MACH GROUP | SUSTAINABILITY & ACOUSTICS

110 – 112 EAST STREET, BRISTOL

Internal Daylighting Assessment

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00	First Issue	Gianluca Ribi	Ryan Jennings	Ryan Jennings	19/02/2025
01	Drawing Update	Gianluca Ribi	Ryan Jennings	Gianluca Ribi	04/03/2025
02	Design Update	Gianluca Ribi	Josh Childs	Josh Childs	17/11/2025

CONTENTS

EXECUTIVE SUMMARY

MACH has carried out a detailed assessment of the internal daylight and sunlight levels within the proposed development at 110-112 East Street in Bristol. The following bullet points provide a summary of the analysis carried out:

- A 3D daylight model has been constructed and assessed for the proposed development, considering the shading from itself and the adjacent buildings that may become a major limiting factor of daylighting performance. All daylight sensitive spaces within the proposed development have been assessed and found to meet the BRE criteria for internal daylighting.

- An assessment has been made against both the latest (2022) and previous version (2011) of BRE guidance BR209, so to allow for a comparison between the new and previous criteria.

- It is apparent that the proposed layouts have been assembled to provide as much daylight access as possible within the exisiting building. The proposed design ensure the internal spaces are getting the optimum daylight and sunlight level through the use of large glazing areas, rooflights and optimised room layouts.

- It is therefore considered that the proposed development has competent daylight design, and all of the assessed spaces comfortably meet both the 2011 and 2022 BRE criteria.

The figure to the opposite shows a view of the existing site. The table opposite shows the daylighting results for the assessed spaces:

Figure 0.1: Top View of the Existing Site (in red)

Room Type	Total Number of Spaces Assessed	Average Daylight Factor (2011 BRE Criteria)		Daylight Distribution (2022 BRE Criteria)	
		Number of spaces meeting BRE criteria	Percentage of BRE Compliance	Number of spaces meeting BRE criteria	Percentage of BRE Compliance
Kitchen / Dining / Kitchenette	3	3	100%	3	100%
Bedroom	15	15	100%	15	100%
Total	**18**	**18**	**100%**	**18**	**100%**

Table 0.1: Summary of the Daylight and Sunlight Assessment Results

1.0 INTRODUCTION

This report outlines an internal daylight and sunlight assessment of the proposed redevelopment at 110-112 East Street in Bristol. The proposed scheme involves the demolition of the annexe buildings belonging to the existing 110-112 East Street properties and erecting a three-storey building containing 15 bed co-living dwellings. The building that will be retained on the site facing East Street will also have a commercial unit on the ground floor.

The purpose of the daylight and sunlight assessment is to provide guidance on the quality of internal daylight and sunlight levels within the proposed living spaces.

The assessment has been carried out using IES 3D modelling software. The report details the modelling carried out to determine the level of daylight and sunlight received in the assessed rooms.

Note: The assessment has been carried out as per the provided architectural drawings.

2.0 PROPOSED DEVELOPMENT

The proposed development is a new build property that will connect to the existing main building on the site. It will contain 15 bedroom co-living dwellings spread across three floors. The ground floor of the building that will be retained on site will be converted into a commercial unit and a bike store.

The figure to the opposite shows the proposed site plan of the development.

Figure 2.1: Proposed Site Plan

The figures to the opposite and on the next page show the floor plans of the proposed development.

Figure 2.2 Proposed Ground Floor Plan

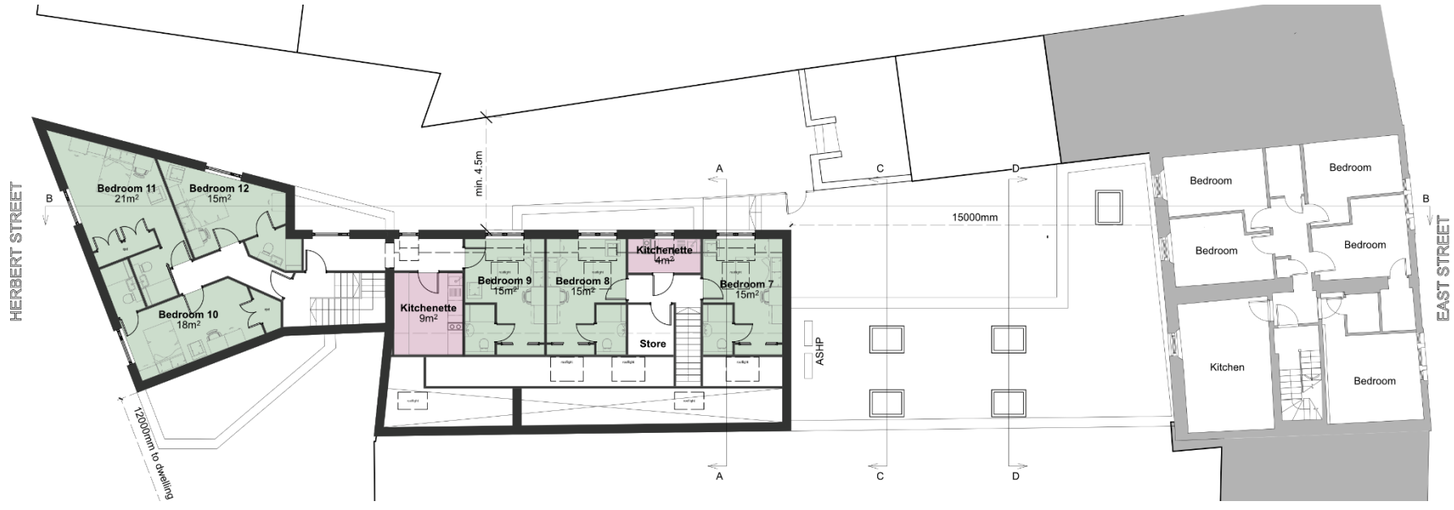

Figure 2.3 Proposed First Floor Plan

The figure to the opposite shows the second floor plan of the proposed development.

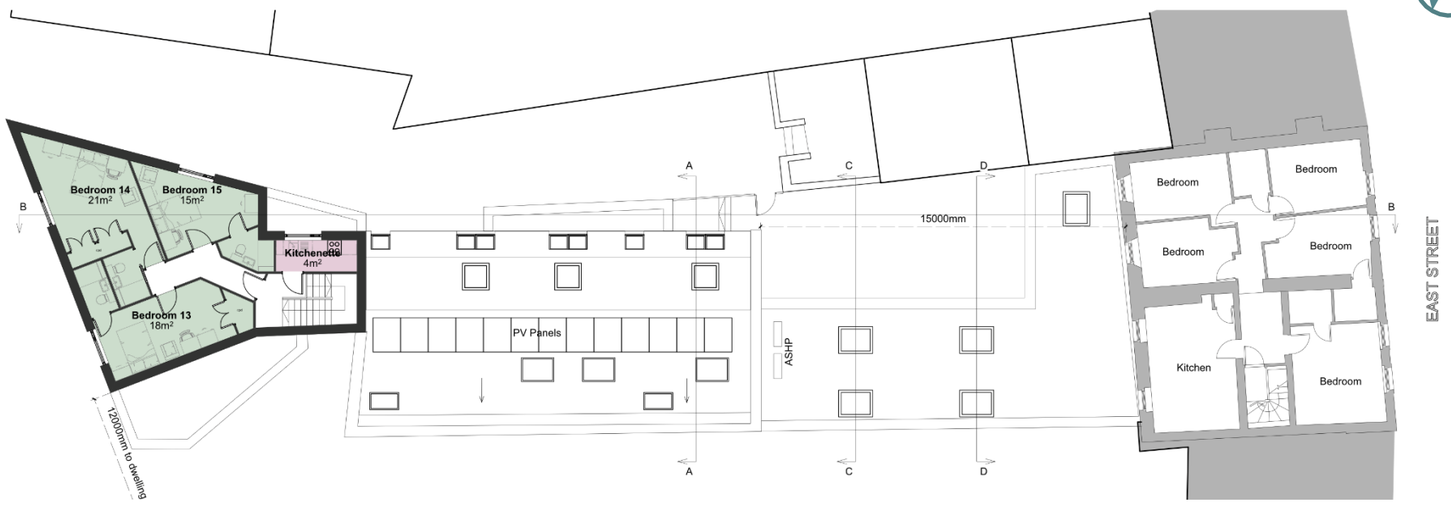

Figure 2.4 Proposed Second Floor Plan

The figures to the opposite and on the following pages represent the elevations and sections of the proposed development.

Figure 2.5 Proposed North East Elevation

Figure 2.6 Proposed North East Elevation & Section BB

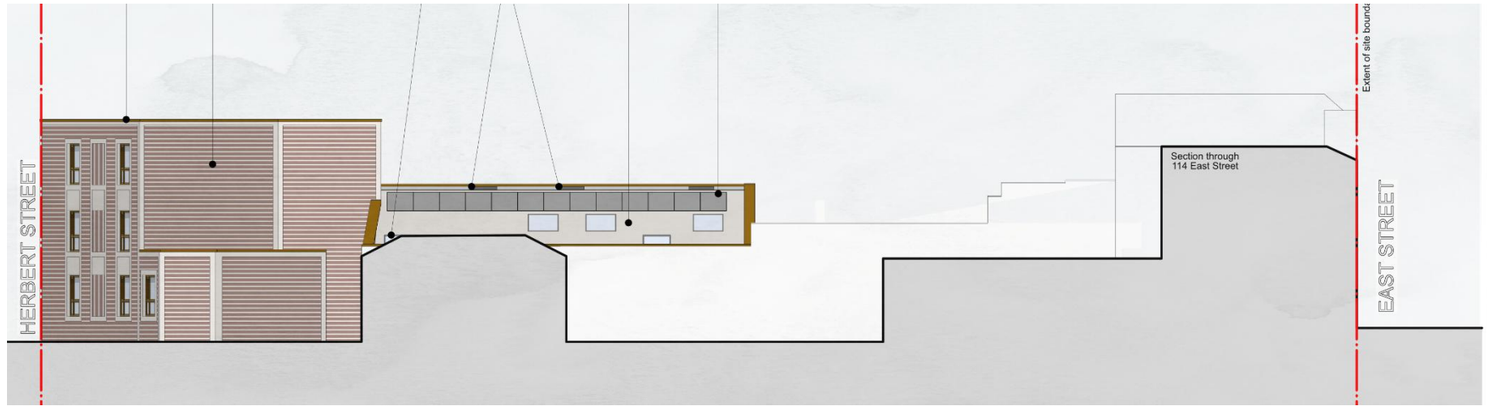

Figure 2.7 Proposed South West Elevation

The figures to the opposite depict a selection of elevations of the proposed development.

Figure 2.8 Proposed North West Elevation

Figure 2.9 Proposed South East Elevation

The figures to the opposite depict the sections of the development.

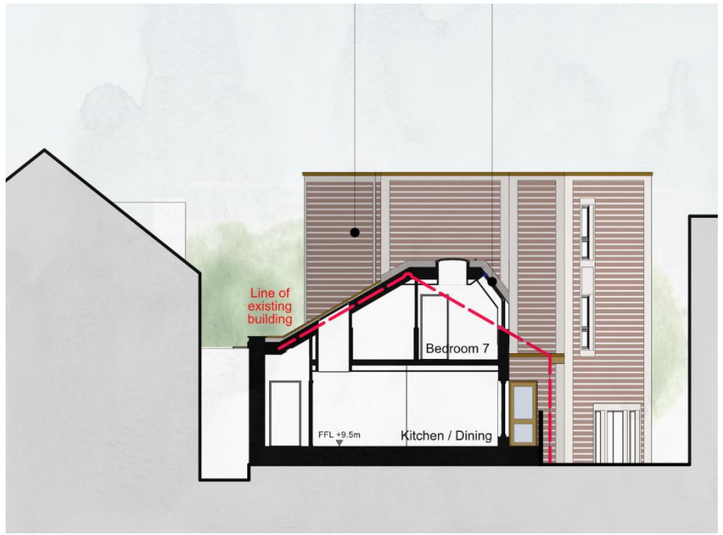

Figure 2.10 Proposed Section / Elevation AA

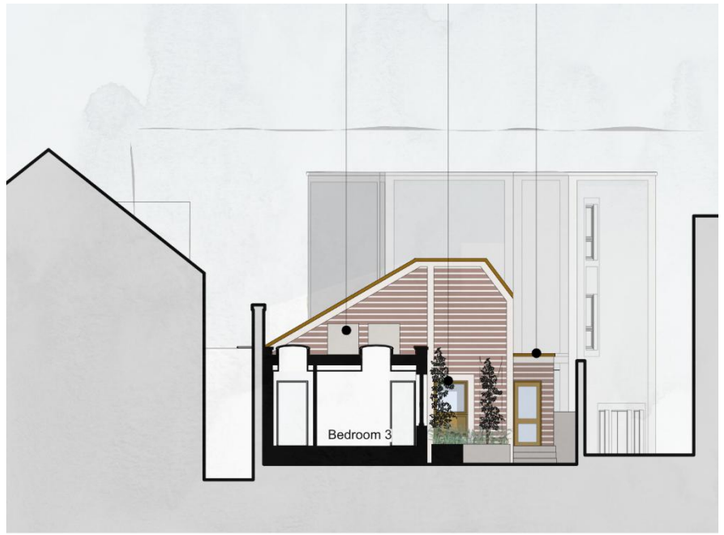

Figure 2.11 Proposed Section / Elevation CC

Figure 2.12 Proposed Section / Elevation DD

3.0 POLICIES & ASSESSMENT METHODOLOGY

3.1 BRE – Site Layout Planning for Sunlight and Daylight: A Guide to Good Practice (2022)

The BRE document states that the daylight criteria should only apply to living and occupied areas within the development, which includes kitchens, living rooms and bedrooms. As such, an assessment for the proposed development will be carried out for the Kitchen/Living/Dining rooms, reception rooms and bedrooms.

Adoption of BRE Guidance

It is important to note that the guidance provided within BR209 is for recommendation only, and thus not a strict set of targets that needs to adhere to at all locations. It is acknowledged in the document that sites of high density or historical context may be particularly restricted by the guidance within the document, and as such alternative performance targets may be suitable.

3.1.1 Daylight

Average Daylight Factor

The most effective way to assess the quality and quantity of daylight within a living area is by calculating the Average Daylight Factor (ADF). The ADF, which measures the overall amount of daylight in space, is the ratio of the average illuminance on the working plane in a room to the illuminance on an unobstructed horizontal surface outdoors, expressed as a percentage. The ADF considers the Visual Sky Component (VSC) value, i.e. the amount of daylight received on windows, the size and number of windows, the diffuse visible transmittance of the glazing used, the maintenance factor and the reflectance of the room surfaces. Therefore, it is considered as a more detailed and representative measure of the daylight levels within a living area. In housing, BS 8206-2 recommends minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

Daylight Factor Distribution

Similarly, to the ADF, which measures the overall amount of daylight in space, is the ratio of the average illuminance on the working plane in a room to the illuminance on an unobstructed horizontal surface outdoors, expressed as a percentage, requirement of the Daylight Factor Distribution, ensures that the certain point daylight factor is achieved over certain calculation area. Criteria changes according to the geographical location of the assessed development, and the purpose of the assessed room.

BRE 2011 Guidance

The previous BRE guidance regarding Sunlight and Daylight was released in 2011 and is referenced by HQM and BREEAM. This document advises using average daylight factor as the measure of internal daylight performance. These are the same values defined in BS 8206-2 as minimum of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

Summary of Targets

For this study, the Average Daylight Factor has been considered in combination with the Daylight Distribution. ADF is a complex and representative calculation as it considers the angle of visible sky reaching the windows as well as the room layout, use and surface reflectance. This has been followed by the Daylight Distribution Criteria, which ensures that the adequate area of the assessed space achieve minimum daylight Factor value.

A summary of the relevant performance targets is provided in the table below.

Measure of Interior Daylight	Benchmark	Daylight Criterion
Average Daylight Factor (2011)	1.5 – 2.0 %	Typical value of ADF for Living rooms/ Kitchens.
	1.0 %	Typical value of ADF for Bedrooms.
Daylight Distribution (2022)	0.7% / 50% area	Target Daylight Factors to achieve over at least 50% of the assessed area of a Bedroom.
	1.1% / 50% area	Target Daylight Factors to achieve over at least 50% of the assessed area of a Living Room.
	1.4% / 50% area	Target Daylight Factors to achieve over at least 50% of the assessed area of a Kitchen.

Table 3.1: Summary of BRE internal daylight criteria

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5.0 ASSESSMENT MEASURES

5.1 Daylight Model

A 3D model of the assessed development and its adjacencies has been created within daylight modelling software IES VE, which has been used to carry out the daylight assessment within each space. The model takes into account the geometry and internal finishes of assessed rooms, as well as the shading from adjacent shading surfaces. The image to the opposite provides screenshots of the built daylight model within IES VE.

5.2 Model Inputs

5.2.1 Surface

The surface reflectance has been assumed as the recommended default values in BRE Guidance.

Surface	Reflectance
Floors (Ground Floor)	0.4
Floors (Other Floors)	0.2
Interior Walls	0.5
Ceiling	0.7
Exterior Walls	0.2
Exterior Ground	0.2

Table 5.1: Summary of Surface Reflectance's

5.2.2 Glazing

No internal blinds have been assigned to any windows at this stage.

Glazing Type	Visible Light Transmittance
External Windows	0.71
Roof Lights	0.71

Table 5.2: Summary of Used Glazing Transmittances

5.2.3 Assessment Grid

Criteria	Description
Height of working plane above finished floor leave	0.85m
Maximum point offset from Wall	0.3m
Maximum grid spacing	0.2m

Table 5.3: Summary of the Assessment Methodology

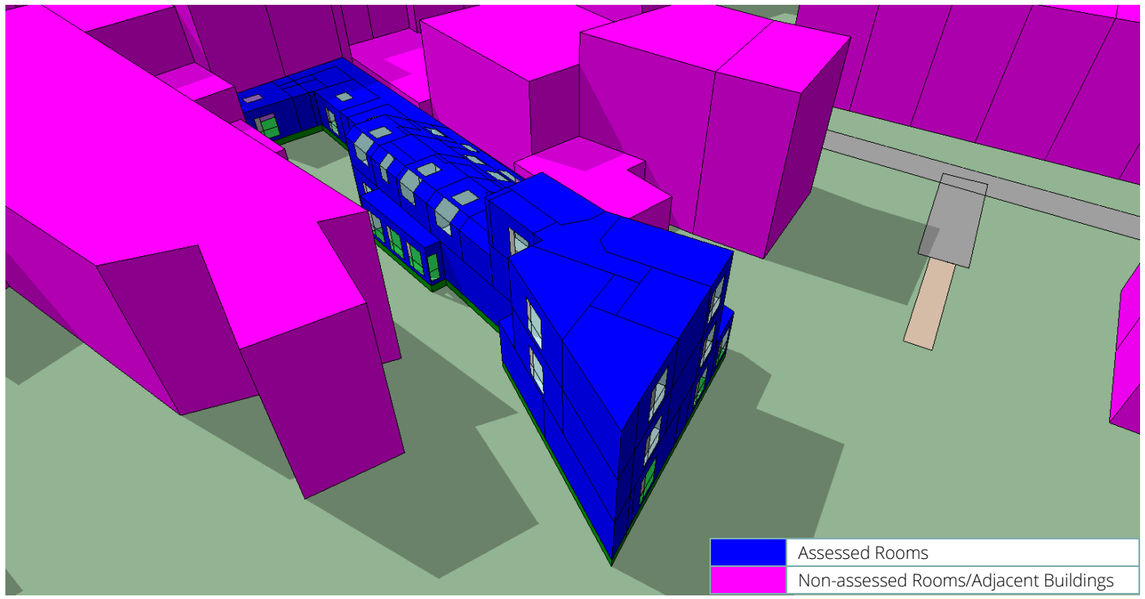


Figure 4.1: South View of The Daylight Model of The Proposed Development and The Adjacent Buildings

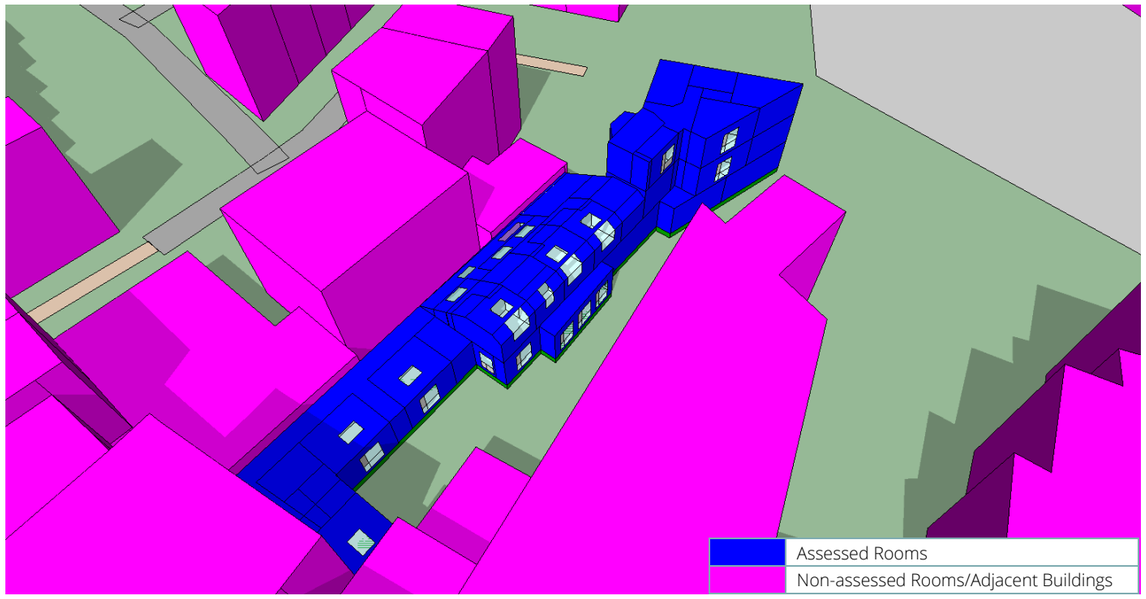


Figure 4.2: North View of The Daylight Model of The Proposed Development and The Adjacent Buildings

7.0 RESULTS

7.1 Daylighting Results Summary

A summary of the daylight results for the assessed spaces on each floor is tabulated to the opposite, while the figures on the following pages show the predicted Average Daylight Factors and Daylight Distribution across each floor.

It is seen that all of the assessed spaces have comfortably passed the criteria of both the 2011 and 2022 BRE guidelines.

It is apparent that the proposed layouts have been optimised to provide as much daylight as possible. The design ensures that the internal spaces achieve good internal daylight through using large glazing areas to many of the habitable rooms. Additionally, rooms located within the mansard roof have rooflights integrated to ensure additional levels of daylighting in conjunction with side windows.

The table opposite shows a summary of the daylight results for the assessed spaces.

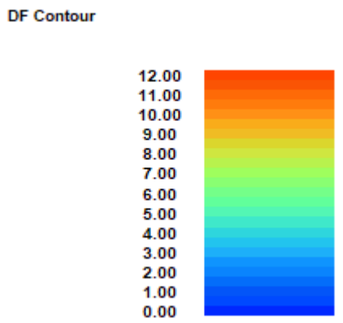
Room Ref.	Internal Daylight Assessment Results						
	Average Daylight Factor (2011)			Daylight Distribution (2022)			
				BRE Criteria		Predicted Results	
	BRE Criteria	Predicted ADF	BRE Compliance	Required Daylight Factor	Minimum Grid Area	Percentage of area with required Daylight Factor	BRE Compliance
Ground Floor: Bedroom 1	1.0	5.0	Pass	0.7	50%	100%	Pass
Ground Floor: Bedroom 2	1.0	5.7	Pass	0.7	50%	100%	Pass
Ground Floor: Bedroom 3	1.0	5.9	Pass	0.7	50%	100%	Pass
Ground Floor: Bedroom 4	1.0	1.8	Pass	0.7	50%	54%	Pass
Ground Floor: Bedroom 5	1.0	2.0	Pass	0.7	50%	67%	Pass
Ground Floor: Bedroom 6	1.0	2.0	Pass	0.7	50%	53%	Pass
Ground Floor: Kitchen/Dining	1.5	2.6	Pass	1.4	50%	56%	Pass
First Floor: Bedroom 7	1.0	18.5	Pass	0.7	50%	100%	Pass
First Floor: Bedroom 8	1.0	18.0	Pass	0.7	50%	100%	Pass
First Floor: Bedroom 9	1.0	18.1	Pass	0.7	50%	100%	Pass
First Floor: Bedroom 10	1.0	2.0	Pass	0.7	50%	55%	Pass
First Floor: Bedroom 11	1.0	2.3	Pass	0.7	50%	84%	Pass
First Floor: Bedroom 12	1.0	2.3	Pass	0.7	50%	94%	Pass
First Floor: Bedroom 13	1.0	2.1	Pass	0.7	50%	59%	Pass
First Floor: Kitchenette	1.5	26.3	Pass	1.4	50%	100%	Pass
Second Floor: Bedroom 14	1.0	2.4	Pass	0.7	50%	89%	Pass
Second Floor: Bedroom 15	1.0	2.6	Pass	0.7	50%	86%	Pass
Second Floor: Kitchenette	1.5	4.8	Pass	1.4	50%	64%	Pass

Table 7.1 Internal Daylight Assessment Results

APPENDIX A - **DAYLIGHT DISTRIBUTION PLOTS**

The figures below show the predicted daylight distribution across each floor of the development.

Figure A.1: Ground Floor Daylight Distribution Plot



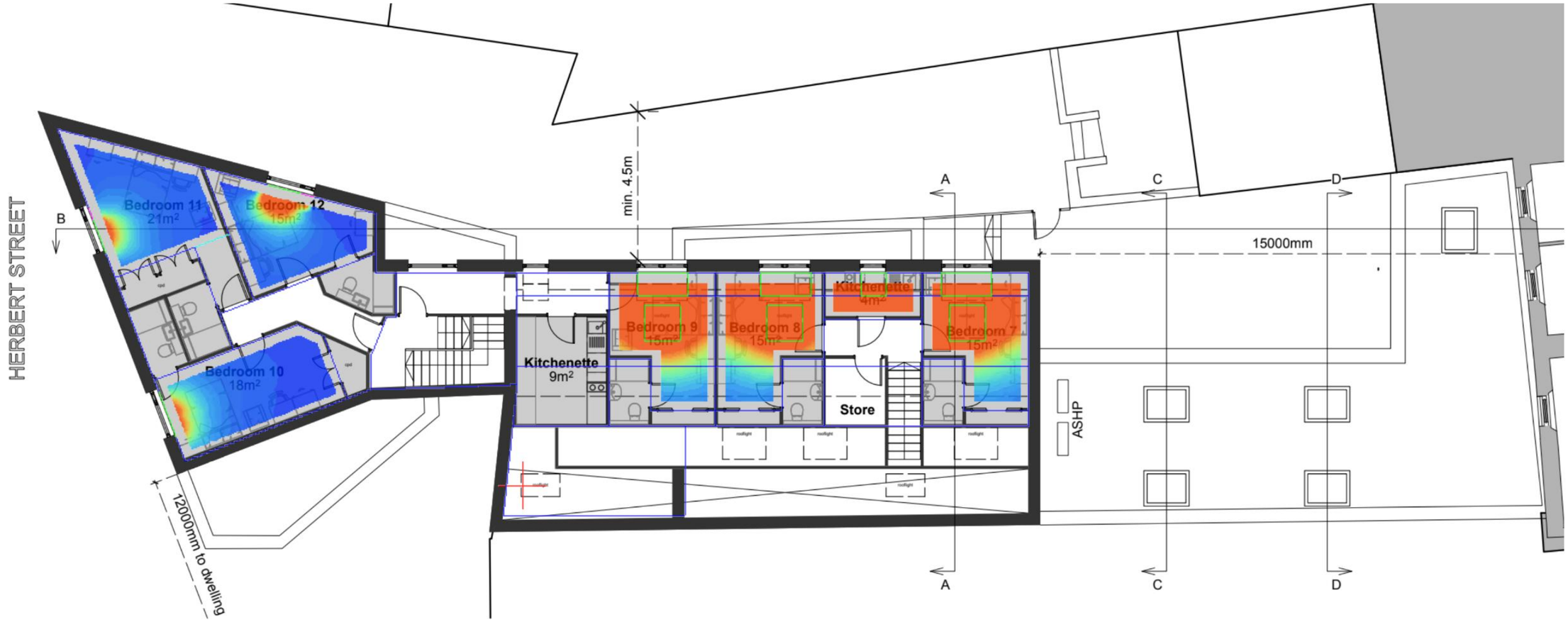
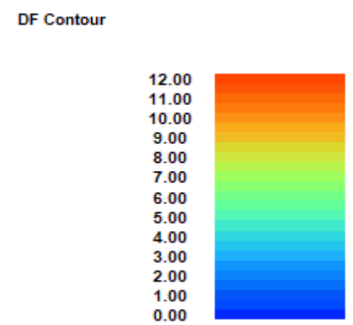


Figure A.2: First Floor Daylight Distribution Plot



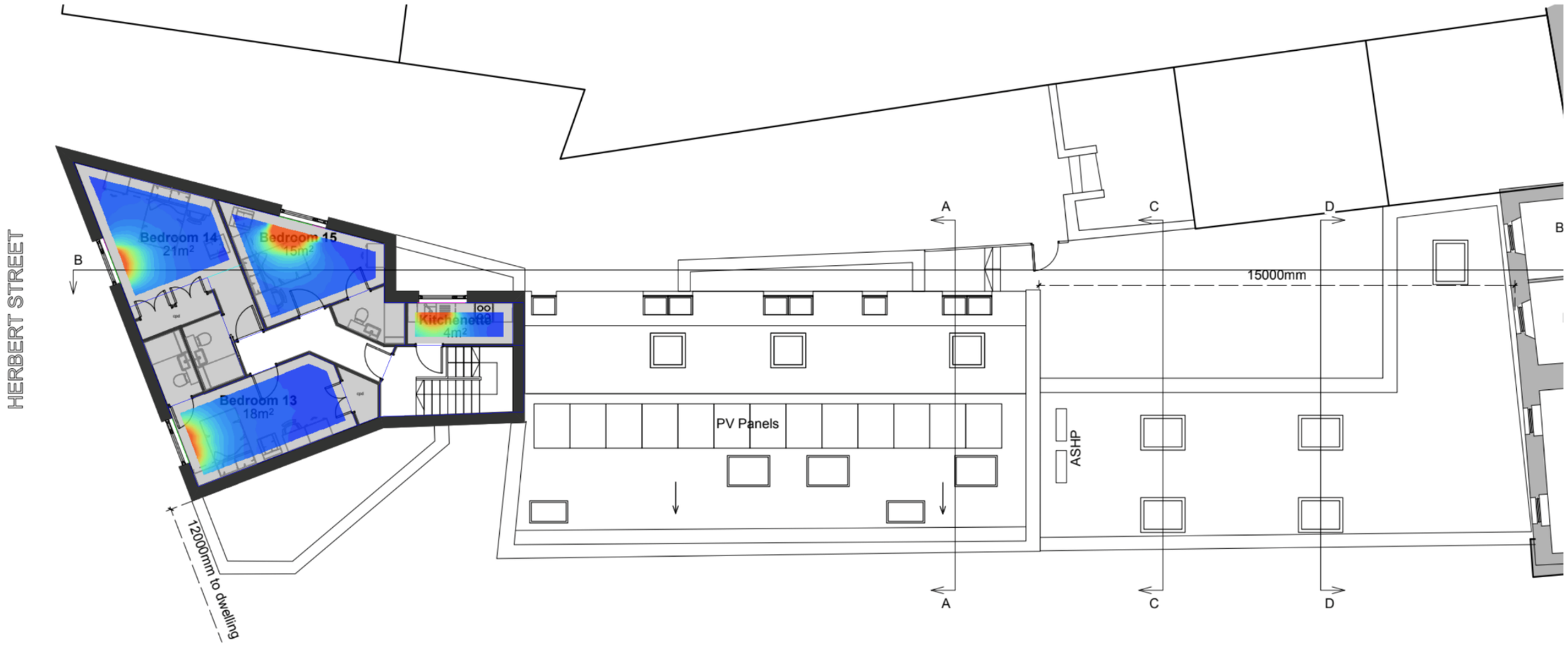


Figure A.3: Second Floor Daylight Distribution Plot