. 07: Perspective view

5 INTERNAL DAYLIGHT AND SUNLIGHT ASSESSMENTS

SITE NO.1 - Ground Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO1 - LEVEL 00									
1	BEDROOM	100.0	100.0	100.0	100	100.0	05:08	06:17	08:30
2	BEDROOM	100.0	100.0	100.0	100	100.0	04:57	06:56	08:50
3	L/K/D	100.0	100.0	99.6	200	99.6	03:54	03:50	02:09
4	L/K/D	100.0	100.0	97.8	200	97.8	04:26	03:50	01:31
5	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:25	01:31
6	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:37	01:35
7	L/K/D	100.0	100.0	97.1	200	97.1	03:38	01:59	00:00
8	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
9	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:05
10	L/K/D	100.0	100.0	94.6	200	94.6	04:10	01:21	00:00
11	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
12	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:06
13	L/K/D	99.4	87.7	67.5	200	67.5	00:45	01:35	01:39
14	BEDROOM	100.0	100.0	100.0	100	100.0	01:48	02:43	03:11
15	BEDROOM	100.0	96.9	79.1	100	100.0	01:26	02:19	03:14

Table 01: Assessment Data

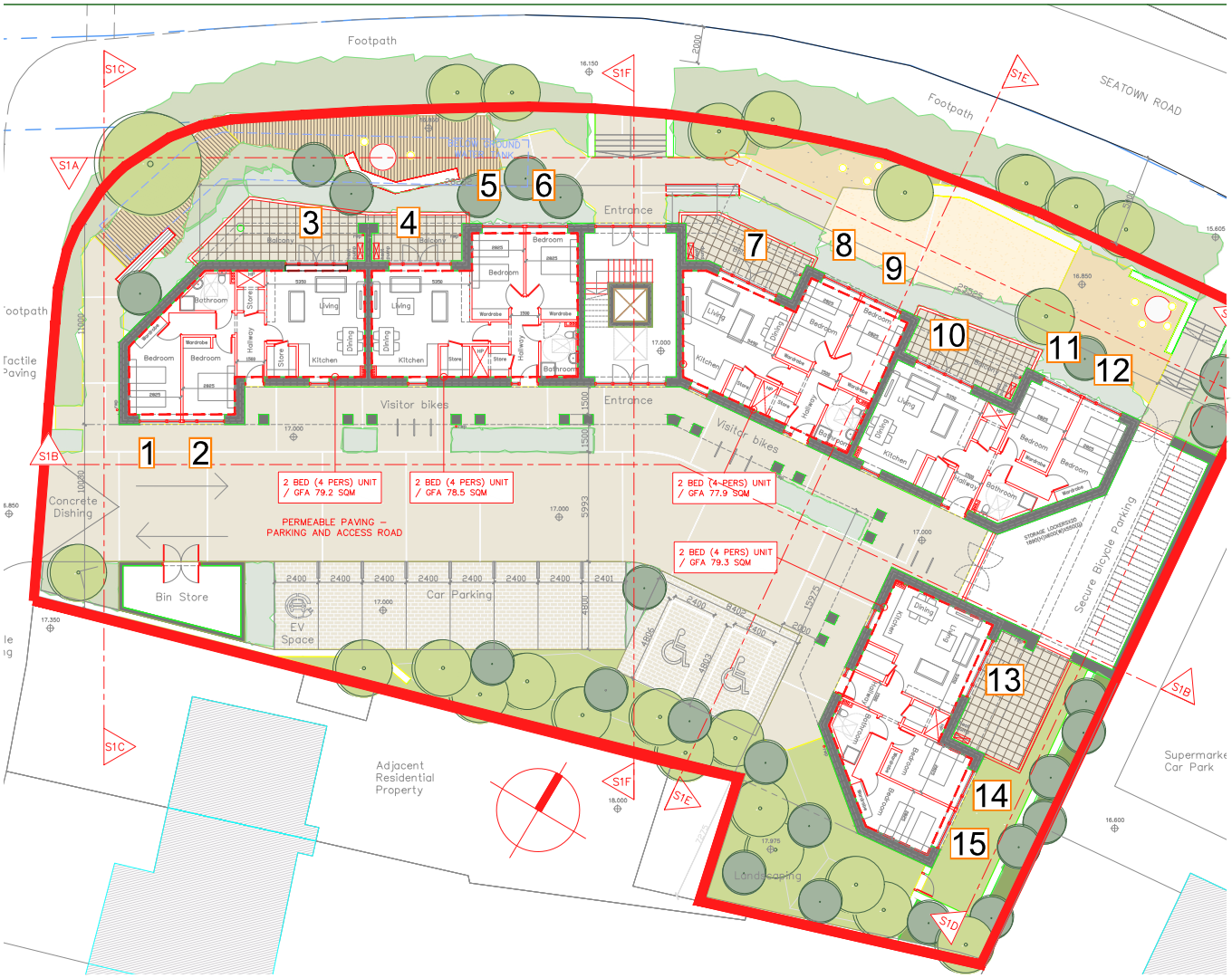


Fig. 08: Floor Plan

SITE NO.1 - First Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO1 - LEVEL 01									
16	BEDROOM	100.0	100.0	100.0	100	100.0	06:03	08:10	08:47
17	BEDROOM	100.0	100.0	100.0	100	100.0	06:03	08:42	09:06
18	L/K/D	100.0	100.0	99.8	200	99.8	05:27	03:35	01:50
19	L/K/D	100.0	100.0	98.3	200	98.3	05:06	03:33	01:14
20	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:25	01:40
21	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:37	01:41
22	L/K/D	100.0	100.0	96.9	200	96.9	03:36	00:57	00:00
23	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
24	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:14
25	L/K/D	100.0	100.0	95.7	200	95.7	04:10	00:00	00:00
26	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
27	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:13
28	L/K/D	100.0	100.0	98.7	200	98.7	01:44	02:33	03:33
29	BEDROOM	100.0	100.0	100.0	100	100.0	03:09	03:40	04:26
30	BEDROOM	100.0	100.0	100.0	100	100.0	02:48	03:39	04:19

Table 02: Assessment Data

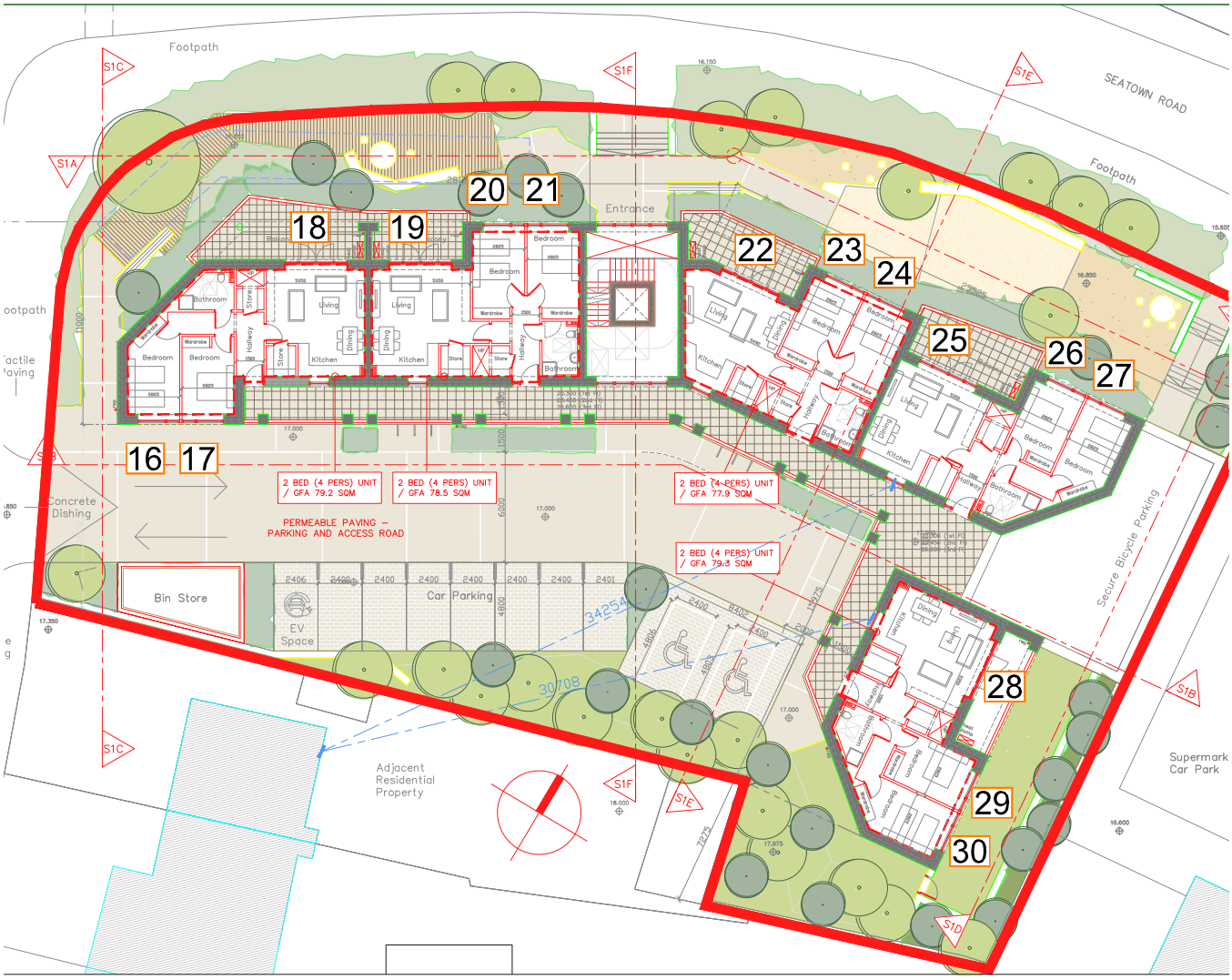


Fig. 09: Floor Plan

SITE NO.1 - Second Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO1 - LEVEL 02									
31	BEDROOM	100.0	100.0	100.0	100	100.0	07:48	08:27	08:58
32	BEDROOM	100.0	100.0	100.0	100	100.0	07:50	08:50	09:10
33	L/K/D	100.0	100.0	100.0	200	100.0	05:12	03:21	01:45
34	L/K/D	100.0	100.0	100.0	200	100.0	05:12	03:19	01:02
35	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:29	01:50
36	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:41	01:52
37	L/K/D	100.0	100.0	98.1	200	98.1	03:17	00:57	00:00
38	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
39	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:16
40	L/K/D	100.0	100.0	99.3	200	99.3	04:06	00:00	00:00
41	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
42	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:16
43	L/K/D	100.0	100.0	99.6	200	99.6	02:36	03:19	03:50
44	BEDROOM	100.0	100.0	100.0	100	100.0	03:46	04:33	05:22
45	BEDROOM	100.0	100.0	100.0	100	100.0	03:25	04:18	05:15

Table 03: Assessment Data

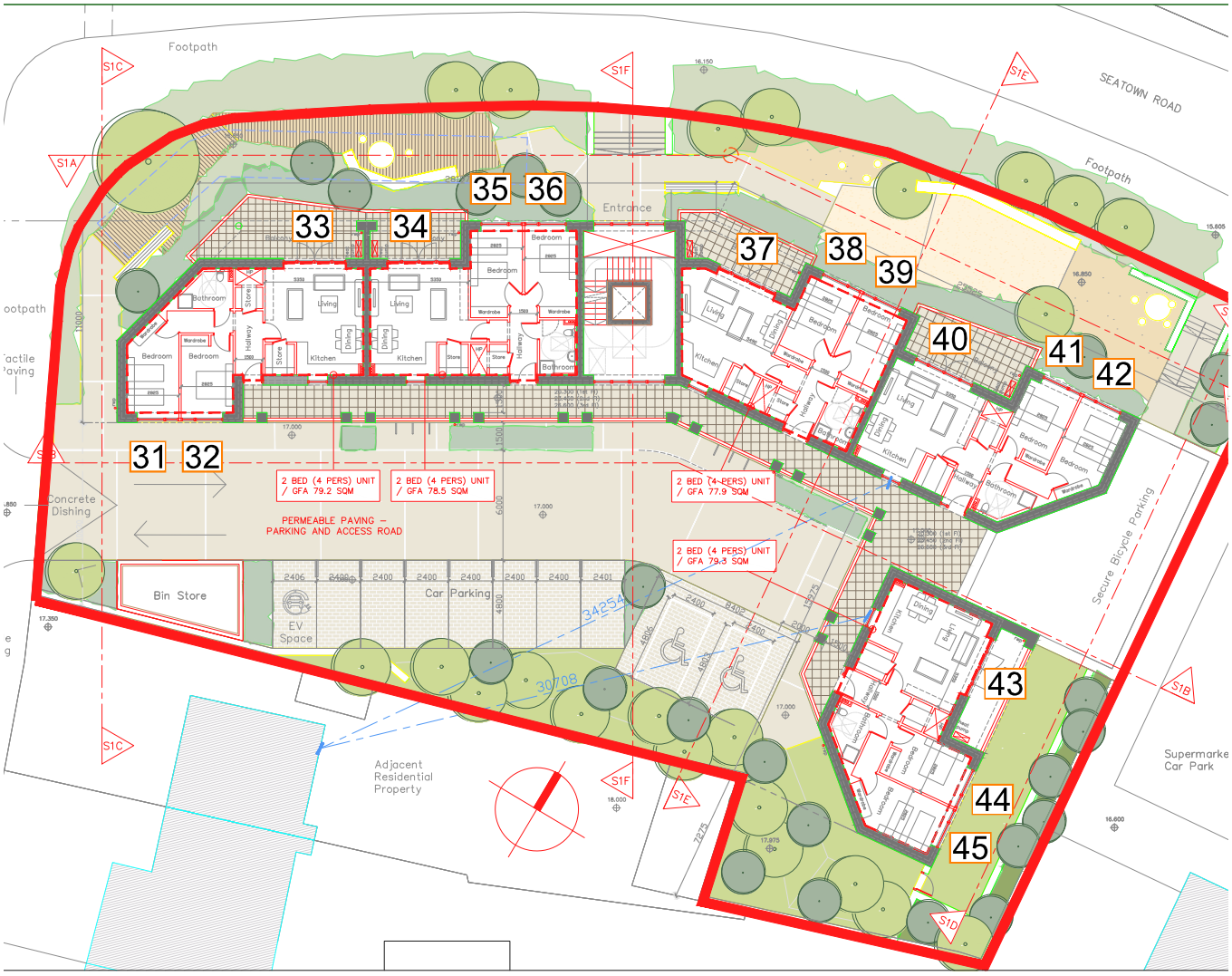


Fig. 10: Floor Plan

SITE NO.1 - Third Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO1 - LEVEL 03									
46	BEDROOM	100.0	100.0	100.0	100	100.0	07:56	08:27	08:58
47	BEDROOM	100.0	100.0	100.0	100	100.0	07:59	08:50	09:10
48	L/K/D	100.0	100.0	100.0	200	100.0	04:02	02:35	01:27
49	L/K/D	100.0	100.0	100.0	200	100.0	04:04	02:31	00:24
50	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:35	01:52
51	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:59	02:15
52	L/K/D	100.0	100.0	98.7	200	98.7	02:14	00:49	00:00
53	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
54	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:16
55	L/K/D	100.0	100.0	100.0	200	100.0	04:17	00:00	00:00
56	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:00
57	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:16
58	L/K/D	100.0	100.0	99.4	200	99.4	02:33	03:10	04:01
59	BEDROOM	100.0	100.0	100.0	100	100.0	03:46	04:33	05:22
60	BEDROOM	100.0	100.0	100.0	100	100.0	03:25	04:18	05:15

Table 04: Assessment Data

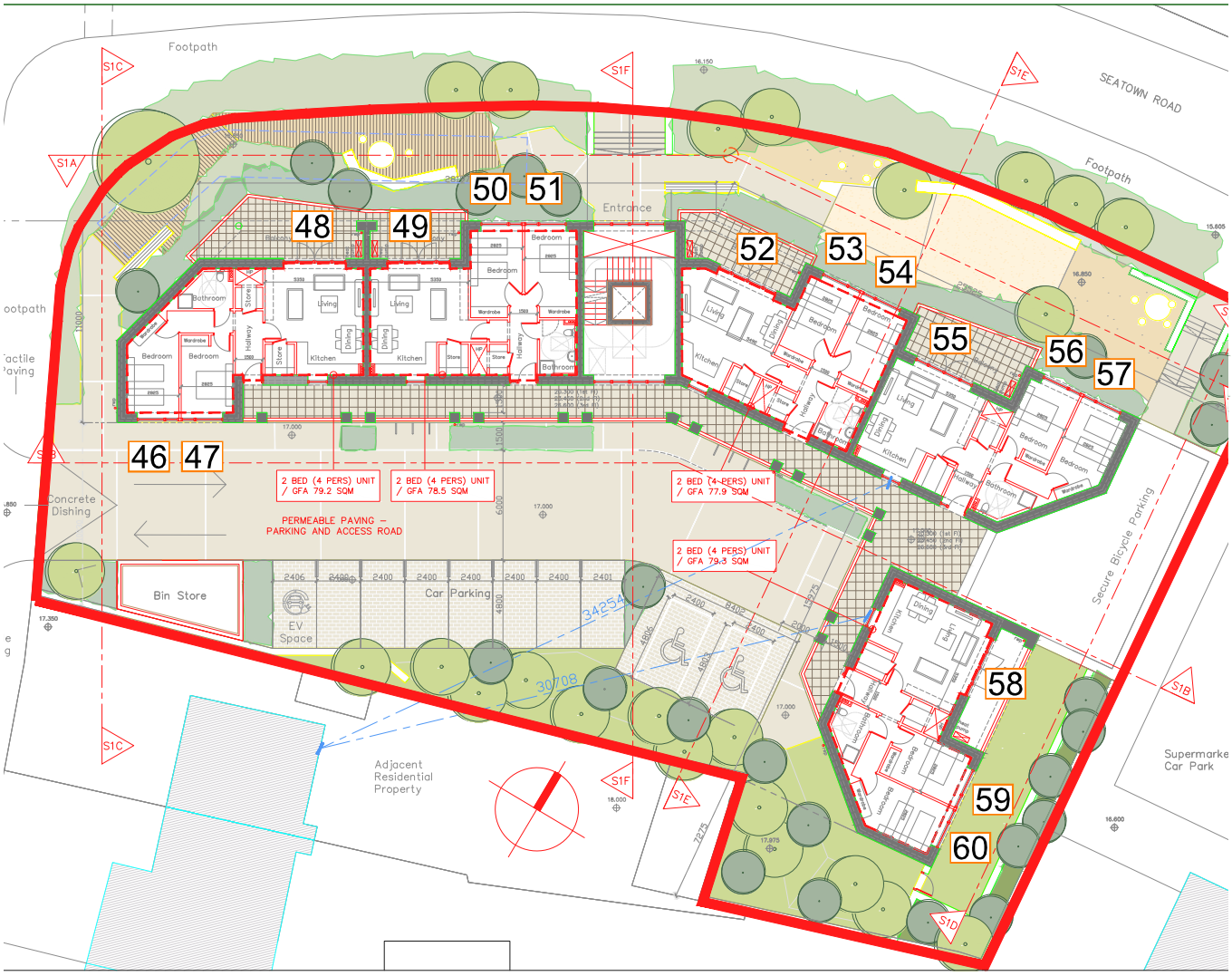


Fig. 11: Floor Plan

SITE NO.2 - Ground Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO2 - LEVEL 00									
61	BEDROOM	100.0	100.0	89.8	100	100.0	01:12	02:16	06:05
62	BEDROOM	100.0	100.0	100.0	100	100.0	01:30	02:27	06:23
63	L/K/D	100.0	99.8	91.4	200	91.4	02:03	02:35	01:40
64	L/K/D	100.0	100.0	97.5	200	97.5	02:33	02:59	01:12
65	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	01:03
66	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:22	01:23
67	L/K/D	100.0	100.0	100.0	200	100.0	02:49	02:06	01:55
68	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:00	00:55
69	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:38	01:17
70	L/K/D	100.0	100.0	99.6	200	99.6	01:50	03:12	02:02
71	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:14	01:22
72	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:39	01:17

Table 05: Assessment Data

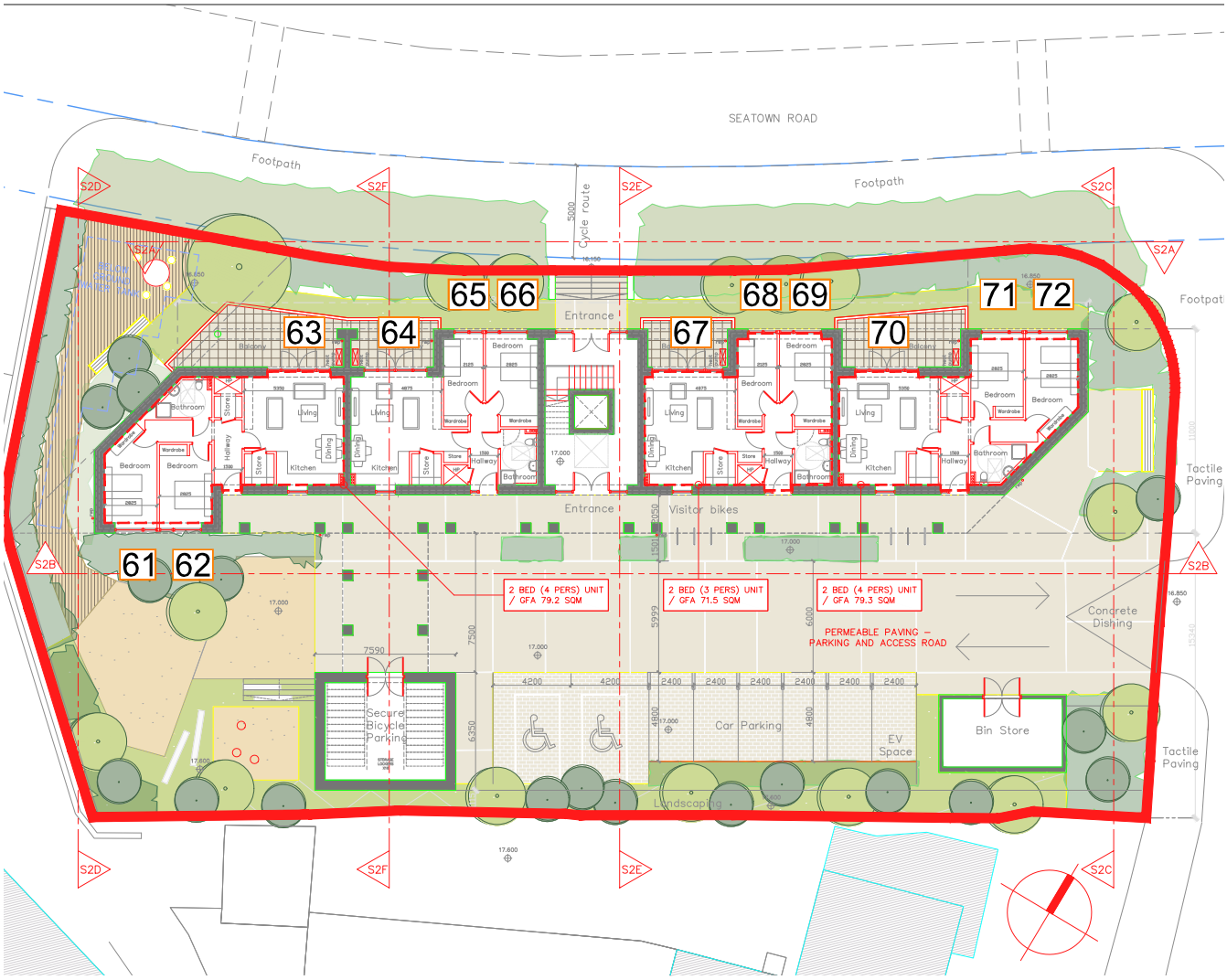


Fig. 12: Floor Plan

SITE NO.2 - First Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO2 - LEVEL 01									
73	BEDROOM	96.1	66.0	51.0	100	96.1	01:34	05:03	05:52
74	BEDROOM	100.0	95.6	72.4	100	100.0	02:05	05:01	05:51
75	L/K/D	100.0	99.6	95.1	200	95.1	04:39	02:37	01:33
76	L/K/D	100.0	100.0	99.6	200	99.6	04:09	03:18	01:13
77	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:03	01:11
78	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:32	01:29
79	L/K/D	100.0	100.0	100.0	200	100.0	03:19	03:33	01:49
80	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:05	01:21
81	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:48	01:40
82	L/K/D	100.0	100.0	99.3	200	99.3	04:00	03:26	01:58
83	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:28	01:24
84	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:54	01:19

Table 06: Assessment Data

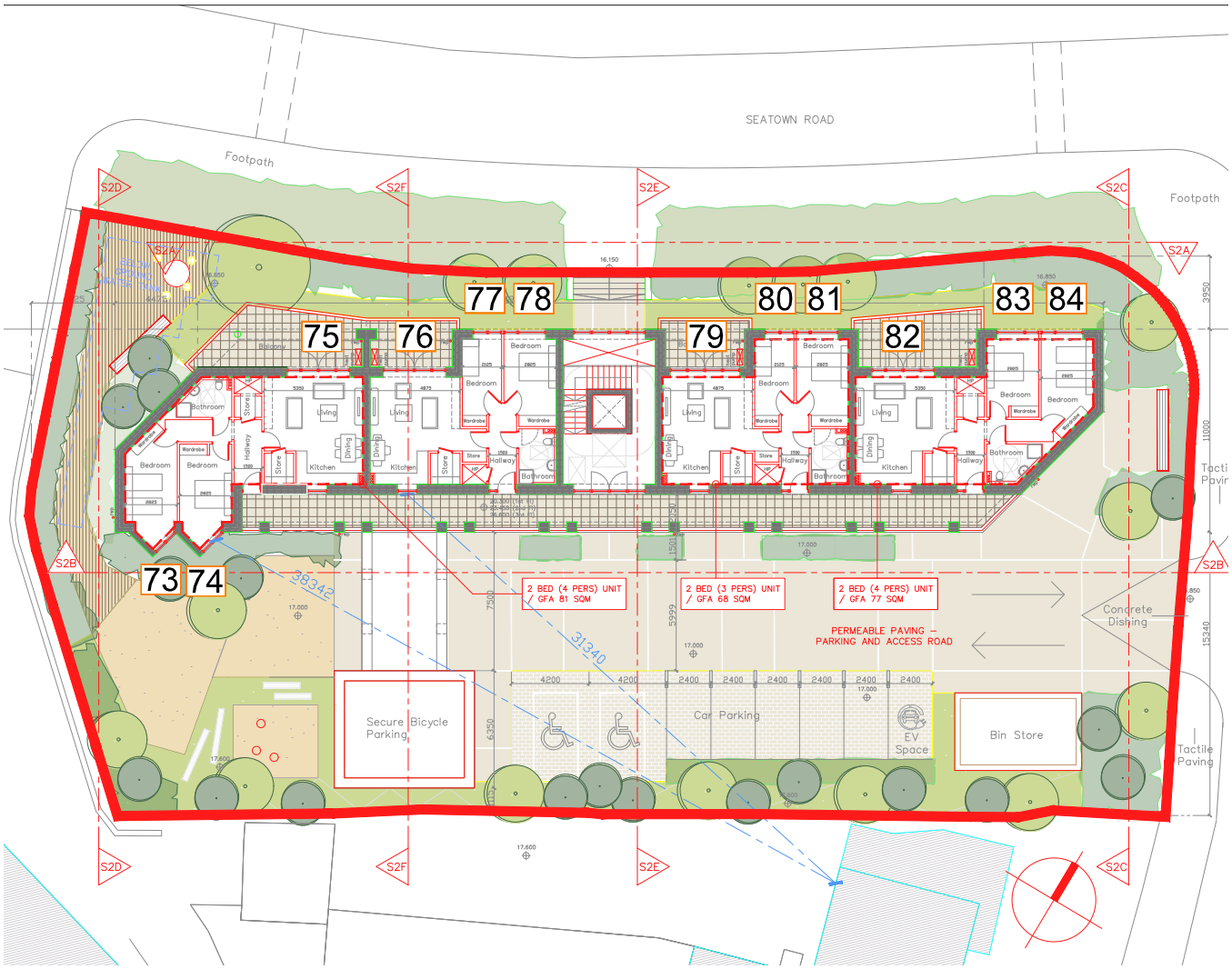


Fig. 13: Floor Plan

SITE NO.2 - Second Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO2 - LEVEL 02									
85	BEDROOM	100.0	78.4	58.3	100	100.0	04:55	05:30	06:15
86	BEDROOM	100.0	100.0	89.2	100	100.0	04:56	05:31	06:10
87	L/K/D	100.0	100.0	98.5	200	98.5	04:53	03:07	01:36
88	L/K/D	100.0	100.0	100.0	200	100.0	04:36	03:25	01:16
89	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:13	01:18
90	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:42	01:42
91	L/K/D	100.0	100.0	100.0	200	100.0	04:02	03:51	01:49
92	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:17	01:34
93	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:59	01:50
94	L/K/D	100.0	100.0	99.6	200	99.6	04:12	03:49	01:58
95	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:35	01:39
96	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:59	01:38

Table 07: Assessment Data

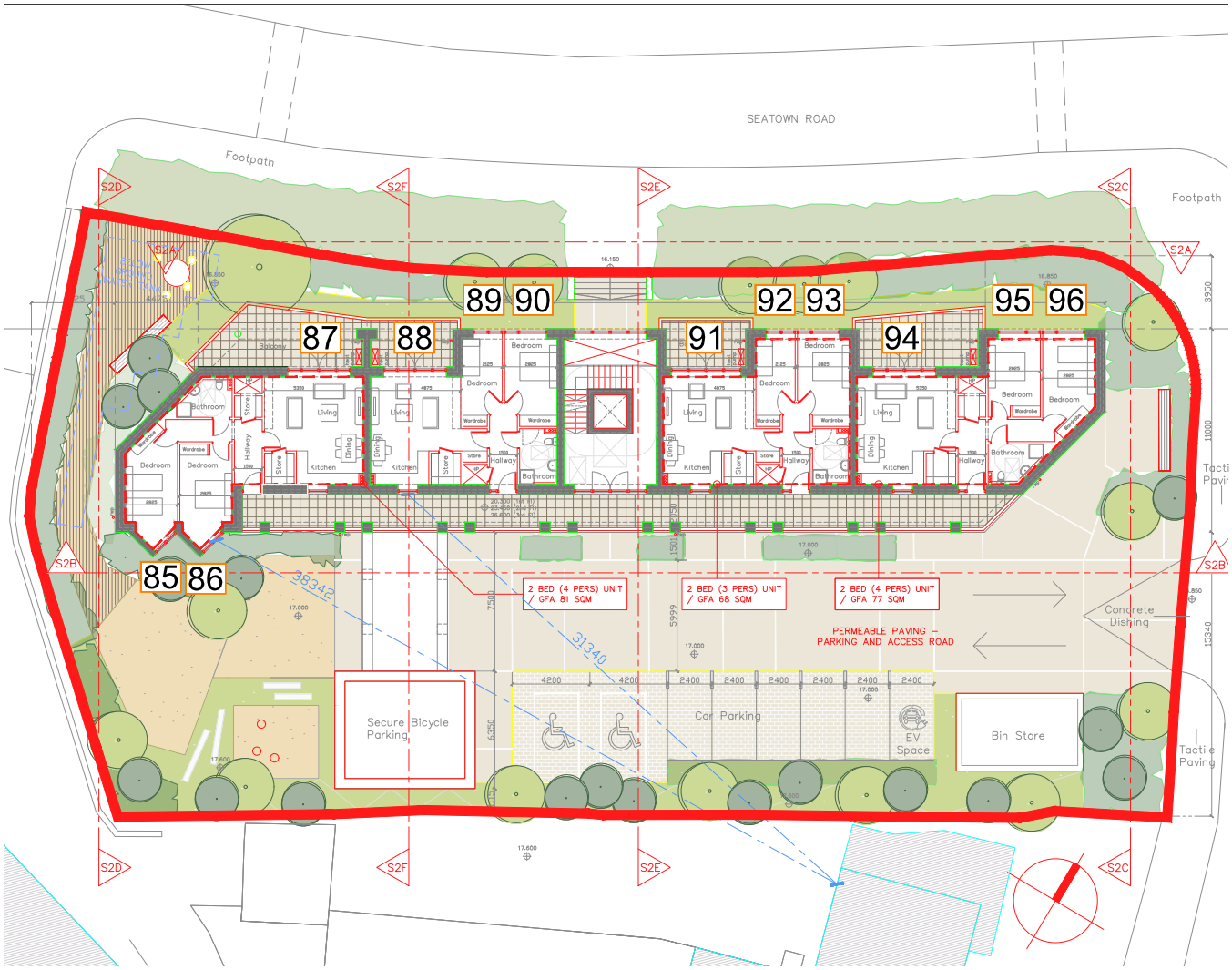


Fig. 14: Floor Plan

SITE NO.2 - Third Floor

ROOM REF.	ROOM USE	DAYLIGHT					SUNLIGHT		
		EN SPATIAL DAYLIGHT AUTONOMY percentage of room achieving target illuminance for 2190 hrs (50% of daylit hours) Weather File: IRL_Dublin					HOURS:MIN		
		100	150	200	TARGET	RELEVANT ENSDA	1 FEB	25 FEB	21 MAR
SITE NO2 - LEVEL 03									
97	BEDROOM	100.0	90.3	63.7	100	100.0	04:57	05:42	06:29
98	BEDROOM	100.0	100.0	96.1	100	100.0	04:58	05:43	06:30
99	L/K/D	100.0	100.0	99.3	200	99.3	03:27	02:19	01:45
100	L/K/D	100.0	100.0	100.0	200	100.0	04:04	02:23	00:26
101	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:17	01:35
102	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:59	02:15
103	L/K/D	100.0	100.0	100.0	200	100.0	04:00	02:56	00:59
104	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:17	01:35
105	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:58	02:14
106	L/K/D	100.0	100.0	99.6	200	99.6	03:47	02:56	01:08
107	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	00:35	01:52
108	BEDROOM	100.0	100.0	100.0	100	100.0	00:00	01:00	02:15

Table 08: Assessment Data

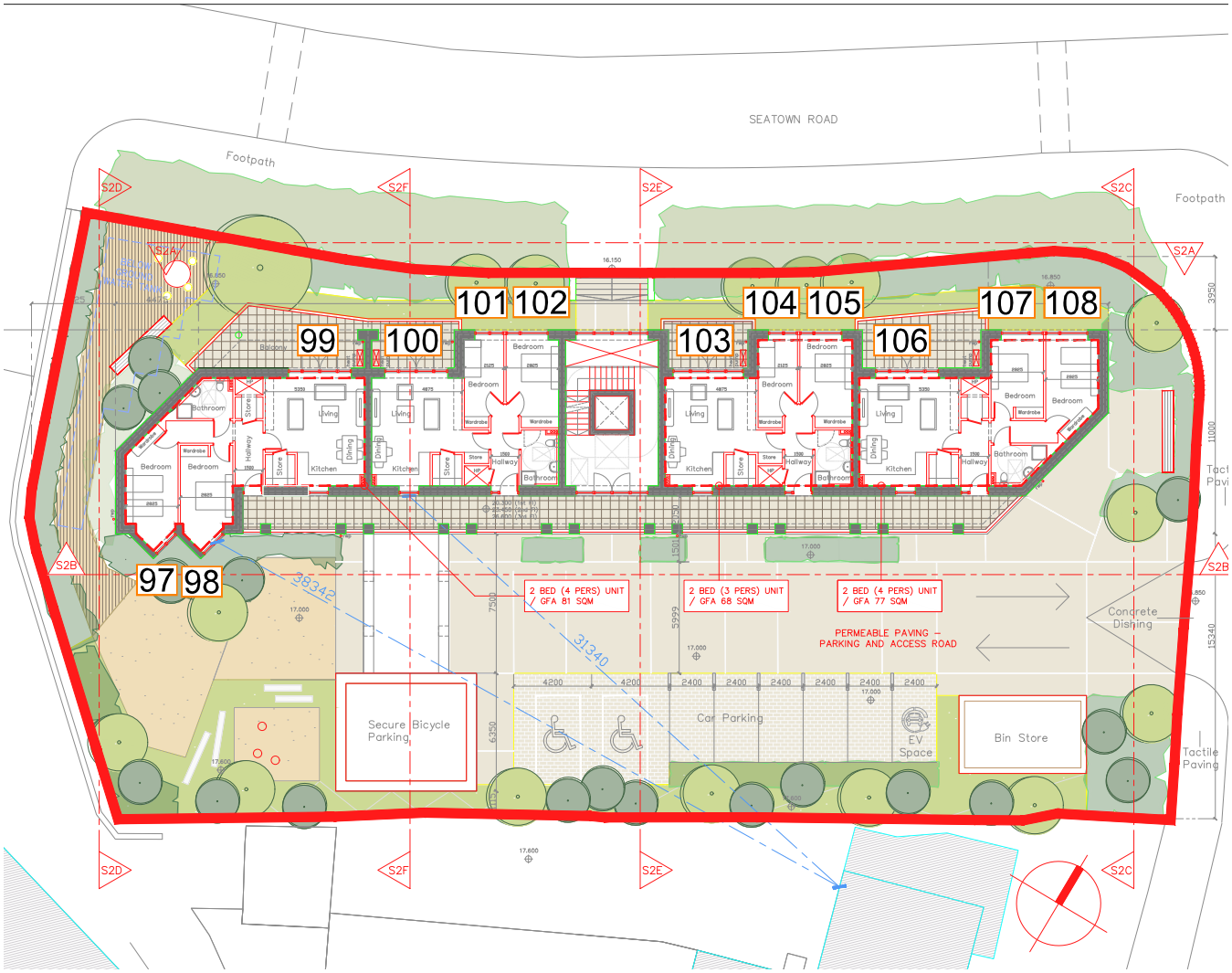
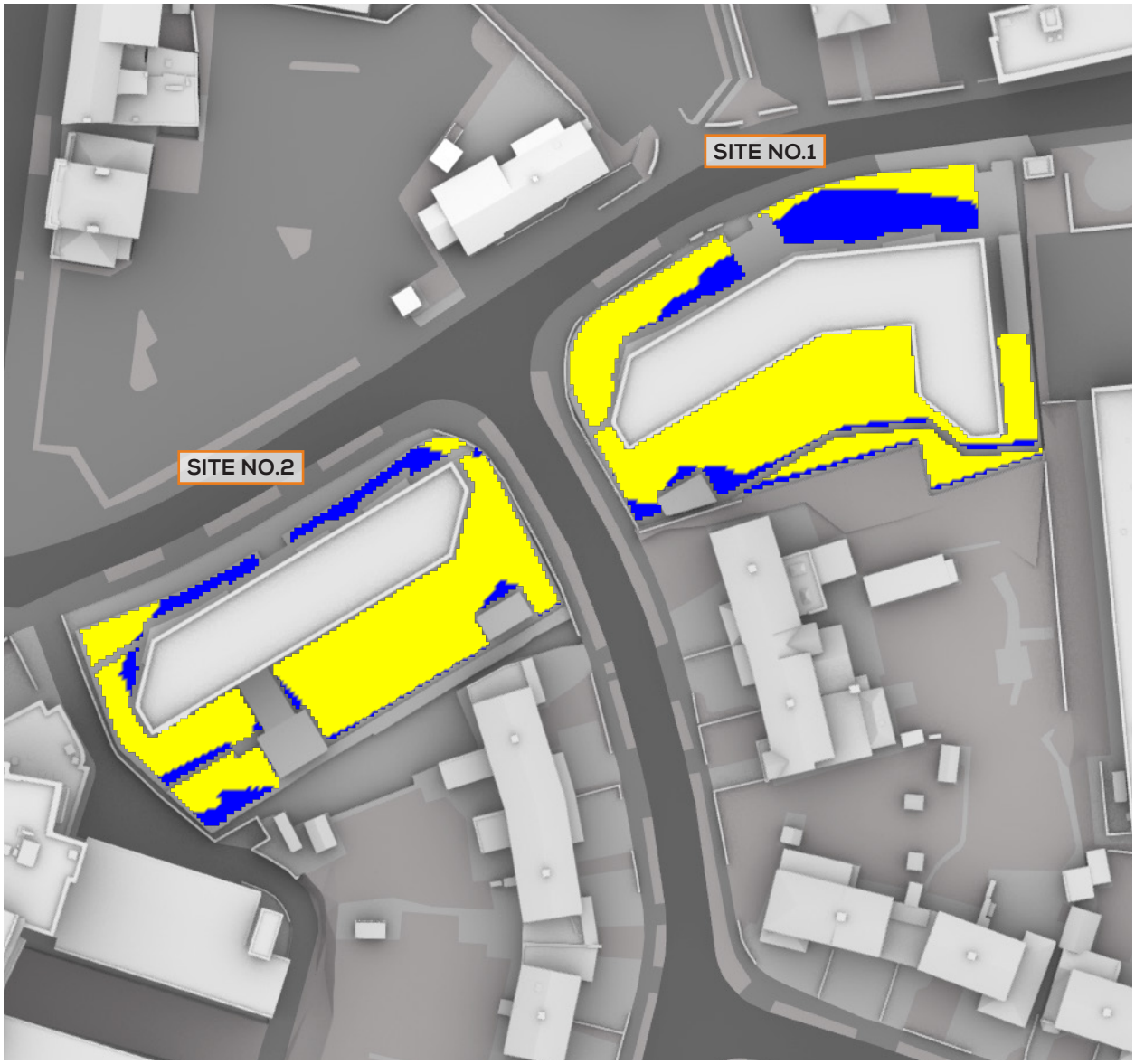


Fig. 15: Floor Plan

6 OVERSHADOWING ASSESSMENTS

OVERSHADOWING ASSESSMENT - OPEN SPACE
SUN HOURS ON GROUND - BRE TEST

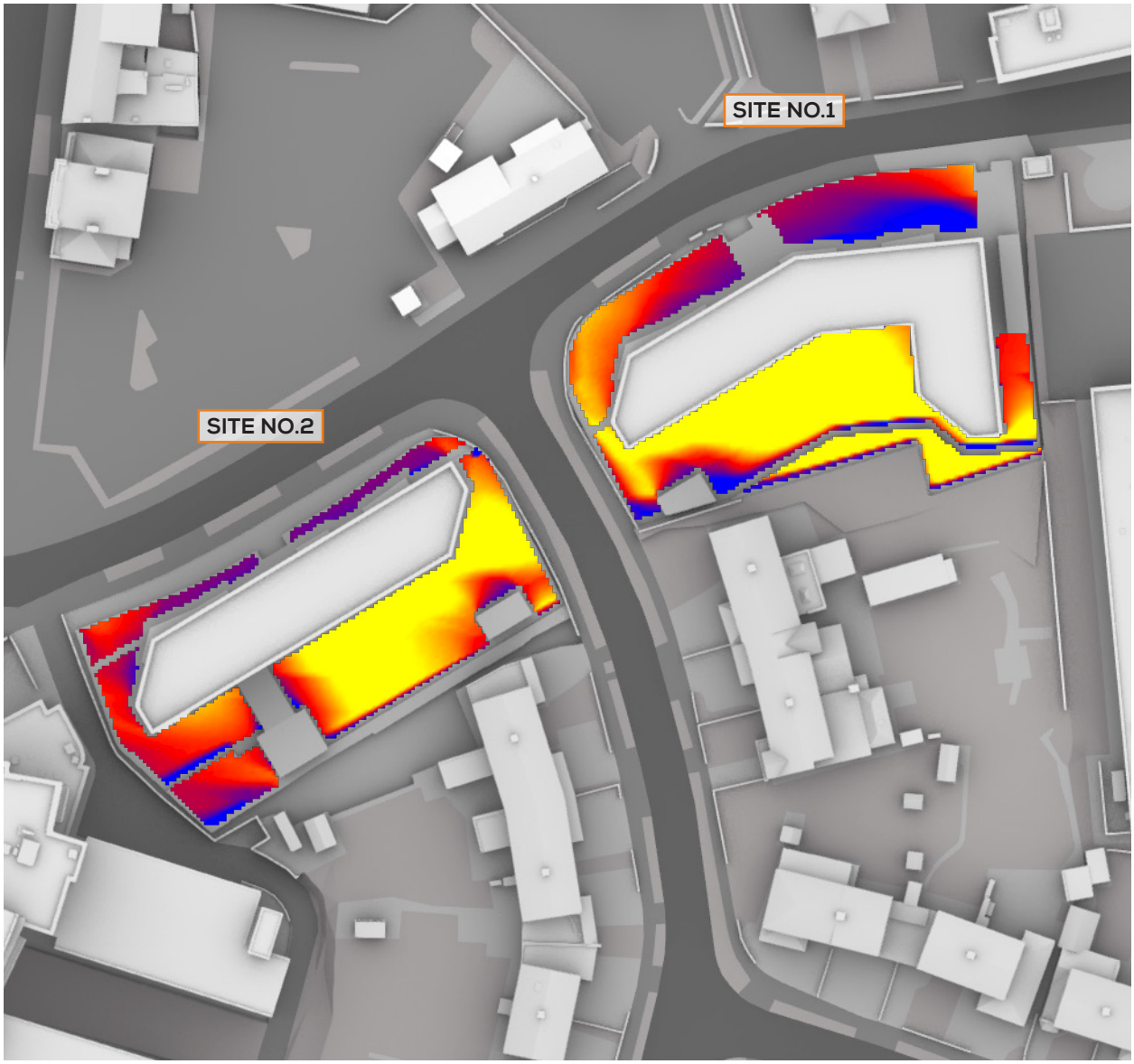


(BRE RECOMMENDS 2+ HOURS OF SUNLIGHT ON 21ST MARCH FOR AT LEAST 50% OF THE OPEN SPACE)

SITE NO.1 OEPN SPACE: 76%
SITE NO.2 OEPN SPACE: 82%
COMBINED OPEN SPACE: 79%

SUN HOURS ON GROUND
BRE TEST - 21ST MARCH

OVERSHADOWING ASSESSMENT - OPEN SPACE
SUN EXPOSURE ON GROUND - 21ST MARCH/SEPTEMBER (EQUINOX)



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+

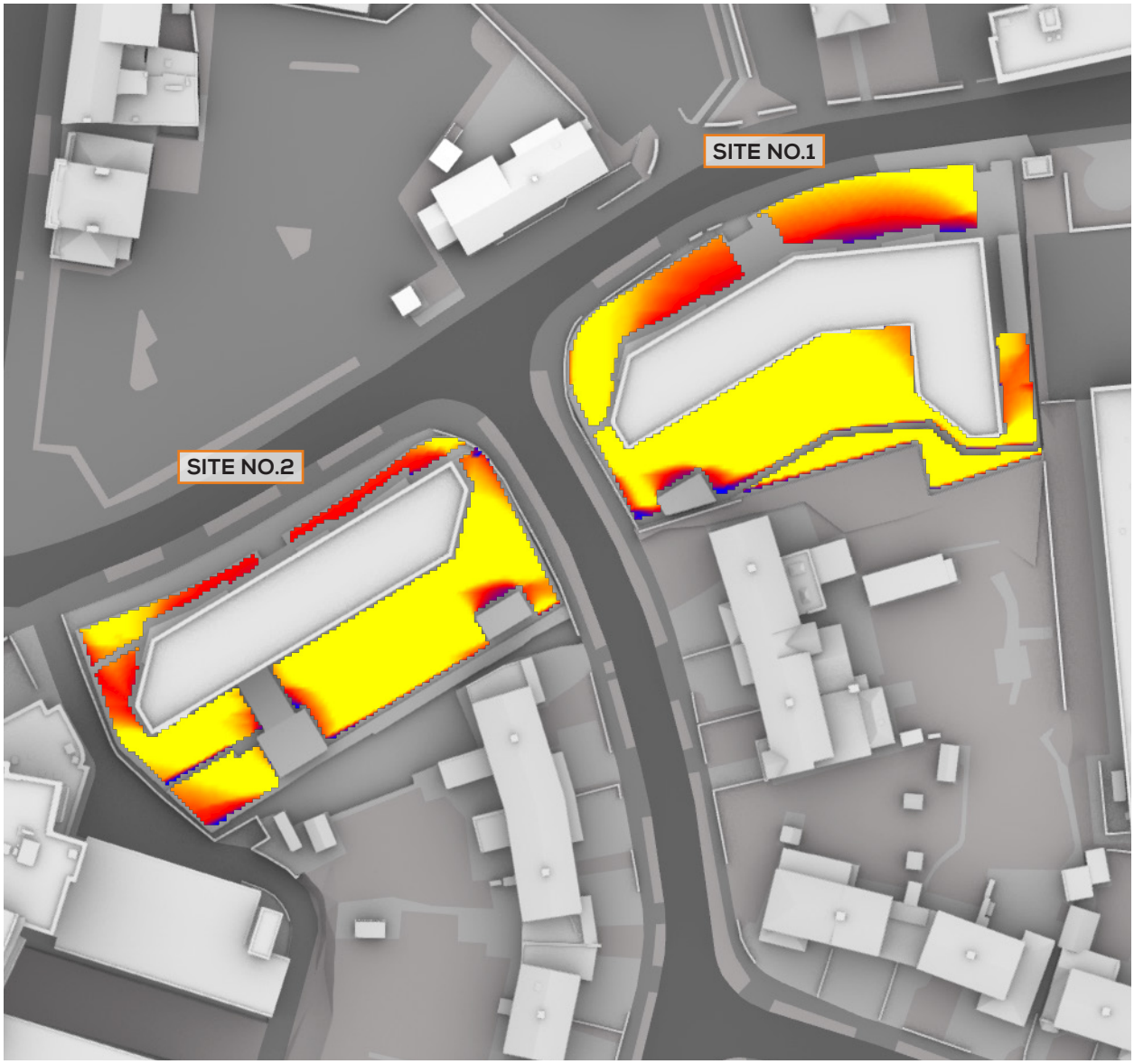
21st MARCH
(SPRING EQUINOX)

DUBLIN

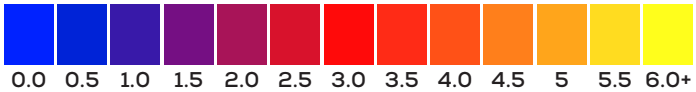
Latitude:	53.4
Longitude:	-6.3
Sunrise:	06:25 GMT
Sunset:	18:40 GMT

Total Available Sunlight:
12hrs 15mins

OVERSHADOWING ASSESSMENT - OPEN SPACE
SUN EXPOSURE ON GROUND - 21ST APRIL/AUGUST

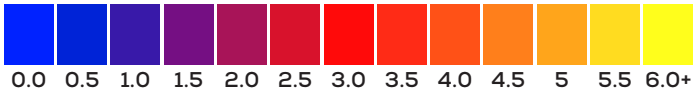


SUN EXPOSURE
TOTAL HOURS



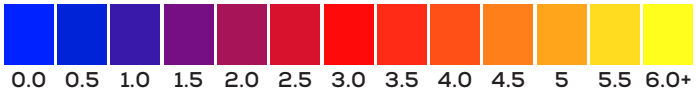
OVERSHADOWING ASSESSMENT - OPEN SPACE
SUN EXPOSURE ON GROUND - 21ST MAY/JULY

SUN EXPOSURE
TOTAL HOURS



OVERSHADOWING ASSESSMENT - OPEN SPACE
SUN EXPOSURE ON GROUND - 21ST JUNE (SUMMER SOLSTICE)

SUN EXPOSURE
TOTAL HOURS



21st JUNE
(SUMMER SOLSTICE)

DUBLIN

Latitude:	53.4
Longitude:	-6.3
Sunrise:	04:56 GMT
Sunset:	21:57 GMT

Total Available Sunlight:
17hrs

gia
CHARTERED SURVEYORS

For further details please contact us on:

LONDON

T 020 7202 1400
E mail@gia.uk.com

The Whitehouse
Belvedere Road
London SE1 8GA

MANCHESTER

T 0161 672 5100
E manchester@gia.uk.com

2 Commercial Street
Manchester
M15 4RQ

BELFAST

T 02892 449 674
E belfast@gia.uk.com

River House
48-60 High Street
Belfast BT1 2BE

BRISTOL

T 0117 374 1504
E bristol@gia.uk.com

33 Bristol
Colston Avenue
Bristol BS1 4UA

DUBLIN

T 020 7202 1400
E hello@giasurveyors.ie

77 Lower Camden Street
Dublin Ireland
D02 XE80