Long View, Ballyvolane, Cork

Daylight & Sunlight Assessment

Project Ref: 20820

Client: Longview Estates Ltd

Date: 02/04/2026

BPC ENGINEERS

BUILDING PERFORMANCE CONSULTING

Rev	Description	Date:	Written By	Approved By:
P1-01	Draft Report for comment	12/11/2025	JG	J.Gleeson (CEng MIEI, CMVP (AEE))
P1-02	Draft Report for comment	11/12/2025	JG	J.Gleeson (CEng MIEI, CMVP (AEE))
P2-01	Final Report	22/12/2025	JG	J.Gleeson (CEng MIEI, CMVP (AEE))
P2-02	Final Report	01/04/2026	JG	J.Gleeson (CEng MIEI, CMVP (AEE))

Contents

Glossary

Illuminance
A measure of the amount of light falling on a surface, usually measured in lux.

Target illuminance (E_T)
Illuminance from daylight that should be achieved for at least half of annual daylight hours across a specified fraction of the reference plane in a daylit space.

Minimum target illuminance (E_{TM})
Illuminance from daylight that should be achieved for at least half of annual daylight hours across 95% of the reference plane in spaces with vertical and/or inclined daylight apertures.

Daylight factor (D)
Ratio of total daylight illuminance at a reference point on the working plane within a space to outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% DF would mean that the indoor illuminance at that point in the space would be one hundredth the outdoor unobstructed horizontal illuminance.

Daylight, natural light
Part of global solar radiation capable of causing a visual sensation. (CIE, 2020) (Combined skylight and sunlight.)

No sky line
The outline on the working plane of the area from which no sky can be seen.

Obstruction Angle
The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

Skylight
Part of *diffuse* sky radiation capable of causing a visual sensation. (CIE, 2020)

Sunlight
Part of direct solar radiation capable of causing a visual sensation. (CIE, 2020)

Winter Probable Sunlight Hours (WPSH)
The long-term average of the total number of hours between the 21st of September and the 21st of March in which direct sunlight reaches the unobstructed ground (when clouds are considered).

Vertical Sky Component (VSC)
Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a sky of assumed or known luminance distribution (usually CIE standard overcast sky), to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.

Reference plane or working plane
Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85 m above the floor in houses and factories, 0.7 m above the floor in offices.

Spatial Daylight Autonomy (sDA)
Spatial Daylight Autonomy (sDA) is a metric describing annual sufficiency of ambient daylight levels in interior environments. It is defined as the percent of an analysis area that meets a minimum daylight illuminance level for a specified fraction of the operating/daylight hours per year. The sDA value is expressed as a percentage of area.

1 Executive Summary

This report provides information on the daylight and sunlight analysis undertaken for the proposed development at Long View Ballyvolane, Cork.

The analysis and assessments in this report have been carried out in line with the recommendations of BRE's "Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice" (BRE Building Technology Group, 2022) and BS EN 17037.

The BRE Guide provides useful recommendations to ensure adequate levels of daylight and sunlight in the proposed development. However, it also has relevance to the impact of the proposed development on existing neighbouring dwellings. The Guidelines make it clear that levels of daylight and sunlight cannot be expected to be as high in dense urban locations as would be the case in suburban or rural ones. It should be noted that whilst widely used, these are guidelines and do not have a statutory or mandatory basis.

There have been some relatively minor changes to the proposed scheme since the analysis outlined in this report was completed. These can be summarised as follows:

- Some apartments now incorporate inset balconies
- Block A has shifted slightly to the east
- Duplex units have been revised to include additional south-facing windows and south-facing balconies
- House layouts remain unchanged, however their positions within the southern portion of the site have been adjusted slightly

In terms of internal daylight levels within the proposed development, the results show that 100% of rooms meet or exceed the BRE's minimum recommendations for internal daylight provision in dwellings. Therefore, we believe the proposed development performs at an exemplar level for a scheme of this scale and aligns with national policy to ensure high-quality sustainable development.

In order to maximise available light, glazing to all habitable rooms exceeds 20%. The design team has developed the proposed building using the principles of the BRE's "Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice".

In terms of the amenity spaces provided, the results show that the open spaces receive greater than 2 hours of sunlight on March 21st. The cumulative area of these spaces exceeds the recommended criteria for sunlight. It should be noted that the amenity area is in excess of the required provision for a scheme of this nature.

Overall, the development has been designed with due consideration for sunlight and daylight and meets the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice" (2022).

2 Introduction

Site layout planning to achieve good daylighting and sun lighting, within buildings and in the open spaces around them is an important aspect in designing new buildings or developments. Daylight animates an interior and makes it attractive and interesting, as well as providing light to work or read by. Good daylight and sunlight can contribute to making a building energy-efficient; they can reduce the need for electric lighting, while winter solar gain can reduce heating requirements.

This report provides information on the daylight and sunlight analysis undertaken for the proposed development.

Longview Estates Ltd. intend to apply for planning permission for a Large Scale Residential Development (LRD) at a site of c. 7.61 ha located at Laherdane, Ballyhooley Road, Cork City.

The development will provide for the construction of 263 no residential units (total GFA c. 22,860.5 sqm), comprising:

i. 2 no. 4 storey apartment buildings (Blocks A & B) comprising 55 no. apartments (34 no. 1 bedroom & 21 no. 2 bedroom);

ii. 3 no. 2-storey apartment buildings (Blocks C, D & E) comprising 14 no. 2-bedroom duplex apartments;

iii. 194 no. houses in a mixture of 2-storey terraced, semi detached and mews end of terrace units (34 no. 4-bedroom, 138 no. 3-bedroom, 22 no. 2-bedroom); and

iv. A proposed creche (c. 412.6m²)

The development will also include: vehicular access points to the east and north of the proposed site connecting to the constructed distributor road to the adjoining Longview Estates (permitted under ABP-306325-20 as amended by CCC Reg Ref 23/42409 / ABP-318904-24 and CCC Reg Ref 25/43863); all associated car parking, EV charging points, cycle parking and bin storage facilities; associated internal roads, pedestrian and cycle paths; public lighting; public open space (c. 12,637 sqm); communal amenity space; landscaping and boundary treatments; connection to public utilities; drainage and surface water management works including attenuation and swales; all ancillary site infrastructure; ESB sub stations and site development and excavation works above and below ground. The proposed development will be constructed in one phase or a series of phases in accordance with construction management plans.

The analysis and assessments in this report have been carried in line with the recommendations of BRE's "Site Layout Planning for daylight and sunlight, a Guide to good practice" (BRE Building Technology Group, 2022) and BS EN 17037. The aforementioned BRE guide is also known as BRE Guide BR 209 and may be referenced as such or simply as the "BRE Guide" hereafter in this document.

This report doesn't need to assess the proposed development's impact on daylight and sunlight to the existing buildings as there are no buildings which are in a close enough proximity to be affected.

The report also assesses access to sunlight for the proposed development by means of sunlight to gardens/open spaces

Additionally, Appendix A B provides shadow images for the proposed development.

3 Site Description

3.1 Location & Context

The site located at Long View Ballyvolane, Cork.

Figure 1: Site Plan of Long View Ballyvolane

Figure 2: Aerial View of Site (Courtesy Google Maps) [Site boundary is only indicative. Refer to architectural drawings for accurate site boundary details.

3.2 Proposed Development

The following images provide details of the proposed houses, apartment and duplex blocks within the development.

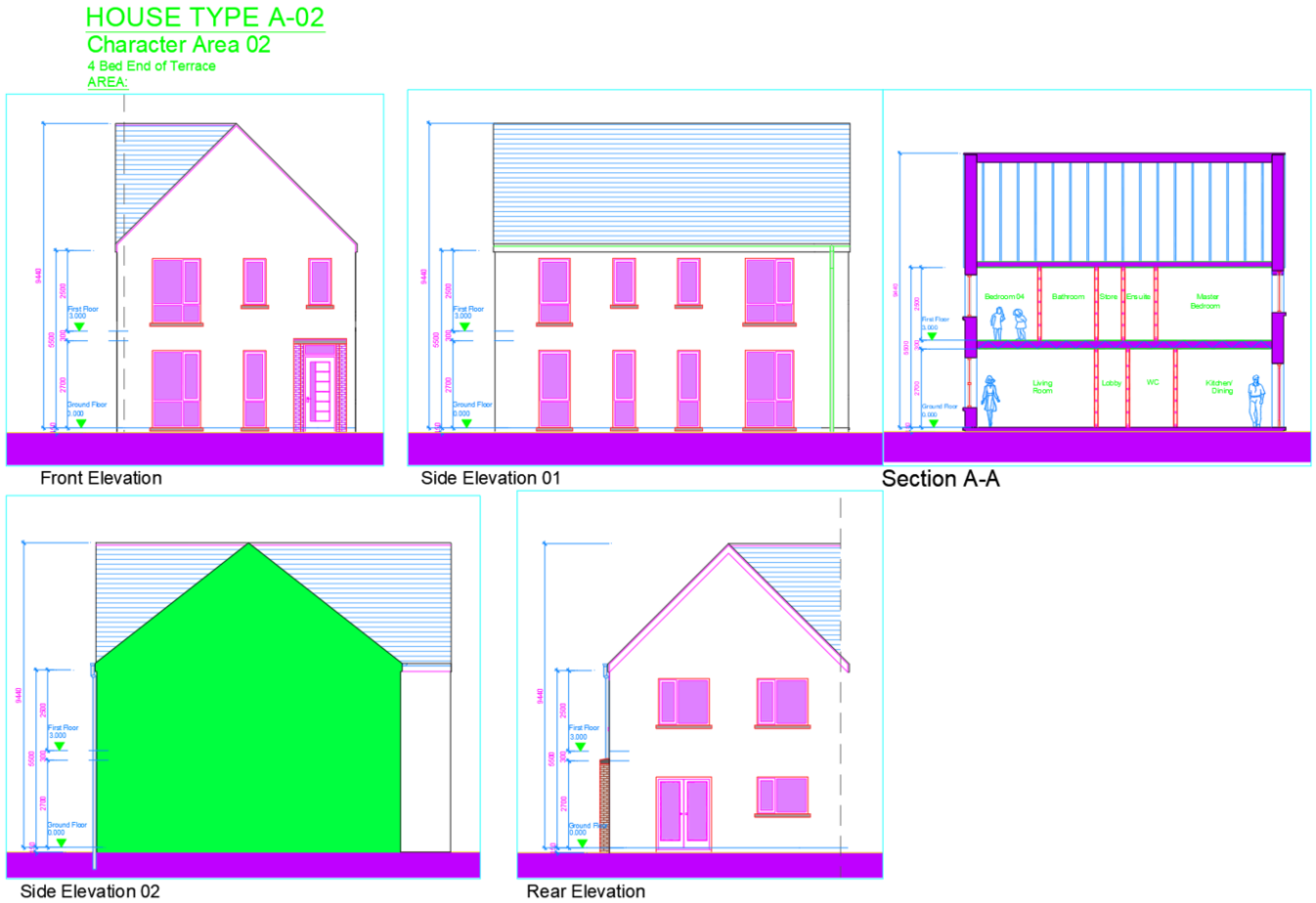


Figure 3: Proposed Section, Side Elevations of House Type A-02

Figure 4: Proposed Section, Side Elevations of House Type B-02

Figure 5: Proposed Section, Side Elevations of House Type D-02

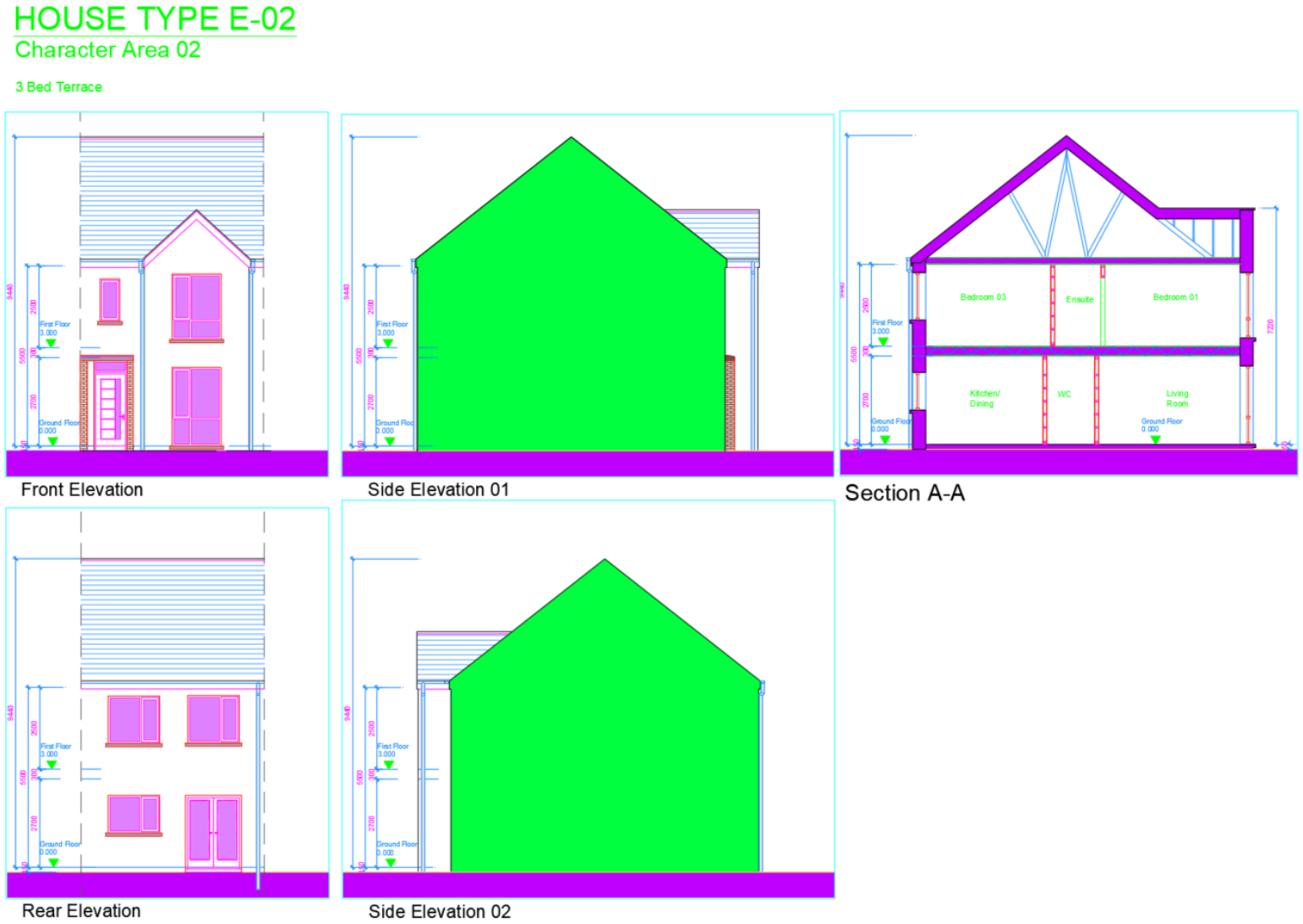


Figure 6: Proposed Section, Side Elevations of House Type E-02

Figure 7: Proposed Section, Side Elevations of House Type F-02

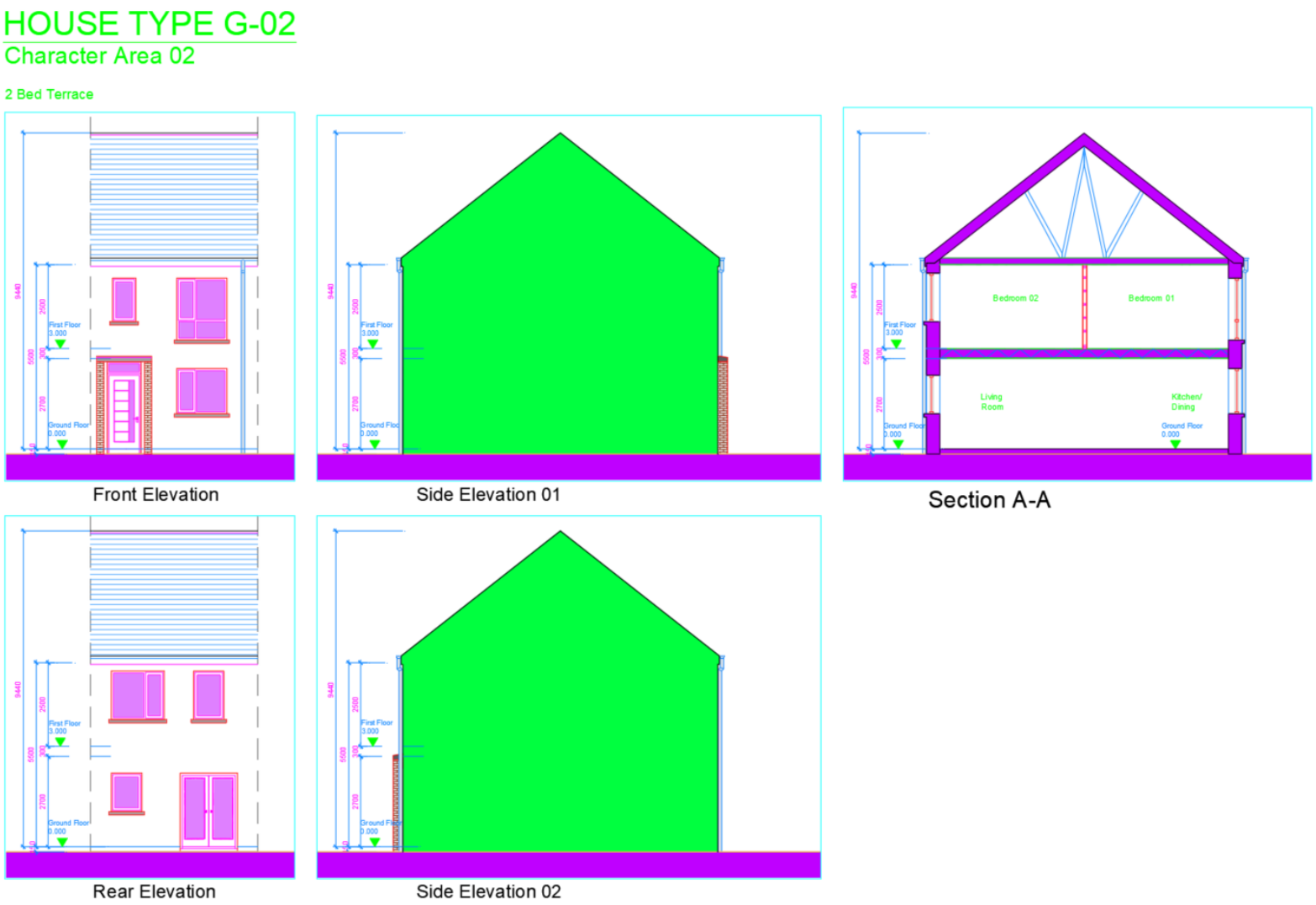


Figure 8: Proposed Section, Side Elevations of House Type G-02

Figure 9: Proposed Section, Side Elevations of House Type H-02

Figure 10: Proposed Section, Side Elevations of House Type A-03

Figure 11: Proposed Section, Side Elevations of House Type B-03

Figure 12: Proposed Section, Side Elevations of House Type D-03

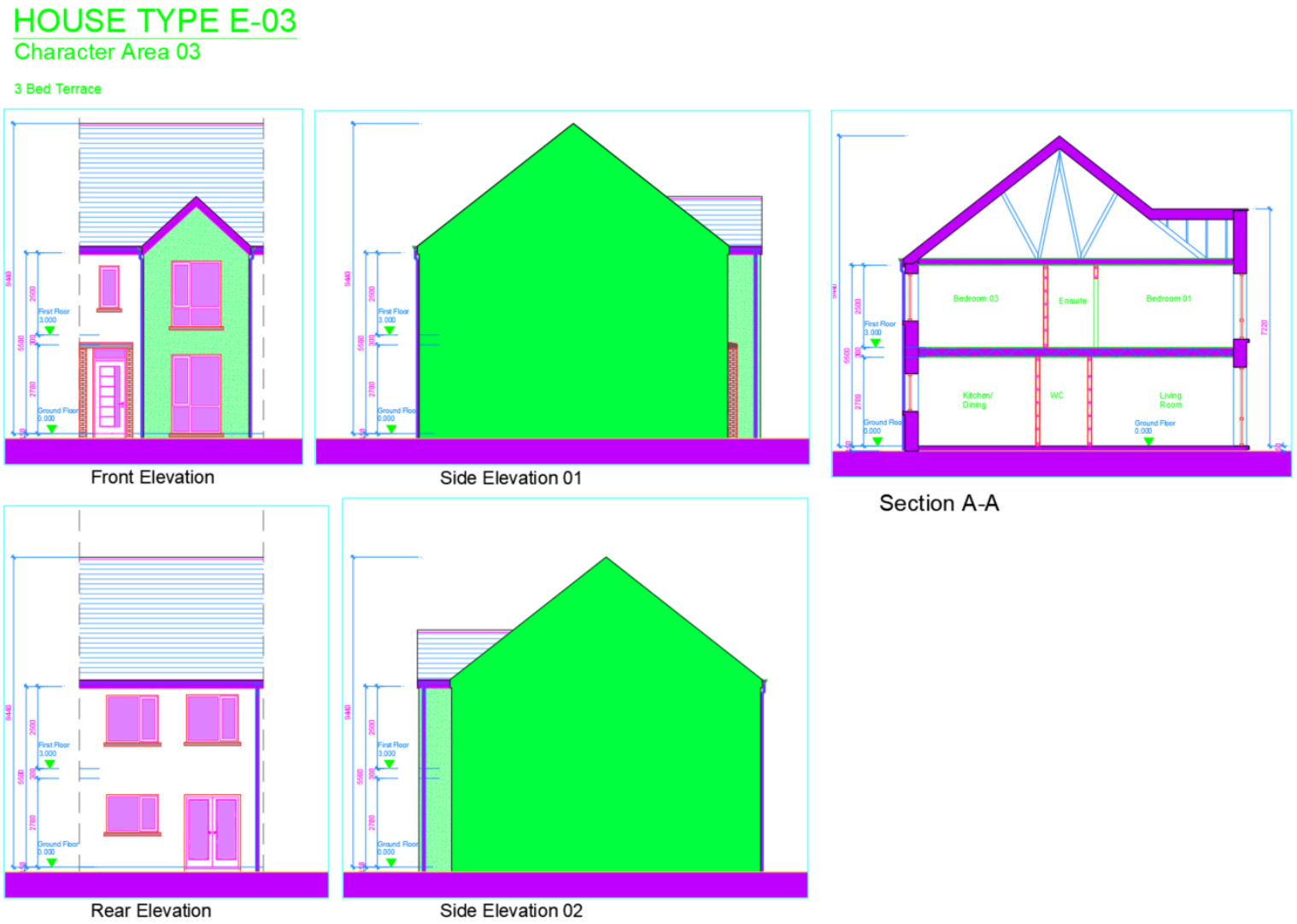


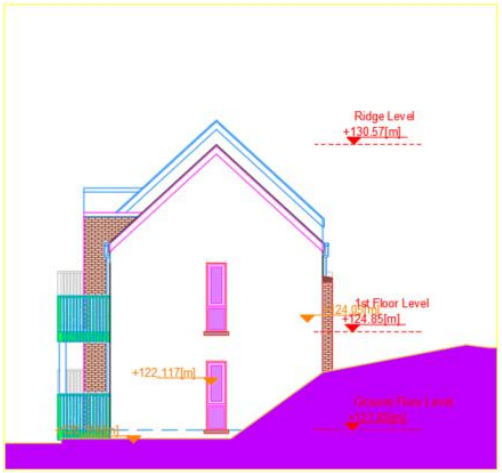
Figure 13: Proposed Section, Side Elevations of House Type E-03

Figure 14: Proposed Section, Side Elevations of House Type F-03

Figure 15: Proposed Section, Side Elevations of House Type G-03

DUPLEX BLOCK C
Character Area 01

Block C - North Elevation
Scale 1: 200 @A3



Block C - West Elevation
Scale 1: 200 @A3

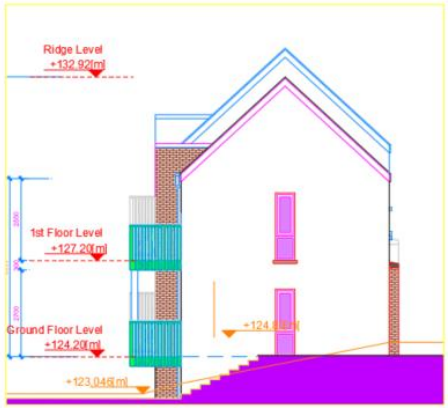
Block C - South Elevation
Scale 1: 200 @A3

Block C - East Elevation
Scale 1: 200 @A3

Figure 16: Proposed Section, Side Elevations of Duplex Block C

DUPLEX BLOCK D
Character Area 01

Block D - North Elevation
Scale 1: 200 @A3



Block D - West Elevation
Scale 1: 200 @A3

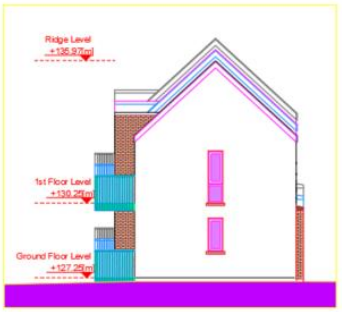
Block D - South Elevation
Scale 1: 200 @A3

Block D - East Elevation
Scale 1: 200 @A3

Figure 17: Proposed Section, Side Elevations of Duplex Block D

DUPLEX BLOCK E
Character Area 01

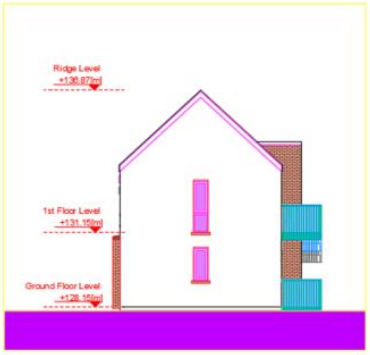
North Elevation
Scale 1: 200 @A3



West Elevation
Scale 1: 200 @A3

Section AA
Scale 1: 200 @A3

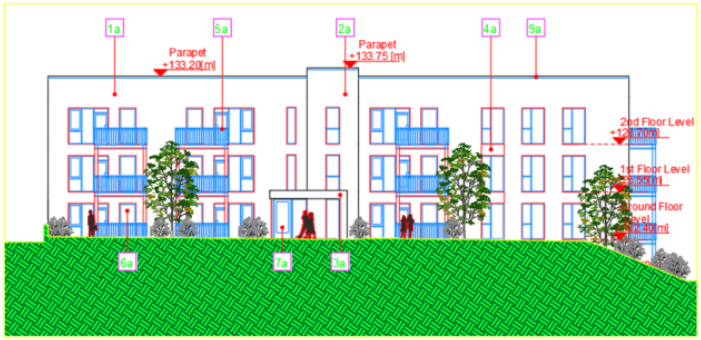
South Elevation
Scale 1: 200 @A3



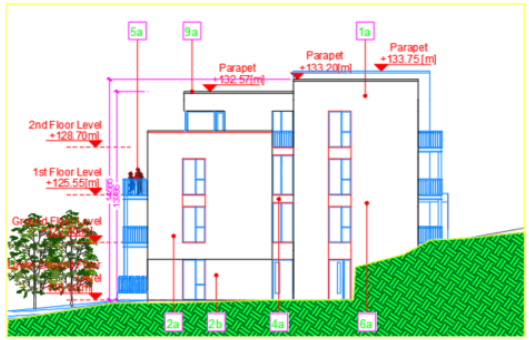
East Elevation
Scale 1: 200 @A3

Figure 18: Proposed Section, Side Elevations of Duplex Block E

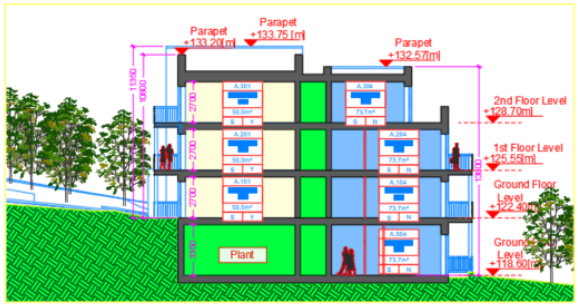
Apartment Block A



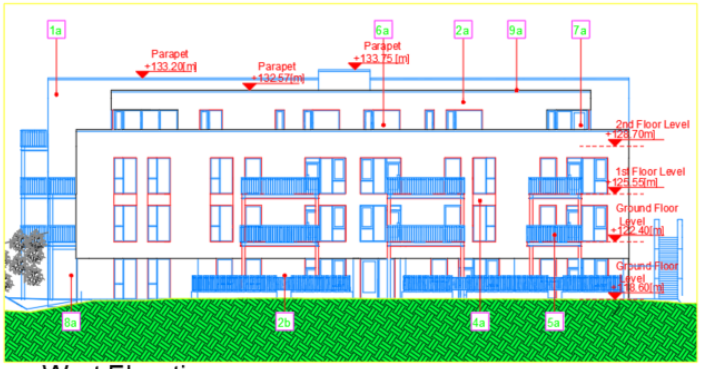
East Elevation
Scale 1: 200 @A1



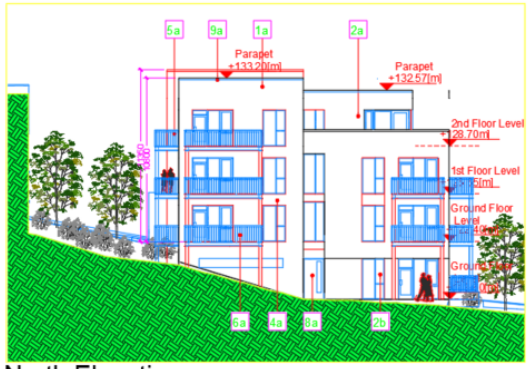
South Elevation
Scale 1: 200 @A1



Section AA
Scale 1: 200 @A1



West Elevation
Scale 1: 200 @A1



North Elevation
Scale 1: 200 @A1

Figure 19: Proposed Section, Side Elevations of Apartment Block A

Apartment Block B

Figure 20: Proposed Section, Side Elevations of Apartment Block B

4 Methodology & Assessment Criteria

The analyses and assessments are based on the guidelines set out in the BRE guide (BR 209) "Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice" (BRE Building Technology Group, 2022). This guide is intended to be used in conjunction with interior lighting recommendations in BS EN 17037 Daylight in buildings, and in the CIBSE publication LG 10 Daylighting – a guide for designers.

It should also be noted that although the BRE guide gives numerical guidelines, "*these should be interpreted flexibly since natural lighting is only one of many factors in site layout design.*" (BRE Building Technology Group, 2022)

Advanced lighting simulation software is used to perform the analysis. The software combines 3D modelling capabilities with a suite of programs which employ advanced raytracing. The software fully meets all relevant guidelines set out in the BRE Guide BR209. The software has the ability to perform annual simulations based on hourly climatic data. This type of simulation is used for the assessment of internal daylight provision in new buildings (discussed in section 4.2.)

Throughout this report an effort will be made to differentiate between metrics used to assess skylight only, sunlight only or a combination of both - daylight. As defined in the glossary of the BRE Guide, "Daylight" is an umbrella term that includes both skylight and sunlight—the diffuse and direct components of light from the sky respectively. Unfortunately, the terms daylight and skylight are often used interchangeably but this report will aim to specify when daylight specifically refers to skylight or when it also encompasses sunlight.

The following sub-sections outline the methodology and assessment criteria used.

4.1 Existing Buildings

The impact of the proposed development on the existing buildings (sensitive receptors only) with respect to daylight is assessed using the following methodologies. The methodologies are grouped into sub-sections based on whether they are "Light from the sky" analysis or "Sun lighting" analysis.

4.1.1 Light from the Sky

4.1.1.1 Obstruction Angle Check

The BRE guide states that:

"Loss of light to existing windows need not be analysed if the distance of each part of the proposed development from the existing window is three or more times its height above the centre of the existing window. In these cases, the loss of light will be small." (BRE Building Technology Group, 2022)

Therefore, in Figure , if the distance s1 was at least 3 times greater than h1, loss of light to the existing windows would not need to be analysed.

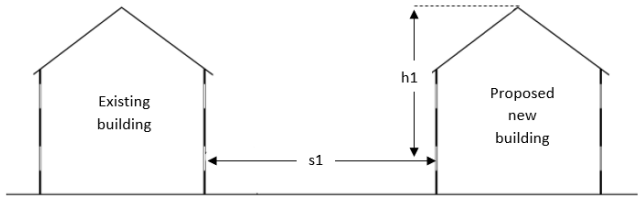


Figure 21: Spacing-to-Height Ratio

If the development is taller or closer than this, then the obstruction angle of the new development can be checked, where the obstruction angle is the angle subtended by the new development at the level of the centre of the lowest window in the existing building.

"If this angle is less than 25° for the whole of the development then it is unlikely to have a substantial effect on the diffuse skylight enjoyed by the existing building." (BRE Building Technology Group, 2022)

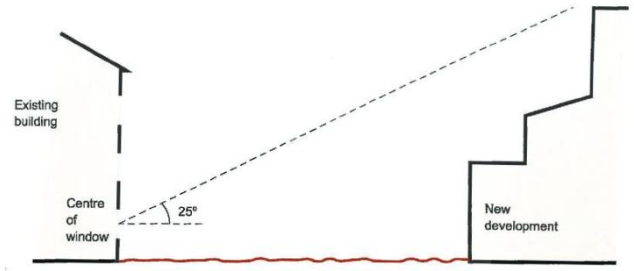


Figure 22: Obstruction Angle Check (25 Degree Line Test)

The obstruction angle is measured from the 3D CAD model. This check is suitable for existing windows where the proposed development is directly opposite an existing window, i.e. proposed development is cut by a vertical section drawn perpendicular to the window.

If, for any part of the new development, this angle is more than 25°, a more detailed check is needed to find the loss of skylight to the existing building. This may also be required in cases where the existing windows are not opposite the proposed development.

4.1.1.2 Vertical Sky Component (VSC)

Any reduction in the total amount of skylight for the existing properties can be calculated by finding the VSC at the centre of each main window. The Vertical Sky Component (VSC) is the ratio of the direct sky illuminance at the vertical reference point, to the simultaneous illuminance on an unobstructed horizontal plane. Reflected light is not included.

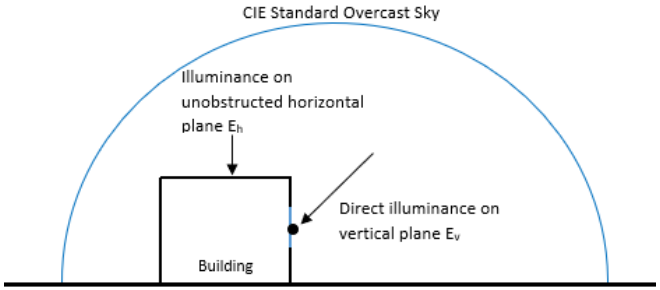


Figure 23: Vertical Sky Component

In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground (or balcony level for an upper storey) on the centre line of the window is used. The reference point is in the external plane of the window wall. Windows to bathrooms, toilets, storerooms, circulation areas and garages are not analysed.

Note that because the CIE standard overcast sky model is used, VSC is independent of orientation and location. (It is a *skylight* metric.)

The diffuse daylighting of any existing building may be adversely affected if:

"the VSC measured at the centre of an existing main window [or 1.6m above bottom of glazed door] is less than 27%, and less than 0.8 times its former value." (BRE Building Technology Group, 2022)

4.1.1.3 No Skyline

While VSC provides an indication of skylight availability, it does provide any information on the distribution of light within a space. In addition to external obstructions, the distribution of daylight within a space is dependent on window sizes and positioning, and room layouts. The no skyline divides points on the working plane which can and cannot see the sky.

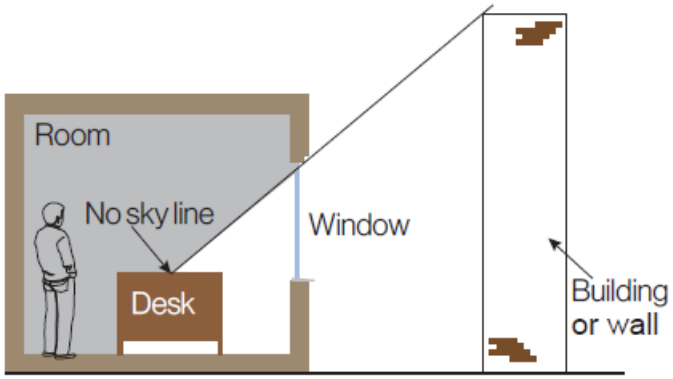


Figure 24: No Skyline [courtesy (BRE Building Technology Group, 2022)]

Areas beyond the no skyline, since they receive no direct daylight, usually look dark and gloomy compared with the rest of the room.

Where room layouts are known, the impact on the daylighting distribution in the existing building should be found by plotting the no sky line in each of the main rooms.

The diffuse daylighting of an existing building may be adversely affected if:

"the area of the working plane in a room which can receive direct skylight is reduced to less than 0.80 times its former value." (BRE Building Technology Group, 2022)

(Room layouts for neighbouring buildings are often not readily available, hence VSC is often the only analysis performed.)

4.1.2 Sun lighting

"In designing a new development or extension to a building, care should be taken to safeguard the access to sunlight both for existing dwellings, and for any nearby non-domestic buildings where there is a particular requirement for sunlight." (BRE Building Technology Group, 2022)

Obstruction to sunlight may become an issue if:

- Some part of a new development is situated within 90° of due south of a main window wall of an existing building.
- In the section drawn perpendicular to this existing window wall, the new development subtends an angle greater than 25° to the horizontal measured from the centre of the lowest window to a main living room.

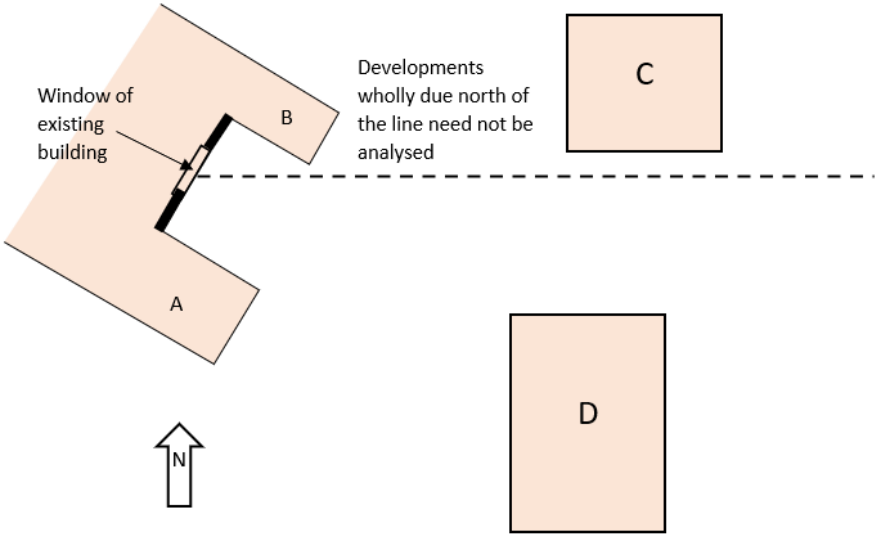


Figure 25: Sunlight Analysis Scenarios for Existing Buildings

No sunlight check is required on the existing window for proposed extension B and new building C, as they lie within 90° of due north of the window. The impact on sunlight to the existing window should be checked for proposed extension A, and new building D if it subtends more than 25° to the horizontal, measured in section from the centre of the window.

To assess loss of sunlight to an existing building, it is suggested that all main living rooms of dwellings, and conservatories, should be checked if they have a window facing within 90° of due south.

4.1.2.1 Probable Sunlight Hours

To calculate the loss of sunlight to an existing building over the year, the annual probable sunlight hours (APSH) metric can be used. "*Here 'probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question (based on sunshine probability data). The sunlight reaching a window is quantified as a percentage of this unobstructed annual total.*" (BRE Building Technology Group, 2022)

Sunlight to an existing dwelling may be adversely affected if the centre of a main living room window (which faces within 90° of due south):

- receives less than 25% of annual probable sunlight hours (APSH) and less than 0.80 times its former annual value.
- or less than 5% of annual probable sunlight hours between 21 September and 21 March (often referred to as winter probable sunlight hours - WPSH) and less than 0.80 times its former value during that period.
- and has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

4.1.2.2 Basic Assessment

It is not always necessary to do a full calculation using Annual Probable Sunlight Hours APSH (section 4.1.2.1). The same "spacing-to-height ratio" and "obstruction angle" checks discussed in section 4.1.1.1 can be used to determine if a more detailed calculation is necessary or not. Additionally, depending on the VSC and orientation of the existing windows an APSH assessment may not be required. The recommendation for safeguarding sunlight to existing neighbouring buildings will be met if:

- *"the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window [see Figure] (note: obstructions within 90° of due north of the existing window need not count here).*
- *The window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal [Figure]. Again, obstructions within 90° of due north of the existing window need not be counted.*
- *The window wall faces within 20° of due south and the reference point has a VSC of 27% or more."* (BRE Building Technology Group, 2022)

4.1.3 Sunlight to Existing Gardens & Open Spaces

Good site layout planning for daylight and sunlight should not limit itself to providing natural lighting inside buildings. Sunlight in the spaces between buildings has an important impact on the overall appearance and ambience of a development.

"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." (BRE Building Technology Group, 2022)

4.1.3.1 Shadow Plots

The BRE guide states:

"Where a large building is proposed which may affect a number of gardens or open spaces it is often illustrative to plot a shadow plan showing the location of shadows at different times of day and year."

4.1.4 Impact Classification

Appendix H of the BRE Guide – "Environmental Impact Assessment" states that the impact of a new building on its surroundings can be classified as negligible, minor, moderate or major adverse. Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide, the impact is assessed as negligible or minor adverse.

Where the loss of skylight or sunlight does not meet the BRE guidelines, the impact is assessed as minor, moderate or major adverse.

Table provides a more detailed description of the impact classification.

Table 1: Environmental Impact Assessment: Impact Classification

Negligible impact	• *Loss of light well within guidelines,* ***or*** • *only a small number of windows losing light (within the guidelines)* ***or*** • *limited area of open space losing light (within the guidelines)*

Minor adverse impact (a)	• *Loss of light only just within guidelines* ***and***
	  ○ *a larger number of windows are affected* ***or***
	  ○ *larger area of open space is affected (within the guidelines)*

Minor adverse impact (b)	• *only a small number of windows or limited open space areas are affected* • *the loss of light is only marginally outside the guidelines* • *an affected room has other sources of skylight or sunlight* • *the affected building or open space only has a low-level requirement for skylight or sunlight* • *there are particular reasons why an alternative, less stringent, guideline should be applied*
Major adverse impact	• *large number of windows or large open space areas are affected* • *the loss of light is substantially outside the guidelines* • *all the windows in a particular property are affected* • *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)*

A moderate adverse impact falls somewhere between the criteria for *"Minor Adverse Impact (b)"* and *"Major Adverse Impact"*.

4.2 New Buildings

The daylight provision was also checked for the proposed development.

4.2.1 Light from the Sky

Section 2.1.8 of the BRE Guide states that:

"Daylight provision in new rooms may be checked using either of the methods in BS EN 17037 Daylight in Buildings: direct prediction of illuminance levels using hourly climate data, or the use of the daylight factor (D)".

Both methods are measures of the overall amount of daylight in a space.

The daylight factor (D) method addresses daylight provision as a ratio of unobstructed external illuminance under overcast sky conditions. This method involves calculating the daylight factor (D) that would be exceeded over half of the room, i.e. the median daylight factor (this is not the same as the average daylight factor used in the previous standard, BS8206-2). The recommended daylight factor values are location specific. This method will not be discussed in any more detail in this report as the illuminance method is the preferred option.

4.2.1.1 Illuminance Method (Target Illuminance E_T)

The illuminance method "*involves using climatic data for the location of the site (via the use of an appropriate, typical or average year, weather file within the software) to calculate the illuminance from daylight at each point on an assessment grid on the reference plane at an at least hourly interval for a typical year."* (BRE Building Technology Group, 2022)

"A target illuminance (E_T) should be achieved across at least half of the reference plane in a daylit space for at least half of the daylight hours. Another target illuminance (E_{TM}) should also be achieved across 95% of the reference plane for at least half of the daylight hours; this is the minimum target illuminance to be achieved towards the back of the room." (BRE Building Technology Group, 2022)

(Note that since hourly climatic data is used based on the location of the site, location and orientation are accounted for. The target illuminance can therefore be considered a *daylight* metric, i.e. incorporating both skylight and sunlight.)

BS EN 17037 gives three levels of recommendation for daylight provision in interior spaces: minimum, medium and high. For compliance with the standard, a daylit space should achieve the minimum level of recommendation.

Table gives the target illuminances for side lit rooms. Different targets, given in Table A2 of BS EN 17037, apply in spaces with horizontal rooflights.

Table 2: EN 17037 Target Illuminances

Level of recommendation	Target illuminance E_T (lx) for half of assessment grid	Target illuminance E_{TM} (lx) for 95% of assessment grid
Minimum	300	100
Medium	500	300
High	750	500

The guidance contained in BR 209 is intended to be used with BS EN 17037 and its UK National Annex. The UK National Annex gives specific minimum recommendations for habitable rooms in dwellings in the UK. Although Ireland adopted EN17037 directly as IS EN EN17037, it is expected that all councils in Ireland will adopt the UK National Annex recommendations. The Dubin City Council Development Plan 2022-2028 states:

"is important to note that no amendments were made to [the IS EN 17037] document and unlike BS EN 17037, it does not contain a national annex. It offers only a single target for new buildings (there are no space-by-space targets – e.g. a kitchen would have the same target as a warehouse or office). […] These limitations make it unsuitable for use in planning policy or during planning applications. BR 209 must still be used for this purpose."

Even if a predominantly daylit appearance is not achievable for a room in a dwelling, the National Annex NA recommends that the target illuminance values given in Table are exceeded over 50% of the points on a reference plane 0.85 m above the floor, for at least half of the daylight hours.

Table 3: BS EN 17037 NA Target Illuminances for dwellings

Room type	Target illuminance E_T (lx)
Bedroom	100
Living Room	150
Kitchen	200

Where one room in a dwelling serves more than a single purpose, it is recommended that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx.

However, it is recommended that local authorities 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.."* (BRE Building Technology Group, 2022). This may be appropriate in instances where small internal kitchens are unavoidable in apartment developments.

The minimum target illuminance level to be achieved across 95% of the reference plane within a space need not be applied to rooms in dwellings.

To avoid any confusion, the targets in Table are those used for the purposes of this analysis.

The illuminance method is detailed and calculation intensive. It can take some time to process depending on the software, detail of the calculation model and the available computing power hence why the daylight factor (D) method may be preferred by some. However, it can provide additional information beyond the limits of the Daylight Factor method due to the use of hourly climate data.

There are a few ways the results of this type of analysis can be presented. One method is to report the % *area* of the reference plane exceeding the target illuminance E_T (for half of the daylight hours.) (This area should be greater than 50% to meet the BS EN 17037 recommendations.) This is equivalent to Spatial Daylight Autonomy (sDA). BR209 recommends reporting the median illuminance (exceeded over 50% of the reference plane) as this enables comparison with the different recommendations in BS EN 17037. It says that *"As an optional extra, the proportional area of the reference plane exceeding a particular target value may be presented".* It should be noted that the calculation methodology and results are the same in both instances. It is only the *presented* result that differs. For completeness, the results will be presented in both ways, i.e. both of the below metrics will be presented:

- The ***median illuminance*** (the illuminance exceeded over 50% of the reference plane).
- The ***% area*** of the reference plane exceeding a particular target illuminance (lux).

The settings used in the computational model for the illuminance calculations are outlined below:

- The reference/working plane is taken to be 0.85m above the floor.

The settings used in the computational model for the illuminance calculations are outlined below:

- The reference/working plane is taken to be 0.85m above the floor.
- The grid spacing is 0.1m.
- A band of 0.3m from the walls is excluded from the grid.

- Window frame factor is set to 20% (This is based on the size of the window openings and the area of the window which is framing.)
- The glazing transmittance (normal) was set to 0.70.
- The glazing maintenance factor is set to 96% (This accounts for the reduction in glazing transmittance due to dirt; 4% loss of daylight compared with clean glazing.)
- The illuminance calculations take account of light which has been reflected from both external and internal surfaces. In the absence of detailed information on surface reflectances the recommended default reflectances from BR209 2022 have been used. These are detailed in Table below.

Table 4: Surface Reflectances

Surface Type	Reflectance
Interior walls	0.50
Floors	0.20
Ceilings	0.70
Exterior walls and obstructions	0.20
Exterior Ground	0.20

Table 5: Balcony Glazing Properties

Surface Type	Properties
Balcony Glazing	Transmittance: 0.80 Refractive Index: 1.52

4.2.2 Sun lighting

For interiors, access to sunlight can be quantified based on the methodology set out in BS EN 17037.

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

- *at least one main window wall faces within 90° 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.*

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." (BRE Building Technology Group, 2022)

There are 3 levels of recommendation provided in EN 17037 relating to sunlight to a room:

- 1.5 hours is the minimum level,
- 3 hours is the medium level, and
- 4 hours is the high level

For dwellings, as outlined above, at least one habitable room, preferably a main living room, should meet at least the minimum criterion.

4.2.3 Sunlight to Proposed Open Spaces

The BRE Guide recommends:

"*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.*"

The communal open spaces and amenity space are analysed and assessed against the above criterion.

5 Analysis

5.1 Overview of Computational Models

3D models of the proposed development were created. The site plans and 2D drawings provided by the architect were used to correctly position the proposed buildings.

In the following figures the building colours correspond to the following:

- The blue elements are the buildings in the proposed development.

Figure 26: Proposed Model (Plan View)

Figure 27: Proposed Model (Perspective view looking South - West)

5.2 Proposed Development

5.2.1 Daylight Analysis for Proposed Development

The daylight provision in the apartments and duplex units in the proposed development was checked using the target illuminance (E_T) method. The results are presented in the following tables.

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
E-03 3-059									
Ground	R1	KD	429	96%	200	50%	50%	4380	YES
	R2	Living Room	293	100%	150	50%	50%	4380	YES
First	R1	Bedroom	269	100%	100	50%	50%	4380	YES
	R2	Bedroom	263	100%	100	50%	50%	4380	YES
	R3	Bedroom	354	100%	100	50%	50%	4380	YES
B-03 3-056									
Ground	R1	Living Room	279	98%	150	50%	50%	4380	YES
	R2	KD	691	100%	200	50%	50%	4380	YES
First	R1	Bedroom	636	100%	100	50%	50%	4380	YES
	R2	Bedroom	250	100%	100	50%	50%	4380	YES
	R3	Bedroom	465	100%	100	50%	50%	4380	YES
	R4	Bedroom	786	100%	100	50%	50%	4380	YES
G-03 3-003									
Ground	R1	LKD	282	71%	200	50%	50%	4380	YES
First	R1	Bedroom	242	100%	100	50%	50%	4380	YES
	R2	Bedroom	387	100%	100	50%	50%	4380	YES

Table 6: Illuminance Results – Proposed Ground & First Floor of House E-03 3-059, B-03 3-056 & G-03 3-003

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
D-03 3-008									
Ground	R1	Living Room	210	97%	150	50%	50%	4380	YES
	R2	KD	428	100%	200	50%	50%	4380	YES
First	R1	Bedroom	196	100%	100	50%	50%	4380	YES
	R2	Bedroom	383	100%	100	50%	50%	4380	YES
	R3	Bedroom	467	100%	100	50%	50%	4380	YES
F-02 2-035									
Ground	R1	KD	368	99%	200	50%	50%	4380	YES
	R2	Living Room	352	100%	150	50%	50%	4380	YES
First	R1	Bedroom	207	94%	100	50%	50%	4380	YES
	R2	Bedroom	513	100%	100	50%	50%	4380	YES
	R3	Bedroom	209	99%	100	50%	50%	4380	YES
H-02 2-039									
Ground	R1	LKD	358	97%	200	50%	50%	4380	YES
First	R1	Bedroom	214	100%	100	50%	50%	4380	YES
	R2	Bedroom	207	96%	100	50%	50%	4380	YES

Table 6: Illuminance Results – Proposed Ground & First Floor of House D-03 3-008, F-02 2-035 & H-02 2-039

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
F-02 2-037									
Ground	R1	KD	397	99%	200	50%	50%	4380	YES
	R2	Living Room	345	99%	150	50%	50%	4380	YES
First	R1	Bedroom	206	94%	100	50%	50%	4380	YES
	R2	Bedroom	522	100%	100	50%	50%	4380	YES
	R3	Bedroom	215	99%	100	50%	50%	4380	YES
G-02 2-043									
Ground	R1	LKD	250	61%	200	50%	50%	4380	YES
First	R1	Bedroom	262	100%	100	50%	50%	4380	YES
	R2	Bedroom	331	100%	100	50%	50%	4380	YES
D-02 2-048									
Ground	R1	KD	405	100%	200	50%	50%	4380	YES
	R2	Living Room	243	100%	150	50%	50%	4380	YES
First	R1	Bedroom	401	100%	100	50%	50%	4380	YES
	R2	Bedroom	361	100%	100	50%	50%	4380	YES
	R3	Bedroom	214	100%	100	50%	50%	4380	YES

Table 7: Illuminance Results – Proposed Ground & First Floor of House F-02 2-037, G-02 2-043 & D-02 2-048

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
B-03 3-027									
Ground	R1	Living Room	332	100%	150	50%	50%	4380	YES
	R2	KD	836	100%	200	50%	50%	4380	YES
First	R1	Bedroom	705	100%	100	50%	50%	4380	YES
	R2	Bedroom	261	100%	100	50%	50%	4380	YES
	R3	Bedroom	465	100%	100	50%	50%	4380	YES
	R4	Bedroom	888	100%	100	50%	50%	4380	YES
B-03 3-013									
Ground	R1	Living Room	350	100%	150	50%	50%	4380	YES
	R2	KD	566	100%	200	50%	50%	4380	YES
First	R1	Bedroom	282	100%	100	50%	50%	4380	YES
	R2	Bedroom	651	100%	100	50%	50%	4380	YES
	R3	Bedroom	650	100%	100	50%	50%	4380	YES
	R4	Bedroom	383	100%	100	50%	50%	4380	YES
F-02 2-001									
Ground	R1	KD	390	100%	200	50%	50%	4380	YES
	R2	Living Room	362	99%	150	50%	50%	4380	YES
First	R1	Bedroom	235	98%	100	50%	50%	4380	YES
	R2	Bedroom	571	100%	100	50%	50%	4380	YES
	R3	Bedroom	237	99%	100	50%	50%	4380	YES

Table 8: Illuminance Results – Proposed Ground & First Floor of House B-03 3-027, B-03 3-013 & F-02 2-001

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
G-02 2-003									
Ground	R1	LKD	239	57%	200	50%	50%	4380	YES
First	R1	Bedroom	265	100%	100	50%	50%	4380	YES
	R2	Bedroom	296	100%	100	50%	50%	4380	YES
B-02 2-008									
Ground	R1	KD	605	100%	200	50%	50%	4380	YES
	R2	Living Room	328	100%	150	50%	50%	4380	YES
First	R1	Bedroom	582	100%	100	50%	50%	4380	YES
	R2	Bedroom	660	100%	100	50%	50%	4380	YES
	R3	Bedroom	269	100%	100	50%	50%	4380	YES
	R4	Bedroom	398	100%	100	50%	50%	4380	YES
B-02 2-056									
Ground	R1	KD	513	98%	200	50%	50%	4380	YES
	R2	Living Room	469	100%	150	50%	50%	4380	YES
First	R1	Bedroom	301	100%	100	50%	50%	4380	YES
	R2	Bedroom	557	100%	100	50%	50%	4380	YES
	R3	Bedroom	889	100%	100	50%	50%	4380	YES
	R4	Bedroom	371	100%	100	50%	50%	4380	YES

Table 9: Illuminance Results – Proposed Ground & First Floor of House G-02 2-003, B-02 2-008 & B-02 2-056

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
D-02 2-072									
Ground	R1	KD	339	96%	200	50%	50%	4380	YES
	R2	Living Room	305	100%	150	50%	50%	4380	YES
First	R1	Bedroom	300	100%	100	50%	50%	4380	YES
	R2	Bedroom	335	100%	100	50%	50%	4380	YES
	R3	Bedroom	269	100%	100	50%	50%	4380	YES
G-02 2-073									
Ground	R1	LKD	268	66%	200	50%	50%	4380	YES
First	R1	Bedroom	281	100%	100	50%	50%	4380	YES
	R2	Bedroom	339	100%	100	50%	50%	4380	YES
D-02 2-074									
Ground	R1	KD	355	98%	200	50%	50%	4380	YES
	R2	Living Room	314	100%	150	50%	50%	4380	YES
First	R1	Bedroom	350	100%	100	50%	50%	4380	YES
	R2	Bedroom	317	100%	100	50%	50%	4380	YES
	R3	Bedroom	270	100%	100	50%	50%	4380	YES

Table 10: Illuminance Results – Proposed Ground & First Floor of House D-02 2-072, G-02 2-073 & D-02 2-074

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
D-02 2-087									
Ground	R1	KD	328	89%	200	50%	50%	4380	YES
	R2	Living Room	246	100%	150	50%	50%	4380	YES
First	R1	Bedroom	292	100%	100	50%	50%	4380	YES
	R2	Bedroom	350	100%	100	50%	50%	4380	YES
	R3	Bedroom	228	100%	100	50%	50%	4380	YES
E-02 2-088									
Ground	R1	KD	389	93%	200	50%	50%	4380	YES
	R2	Living Room	230	99%	150	50%	50%	4380	YES
First	R1	Bedroom	269	100%	100	50%	50%	4380	YES
	R2	Bedroom	255	100%	100	50%	50%	4380	YES
	R3	Bedroom	282	100%	100	50%	50%	4380	YES
B-02 2-089									
Ground	R1	KD	574	100%	200	50%	50%	4380	YES
	R2	Living Room	306	99%	150	50%	50%	4380	YES
First	R1	Bedroom	574	100%	100	50%	50%	4380	YES
	R2	Bedroom	643	100%	100	50%	50%	4380	YES
	R3	Bedroom	258	100%	100	50%	50%	4380	YES
	R4	Bedroom	375	100%	100	50%	50%	4380	YES

Table 11: Illuminance Results – Proposed Ground & First Floor of House D-02 2-087, E-02 2-088 & B-02 2-089

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
House 3 Block E									
Ground	R1	Bedroom	214	100%	100	50%	50%	4380	YES
	R2	Bedroom	292	100%	100	50%	50%	4380	YES
	R3	LKD	289	86%	200	50%	50%	4380	YES
First	R1	Bedroom	224	100%	100	50%	50%	4380	YES
	R2	Bedroom	293	100%	100	50%	50%	4380	YES
	R3	LKD	483	97%	200	50%	50%	4380	YES
House 2 Block E									
Ground	R1	Bedroom	210	100%	100	50%	50%	4380	YES
	R2	Bedroom	288	100%	100	50%	50%	4380	YES
	R3	LKD	200	50%	200	50%	50%	4380	YES
First	R1	Bedroom	199	100%	100	50%	50%	4380	YES
	R2	Bedroom	288	100%	100	50%	50%	4380	YES
	R3	LKD	358	94%	200	50%	50%	4380	YES
House 1 Block E									
Ground	R1	LKD	242	62%	200	50%	50%	4380	YES
	R2	Bedroom	281	100%	100	50%	50%	4380	YES
	R3	Bedroom	214	100%	100	50%	50%	4380	YES
First	R1	LKD	437	88%	200	50%	50%	4380	YES
	R2	Bedroom	281	100%	100	50%	50%	4380	YES
	R3	Bedroom	211	100%	100	50%	50%	4380	YES

Table 12: Illuminance Results – Proposed Ground & First Floor of House 1,2 & 3 Block E

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Apt. Block B									
Ground	R1	LKD	487	100%	200	50%	50%	4380	YES
	R2	LKD	661	100%	200	50%	50%	4380	YES
	R3	Bedroom	330	100%	100	50%	50%	4380	YES
	R4	Bedroom	188	96%	100	50%	50%	4380	YES
	R5	Bedroom	167	91%	100	50%	50%	4380	YES
	R6	LKD	234	57%	200	50%	50%	4380	YES
	R7	LKD	225	57%	200	50%	50%	4380	YES
	R8	Bedroom	168	88%	100	50%	50%	4380	YES
	R9	Bedroom	164	94%	100	50%	50%	4380	YES
	R10	Bedroom	138	81%	100	50%	50%	4380	YES
	R11	LKD	579	98%	200	50%	50%	4380	YES
	R12	Bedroom	312	100%	100	50%	50%	4380	YES
	R13	Bedroom	395	100%	100	50%	50%	4380	YES
First	R1	LKD	451	100%	200	50%	50%	4380	YES
	R2	LKD	605	100%	200	50%	50%	4380	YES
	R3	Bedroom	325	100%	100	50%	50%	4380	YES
	R4	Bedroom	288	100%	100	50%	50%	4380	YES
	R5	Bedroom	158	91%	100	50%	50%	4380	YES
	R6	LKD	220	53%	200	50%	50%	4380	YES
	R7	LKD	212	51%	200	50%	50%	4380	YES
	R8	Bedroom	161	95%	100	50%	50%	4380	YES
	R9	Bedroom	265	100%	100	50%	50%	4380	YES
	R10	Bedroom	145	94%	100	50%	50%	4380	YES
	R11	LKD	615	100%	200	50%	50%	4380	YES
	R12	LKD	653	100%	200	50%	50%	4380	YES
	R13	Bedroom	166	96%	100	50%	50%	4380	YES
	R14	Bedroom	153	94%	100	50%	50%	4380	YES
	R15	LKD	260	65%	200	50%	50%	4380	YES
	R16	LKD	258	65%	200	50%	50%	4380	YES
	R17	Bedroom	169	96%	100	50%	50%	4380	YES
	R18	Bedroom	295	100%	100	50%	50%	4380	YES
	R19	Bedroom	381	100%	100	50%	50%	4380	YES

Table 13: Illuminance Results – Proposed Ground & First Floor of Apt. Block B

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Apt. Block B									
Second	R1	LKD	471	100%	200	50%	50%	4380	YES
	R2	LKD	620	100%	200	50%	50%	4380	YES
	R3	Bedroom	338	100%	100	50%	50%	4380	YES
	R4	Bedroom	305	100%	100	50%	50%	4380	YES
	R5	Bedroom	164	92%	100	50%	50%	4380	YES
	R6	LKD	234	57%	200	50%	50%	4380	YES
	R7	LKD	229	56%	200	50%	50%	4380	YES
	R8	Bedroom	173	95%	100	50%	50%	4380	YES
	R9	Bedroom	281	100%	100	50%	50%	4380	YES
	R10	Bedroom	161	96%	100	50%	50%	4380	YES
	R11	LKD	668	100%	200	50%	50%	4380	YES
	R12	LKD	690	100%	200	50%	50%	4380	YES
	R13	Bedroom	173	96%	100	50%	50%	4380	YES
	R14	Bedroom	158	96%	100	50%	50%	4380	YES
	R15	LKD	271	66%	200	50%	50%	4380	YES
	R16	LKD	271	67%	200	50%	50%	4380	YES
	R17	Bedroom	176	97%	100	50%	50%	4380	YES
	R18	Bedroom	316	100%	100	50%	50%	4380	YES
	R19	Bedroom	406	100%	100	50%	50%	4380	YES
Third	R1	LKD	531	100%	200	50%	50%	4380	YES
	R2	LKD	716	100%	200	50%	50%	4380	YES
	R3	Bedroom	347	100%	100	50%	50%	4380	YES
	R4	Bedroom	329	100%	100	50%	50%	4380	YES
	R5	Bedroom	205	95%	100	50%	50%	4380	YES
	R6	LKD	258	61%	200	50%	50%	4380	YES
	R7	LKD	251	60%	200	50%	50%	4380	YES
	R8	Bedroom	214	97%	100	50%	50%	4380	YES
	R9	Bedroom	301	100%	100	50%	50%	4380	YES
	R10	Bedroom	214	99%	100	50%	50%	4380	YES
	R11	LKD	729	100%	200	50%	50%	4380	YES
	R12	LKD	738	100%	200	50%	50%	4380	YES
	R13	Bedroom	218	99%	100	50%	50%	4380	YES
	R14	Bedroom	216	99%	100	50%	50%	4380	YES
	R15	LKD	297	72%	200	50%	50%	4380	YES
	R16	LKD	292	71%	200	50%	50%	4380	YES
	R17	Bedroom	223	99%	100	50%	50%	4380	YES
	R18	Bedroom	326	100%	100	50%	50%	4380	YES
	R19	Bedroom	414	100%	100	50%	50%	4380	YES

Table 14: Illuminance Results – Proposed Second & Third Floor of Apt. Block B

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
House 2 Block D									
Ground	R1	Bedroom	232	100%	100	50%	50%	4380	YES
	R2	Bedroom	323	100%	100	50%	50%	4380	YES
	R3	LKD	213	54%	200	50%	50%	4380	YES
First	R1	Bedroom	245	100%	100	50%	50%	4380	YES
	R2	Bedroom	343	100%	100	50%	50%	4380	YES
	R3	LKD	352	73%	200	50%	50%	4380	YES
House 1 Block D									
Ground	R1	LKD	247	70%	200	50%	50%	4380	YES
	R2	Bedroom	323	100%	100	50%	50%	4380	YES
	R3	Bedroom	240	100%	100	50%	50%	4380	YES
First	R1	LKD	378	74%	200	50%	50%	4380	YES
	R2	Bedroom	340	100%	100	50%	50%	4380	YES
	R3	Bedroom	252	100%	100	50%	50%	4380	YES

Table 15: Illuminance Results – Proposed Ground & First Floor of House 1 & 2 Block D

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
House 2 Block C									
Ground	R1	Bedroom	266	100%	100	50%	50%	4380	YES
	R2	Bedroom	361	100%	100	50%	50%	4380	YES
	R3	LKD	284	88%	200	50%	50%	4380	YES
First	R1	Bedroom	196	100%	100	50%	50%	4380	YES
	R2	Bedroom	263	100%	100	50%	50%	4380	YES
	R3	LKD	240	68%	200	50%	50%	4380	YES
House 1 Block C									
Ground	R1	LKD	255	78%	200	50%	50%	4380	YES
	R2	Bedroom	322	100%	100	50%	50%	4380	YES
	R3	Bedroom	239	100%	100	50%	50%	4380	YES
First	R1	LKD	416	99%	200	50%	50%	4380	YES
	R2	Bedroom	267	100%	100	50%	50%	4380	YES
	R3	Bedroom	198	100%	100	50%	50%	4380	YES

Table 16: Illuminance Results – Proposed Ground & First Floor of House 1 & 2 Block C

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Apt. Blocl A									
Lower Ground	R1	LKD	747	100%	200	50%	50%	4380	YES
	R2	Bedroom	214	99%	100	50%	50%	4380	YES
	R3	LKD	304	75%	200	50%	50%	4380	YES
	R4	Bedroom	212	99%	100	50%	50%	4380	YES
	R5	LKD	256	61%	200	50%	50%	4380	YES
	R6	Bedroom	210	95%	100	50%	50%	4380	YES
	R7	Bedroom	207	99%	100	50%	50%	4380	YES
	R8	Bedroom	360	100%	100	50%	50%	4380	YES
	R9	LKD	721	100%	200	50%	50%	4380	YES
Ground	R1	LKD	657	100%	200	50%	50%	4380	YES
	R2	Bedroom	167	96%	100	50%	50%	4380	YES
	R3	Bedroom	293	100%	100	50%	50%	4380	YES
	R4	Bedroom	174	95%	100	50%	50%	4380	YES
	R5	LKD	217	54%	200	50%	50%	4380	YES
	R6	LKD	225	55%	200	50%	50%	4380	YES
	R7	Bedroom	170	95%	100	50%	50%	4380	YES
	R8	Bedroom	303	100%	100	50%	50%	4380	YES
	R9	Bedroom	331	100%	100	50%	50%	4380	YES
	R10	LKD	617	100%	200	50%	50%	4380	YES
	R11	LKD	429	100%	200	50%	50%	4380	YES
	R12	Bedroom	329	100%	100	50%	50%	4380	YES
	R13	Bedroom	236	100%	100	50%	50%	4380	YES
	R14	Bedroom	131	78%	100	50%	50%	4380	YES
	R15	LKD	202	51%	200	50%	50%	4380	YES
	R16	LKD	203	51%	200	50%	50%	4380	YES
	R17	Bedroom	133	79%	100	50%	50%	4380	YES
	R18	Bedroom	128	76%	100	50%	50%	4380	YES
	R19	LKD	578	97%	200	50%	50%	4380	YES

Table 17: Illuminance Results – Proposed Lower Ground & Ground Floor of Apt. Block A

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Apt. Blocl A									
First	R1	LKD	698	100%	200	50%	50%	4380	YES
	R2	Bedroom	212	99%	100	50%	50%	4380	YES
	R3	Bedroom	313	100%	100	50%	50%	4380	YES
	R4	Bedroom	212	97%	100	50%	50%	4380	YES
	R5	LKD	239	59%	200	50%	50%	4380	YES
	R6	LKD	242	59%	200	50%	50%	4380	YES
	R7	Bedroom	212	97%	100	50%	50%	4380	YES
	R8	Bedroom	326	100%	100	50%	50%	4380	YES
	R9	Bedroom	336	100%	100	50%	50%	4380	YES
	R10	LKD	707	100%	200	50%	50%	4380	YES
	R11	LKD	453	100%	200	50%	50%	4380	YES
	R12	Bedroom	367	100%	100	50%	50%	4380	YES
	R13	Bedroom	270	100%	100	50%	50%	4380	YES
	R14	Bedroom	150	94%	100	50%	50%	4380	YES
	R15	LKD	233	59%	200	50%	50%	4380	YES
	R16	LKD	234	59%	200	50%	50%	4380	YES
	R17	Bedroom	152	94%	100	50%	50%	4380	YES
	R18	Bedroom	152	94%	100	50%	50%	4380	YES
	R19	LKD	627	100%	200	50%	50%	4380	YES
Second	R1	LKD	532	100%	200	50%	50%	4380	YES
	R2	Bedroom	585	100%	100	50%	50%	4380	YES
	R3	Bedroom	416	100%	100	50%	50%	4380	YES
	R4	Bedroom	487	100%	100	50%	50%	4380	YES
	R5	LKD	634	100%	200	50%	50%	4380	YES
	R6	LKD	533	100%	200	50%	50%	4380	YES
	R7	Bedroom	389	100%	100	50%	50%	4380	YES
	R8	Bedroom	297	100%	100	50%	50%	4380	YES
	R9	Bedroom	206	97%	100	50%	50%	4380	YES
	R10	LKD	270	66%	200	50%	50%	4380	YES
	R11	LKD	273	66%	200	50%	50%	4380	YES
	R12	Bedroom	203	99%	100	50%	50%	4380	YES
	R13	Bedroom	203	97%	100	50%	50%	4380	YES
	R14	LKD	685	100%	200	50%	50%	4380	YES

Table 18: Illuminance Results – Proposed First & Second Floor of Apt. Block A

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
D-03 3-064									
Ground	R1	KD	327	92%	200	50%	50%	4380	YES
	R2	Living Room	314	100%	150	50%	50%	4380	YES
First	R1	Bedroom	328	100%	100	50%	50%	4380	YES
	R2	Bedroom	300	100%	100	50%	50%	4380	YES
	R3	Bedroom	275	100%	100	50%	50%	4380	YES
G-02 2-054									
Ground	R1	LKD	293	69%	200	50%	50%	4380	YES
First	R1	Bedroom	230	100%	100	50%	50%	4380	YES
	R2	Bedroom	387	100%	100	50%	50%	4380	YES
E-03 3-073									
Ground	R1	KD	380	94%	200	50%	50%	4380	YES
	R2	Living Room	285	100%	150	50%	50%	4380	YES
First	R1	Bedroom	240	100%	100	50%	50%	4380	YES
	R2	Bedroom	251	100%	100	50%	50%	4380	YES
	R3	Bedroom	346	100%	100	50%	50%	4380	YES

Table 19: Illuminance Results – Proposed First & Second Floor of House D-03 3-064, G-02 2-054 & E-03 3-073

Table 20: Illuminance Results Summary

Property	Number of Rooms Tested	Rooms satisfying Criteria		Rooms not satisfying Criteria
		No.	%	
E-03 3-059	5	5	100%	0
B-03 3-056	6	6	100%	0
G-03 3-003	3	3	100%	0
D-03 3-008	5	5	100%	0
F-02 2-035	5	5	100%	0
H-02 2-039	3	3	100%	0
F-02 2-037	5	5	100%	0
G-02 2-043	3	3	100%	0
D-02 2-048	5	5	100%	0
B-03 3-027	6	6	100%	0
B-03 3-013	6	6	100%	0
F-02 2-001	5	5	100%	0
G-02 2-003	3	3	100%	0
B-02 2-008	6	6	100%	0
B-02 2-056	6	6	100%	0
D-02 2-072	5	5	100%	0
G-02 2-073	3	3	100%	0
D-02 2-074	5	5	100%	0
D-02 2-087	5	5	100%	0
E-02 2-088	5	5	100%	0
B-02 2-089	6	6	100%	0
House 3 Block E	6	6	100%	0
House 2 Block E	6	6	100%	0
House 1 Block E	6	6	100%	0
Apt. Block B	70	70	100%	0
House 2 Block D	6	6	100%	0
House 1 Block D	6	6	100%	0
House 2 Block C	6	6	100%	0
House 1 Block C	6	6	100%	0
Apt. Blocl A	61	61	100%	0
D-03 3-064	5	5	100%	0
G-02 2-054	3	3	100%	0
E-03 3-073	5	5	100%	0
Total	**287**	**287**	**100%**	**0**

A summary of the results is provided above for the residential units. The results show that 100% of all rooms meet or exceed the BRE's minimum recommendations for internal daylight provision in dwellings. Therefore, we believe the proposed development performs at an exemplar level for a scheme of this scale and aligns to national policy to ensure high quality sustainable development.

5.2.2 Sunlight to Proposed Amenity Spaces

The BRE guide recommends:

"*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.*"

The main communal open spaces and the open space was analysed. These areas are identified in the following figures and labelled for reference in the results *Table 21*

Figure 28: Proposed Amenity Space, 2hr Sunlight Test

Table 21: Open Spaces 2hr Sunlight Test Results

Open Space	Area (m^2)	2hr Sun Area (m^2)	% Area	Meets Criteria
Amenity Area A1	3016.88	2999.73	99.43%	YES
Amenity Area A2	2076.67	2076.67	100.00%	YES
Amenity Area A3	6765.53	6726.52	99.42%	YES
Amenity Area A4	1103.58	1097.35	99.43%	YES
Communal Space Area	490.28	479.46	97.79%	YES
Total	13452.95	13379.73	99.46%	YES

The results show the open spaces receive greater than 2 hours of sunlight on March 21st. The spaces exceed the recommended criteria for sunlight. It should be noted that the amenity area is in excess of the required area for such a scheme also.

6 Conclusion

The analysis and assessments in this report have been carried out in line with the recommendations of BRE's "Site Layout Planning for daylight and sunlight, a Guide to good practice" (BRE Building Technology Group, 2022) and BS EN 17037.

In terms of internal daylight levels within the proposed development, the results show that 100% of all rooms meet or exceed the BRE's minimum recommendations for internal daylight provision in dwellings. Therefore, we believe the proposed development performs at an exemplar level for a scheme of this scale and aligns to national policy to ensure high quality sustainable development.

In order to maximise available light, glazing to all habitable rooms is in excess of 20%. The design team have developed the proposed building using the principles of the BREs "Site Layout Planning for Daylight and Sunlight, A guide to good practice".

In terms of the amenity spaces provided the results show the open spaces receives greater than 2 hours of sunlight on March 21st. All spaces exceed the recommended criteria for sunlight. It should be noted that the amenity area is in excess of the required area for such a scheme.

Overall, the development has been designed with due consideration for sunlight and daylight and meets the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022)."

Appendix A Proposed Illuminance Contours (with Room & Window Legends)

A.1 Proposed Houses & Apartments

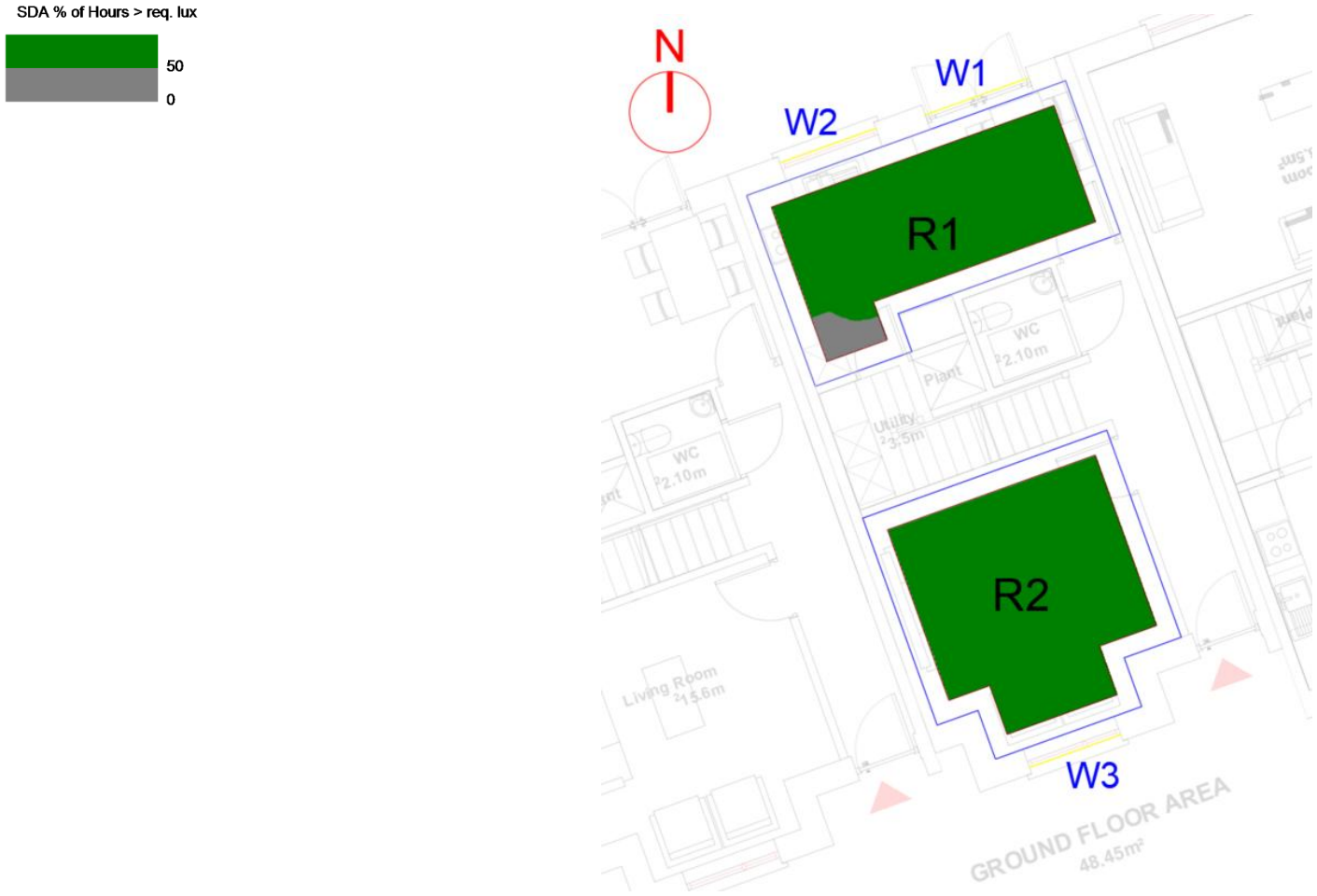
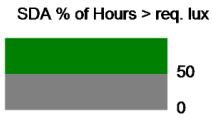


Figure 29: Proposed Ground Floor sDA Contours of House E-03 3-059



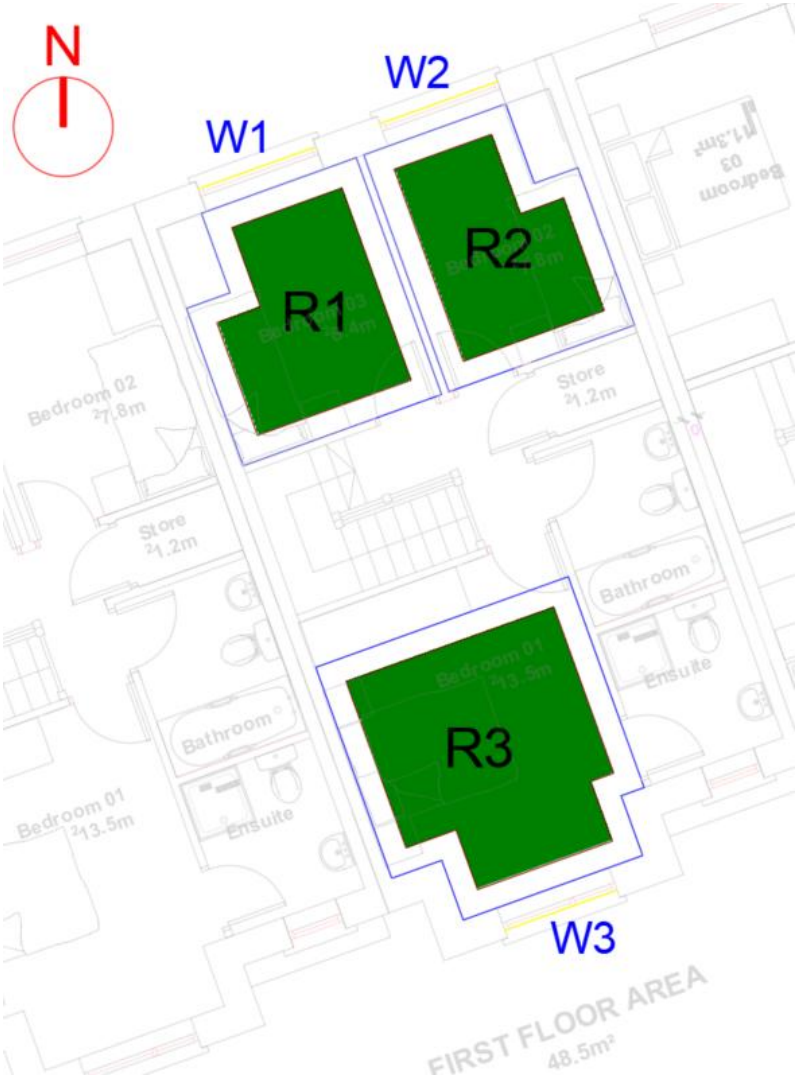


Figure 30: Proposed First Floor sDA Contours of House E-03 3-059

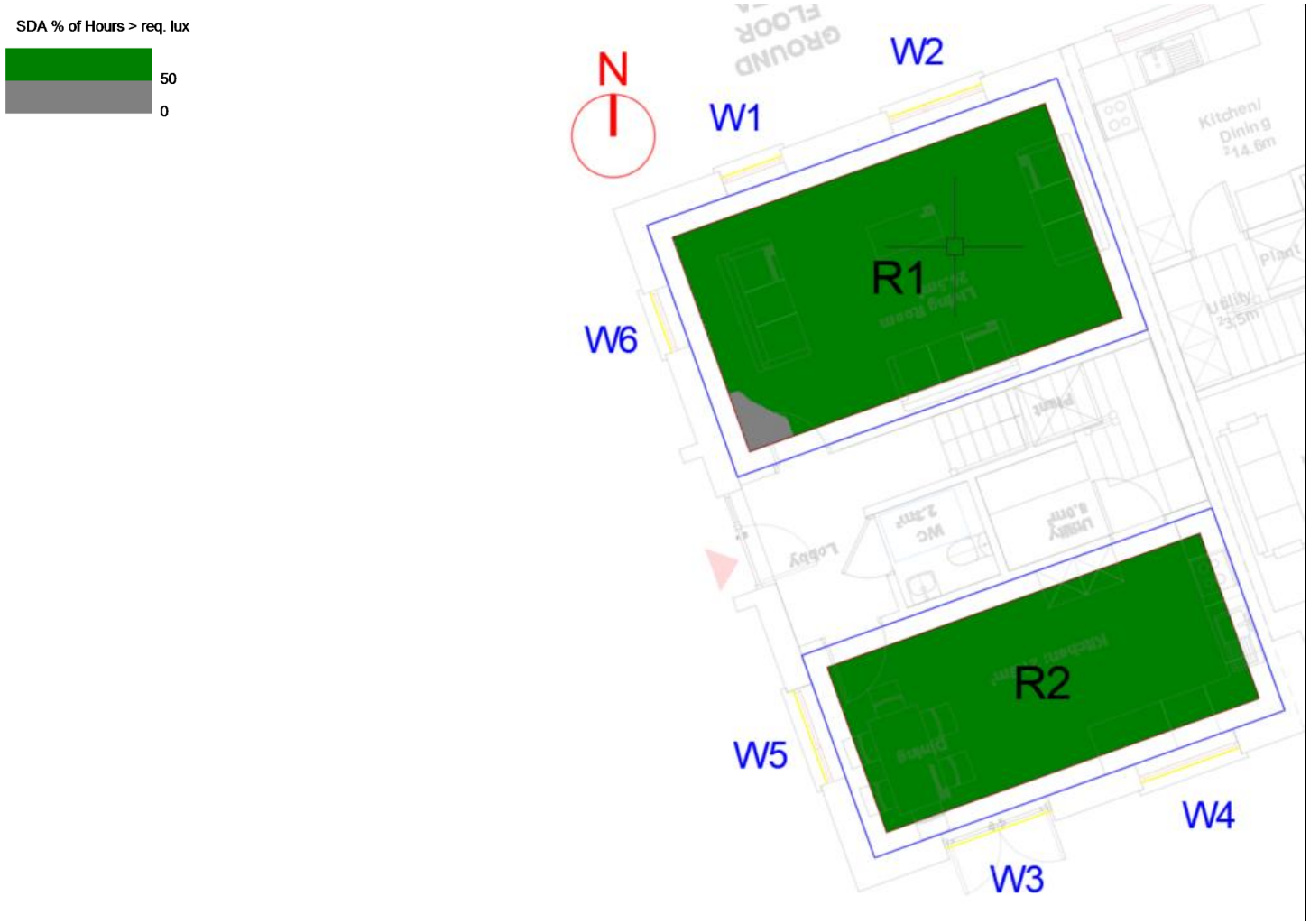


Figure 31: Proposed Ground Floor sDA Contours of House B-03 3-056

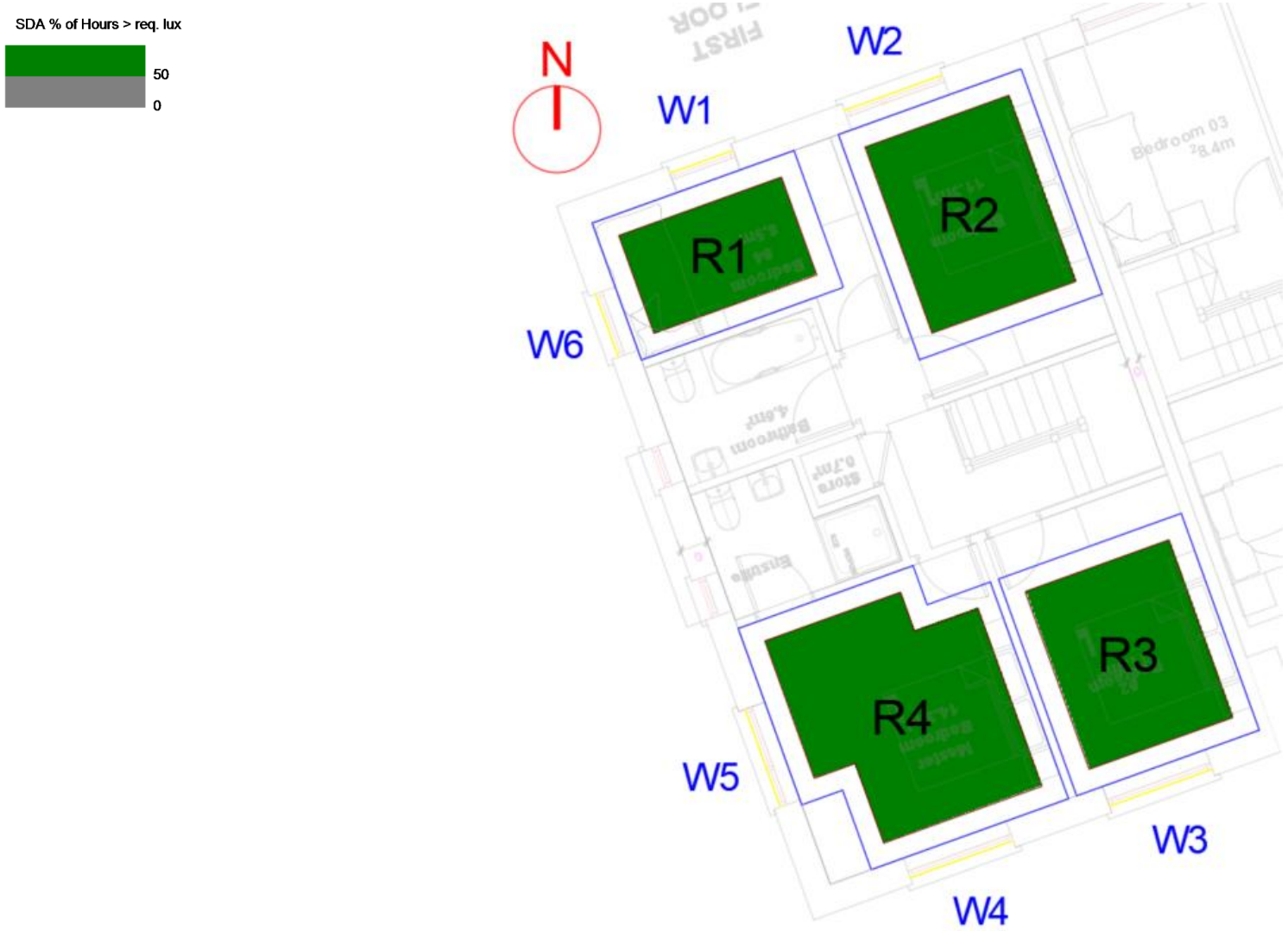


Figure 32: Proposed First Floor sDA Contours of House B-03 3-056

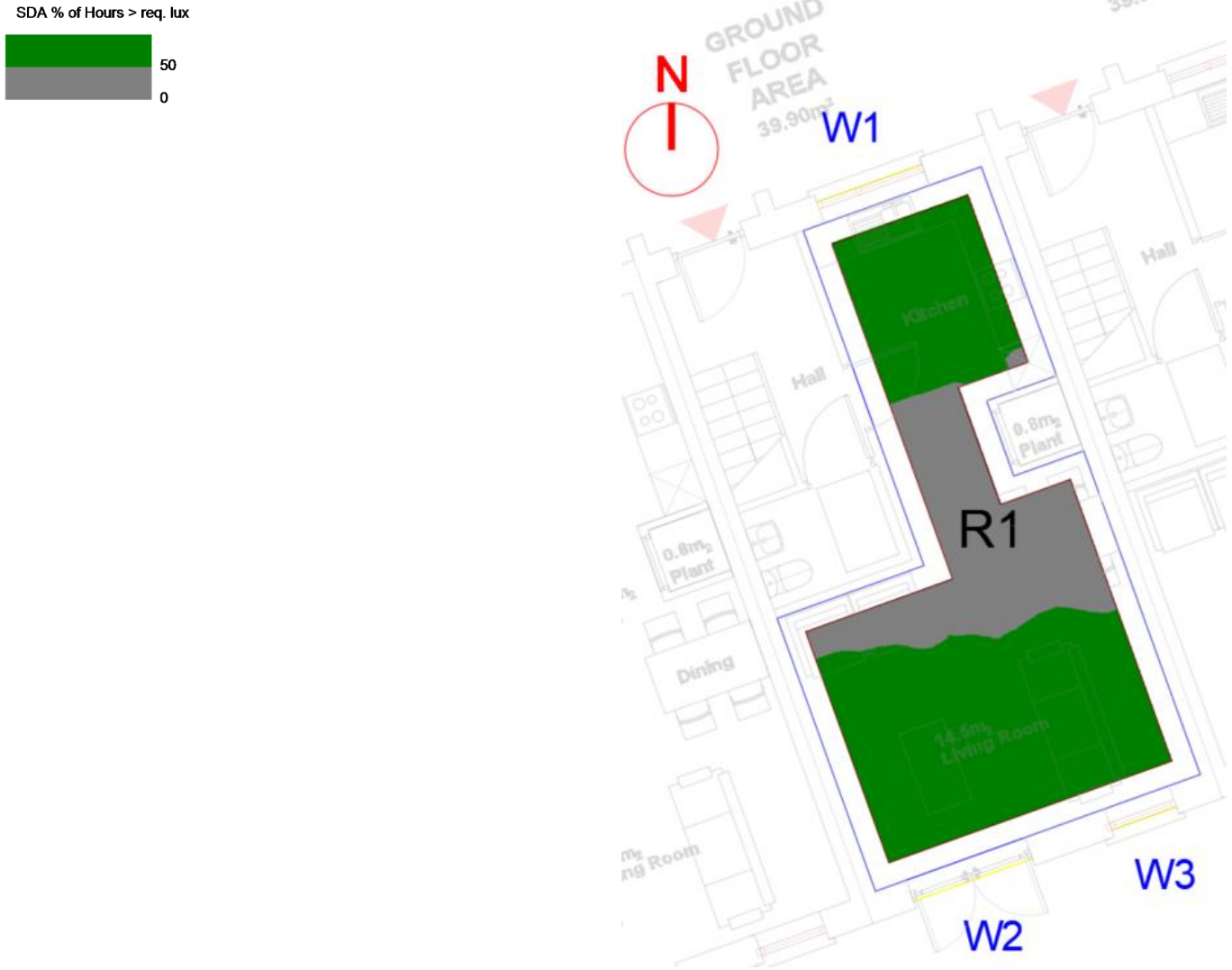
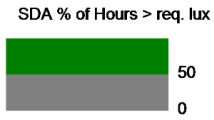


Figure 33: Proposed Ground Floor sDA Contours of House G-03 3-003



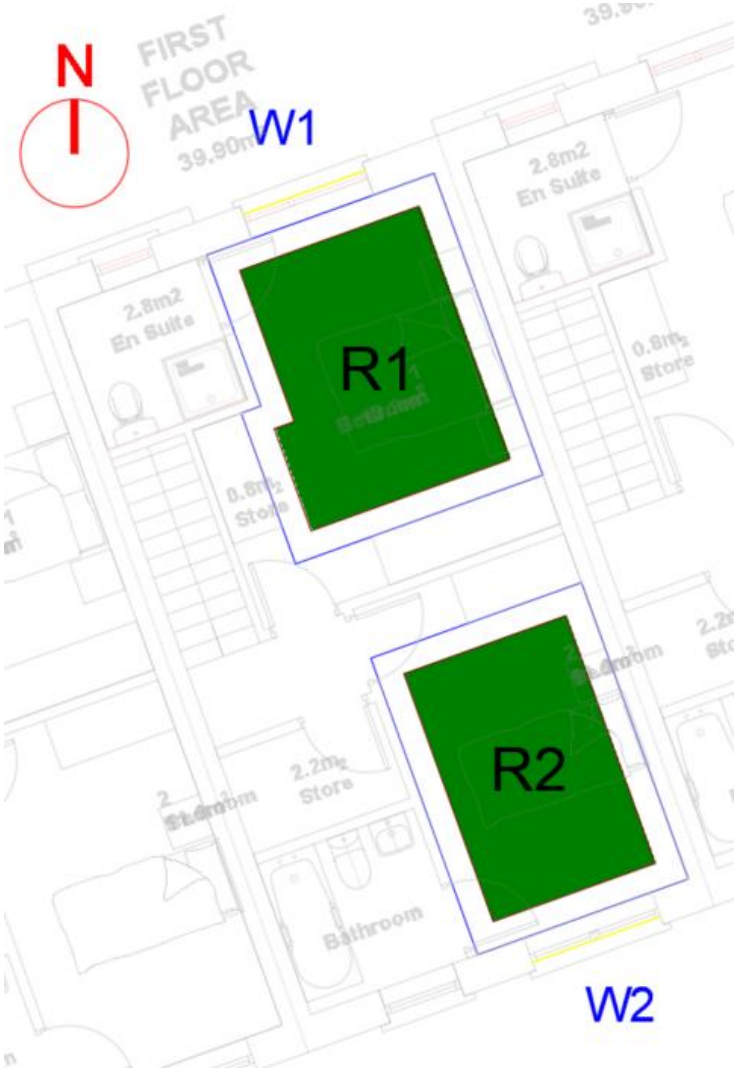


Figure 34: Proposed First Floor sDA Contours of House G-03 3-003

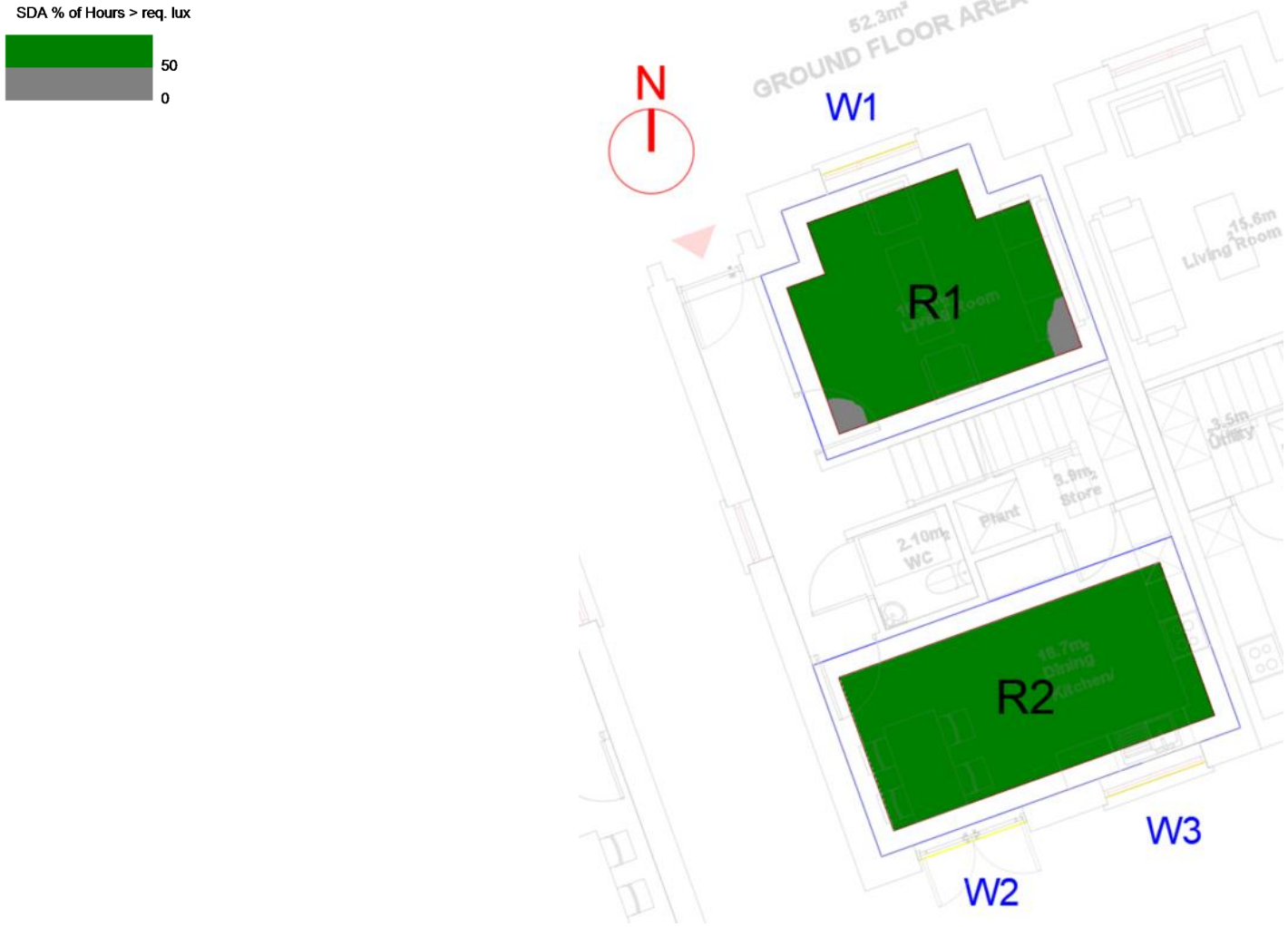


Figure 35: Proposed Ground Floor sDA Contours of House D-03 3-008

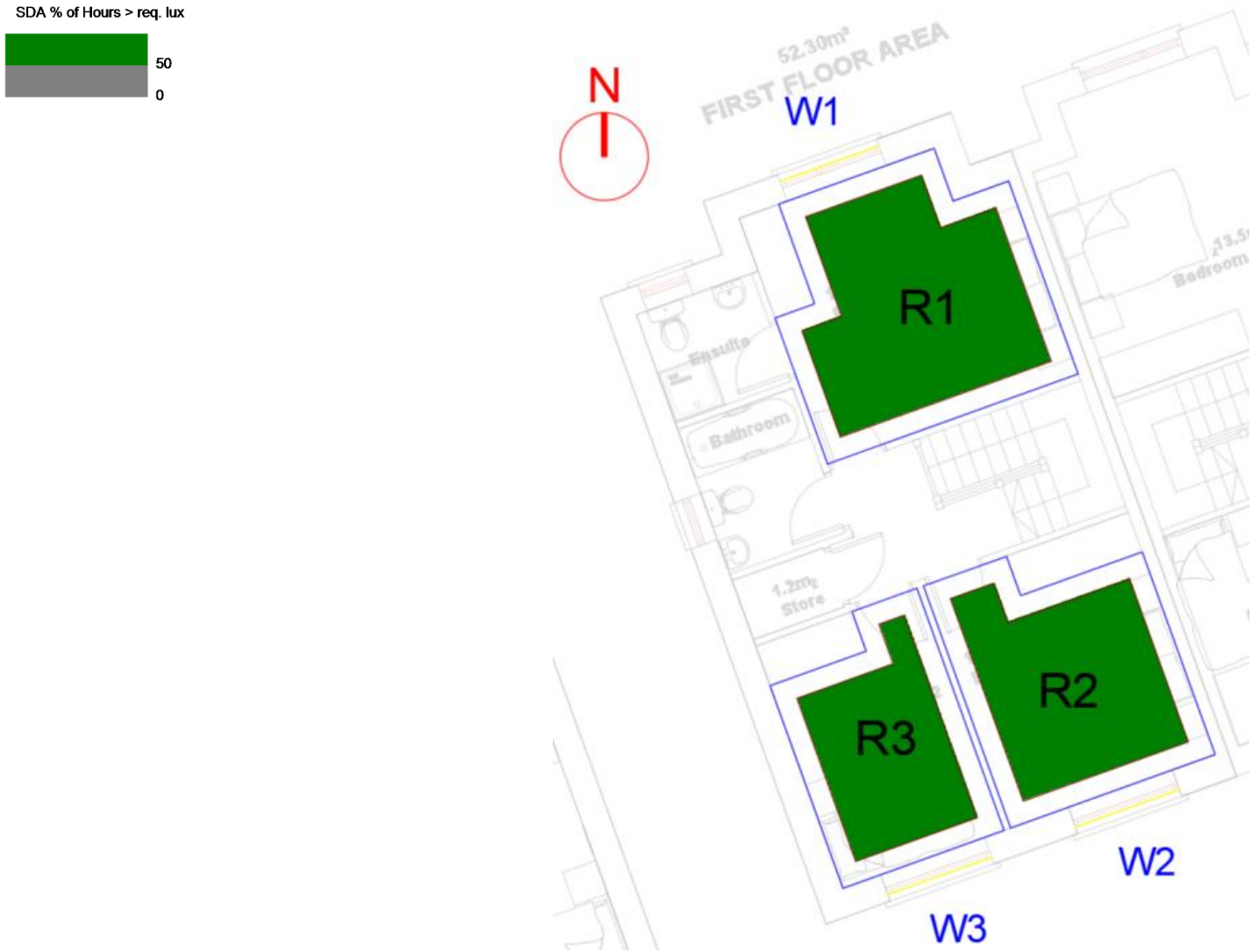


Figure 36: Proposed First Floor sDA Contours of House D-03 3-008

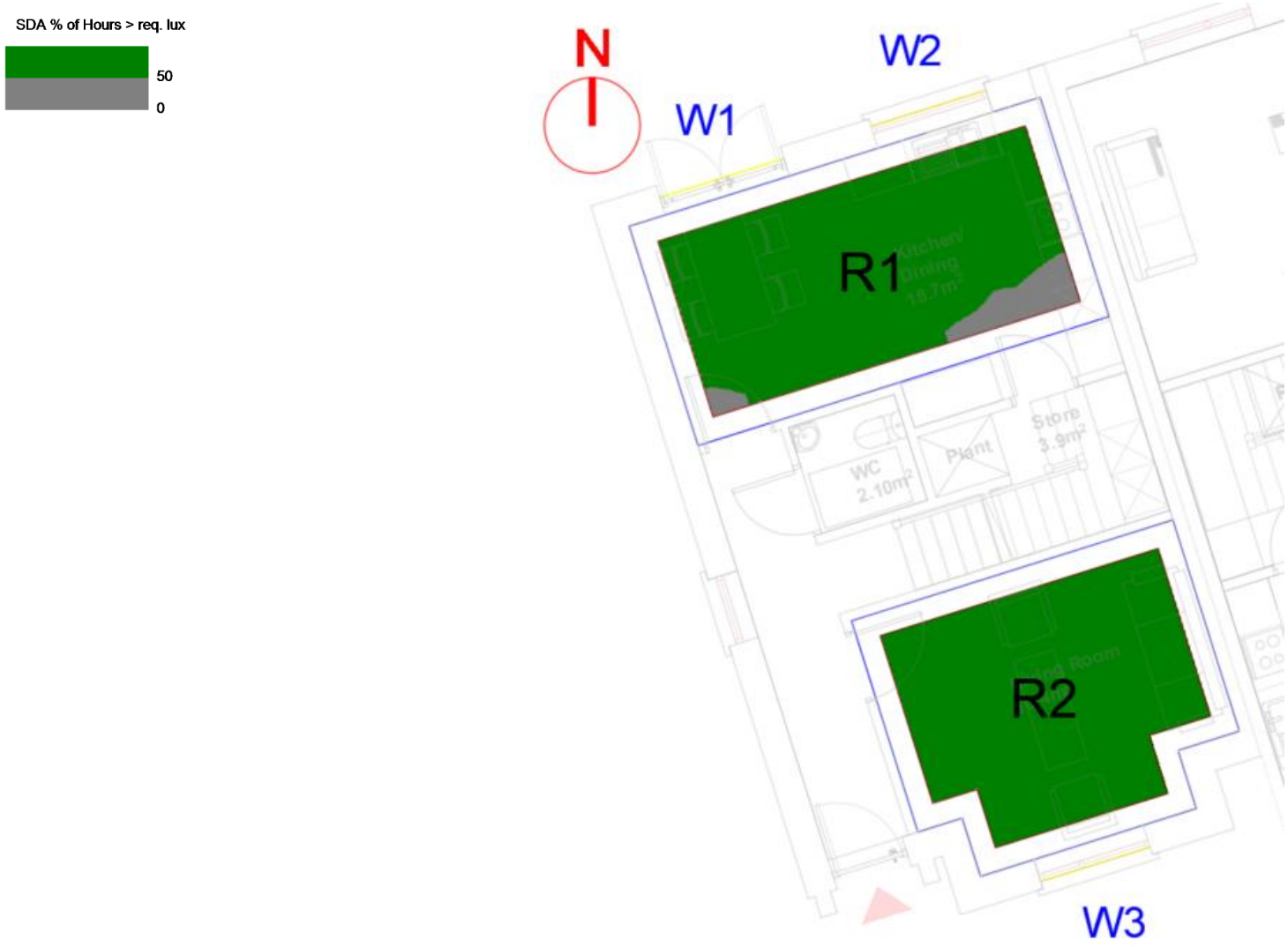


Figure 37: Proposed Ground Floor sDA Contours of House D-03 3-064

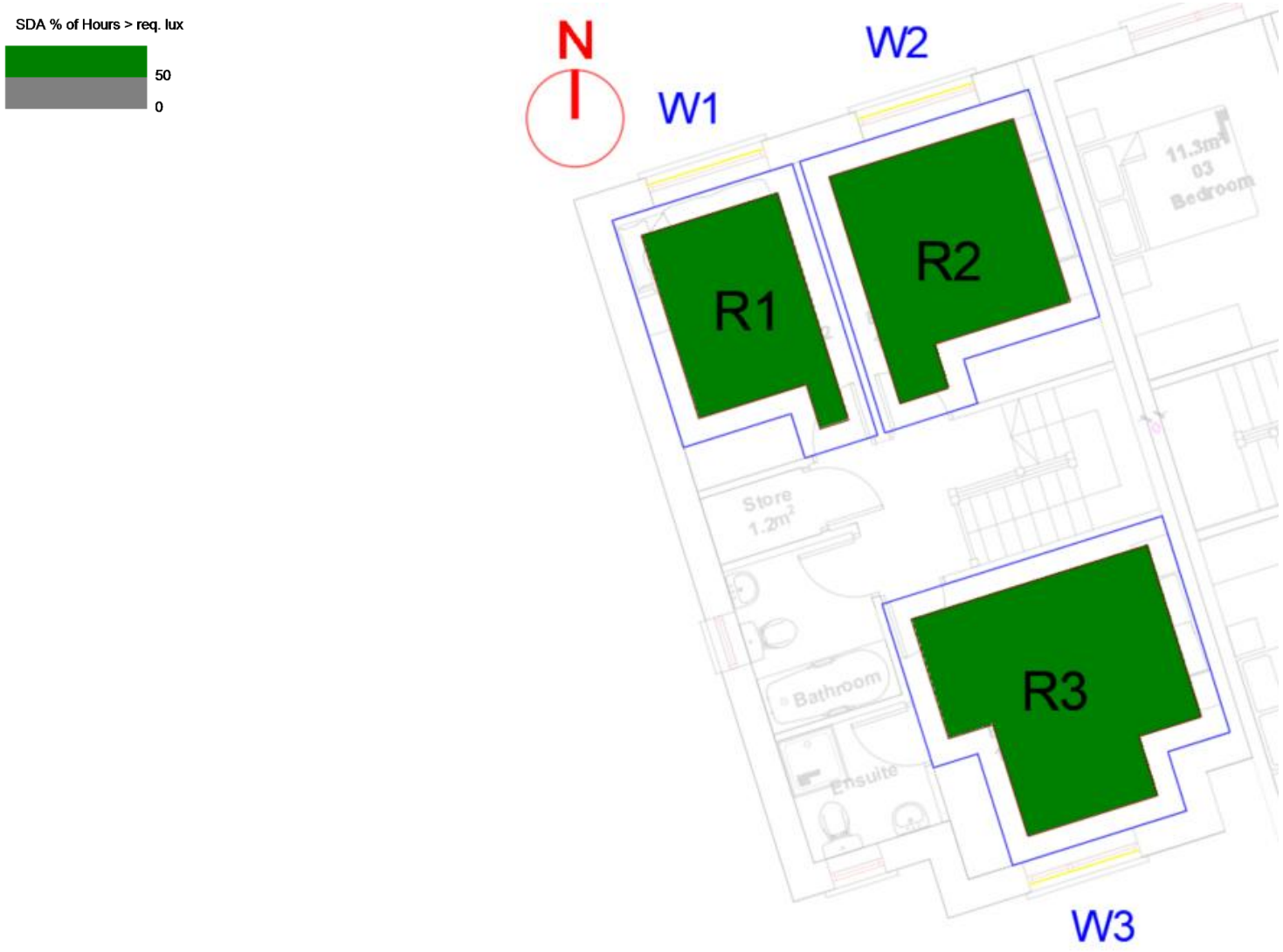


Figure 38: Proposed First Floor sDA Contours of House D-03 3-064

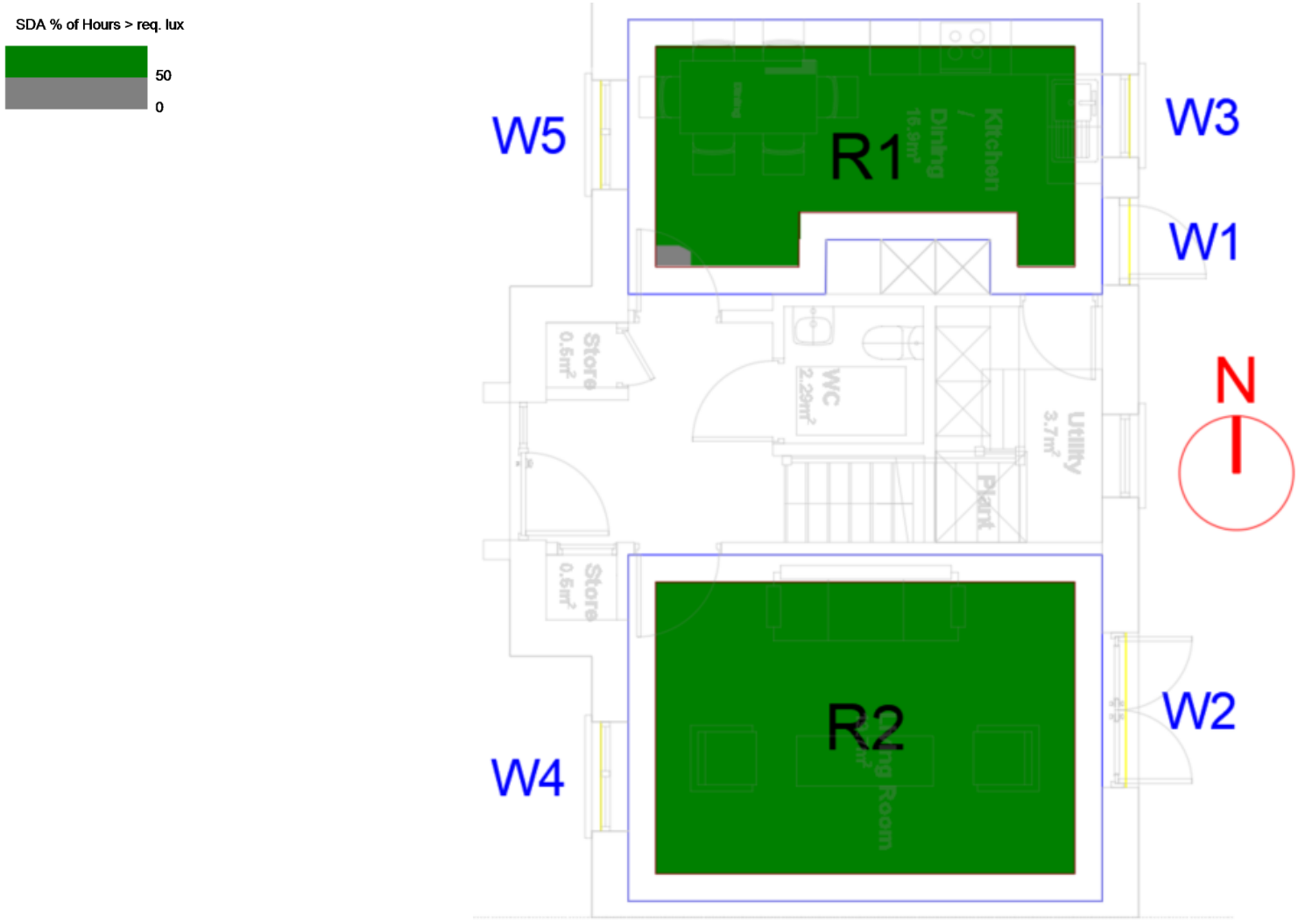


Figure 39: Proposed Ground Floor sDA Contours of House F-02 2-035

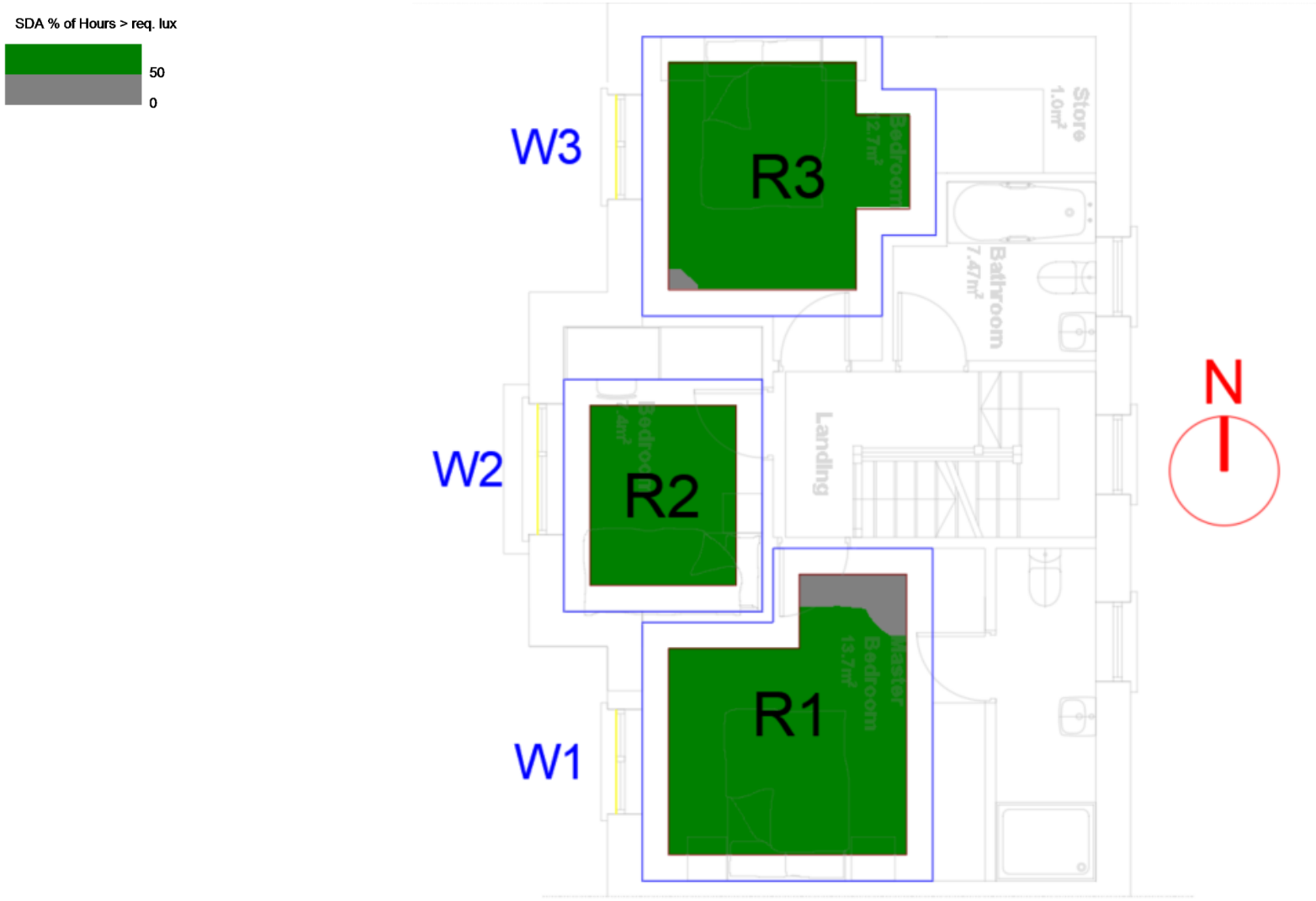


Figure 40: Proposed First Floor sDA Contours of House F-02 2-035

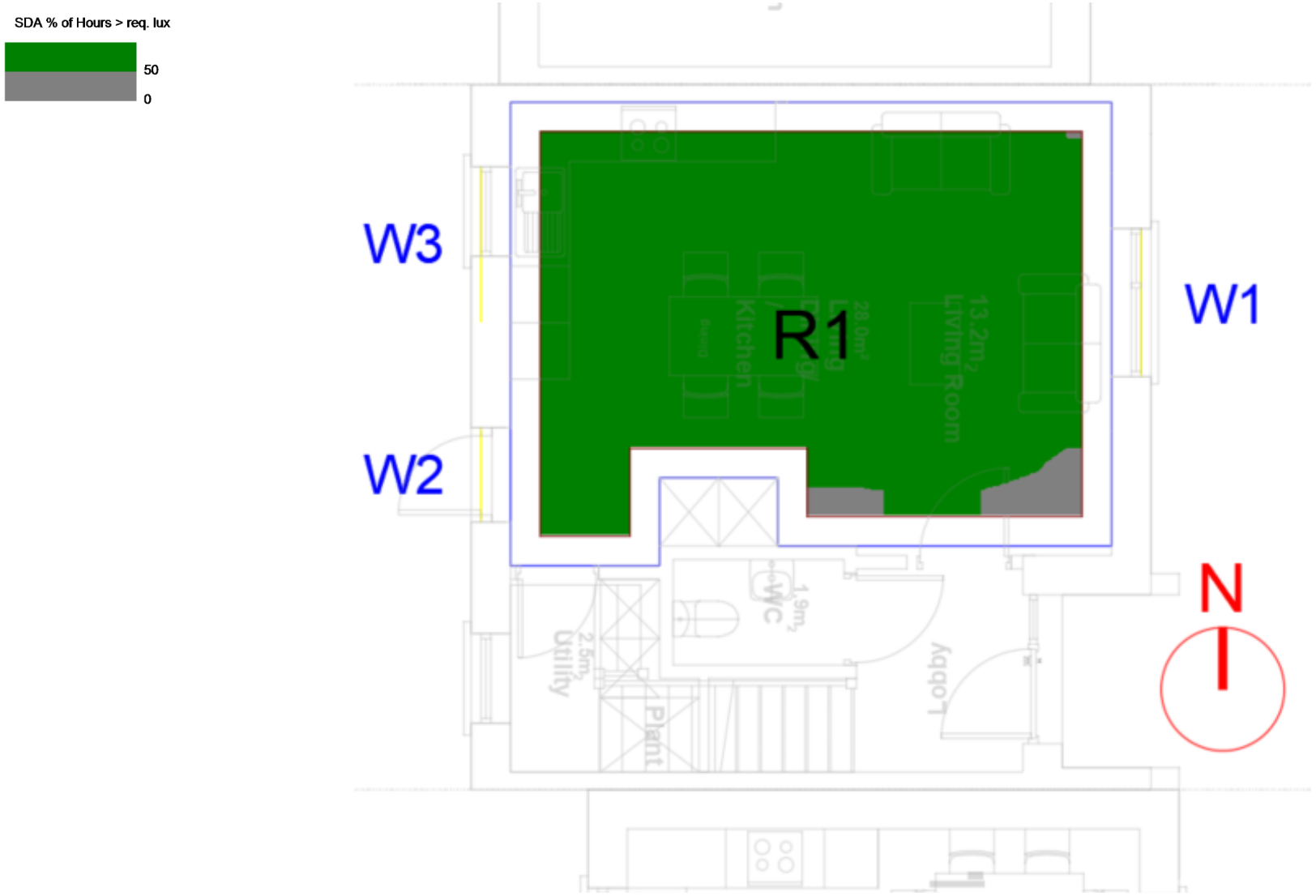


Figure 41: Proposed Ground Floor sDA Contours of House H-02 2-039

Figure 42: Proposed First Floor sDA Contours of House H-02 2-039

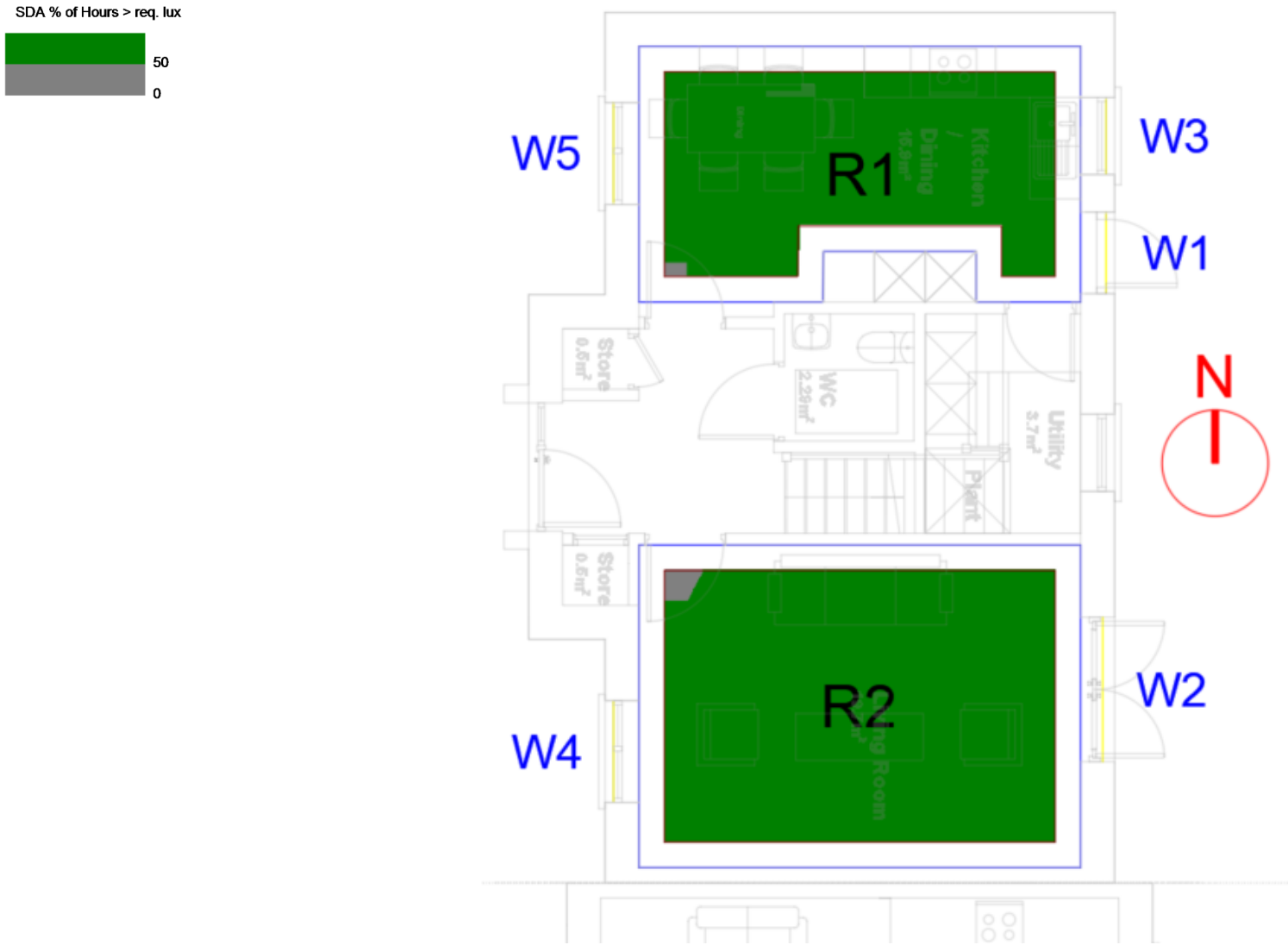


Figure 43: Proposed Ground Floor sDA Contours of House F-02 2-037

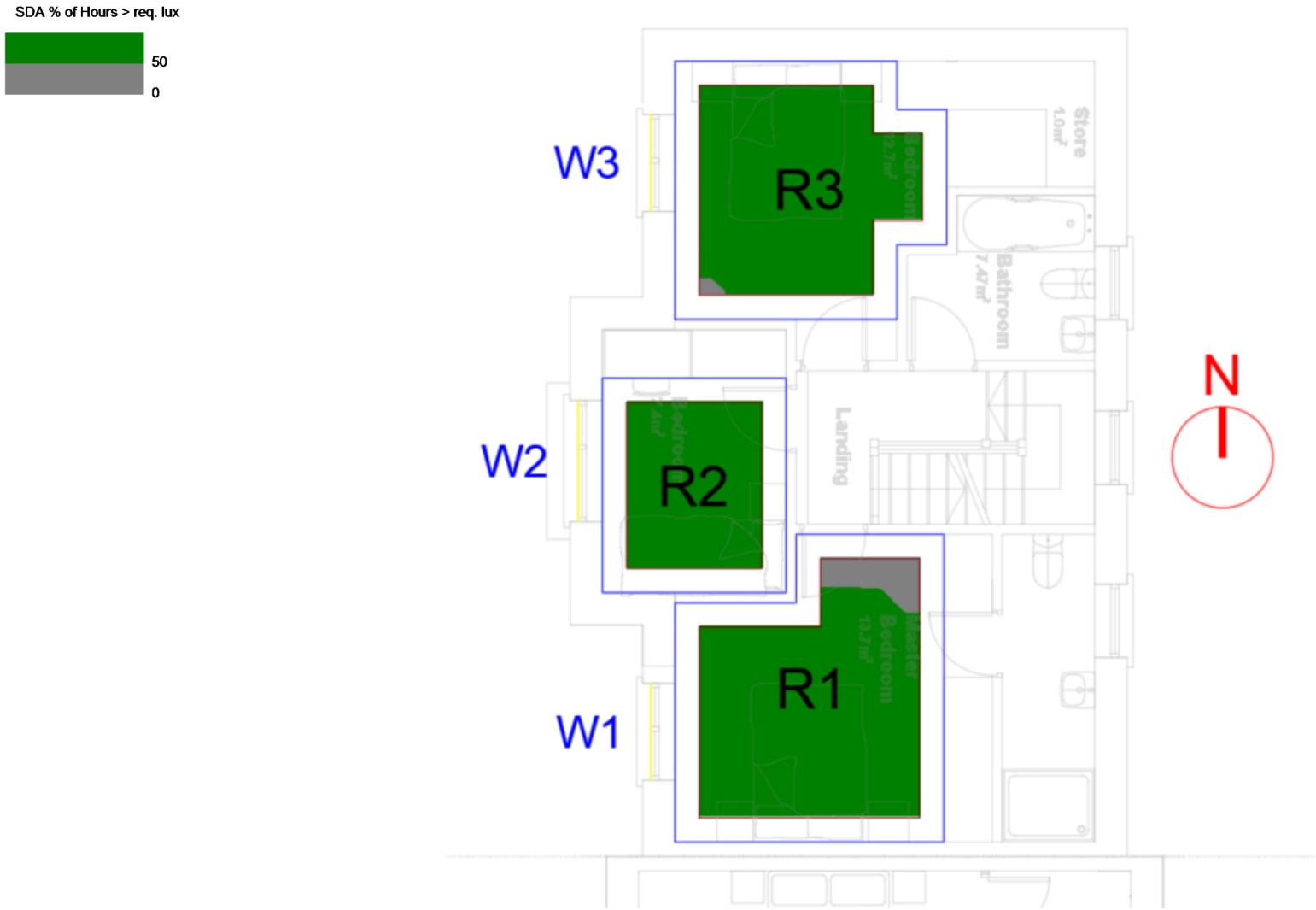


Figure 44: Proposed First Floor sDA Contours of House F-02 2-037

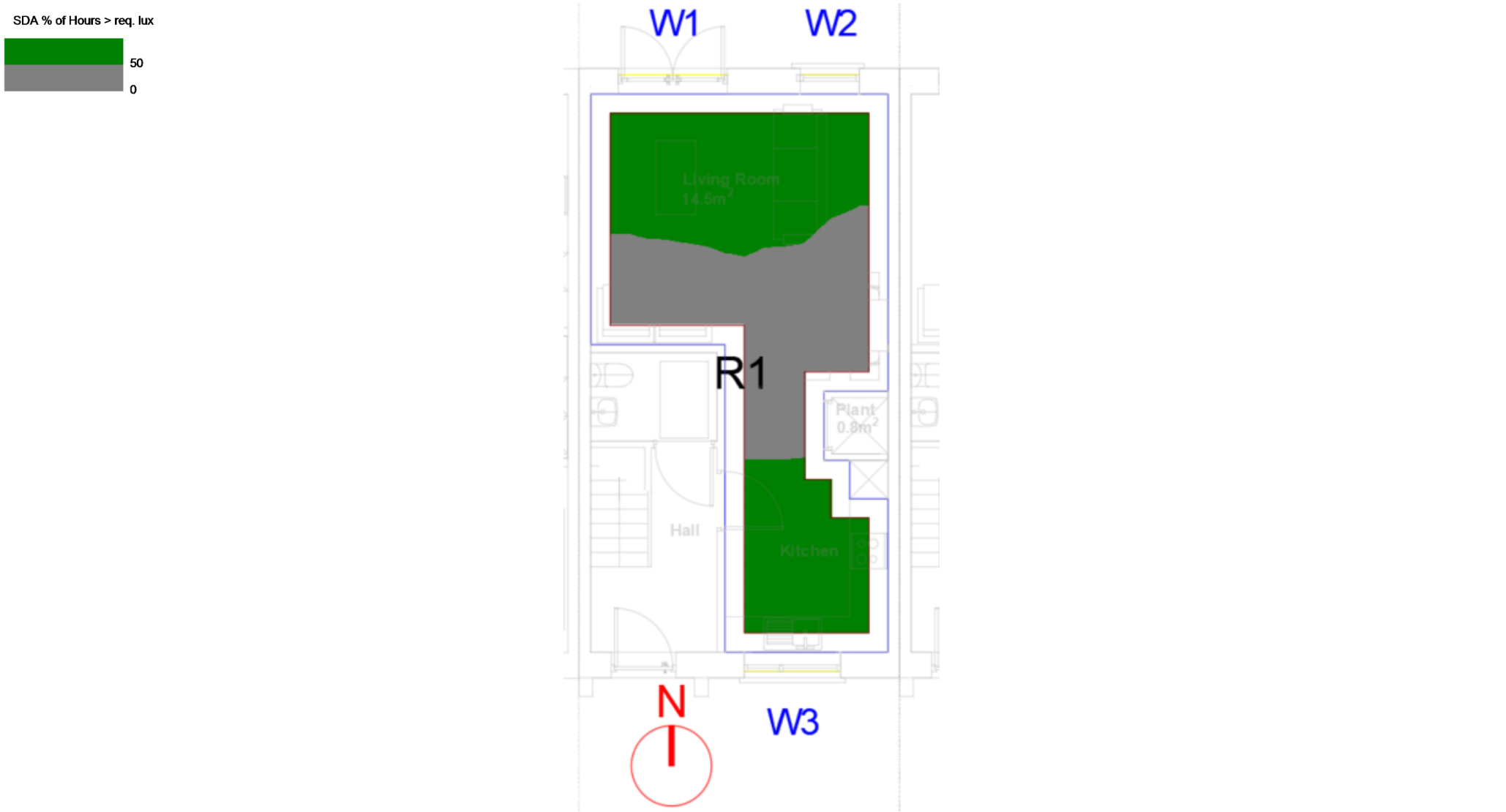


Figure 45: Proposed Ground Floor sDA Contours of House G-02 2-043

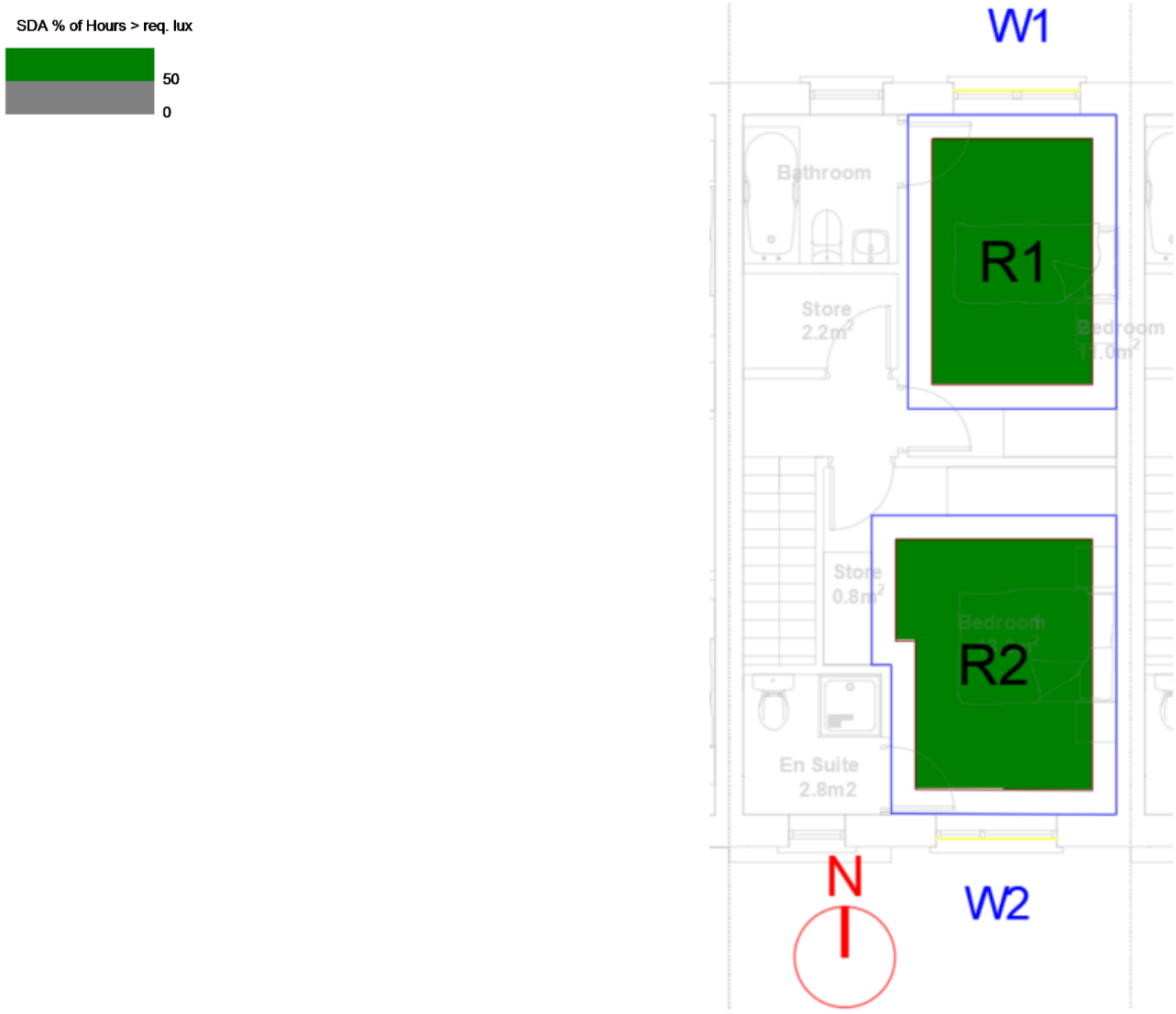


Figure 46: Proposed First Floor sDA Contours of House G-02 2-043

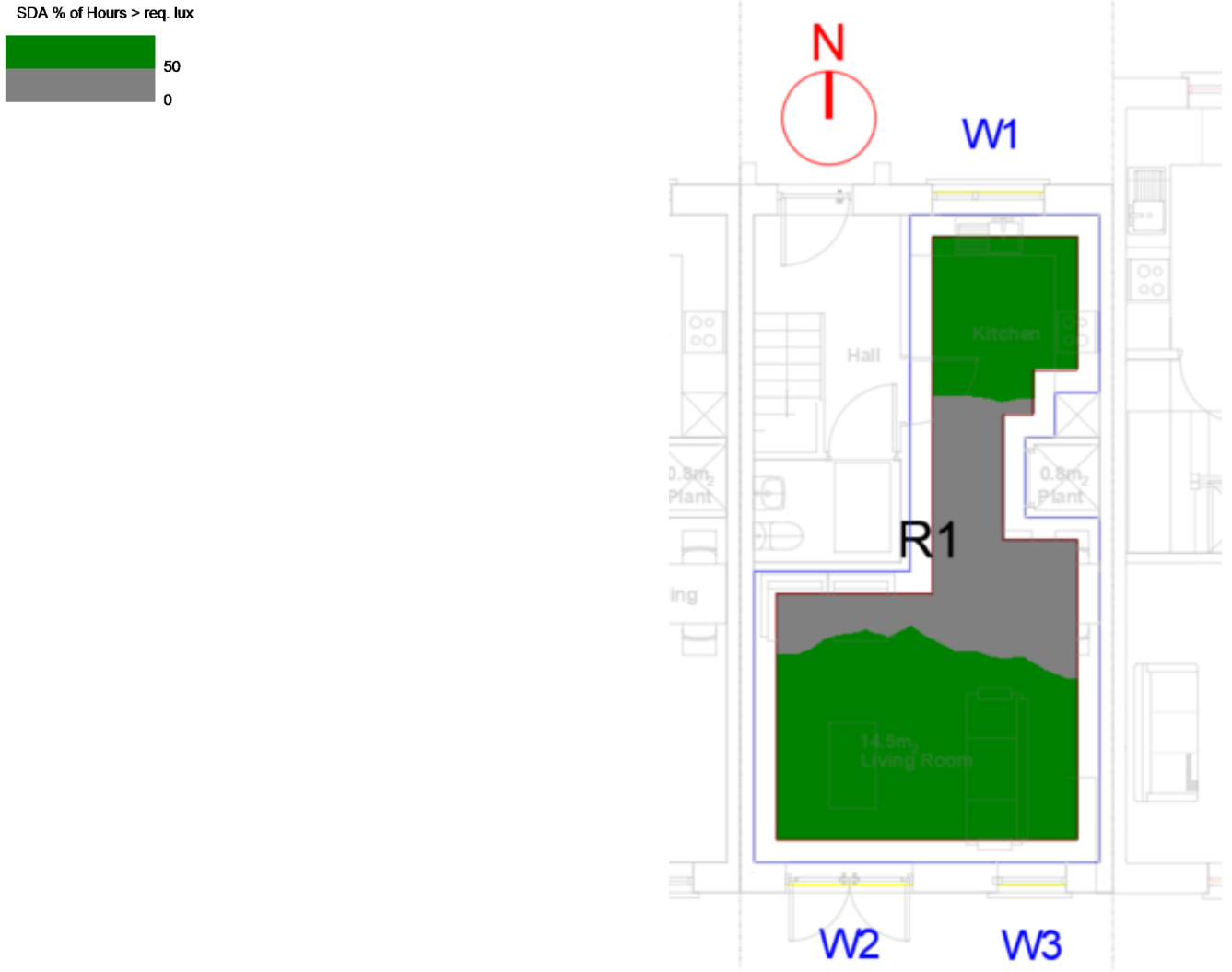


Figure 47: Proposed Ground Floor sDA Contours of House G-02 2-054

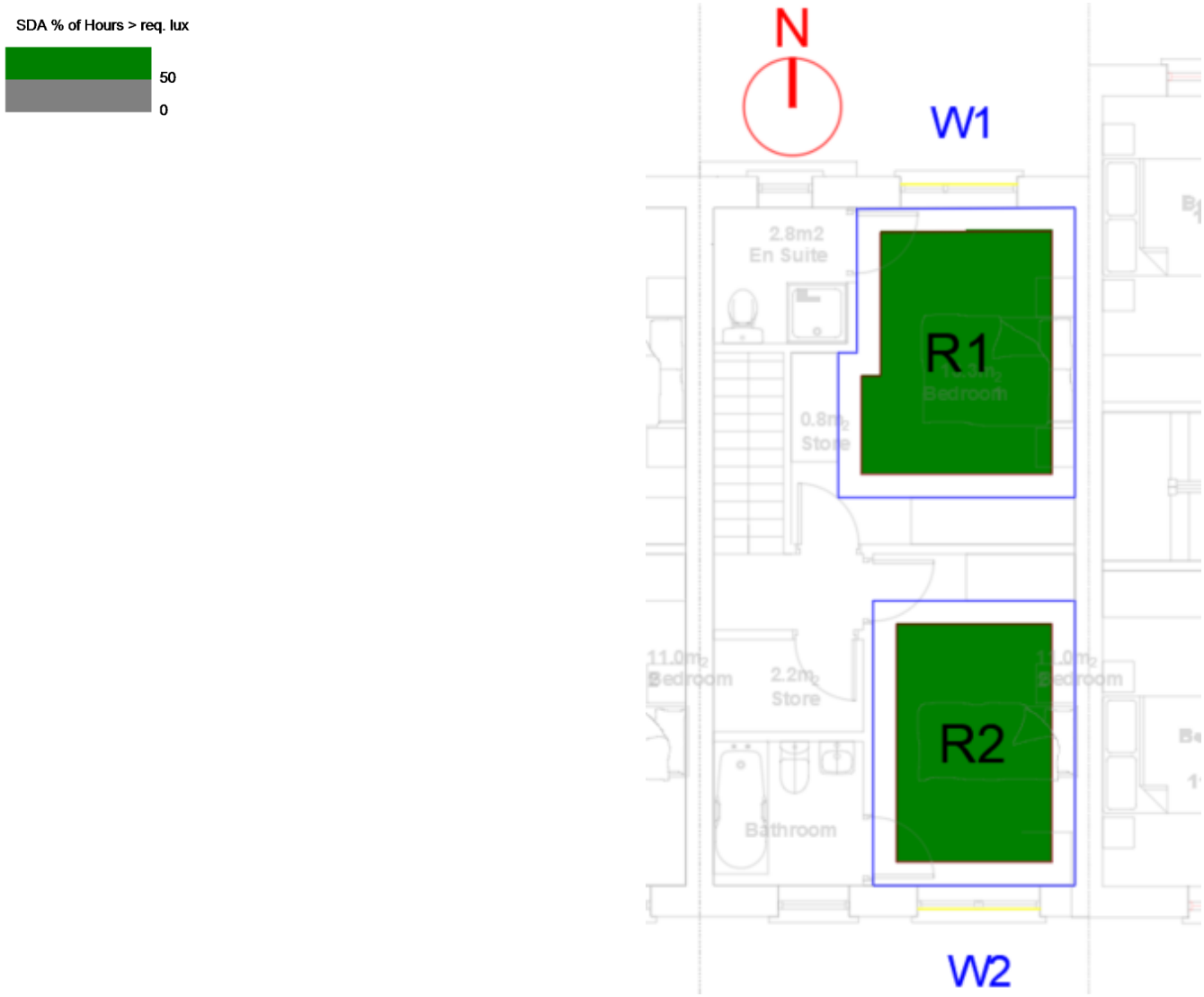


Figure 48: Proposed First Floor sDA Contours of House G-02 2-054

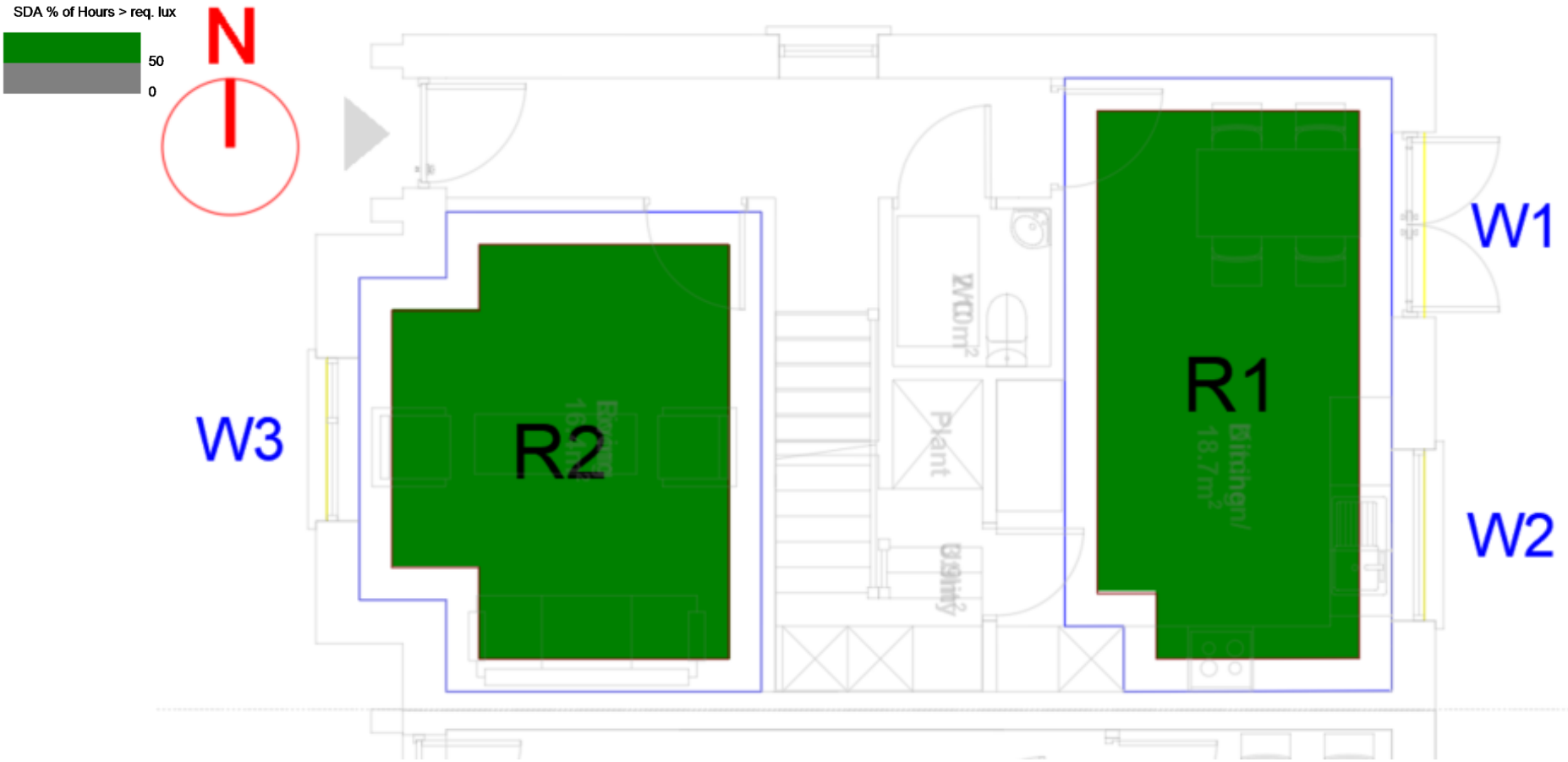


Figure 49: Proposed Ground Floor sDA Contours of House D-02 2-048

Figure 50: Proposed First Floor sDA Contours of House D-02 2-048

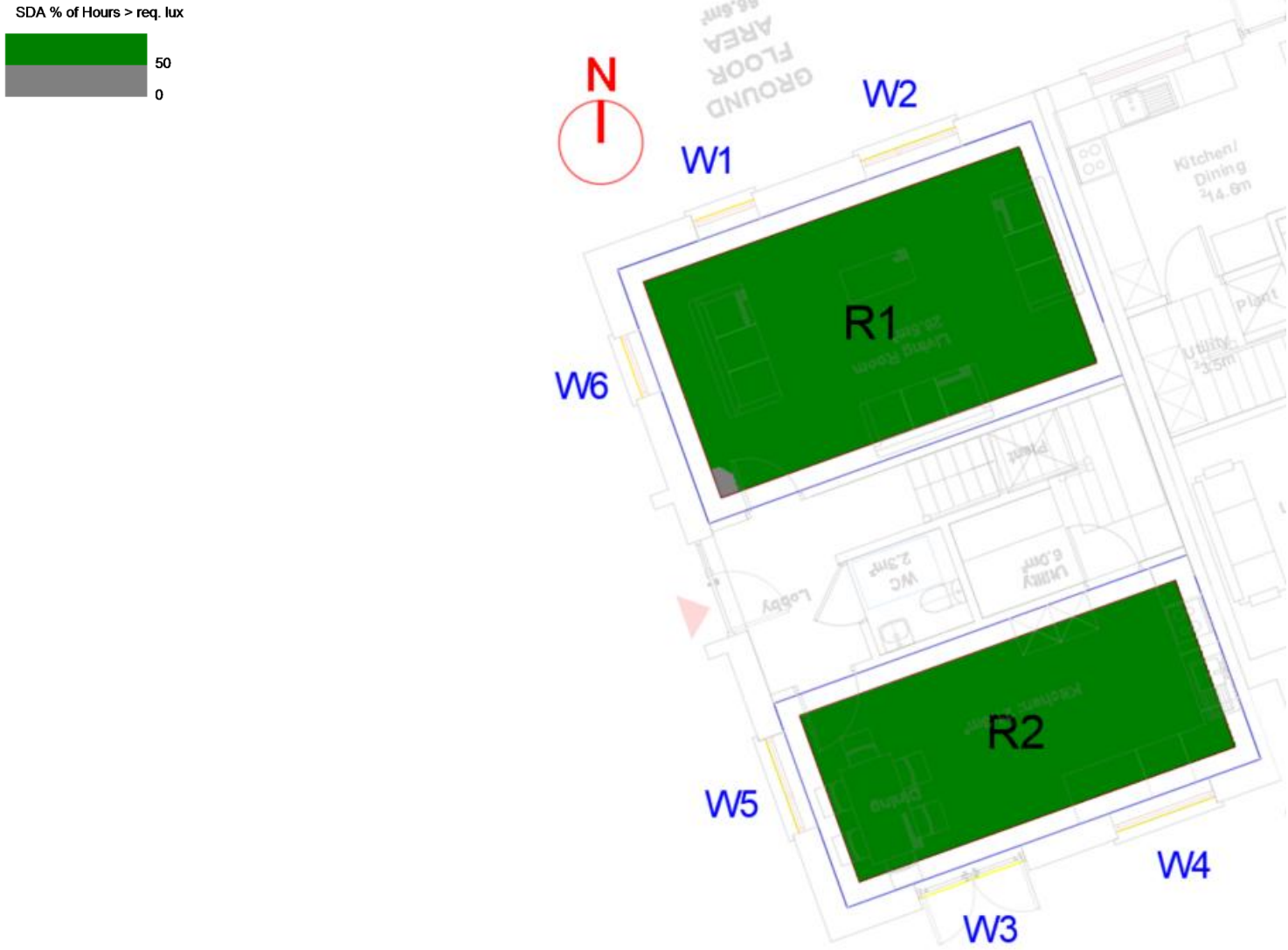


Figure 51: Proposed Ground Floor sDA Contours of House B-03 3-027

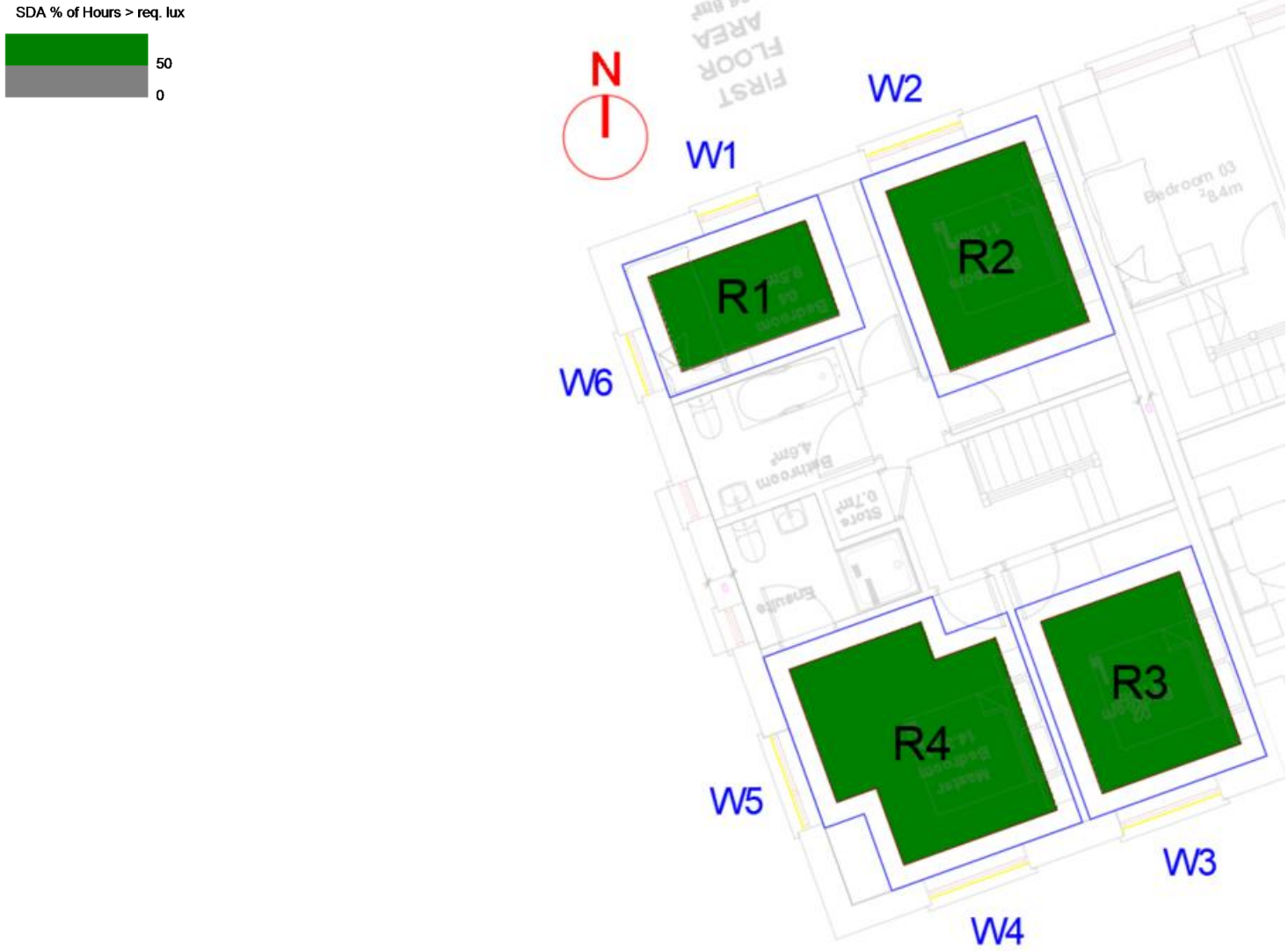


Figure 52: Proposed First Floor sDA Contours of House B-03 3-027

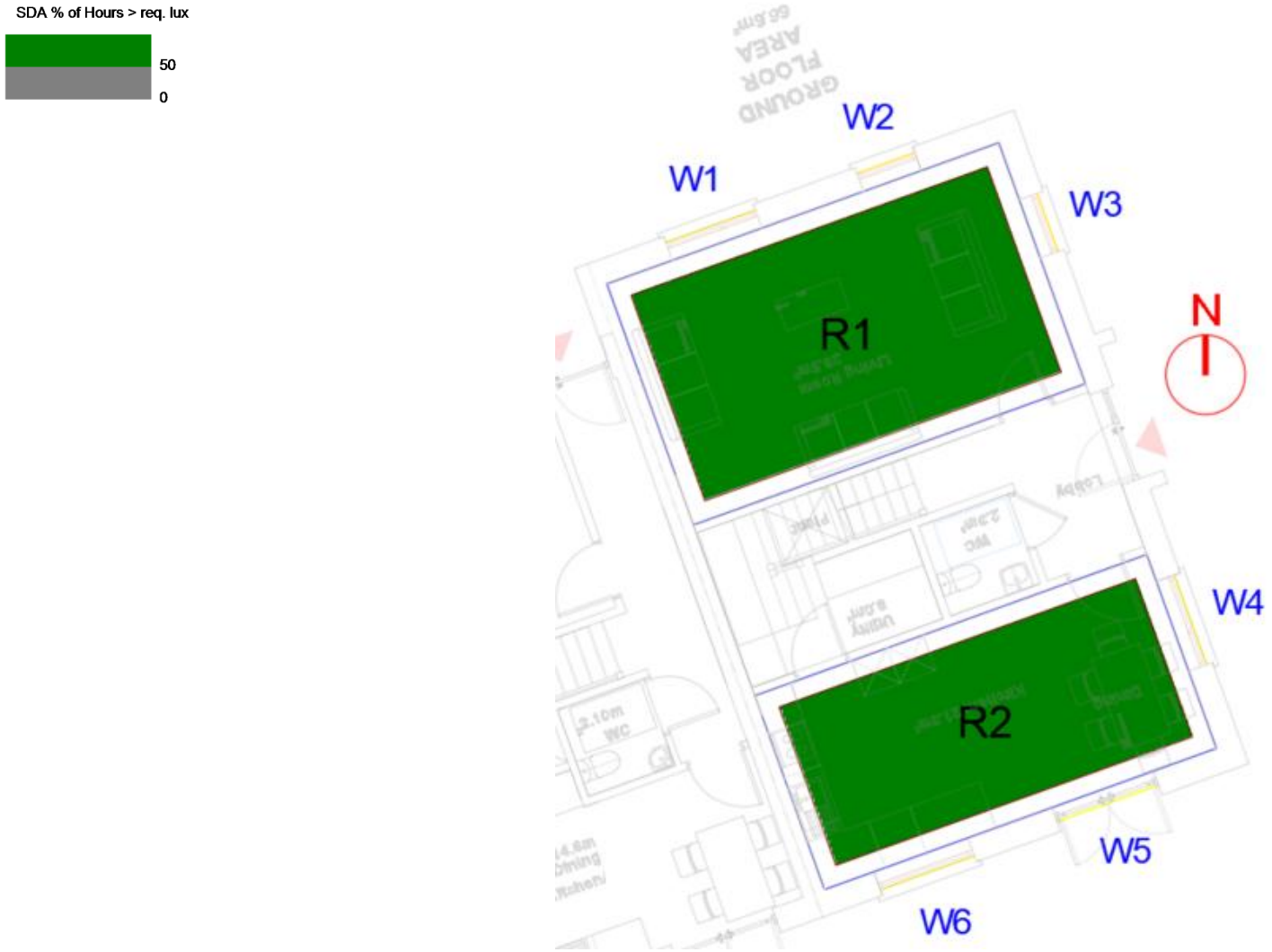


Figure 53: Proposed Ground Floor sDA Contours of House B-03 3-013

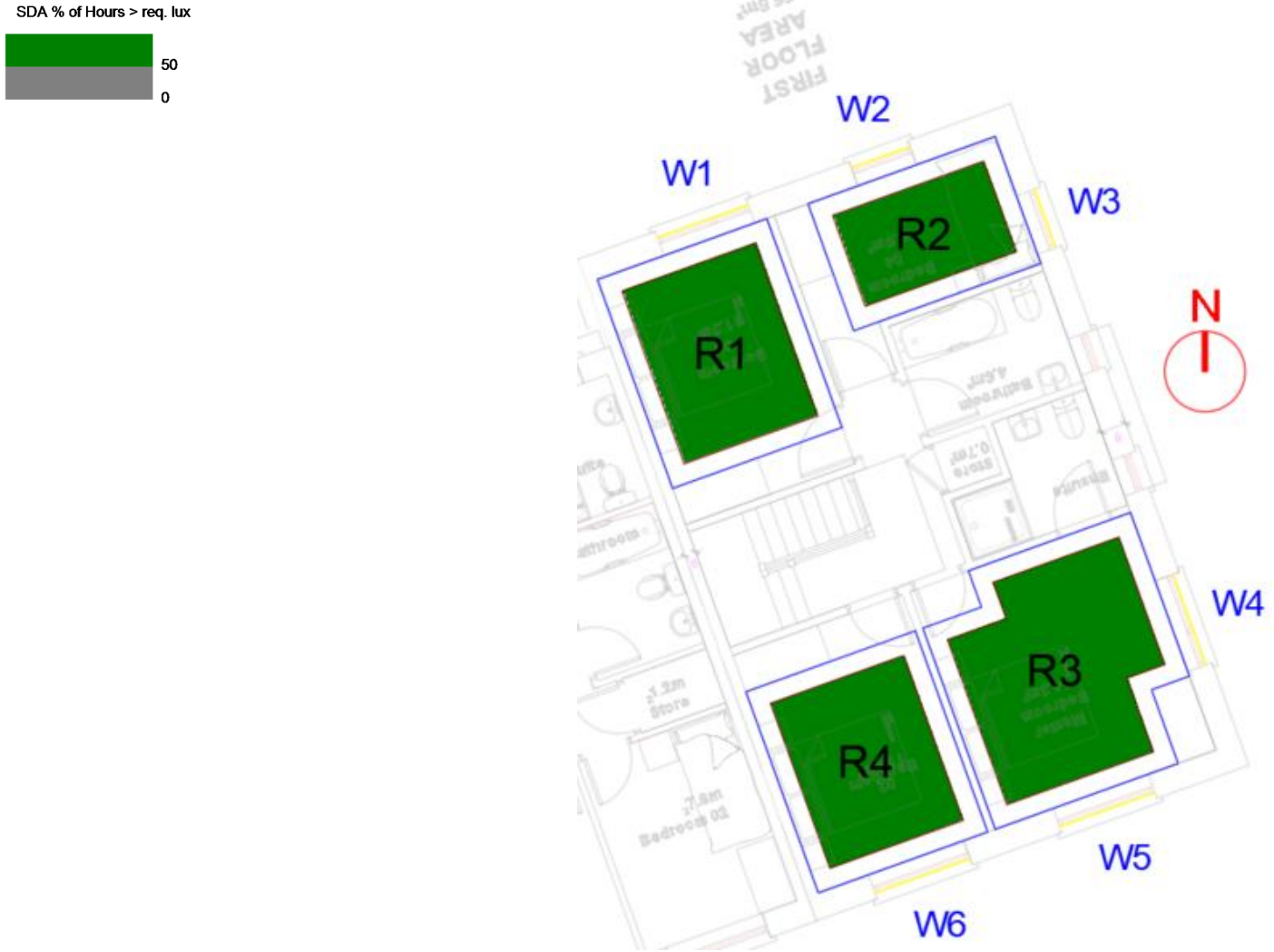
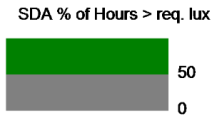


Figure 54: Proposed First Floor sDA Contours of House B-03 3-013



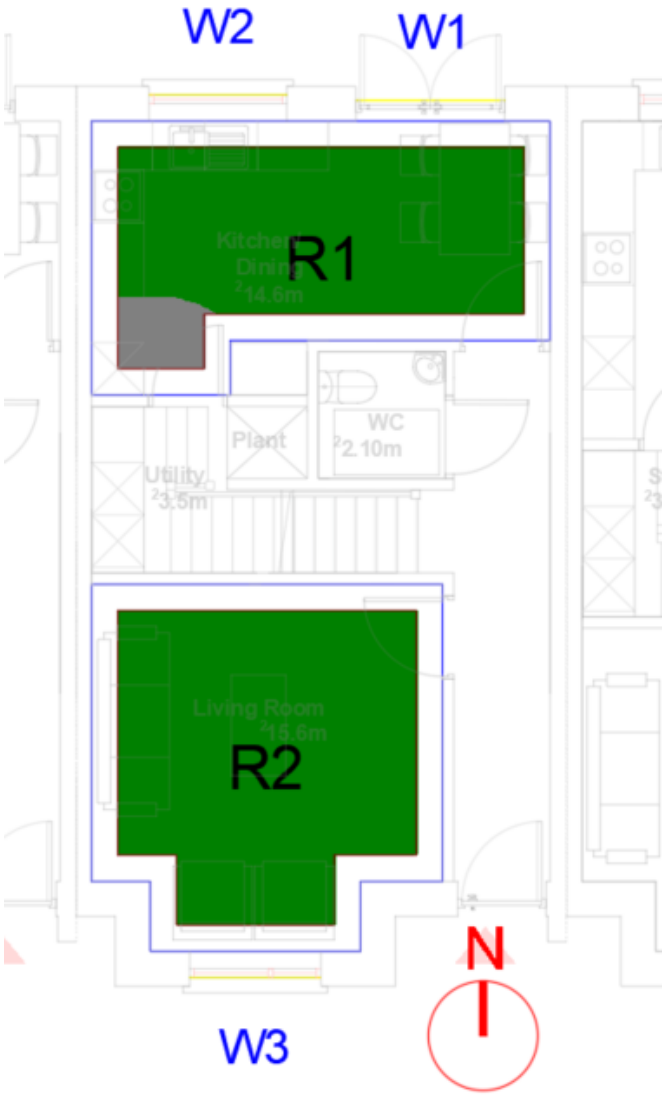


Figure 55: Proposed Ground Floor sDA Contours of House E-03 3-073

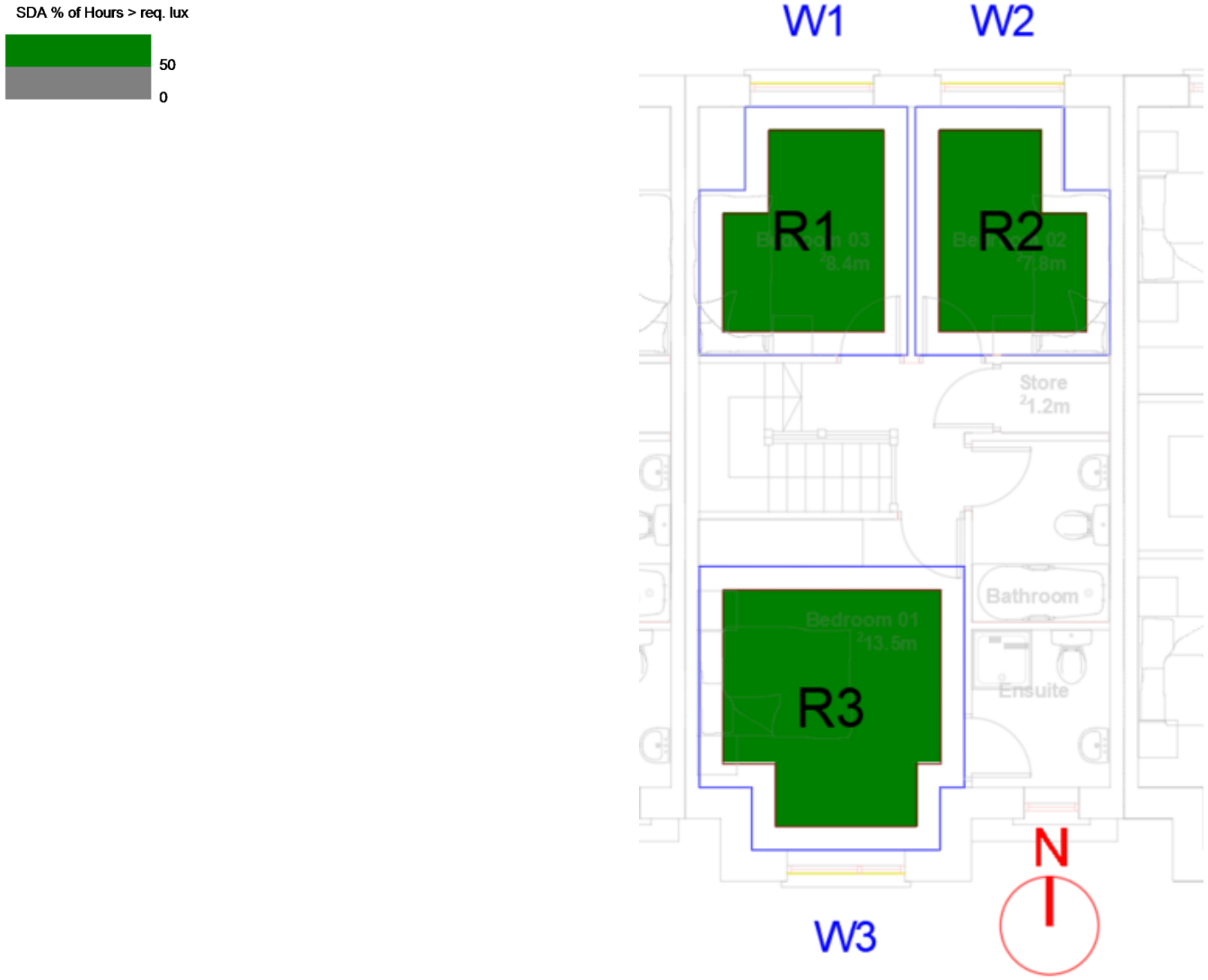


Figure 56: Proposed First Floor sDA Contours of House E-03 3-073

Figure 57: Proposed Ground Floor sDA Contours of House F-02 2-001

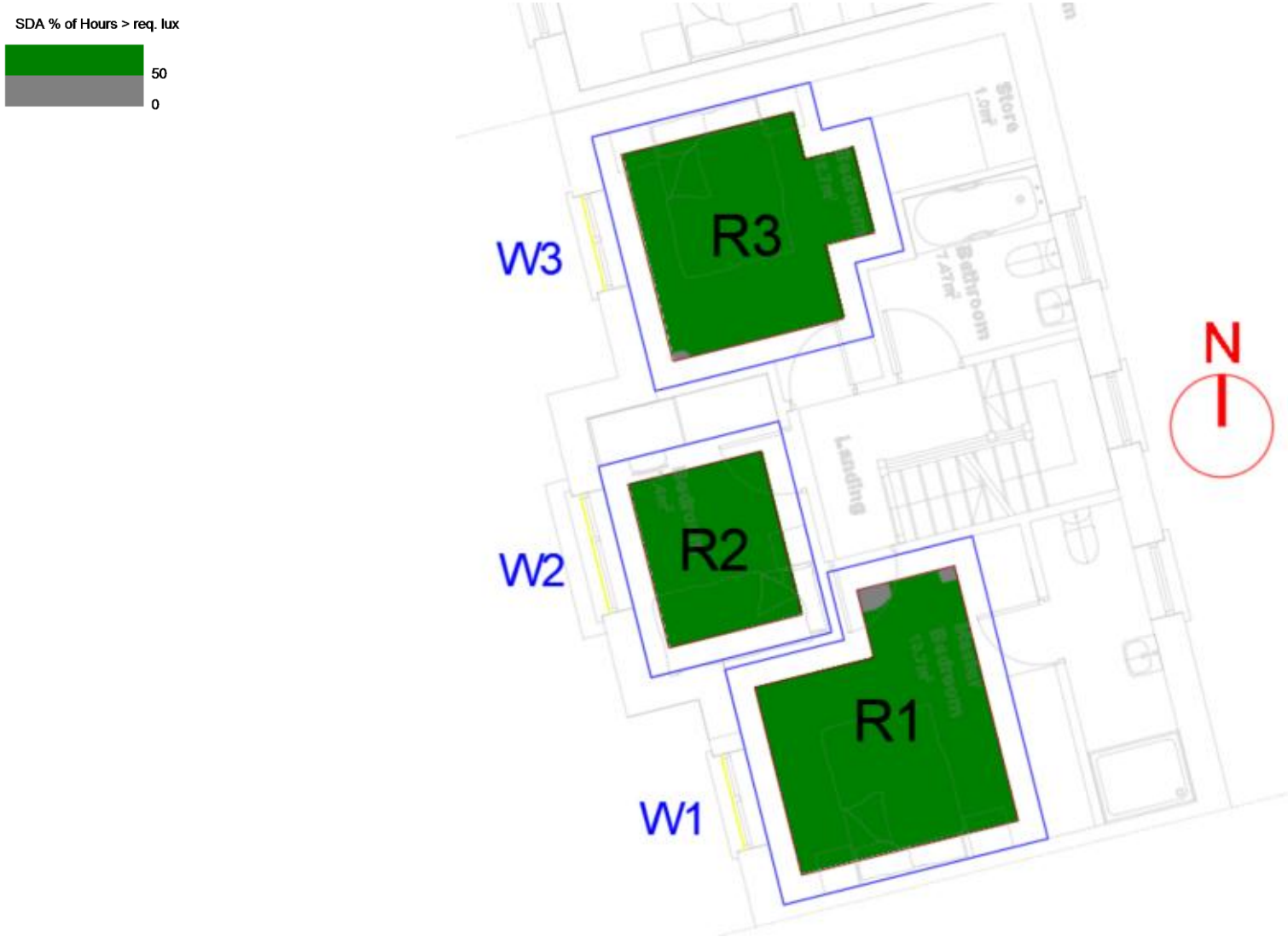


Figure 58: Proposed First Floor sDA Contours of House F-02 2-001

Figure 59: Proposed Ground Floor sDA Contours of House G-02 2-003

Figure 60: Proposed First Floor sDA Contours of House G-02 2-003

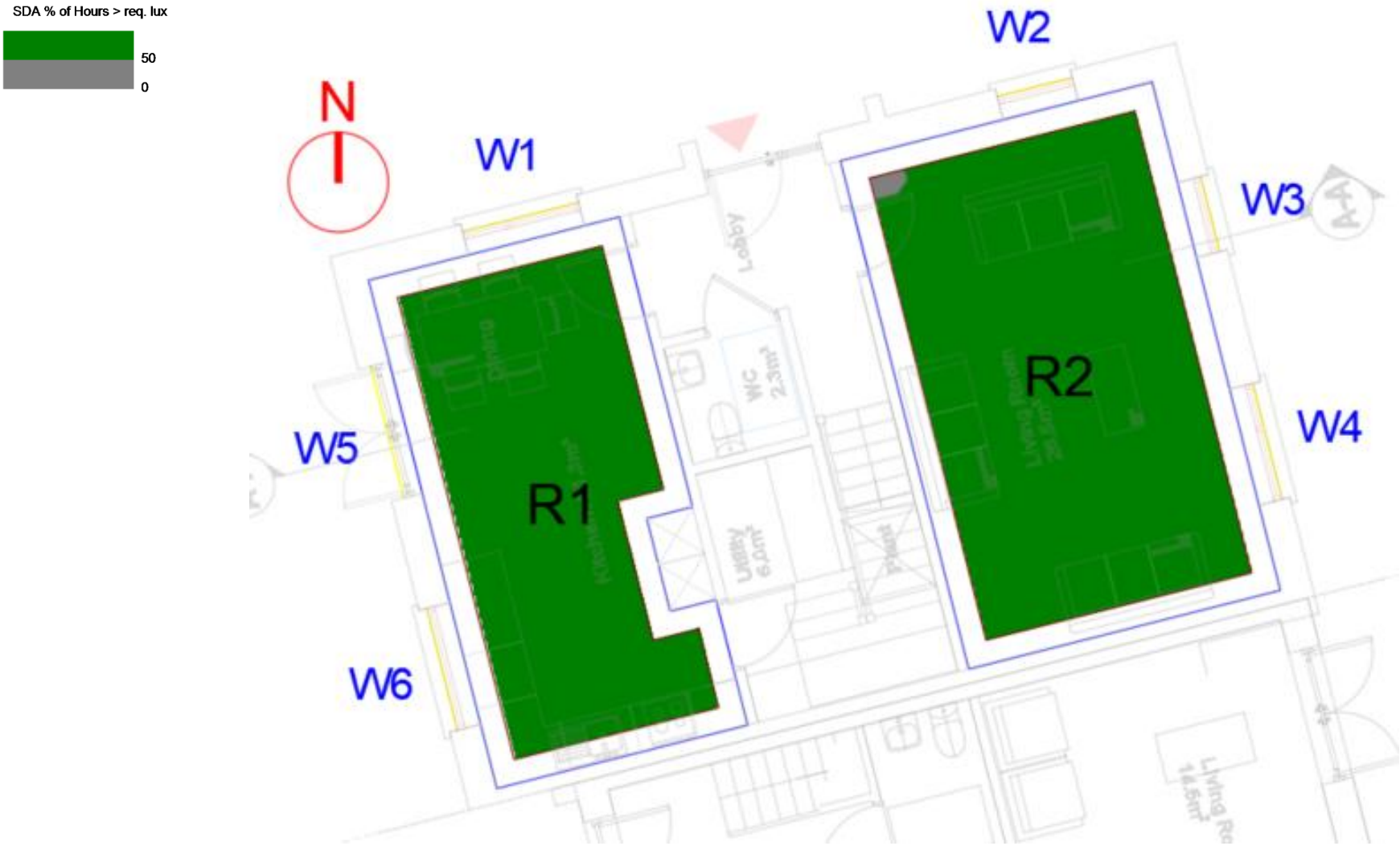


Figure 61: Proposed Ground Floor sDA Contours of House B-02 2-008

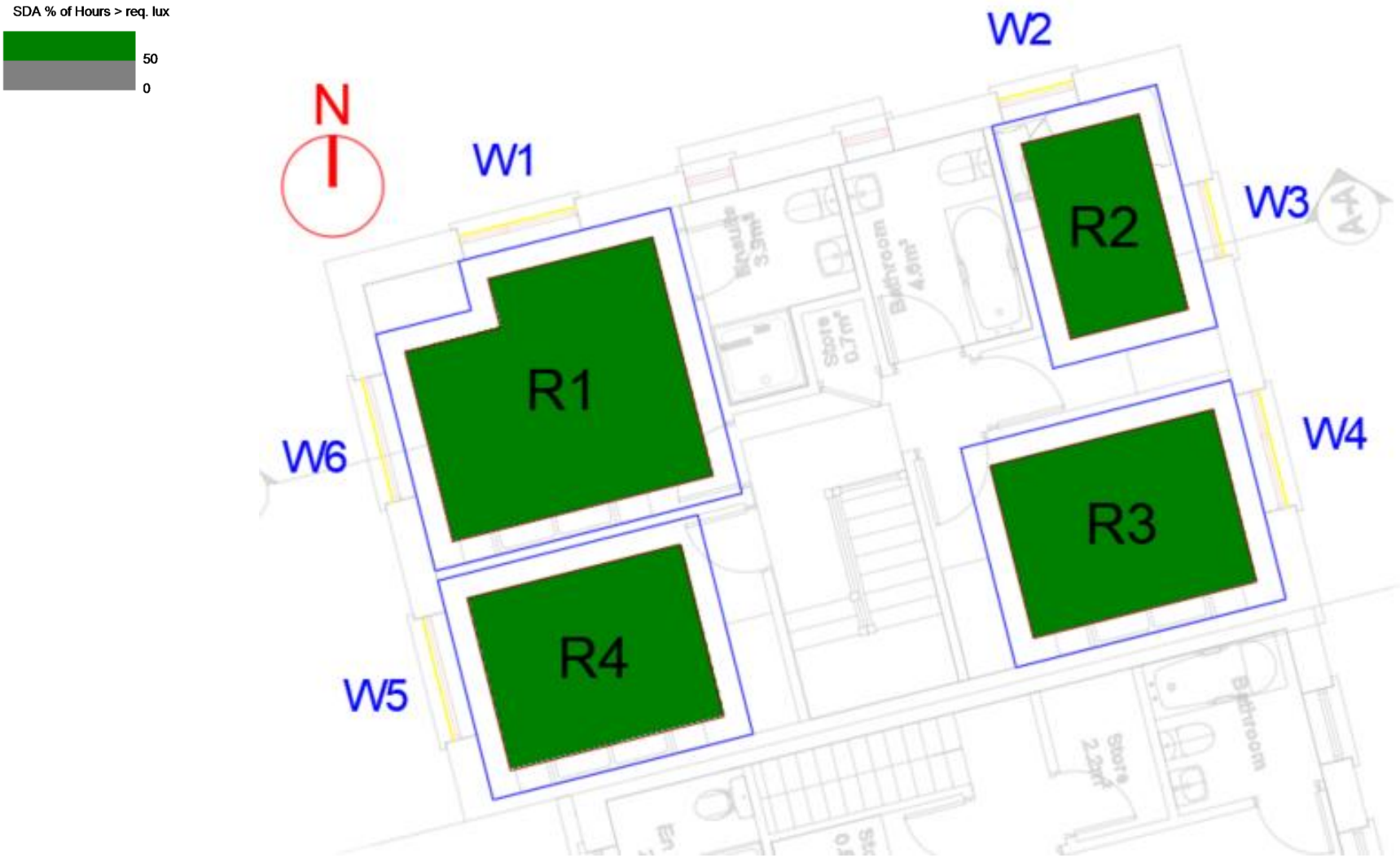


Figure 62: Proposed First Floor sDA Contours of House B-02 2-008

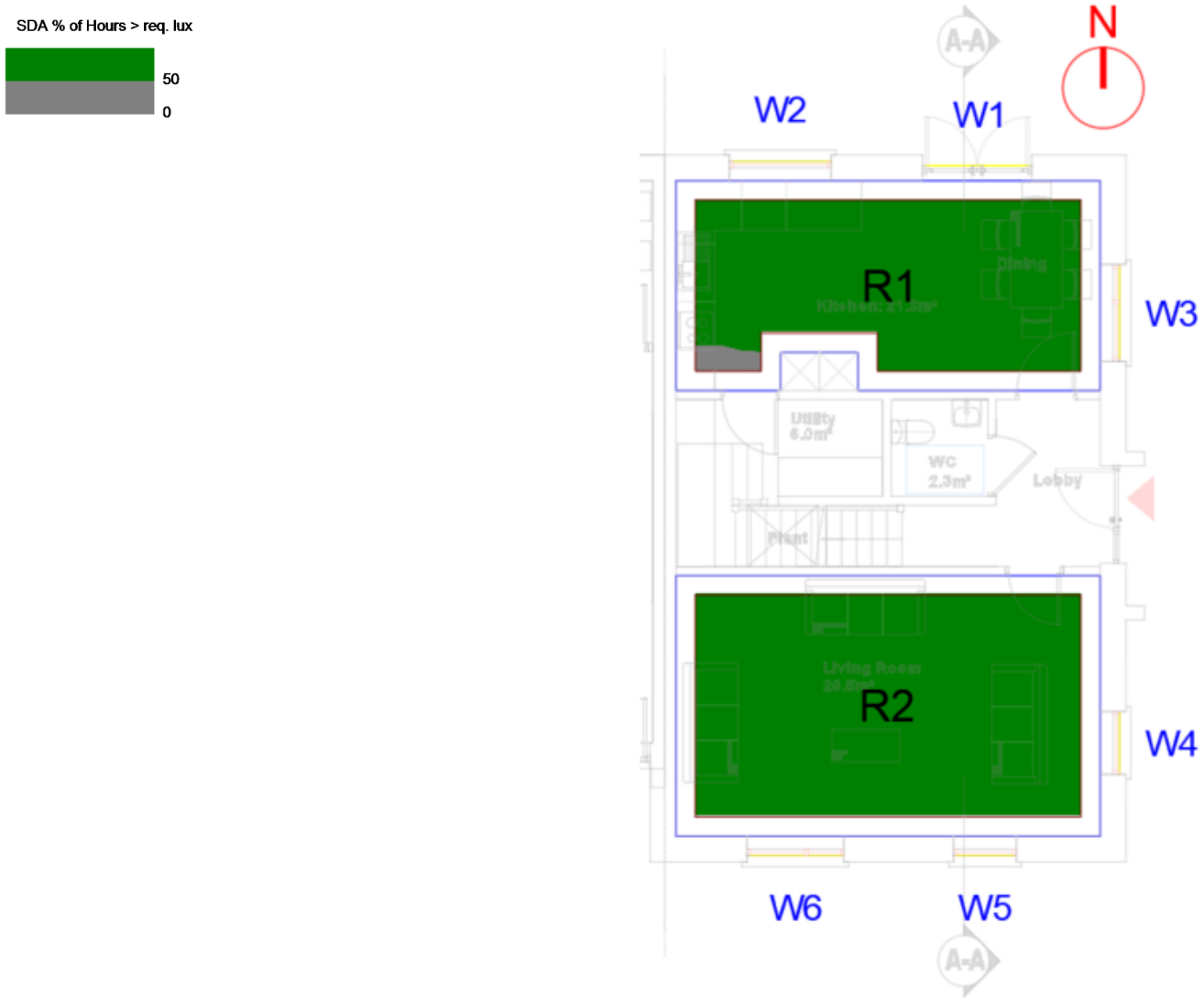


Figure 63: Proposed Ground Floor sDA Contours of House B-02 2-056

Figure 64: Proposed First Floor sDA Contours of House B-02 2-056

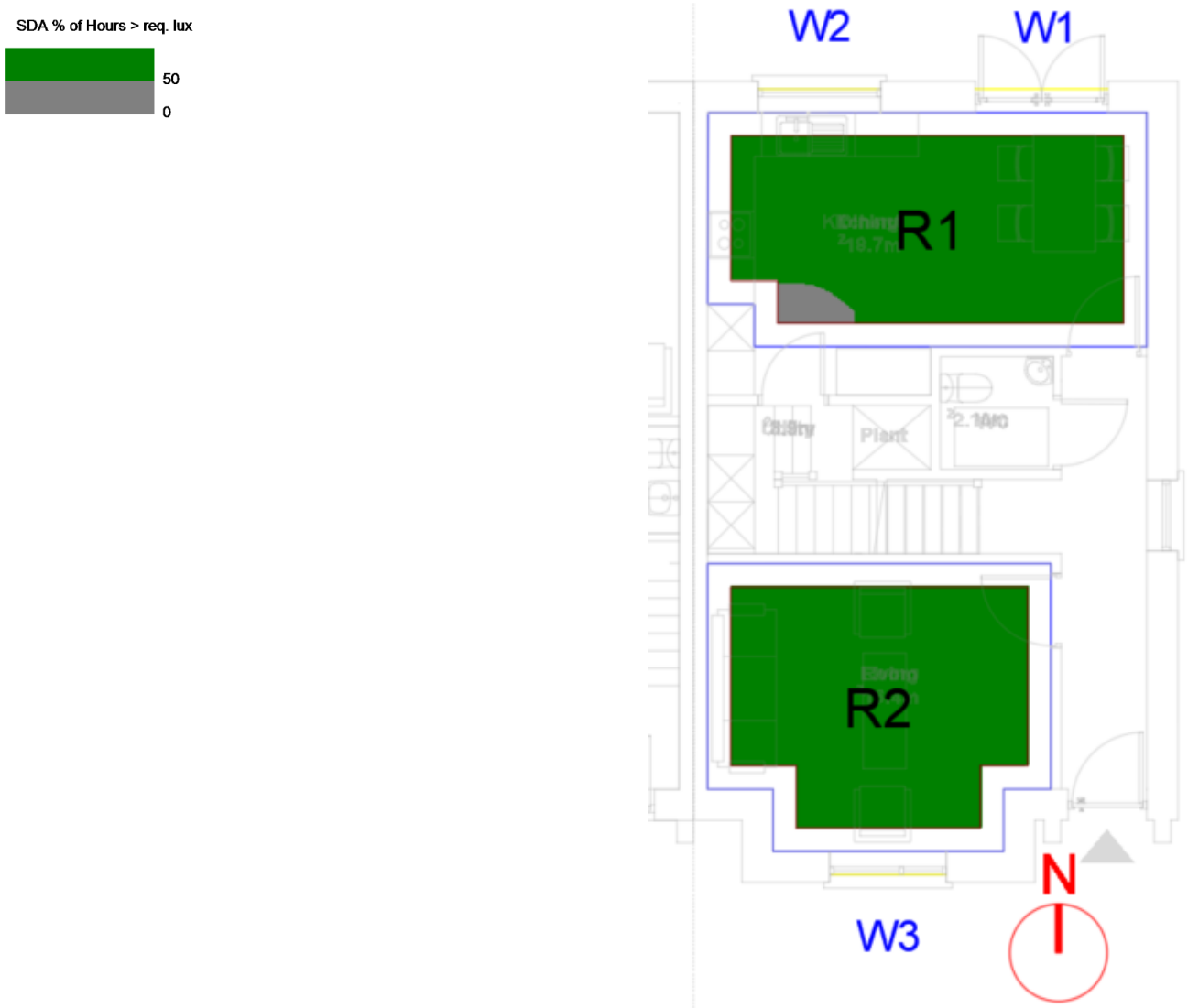


Figure 65: Proposed Ground Floor sDA Contours of House D-02 2-072

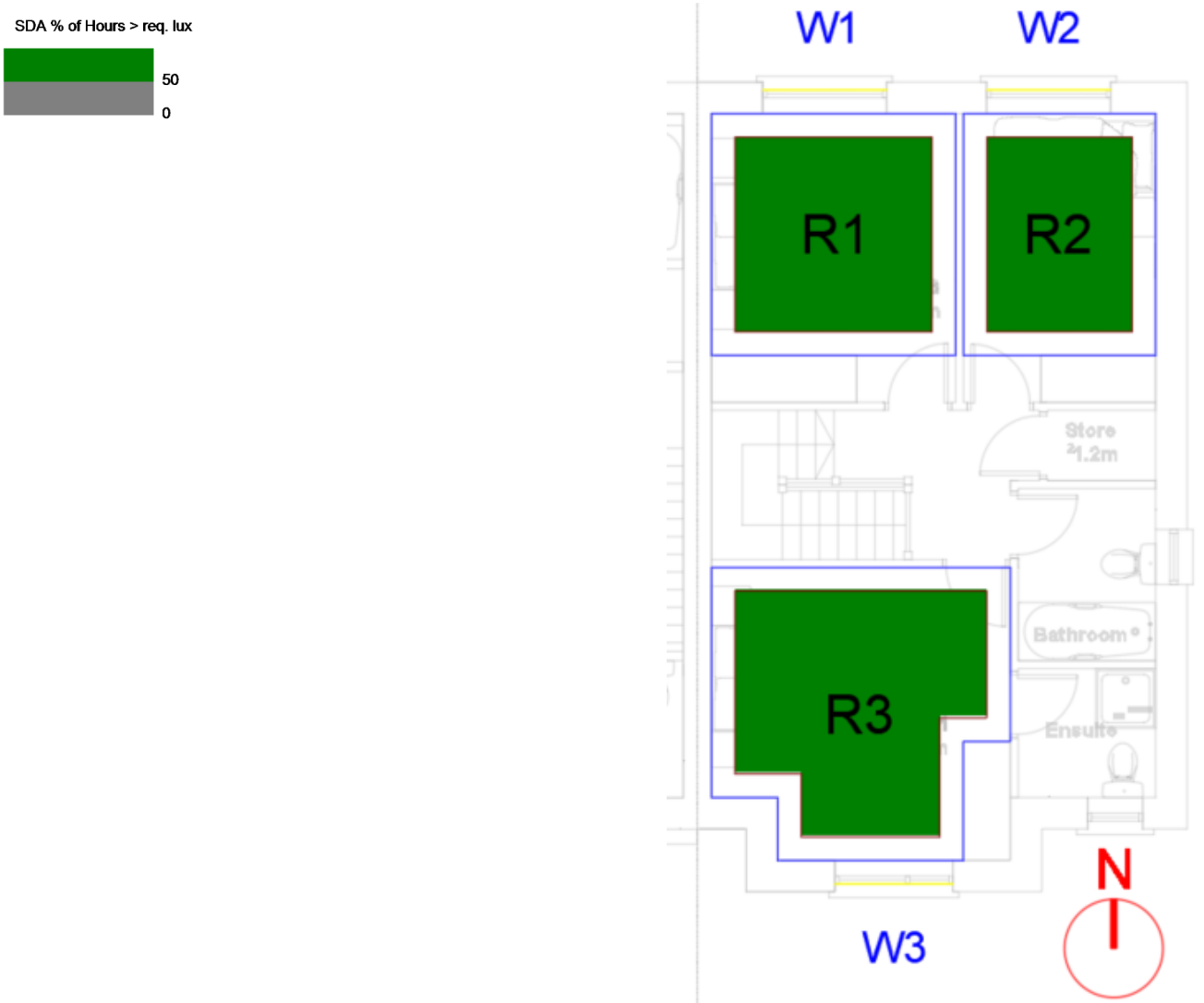
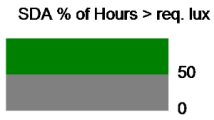


Figure 66: Proposed First Floor sDA Contours of House D-02 2-072



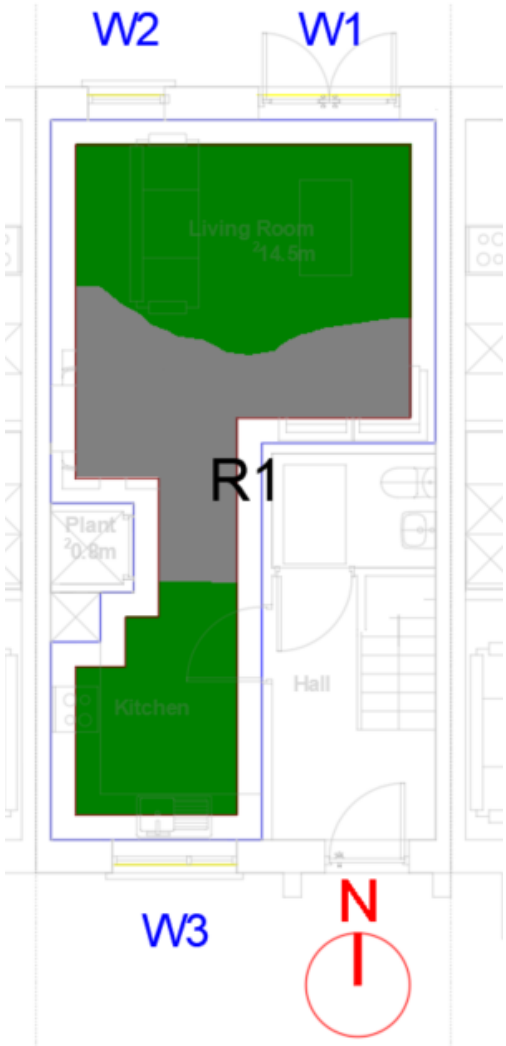
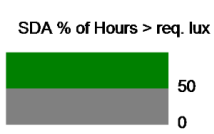


Figure 67: Proposed Ground Floor sDA Contours of House G-02 2-073



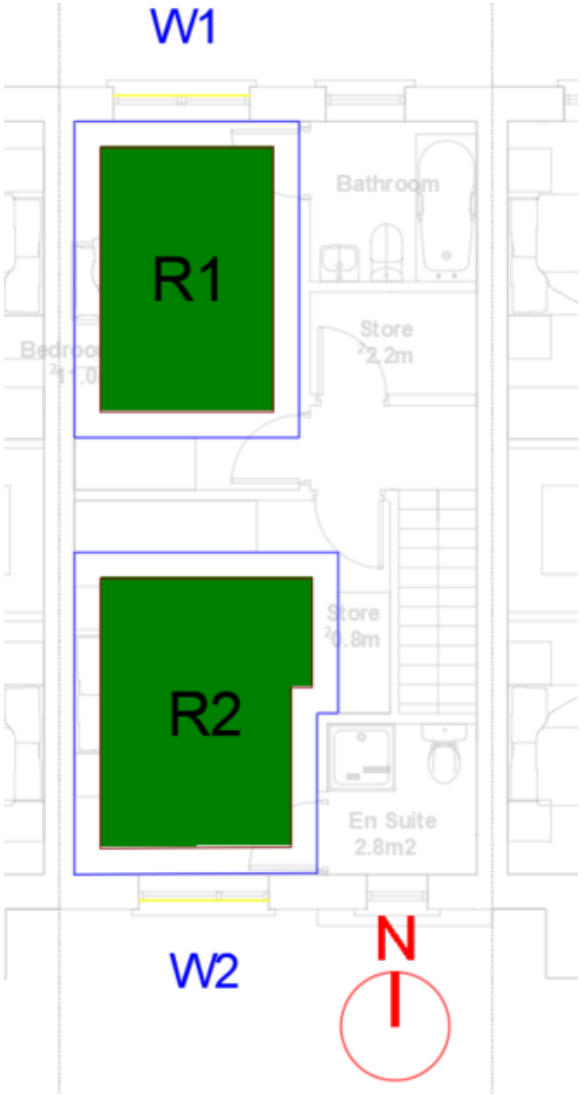


Figure 68: Proposed First Floor sDA Contours of House G-02 2-073

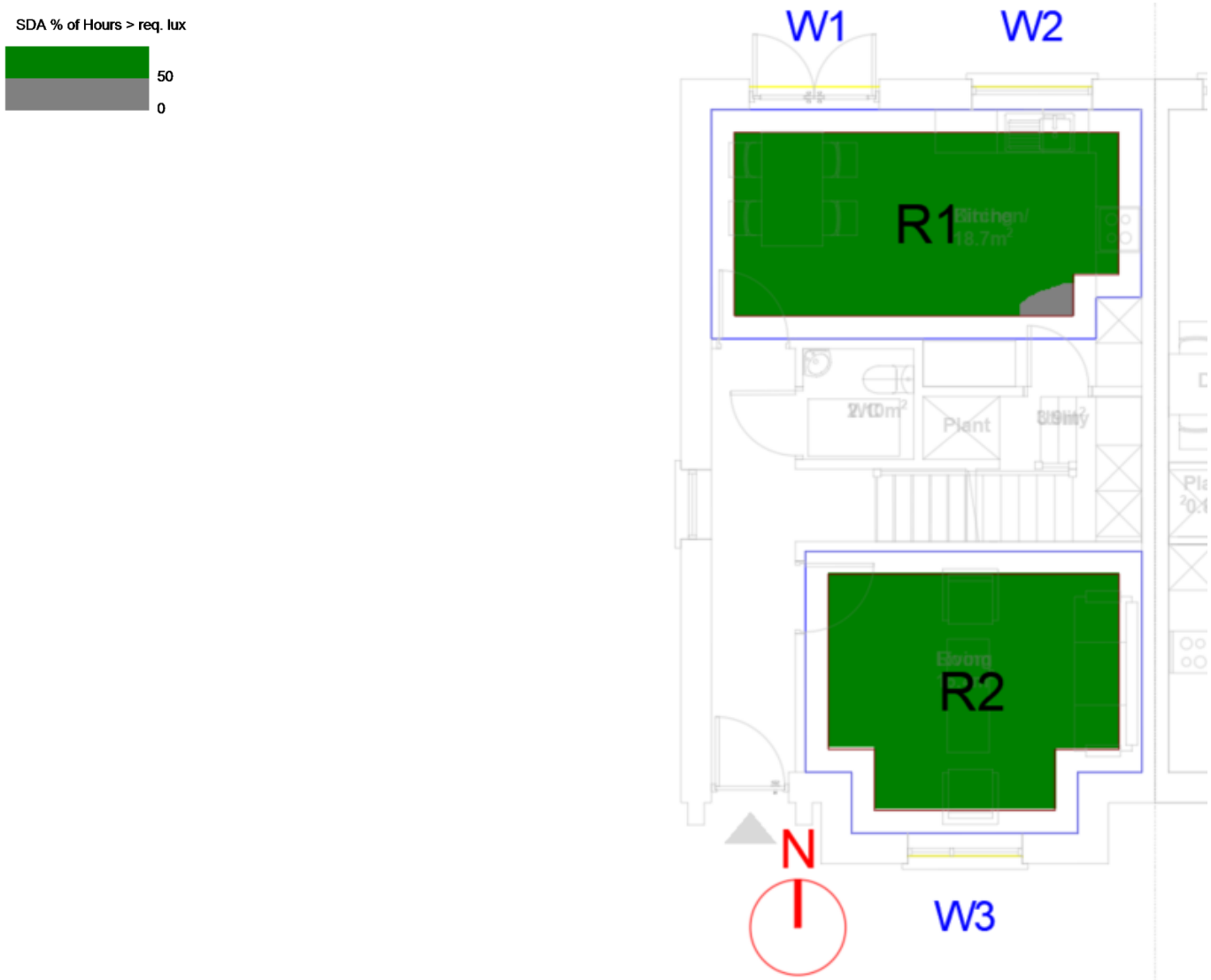


Figure 69: Proposed Ground Floor sDA Contours of House D-02 2-074

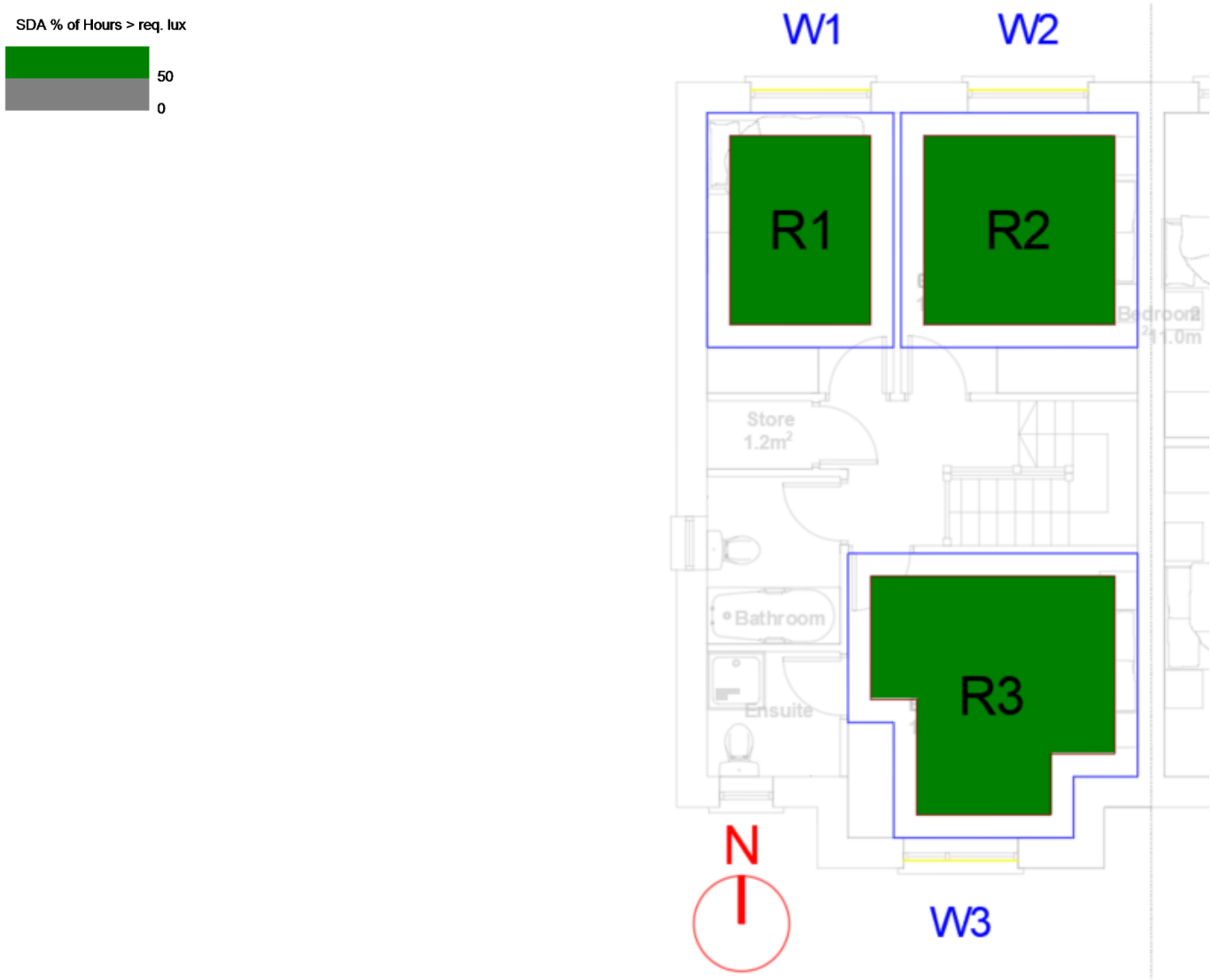


Figure 70: Proposed First Floor sDA Contours of House D-02 2-074

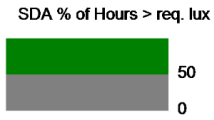


Figure 71: Proposed Ground Floor sDA Contours of House D-02 2-087

SDA % of Hours > req. lux
50
0

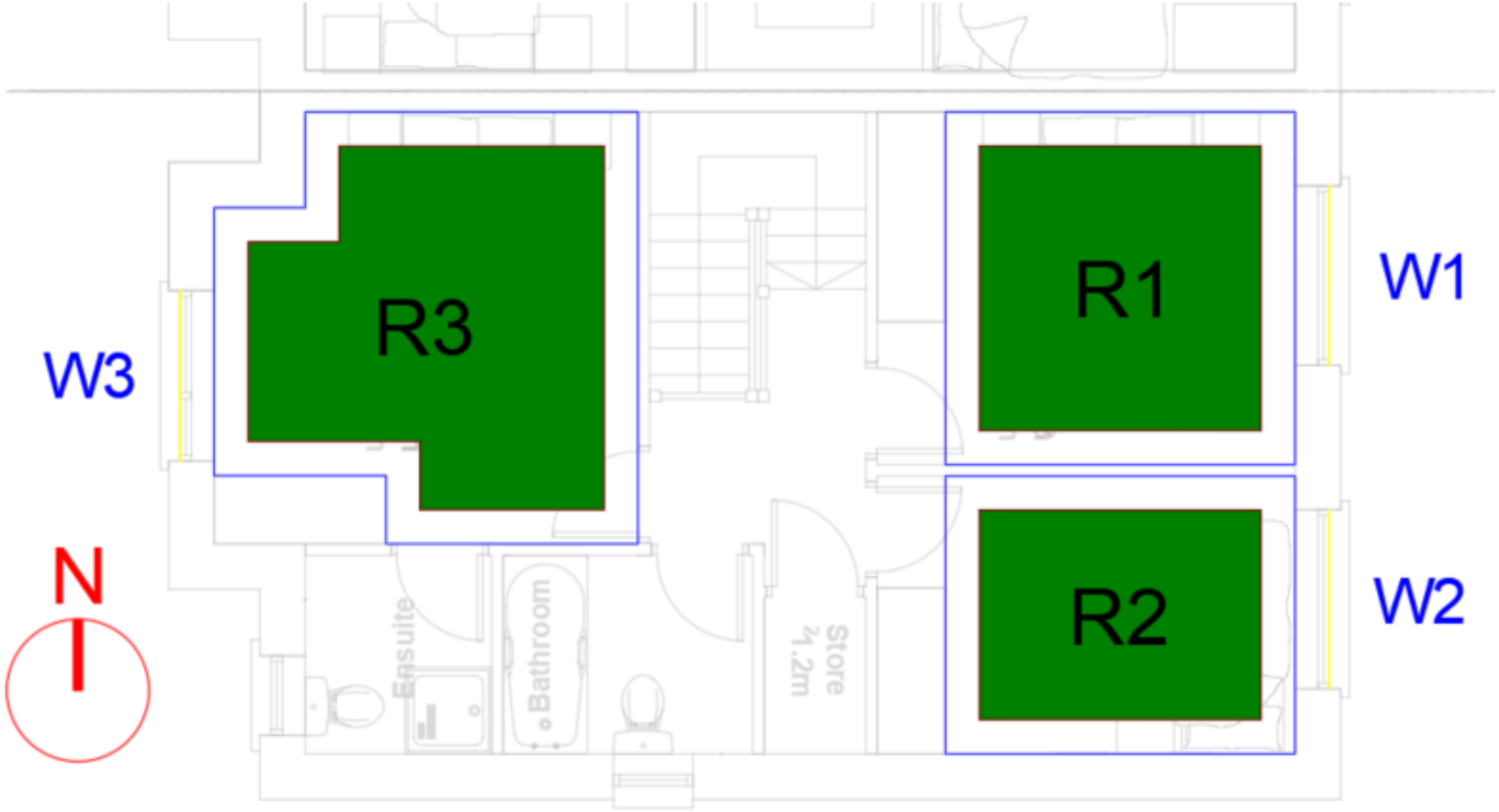


Figure 72: Proposed First Floor sDA Contours of House D-02 2-087

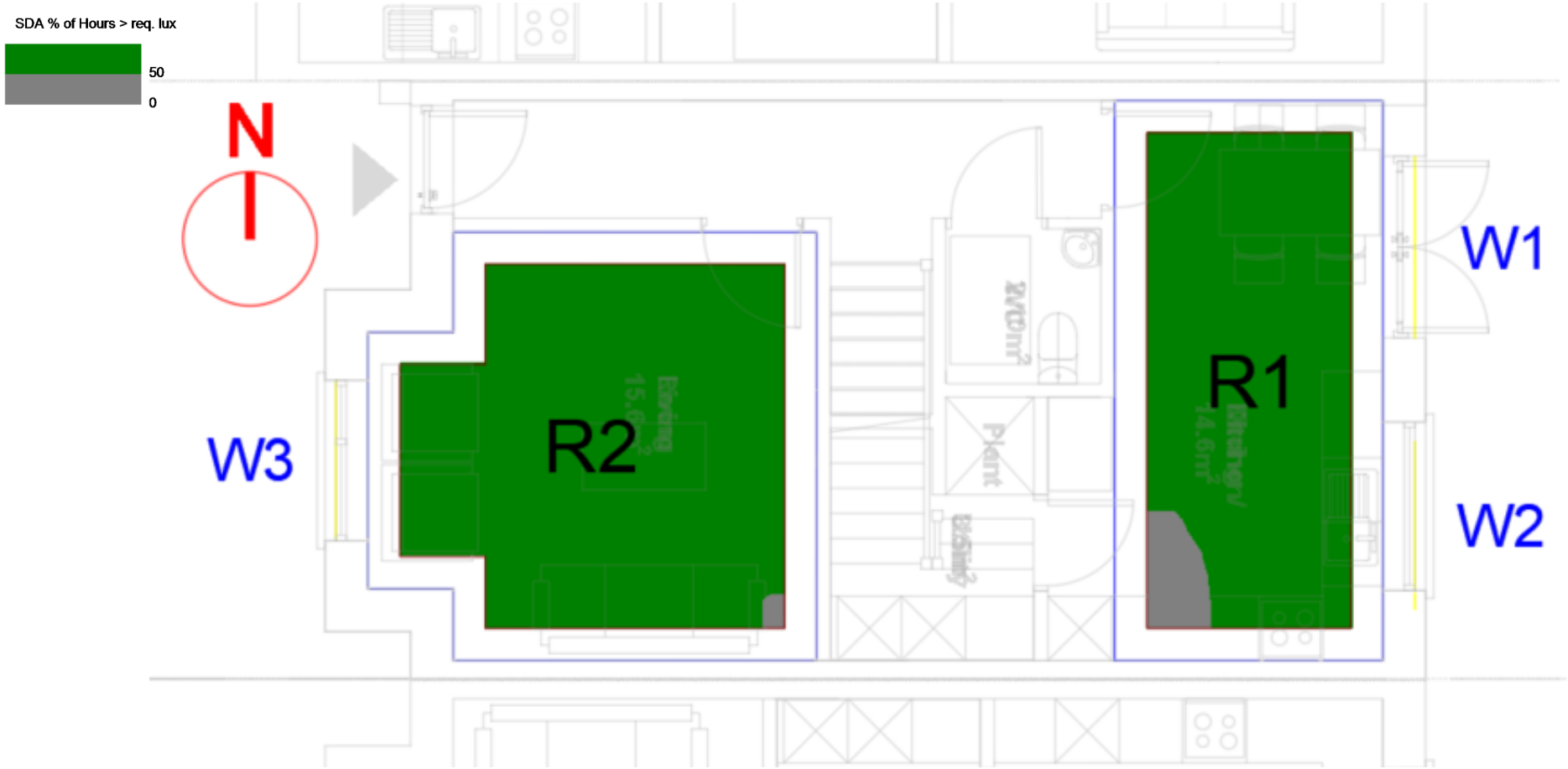


Figure 73: Proposed Ground Floor sDA Contours of House E-02 2-088

Figure 74: Proposed First Floor sDA Contours of House E-02 2-088

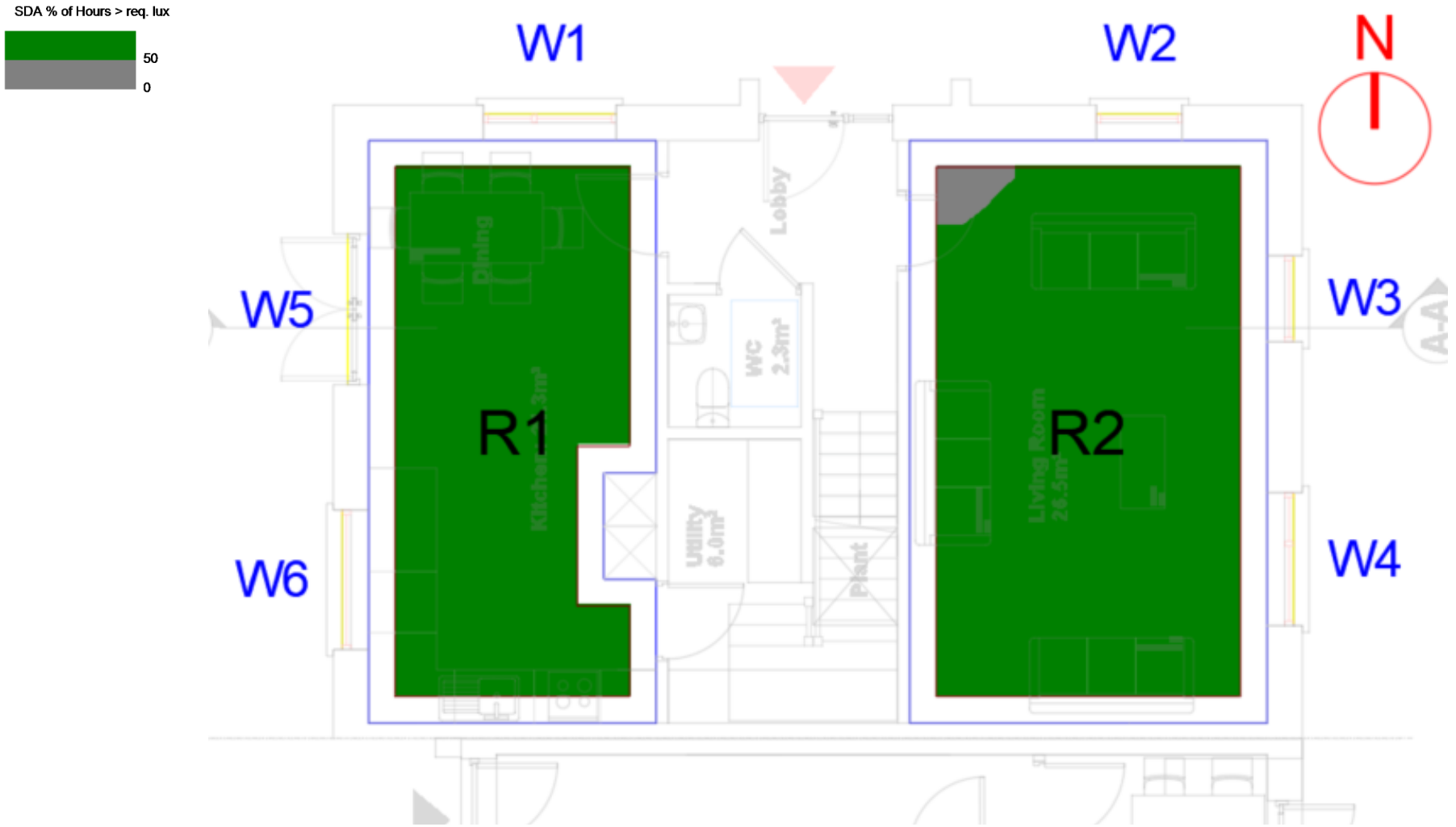


Figure 75: Proposed Ground Floor sDA Contours of House B-02 2-089

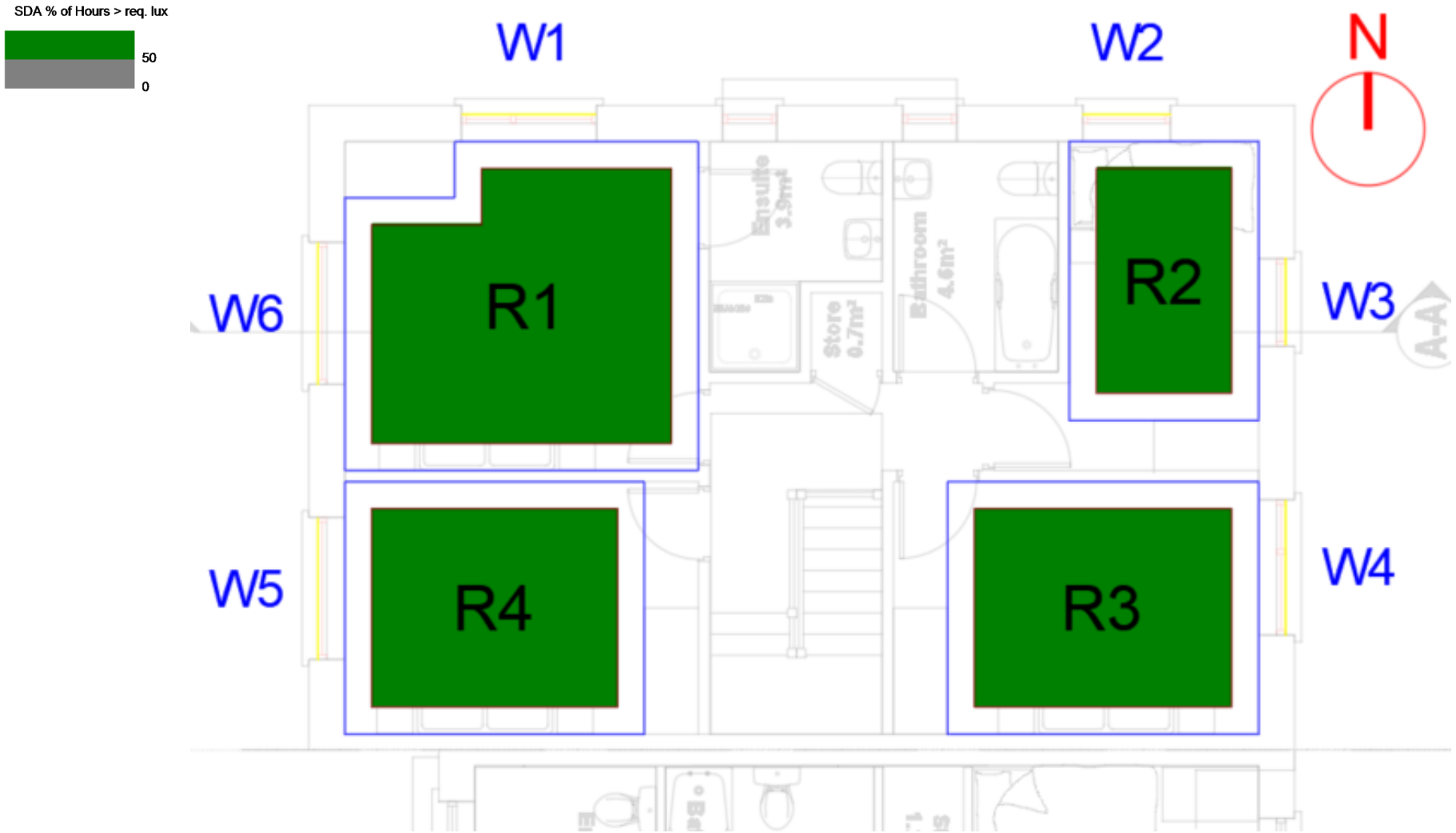


Figure 76: Proposed First Floor sDA Contours of House B-02 2-089

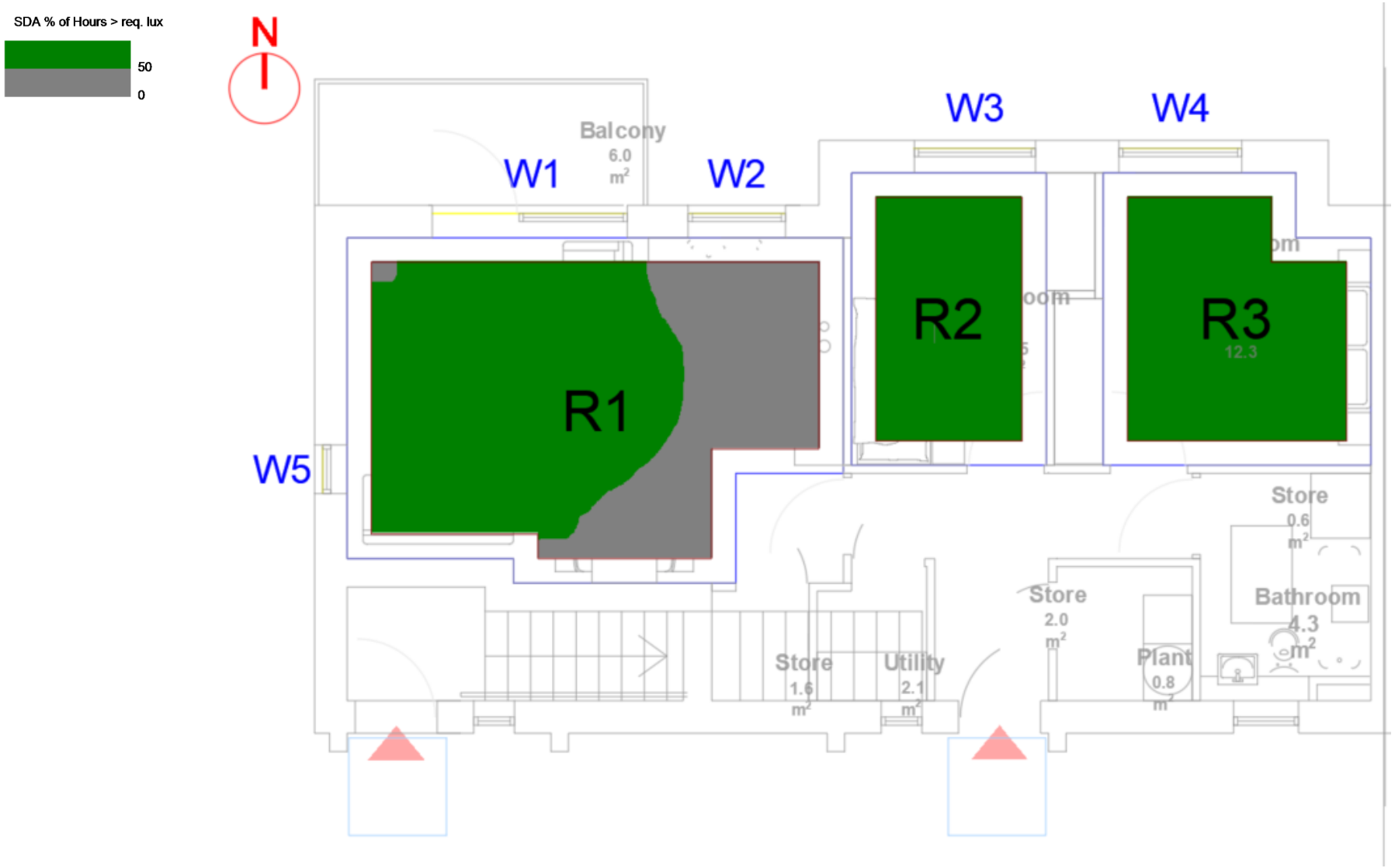


Figure 77: Proposed Ground Floor sDA Contours of House No.1 Block E (Duplex)

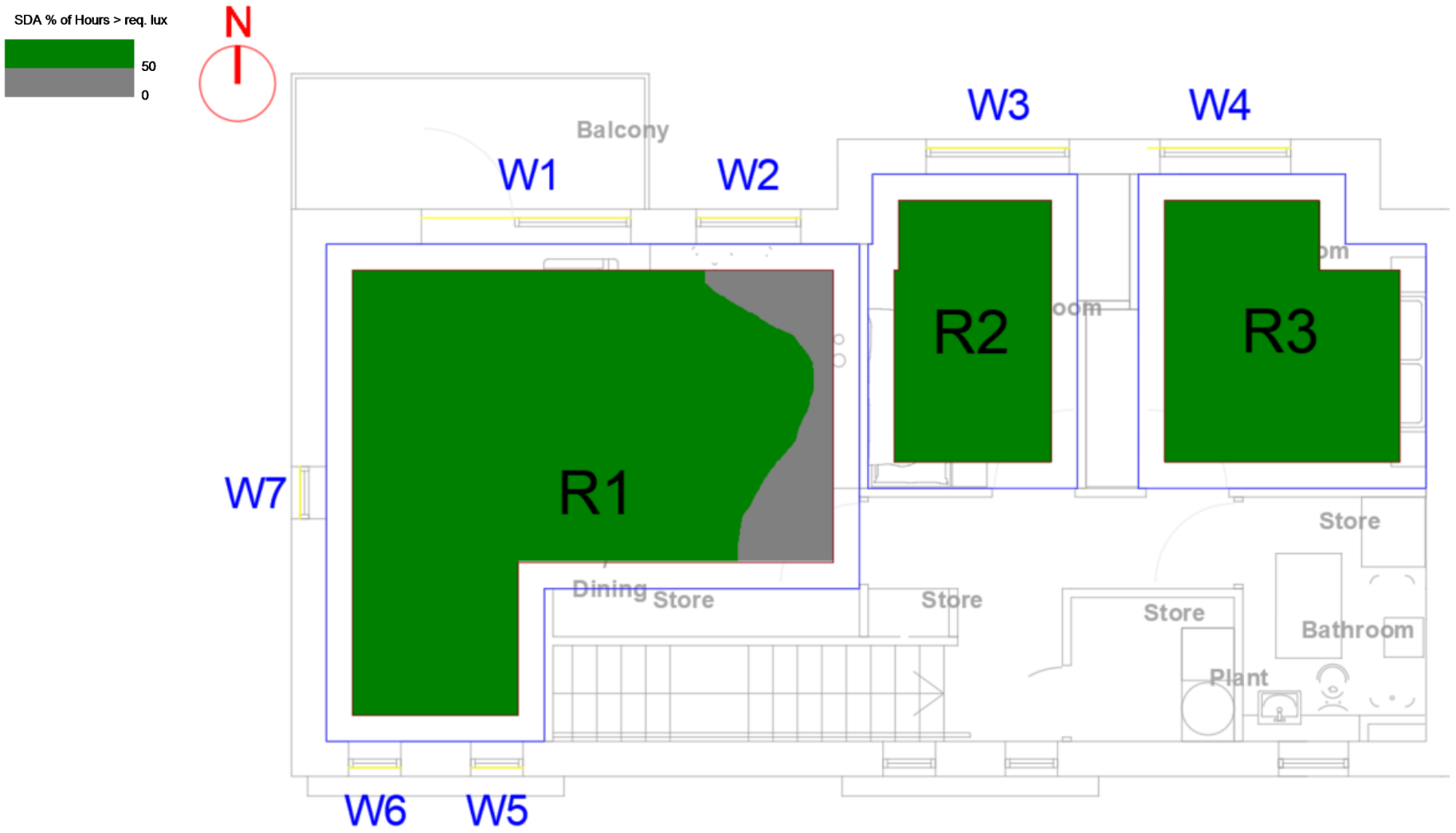


Figure 78: Proposed First Floor sDA Contours of House No.1 Block E (Duplex)

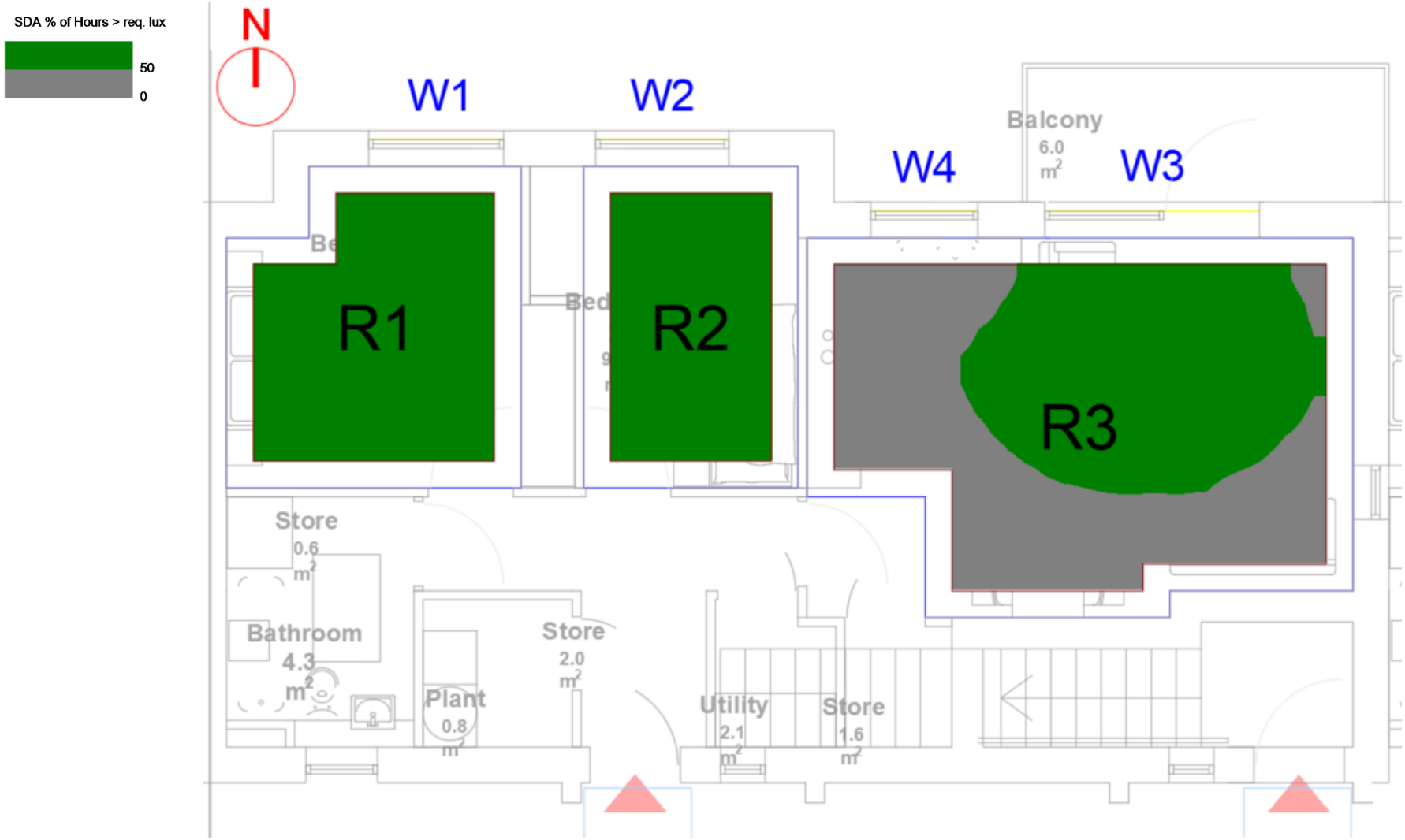


Figure 79: Proposed Ground Floor sDA Contours of House No.2 Block E (Duplex)

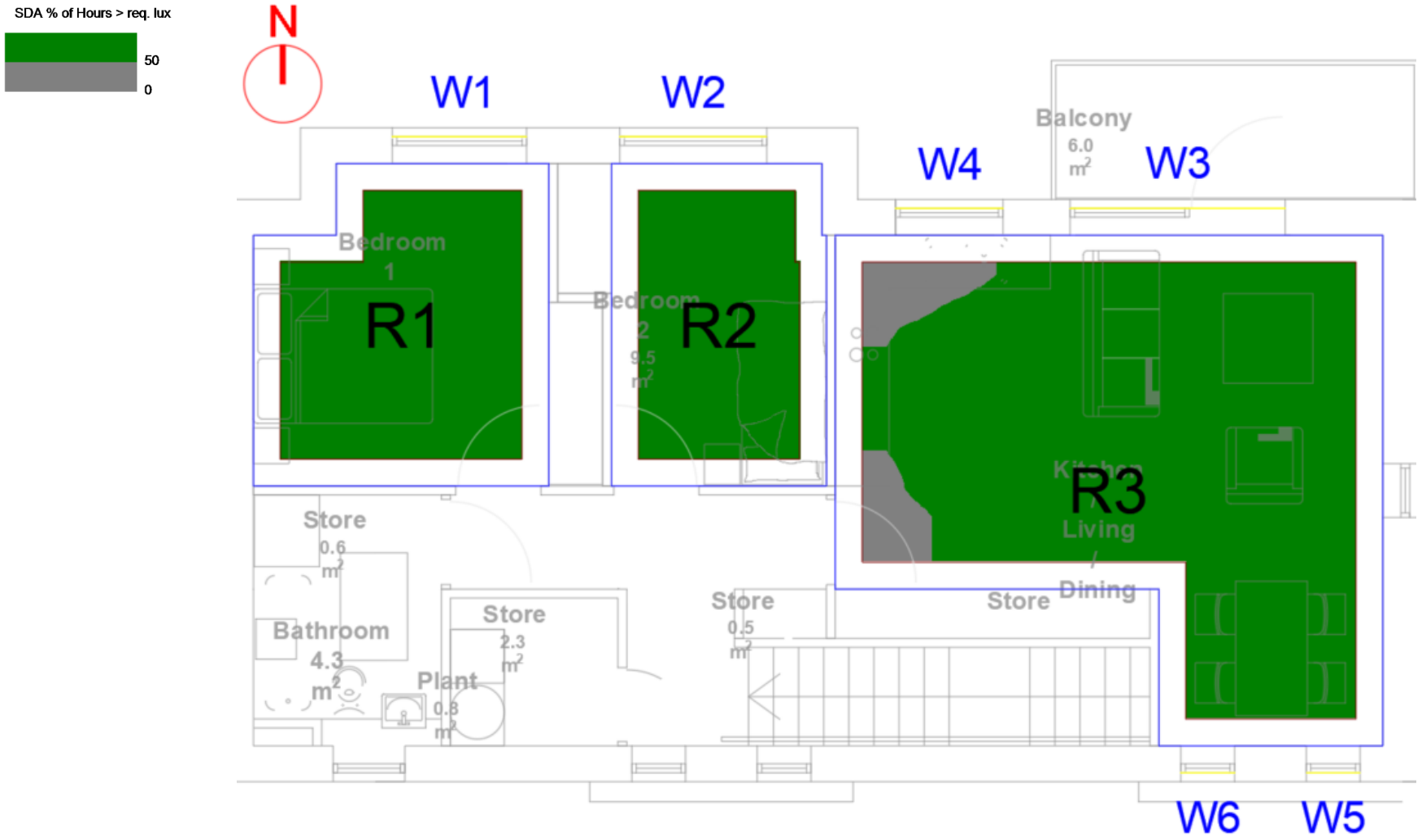


Figure 80: Proposed First Floor sDA Contours of House No.2 Block E (Duplex)

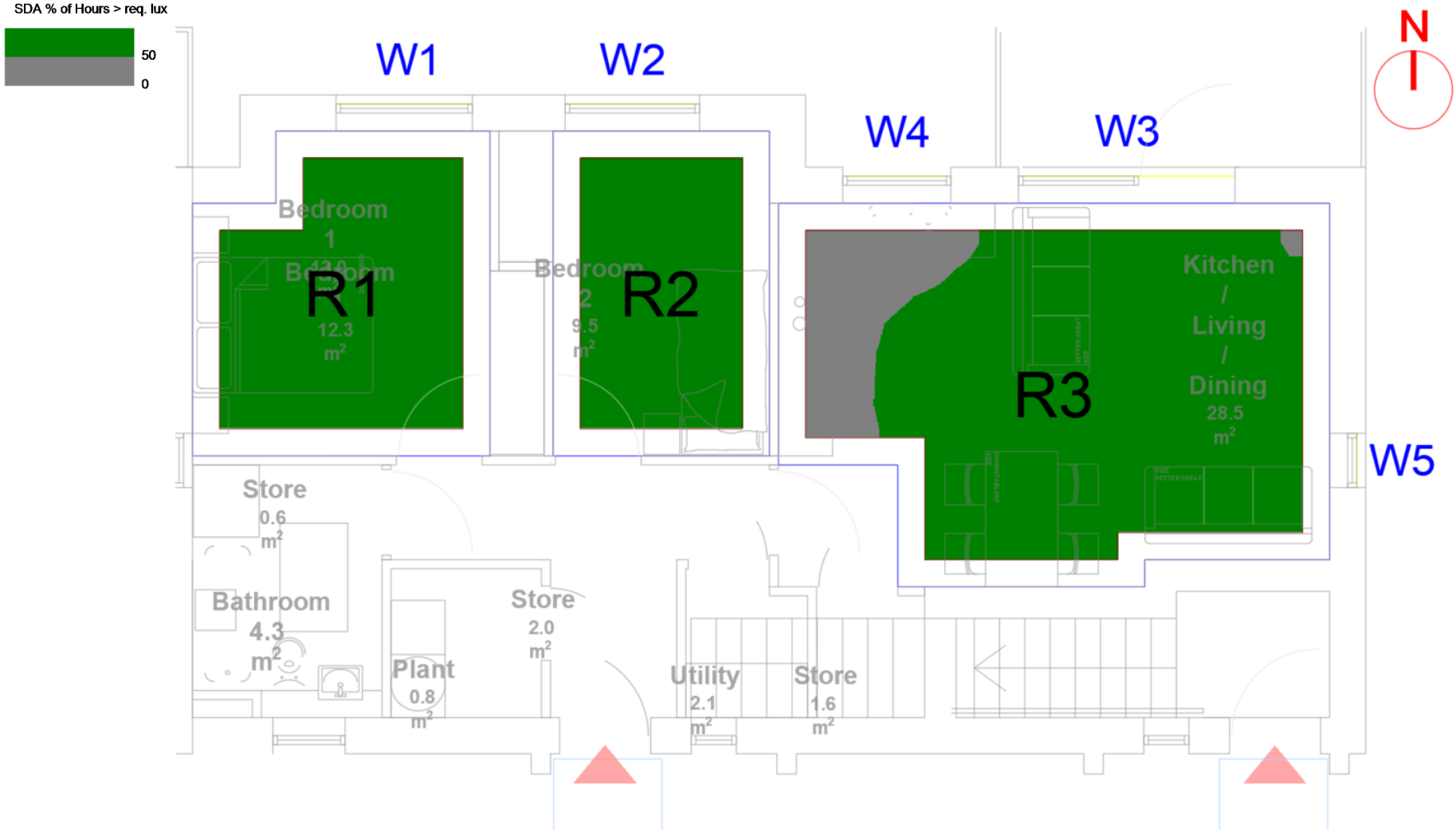


Figure 81: Proposed Ground Floor sDA Contours of House No.3 Block E (Duplex)

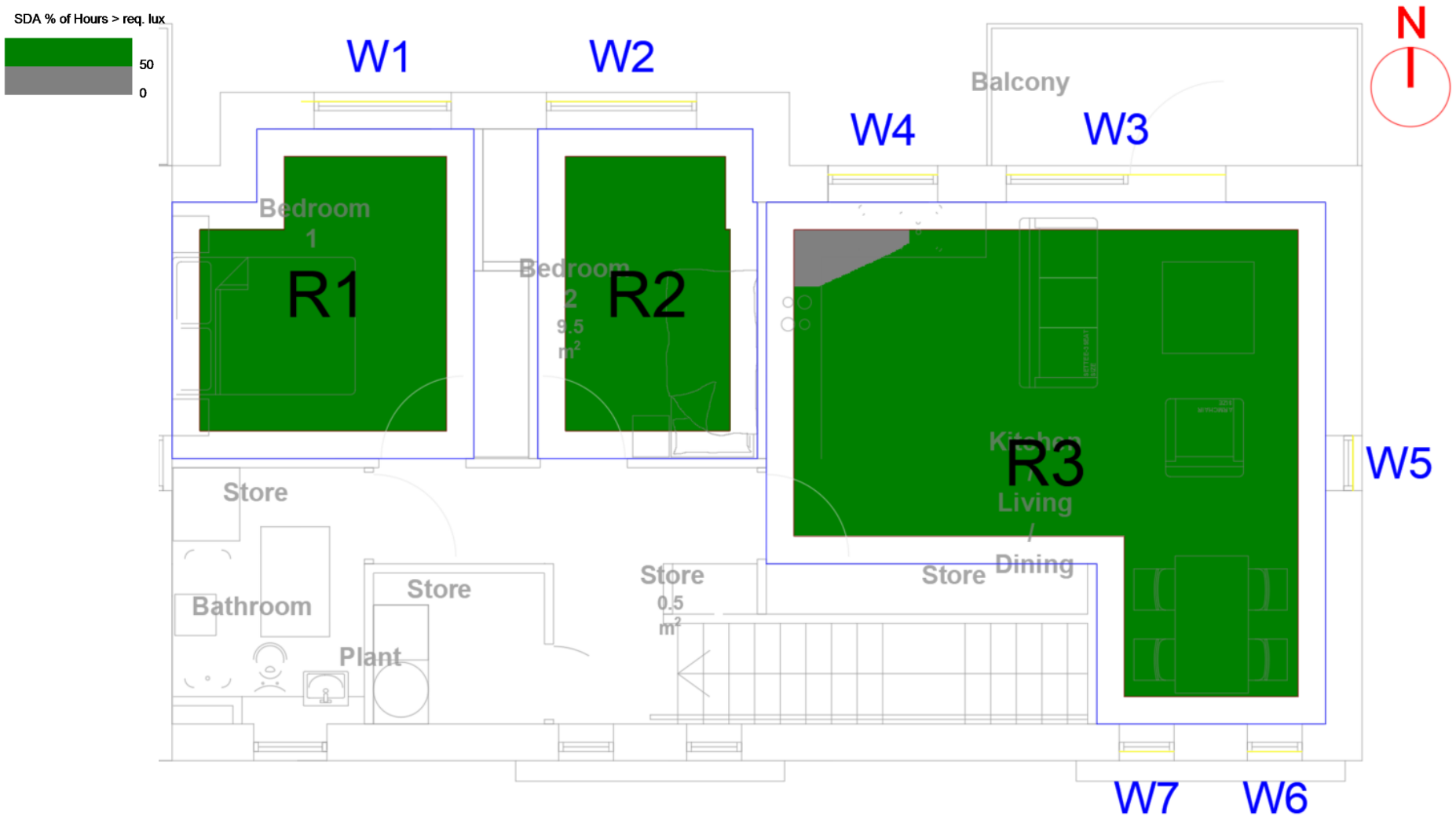


Figure 82: Proposed First Floor sDA Contours of House No.3 Block E (Duplex)

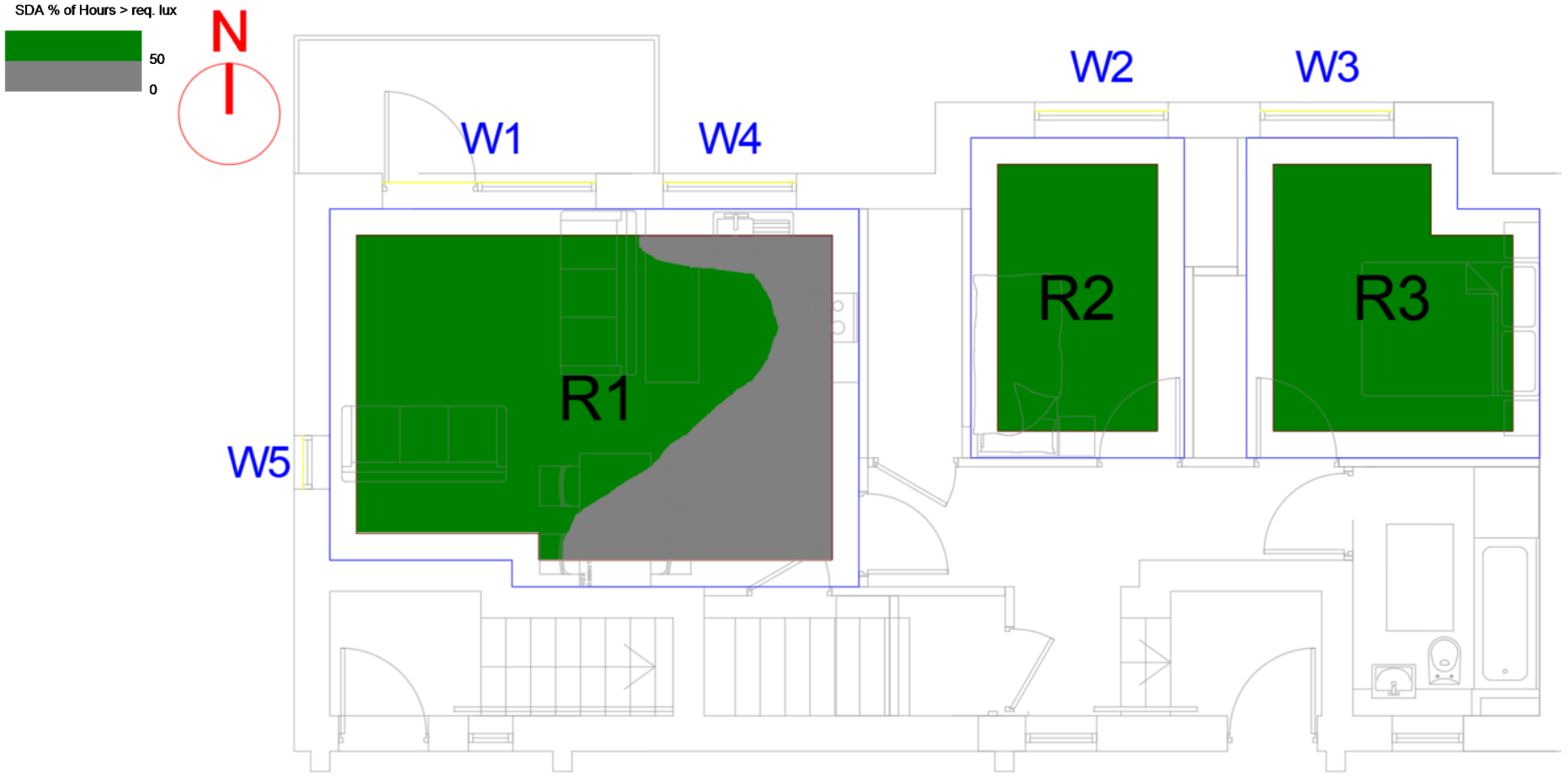


Figure 83: Proposed Ground Floor sDA Contours of House No.1 Block D (Duplex)

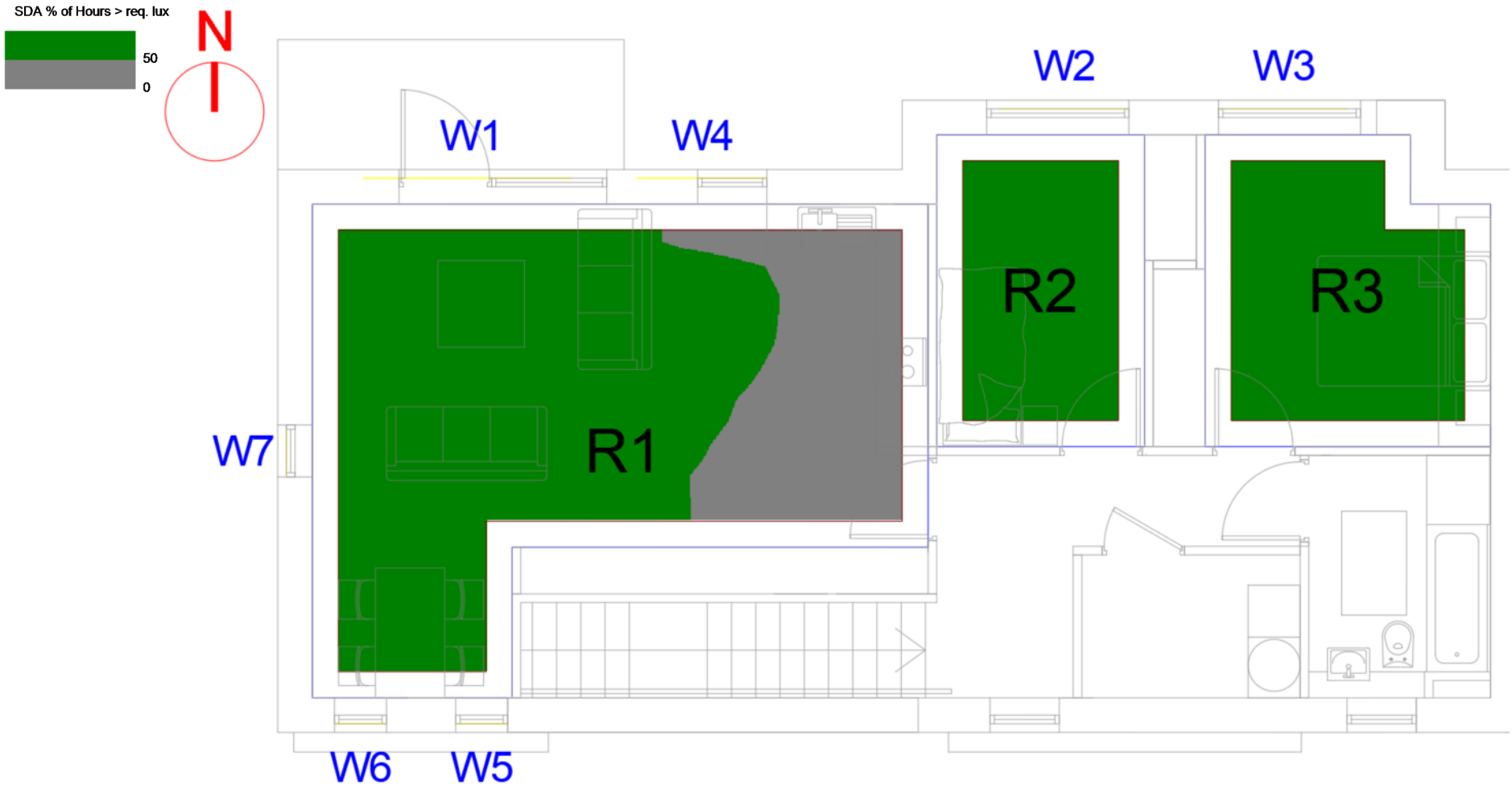


Figure 84: Proposed First Floor sDA Contours of House No.1 Block D (Duplex)

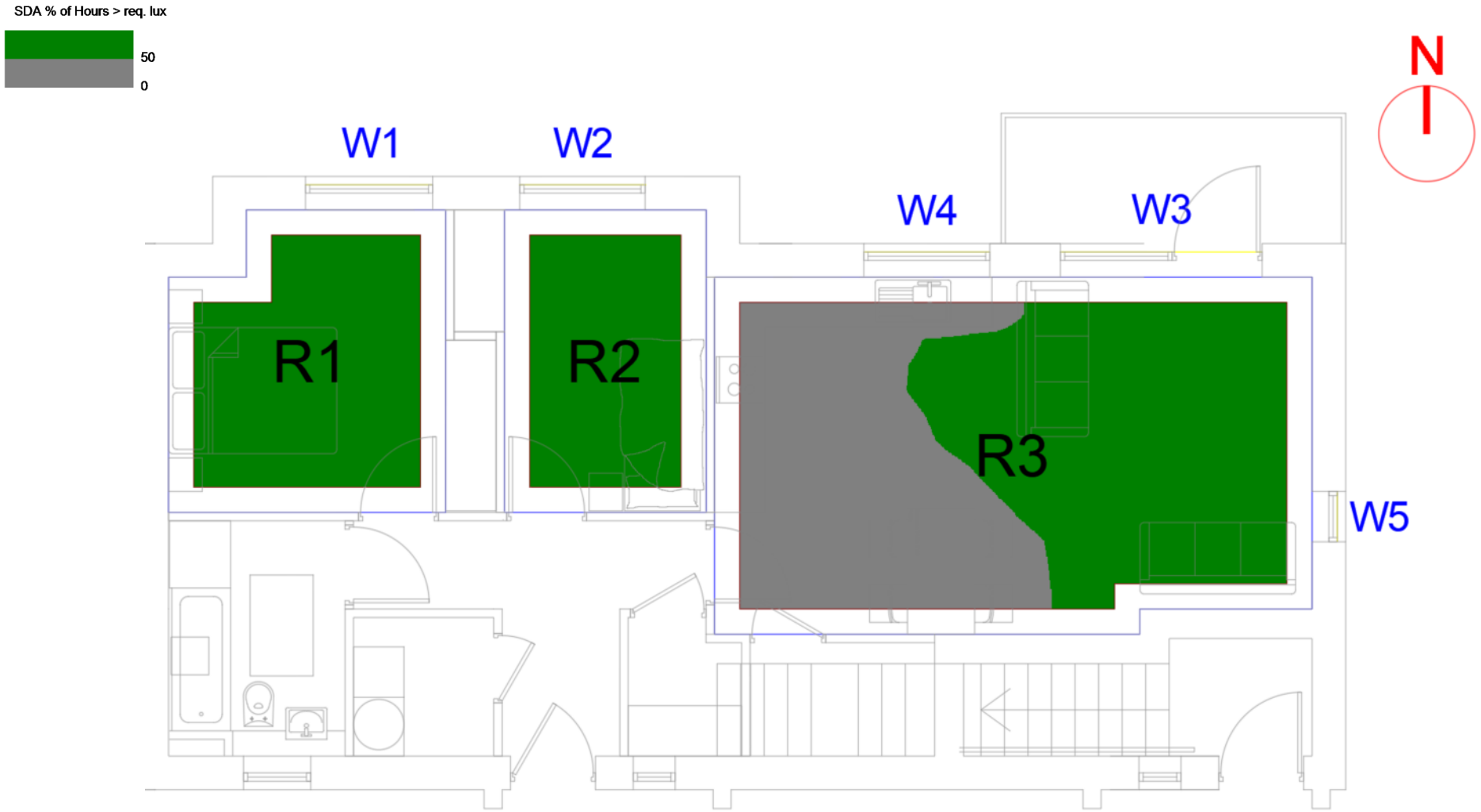


Figure 85: Proposed Ground Floor sDA Contours of House No.2 Block D (Duplex)

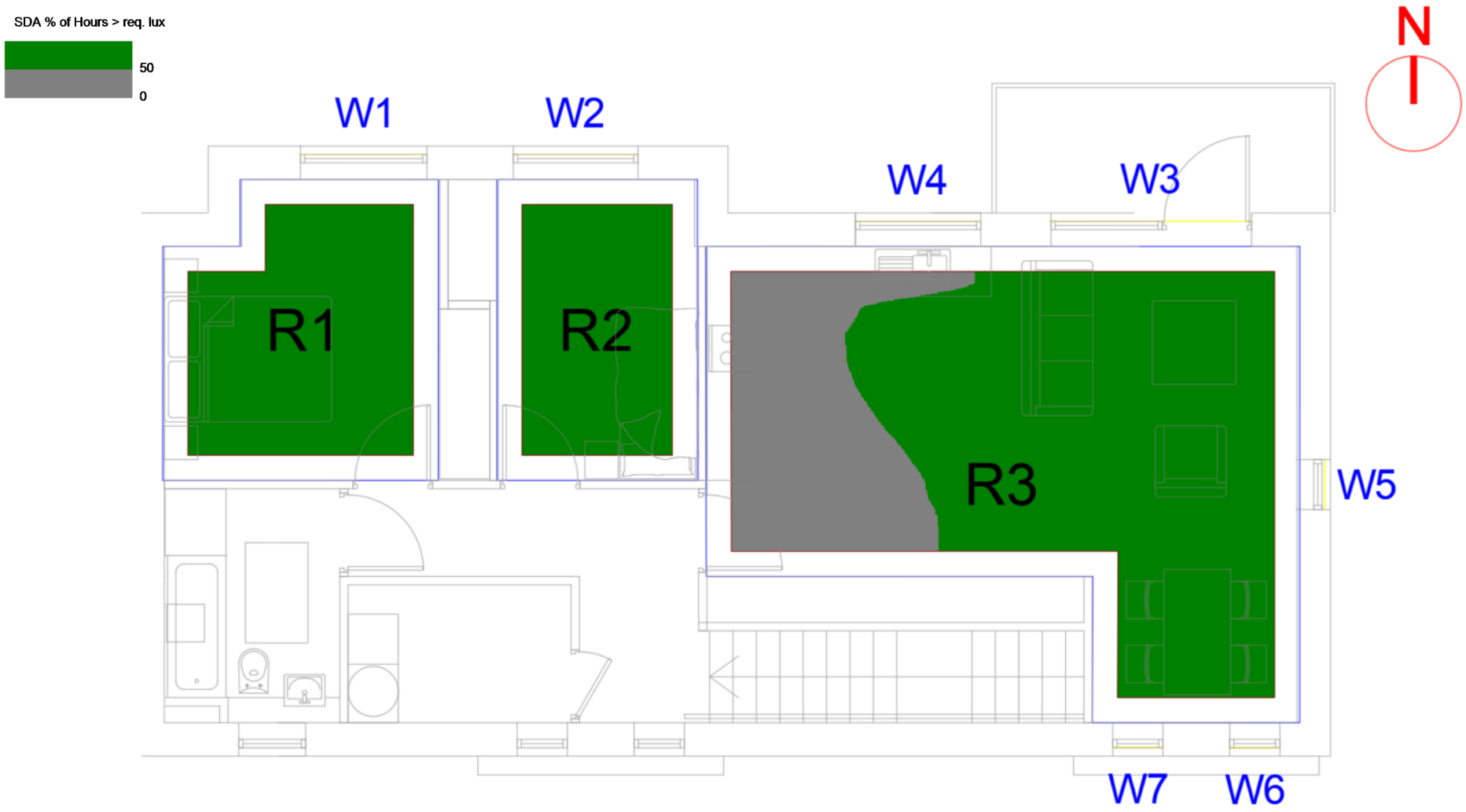


Figure 86: Proposed First Floor sDA Contours of House No.2 Block D (Duplex)

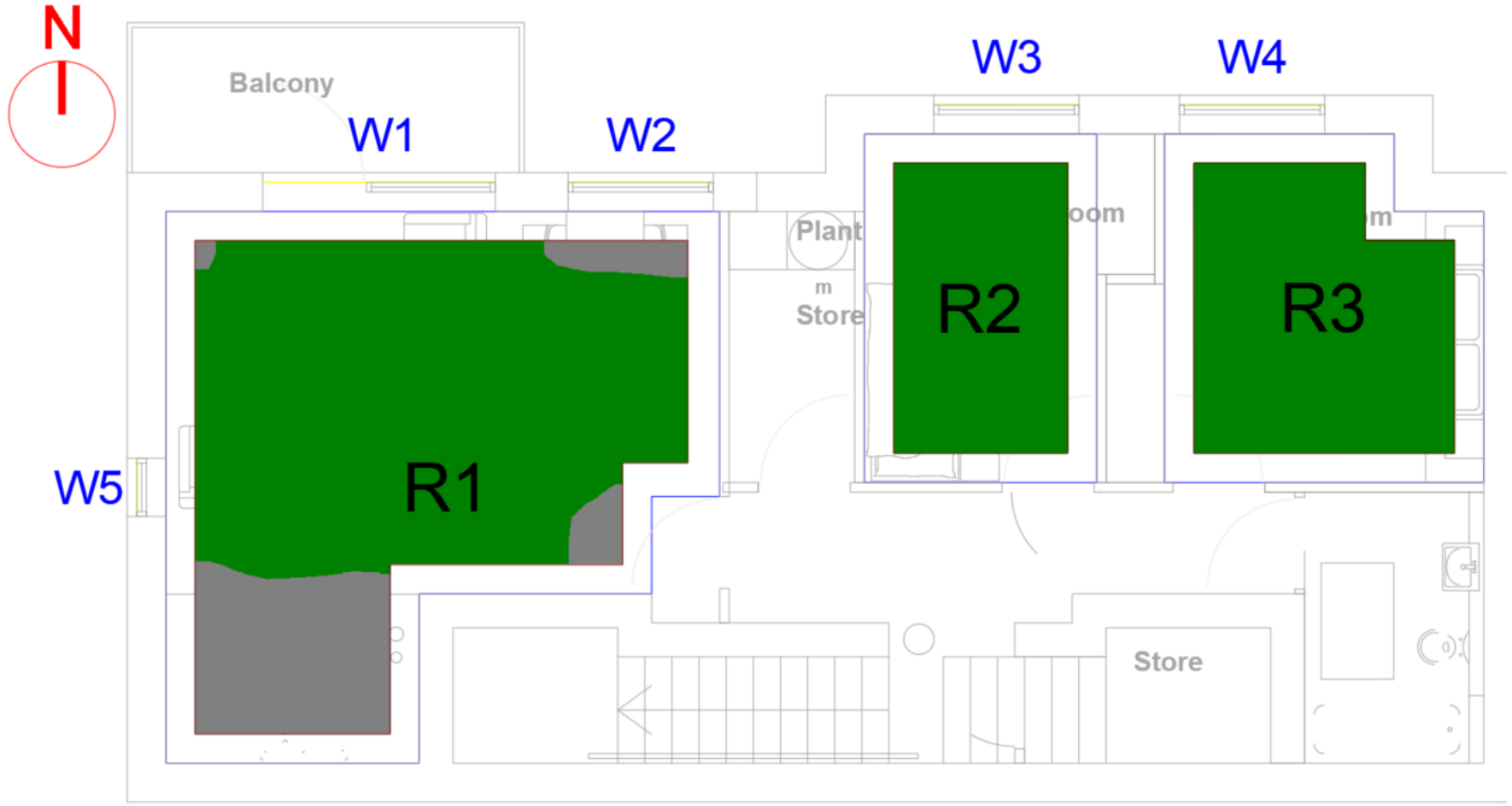


Figure 87: Proposed Ground Floor sDA Contours of House No.1 Block C (Duplex)

Figure 88: Proposed First Floor sDA Contours of House No.1 Block C (Duplex)

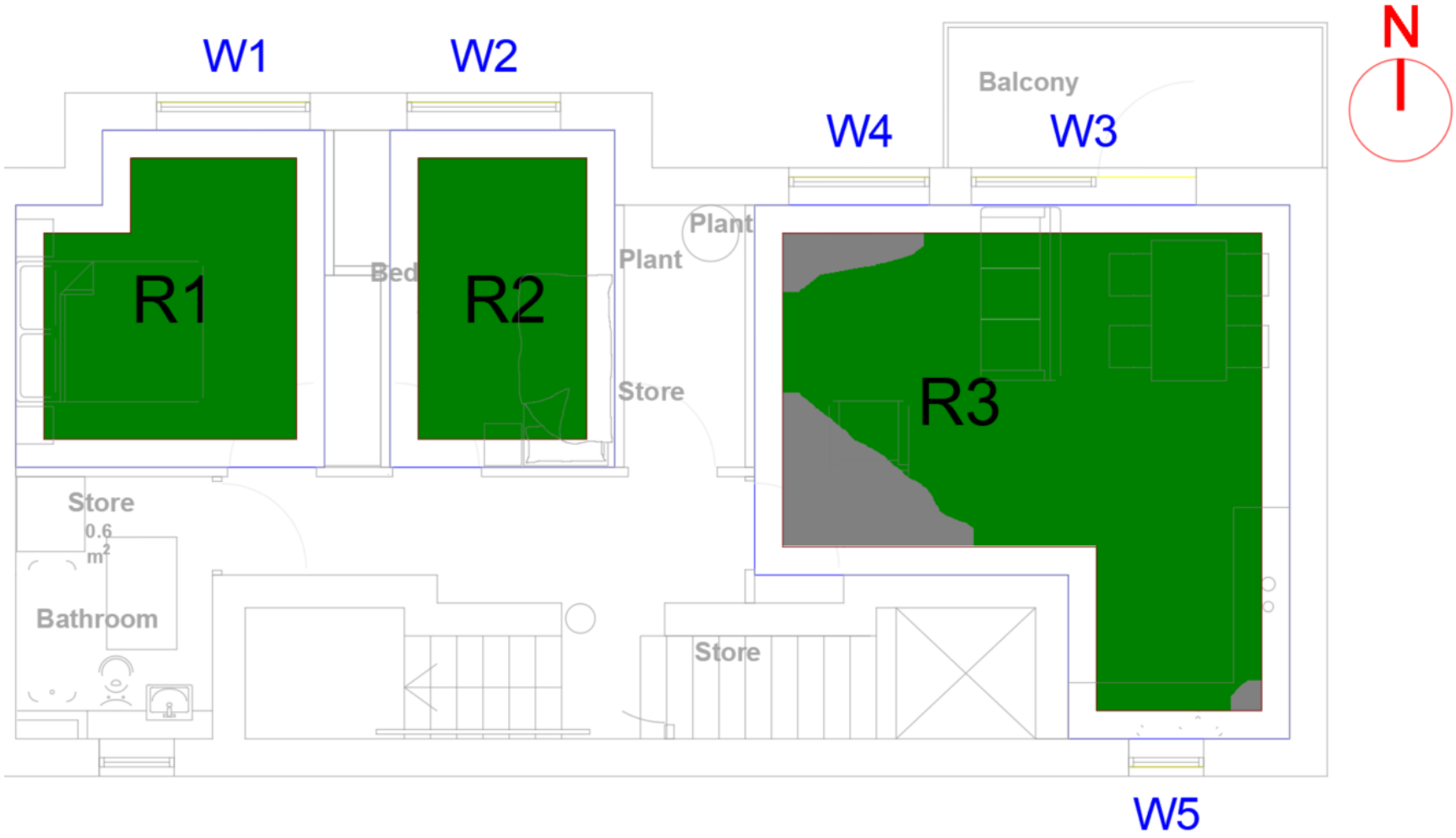


Figure 89: Proposed Ground Floor sDA Contours of House No.2 Block C (Duplex)

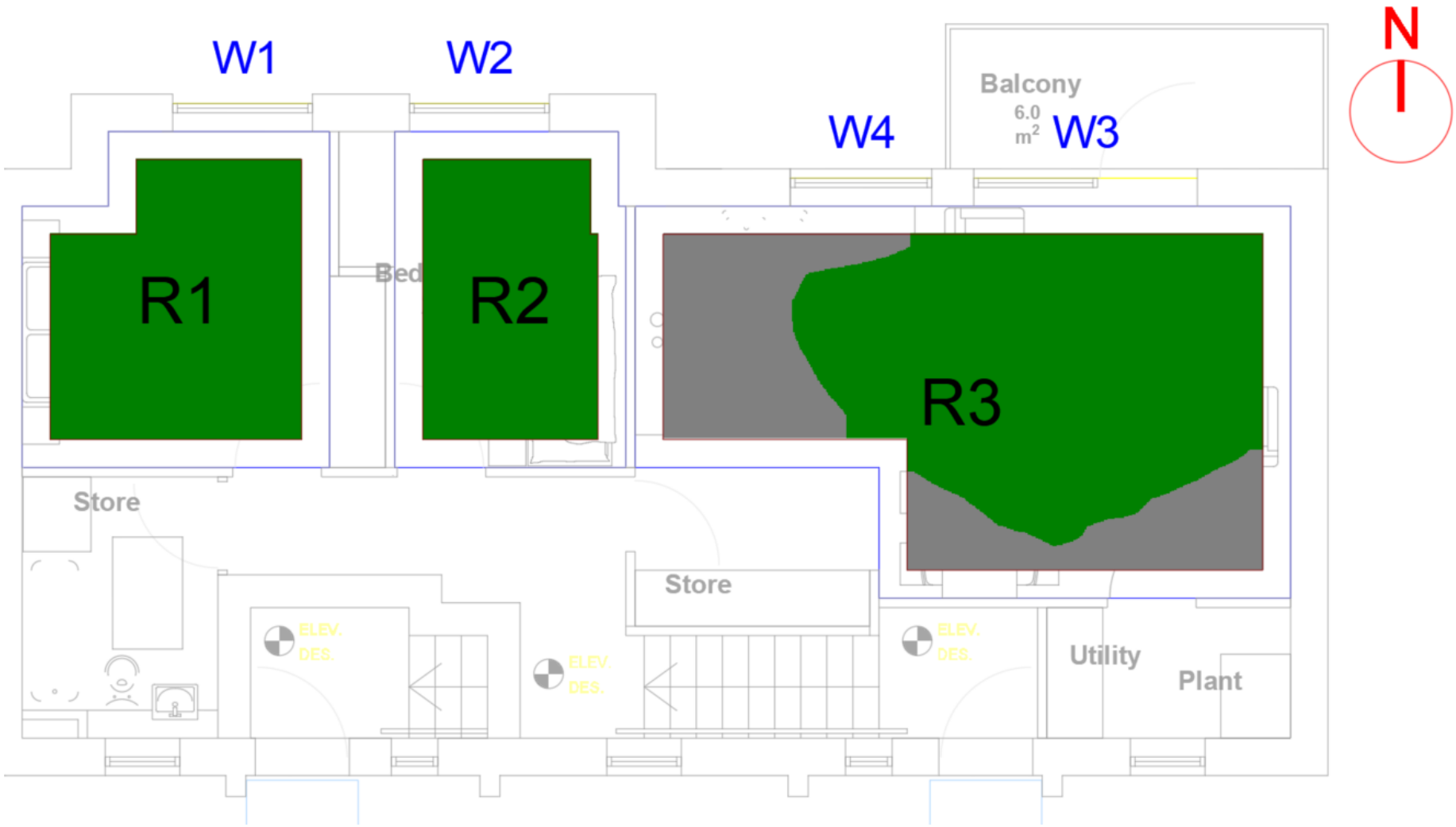


Figure 90: Proposed First Floor sDA Contours of House No.2 Block C (Duplex)

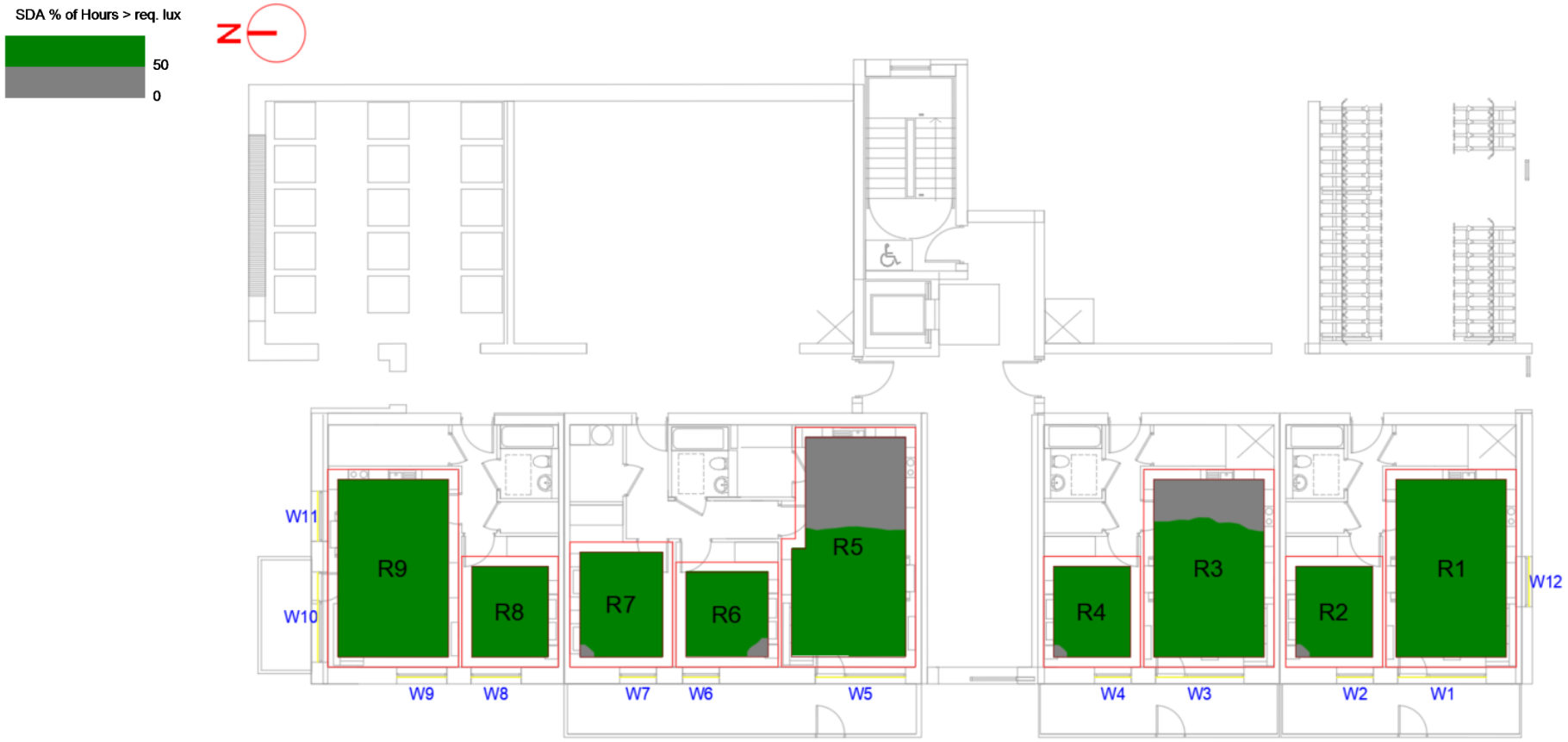


Figure 91: Proposed Lower Ground Floor sDA Contours of Apartment Block A

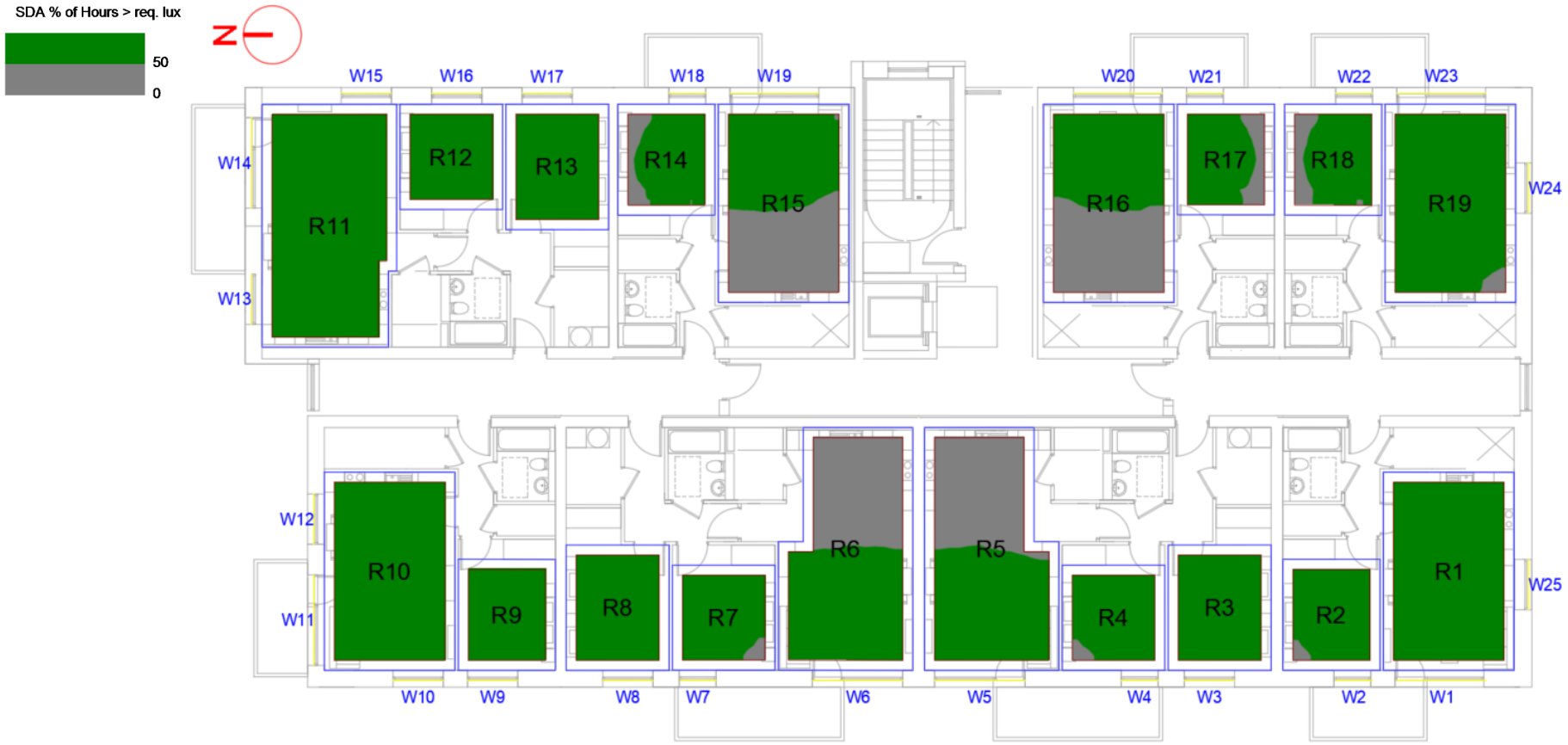


Figure 92: Proposed Ground Floor sDA Contours of Apartment Block A

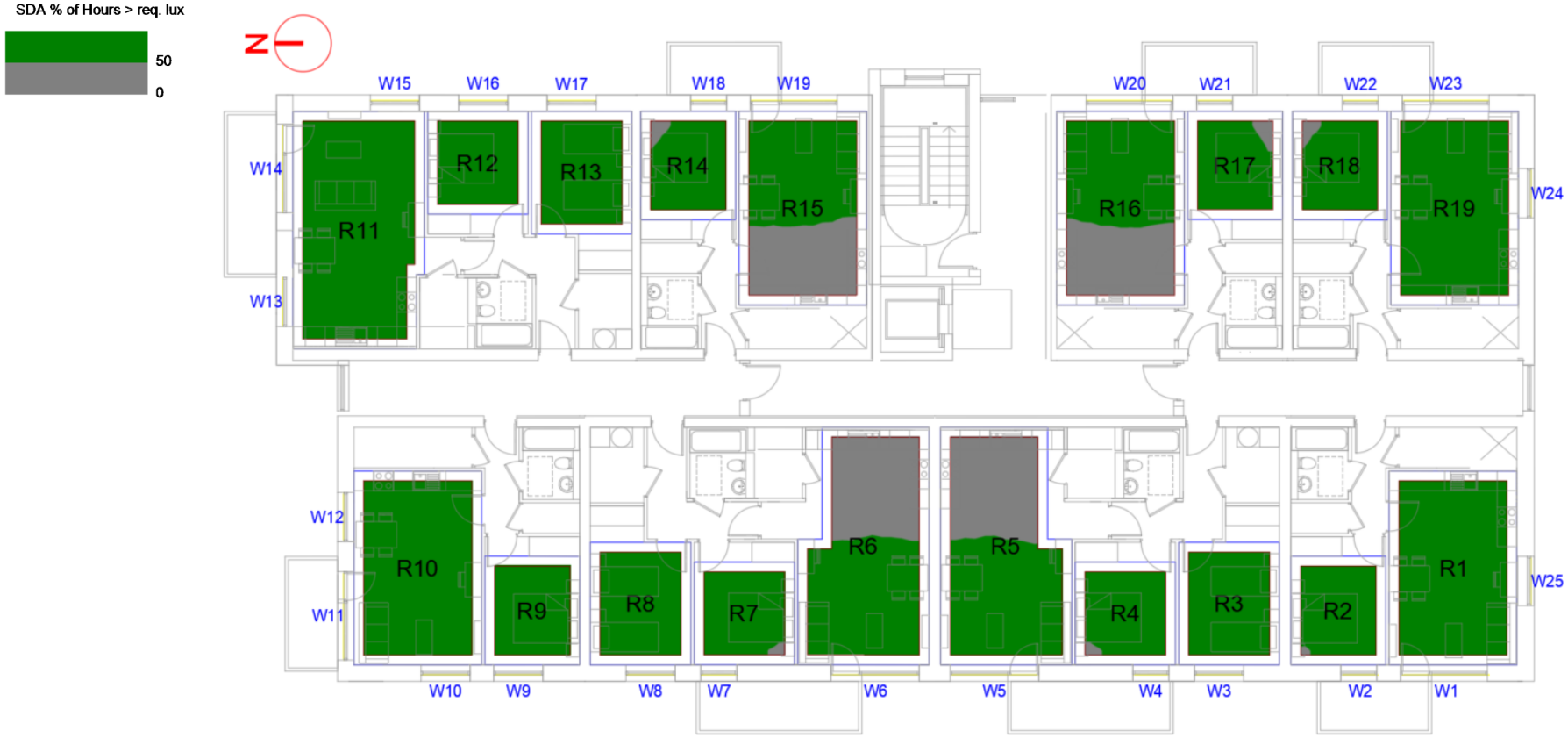


Figure 93: Proposed First Floor sDA Contours of Apartment Block A

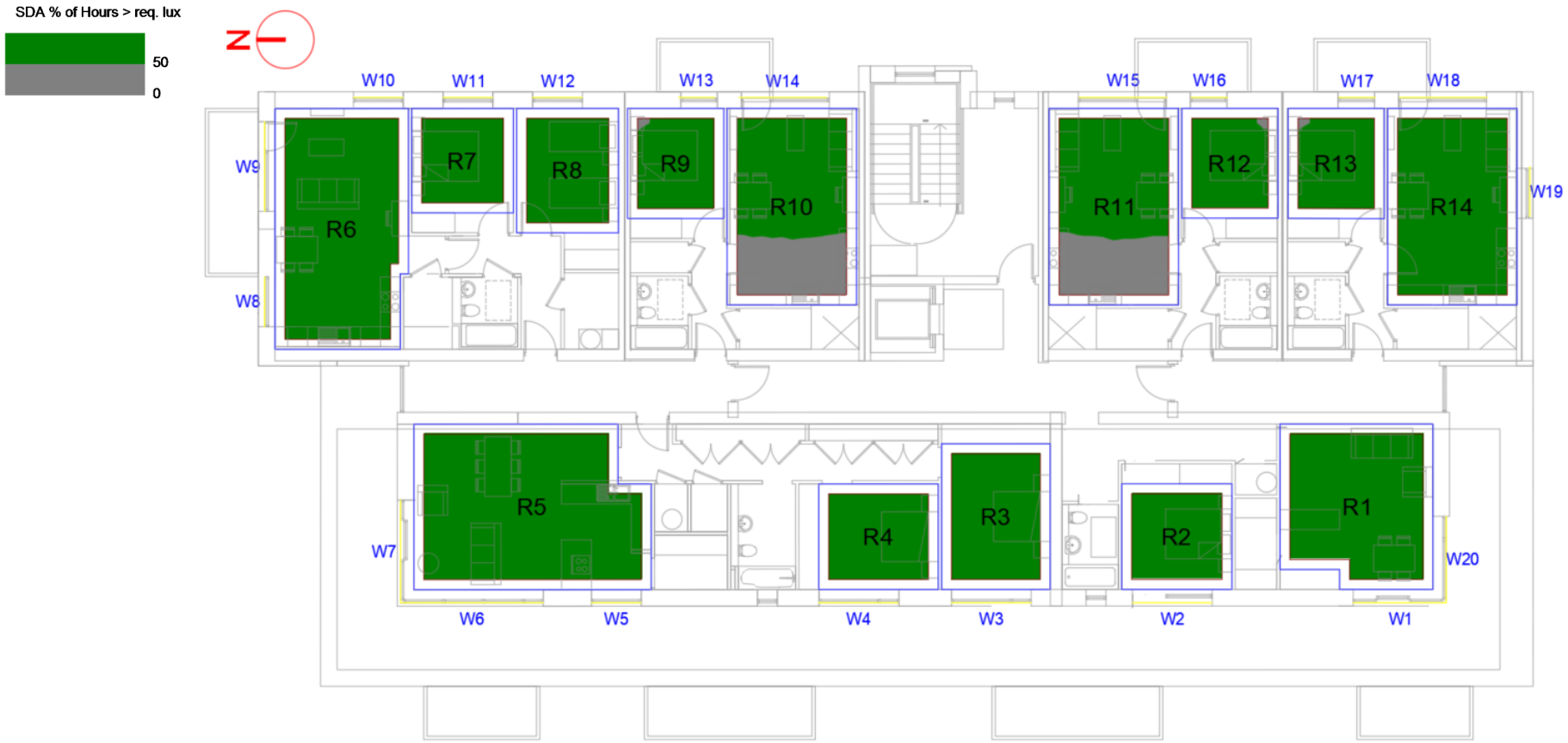


Figure 94: Proposed Second Floor sDA Contours of Apartment Block A

Figure 95: Proposed Ground Floor sDA Contours of Apartment Block B

Figure 96: Proposed First Floor sDA Contours of Apartment Block B

Figure 97: Proposed Second Floor sDA Contours of Apartment Block B

Figure 98: Proposed Third Floor sDA Contours of Apartment Block B

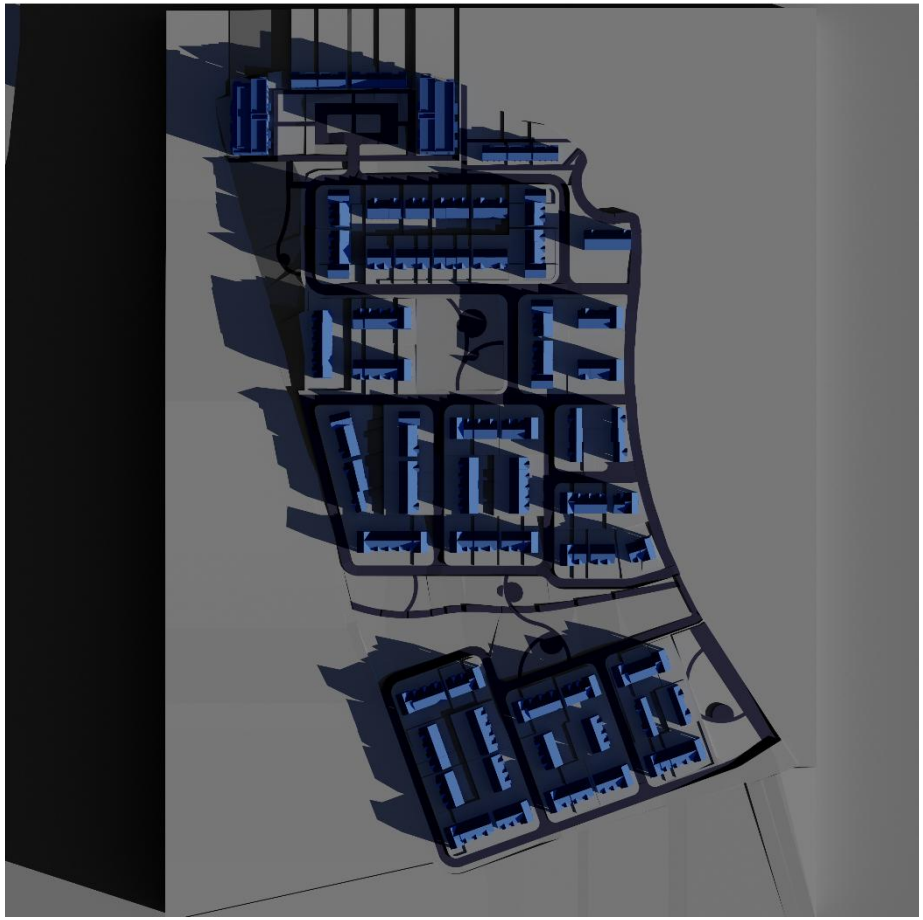
Appendix B Shadow Images

Shadow plots are used to show the shadows which the proposed building makes. "*In interpreting the impact of such differences, it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected.*" (BRE Building Technology Group, 2022)

Shadow plots were created for March 21st and June 21st. March 21st is the equinox and as such provides the average level of shadowing that can be expected. June 21st is a summertime plot and represents the best case for shadow. (December 21st has not been plotted as at this time of year even low buildings will cast long shadows. In a built-up area, it is common for large areas of the ground to be in shadow in December.)

The shadow plots are purely illustrative (as opposed to other quantitative or quantitative metrics used in the analysis).

B.1 March 21st

	Proposed
March 21st - 08:00 (UTC)	20820-LON-BPC-XX-ZZ-M3-P2-01 21-Mar 08-00-PROPOSED 

March 21st – 10:00 (UTC)

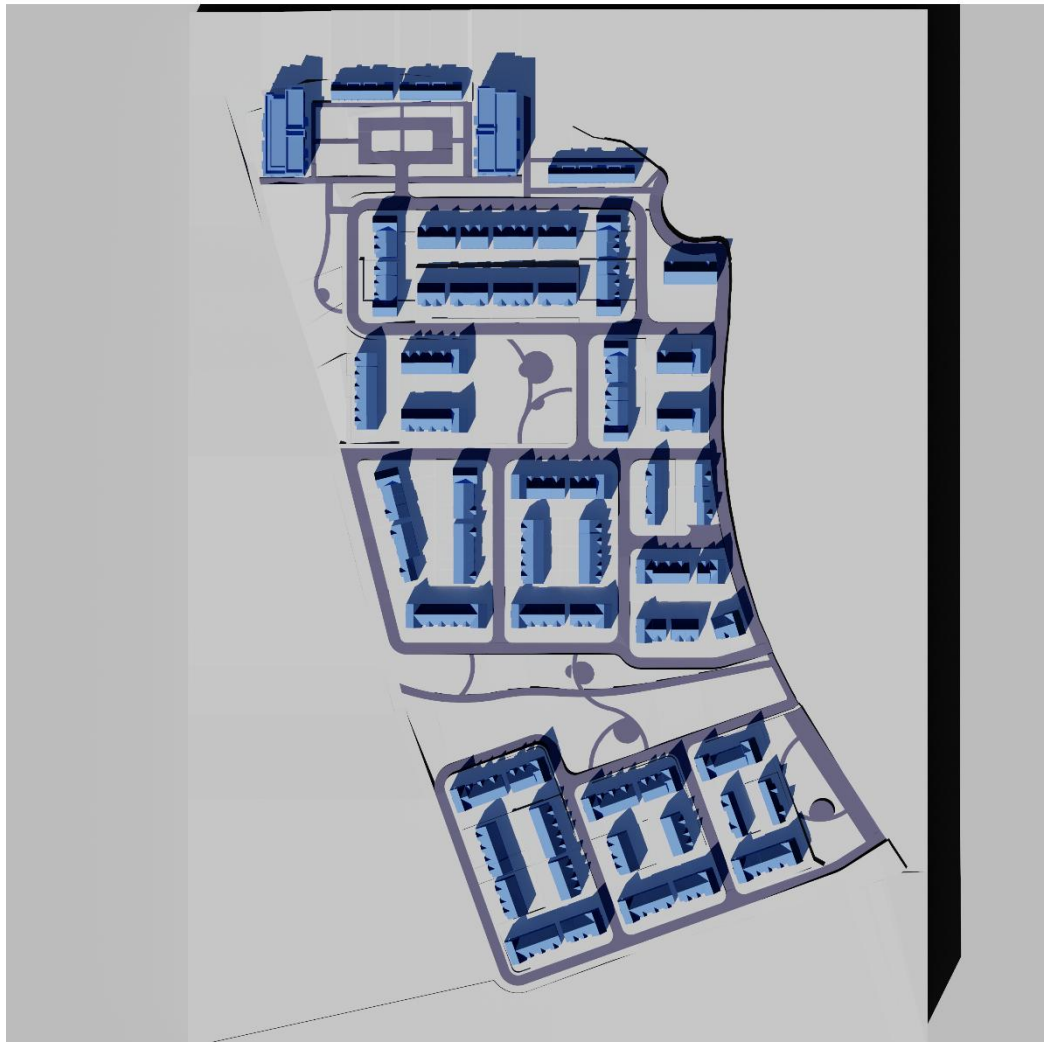
20820-LON-BPC-XX-ZZ-M3-P2-01
21-Mar 10-00-PROPOSED

March 21st - 12:00 (UTC)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Mar 12-00-PROPOSED

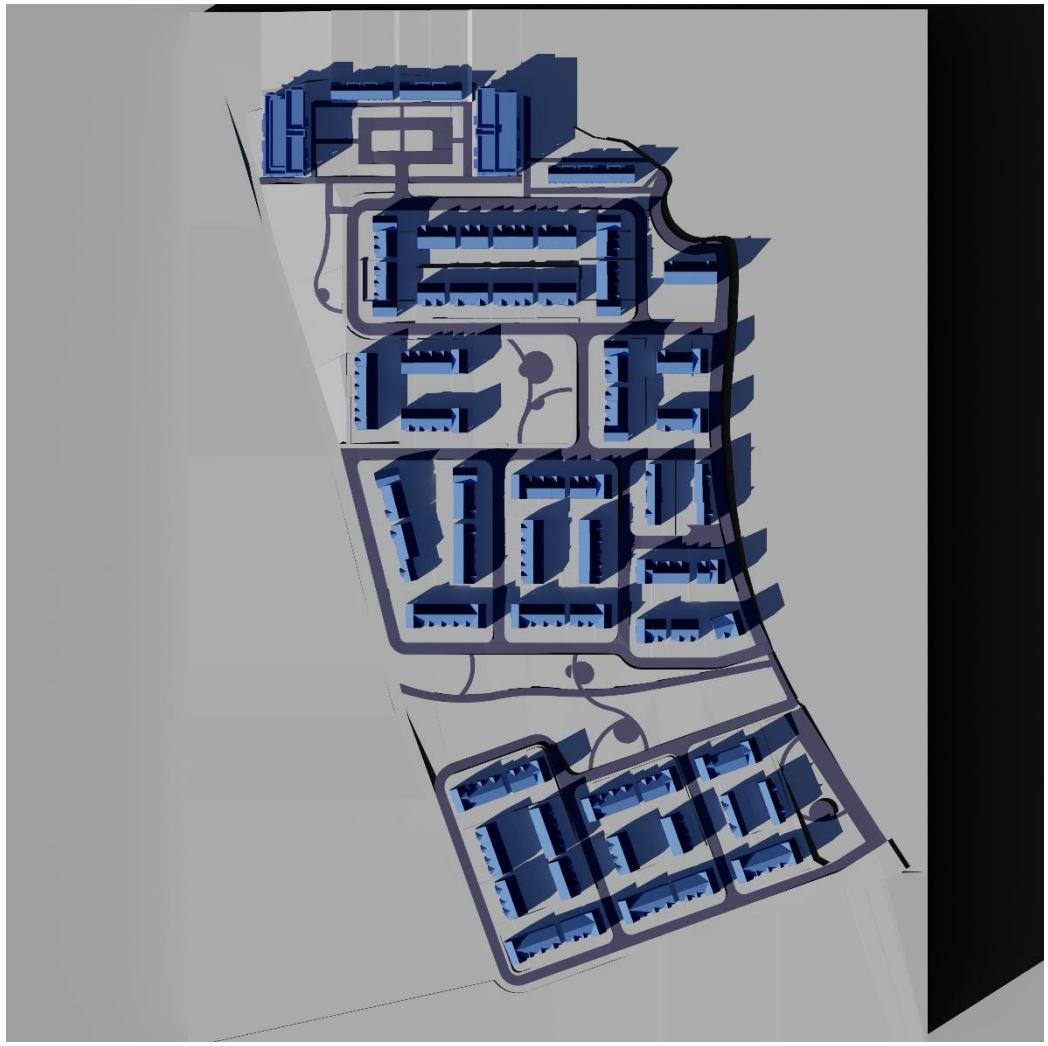
March 21st - 14:00 (UTC)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Mar 14-00-PROPOSED

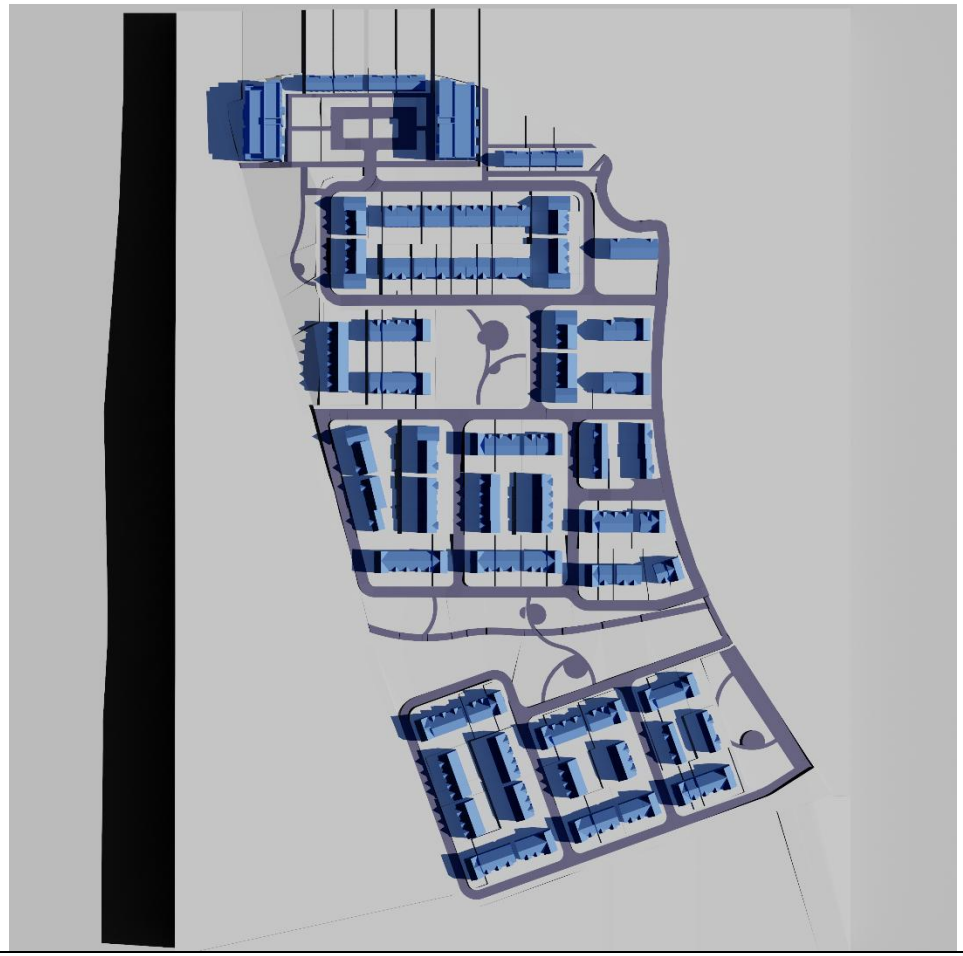


March 21st - 16:00 (UTC)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Mar 16-00-PROPOSED



B.2 June 21st

	Proposed
June 21st - 8:00 (UTC+1)	20820-LON-BPC-XX-ZZ-M3-P2-01 21-Jun 08-00-PROPOSED 

June 21st - 10:00 (UTC+1)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Jun 10-00-PROPOSED

June 21st - 12:00 (UTC+1)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Jun 12-00-PROPOSED

June 21st - 14:00 (UTC+1)

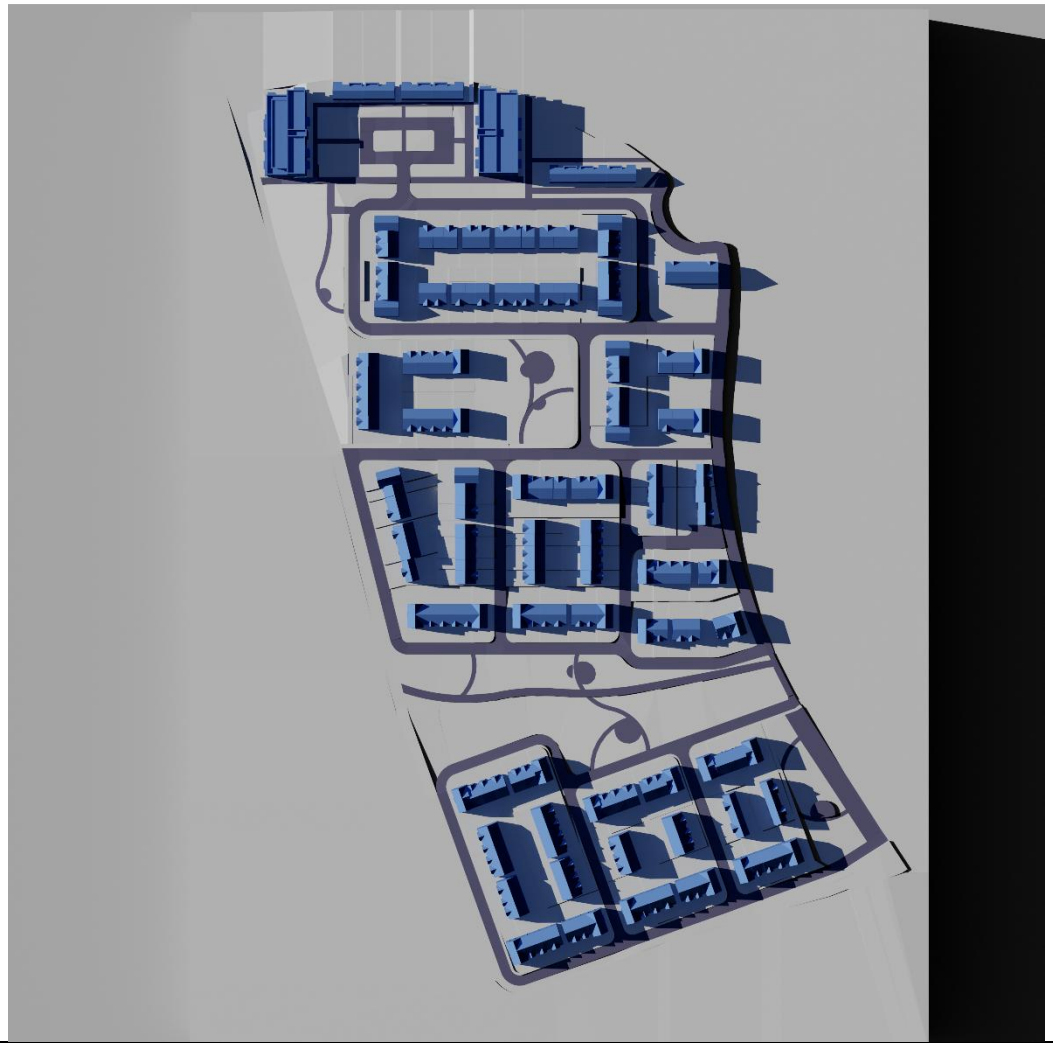
20820-LON-BPC-XX-ZZ-M3-P2-01
21-Jun 14-00-PROPOSED

June 21st - 16:00 (UTC+1)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Jun 16-00-PROPOSED

June 21st – 18:00 (UTC+1)

20820-LON-BPC-XX-ZZ-M3-P2-01
21-Jun 18-00-PROPOSED



7 Bibliography

BRE Building Technology Group. (2022). *Site layout planning for daylight and sunlight, A guide to good practice.* London: BRE.

CEN. (2019). *BS EN 17037:2018 Daylight in buildings.* BSI Standards Limited 2019.

CIE. (2020). *CIE S 017:2020 ILV: International Lighting Vocabulary, 2nd edition.* CIE.

Illuminating Engineering Society. (2022). *https://www.ies.org/standards/definitions/*. Retrieved from https://www.ies.org: https://www.ies.org/standards/definitions/

www.bpcengineers.com

BUILDING PERFORMANCE CONSULTING