BARHOS DEVELOPMENT LTD

# 10-11 KING'S MEWS

## DAYLIGHT AND SUNLIGHT ASSESSMENT REPORT

AUGUST 03, 2017

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BARHOS DEVELOPMENT LTD

PROJECT NO.: 70035150
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WSP
WSP HOUSE 70 CHANCERY LANE
LONDON WC2A 1AF

PHONE: +44 (0)20-7314-5000
FAX: +44 (0)20-7314-5111
WSP.COM

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| Checked by | Camilo Diaz | | | |
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# 1 INTRODUCTION

WSP has been appointed by Barhos Development Ltd to provide a daylight and sunlight assessment report to support the planning application of the proposed development at 10-11 King's Mews site, London (Fig1-1). The proposed development is a 3- storey building containing 7 flats.

The purpose of this study is to determine the level of daylight within the proposed development for comparison with recommended standards.

**Figure 1-1 Site location**

# 2 METHODOLOGY & CRITERIA

A 3D model has been developed for the purpose of the daylight and sunlight assessment. This model has been based on the drawings provided by MAA Architects and includes all the windows and rooms within the proposed scheme and also the surrounding adjacent buildings to account for external obstruction to light.

The BRE Guide gives criteria and methods for calculating daylight and sunlight both within new developments and the impact on existing surrounding windows. Based on the BRE Guide, the level impact of the proposed development on the level of daylight and sunlight availability of the surrounding properties has been assessed using the parameters discussed below.

## 2.1 ANGLE OF VISIBLE SKY ($\theta$)

The visible sky angle ($\theta$) gives the availability of daylight to a window and is measured from the top of the obstruction to the top of the window. For an unobstructed window $\theta$ is $90^{o}$. If the Visible Sky Angle VSA is greater than $65^{o}$ conventional window design usually gives reasonable results. If the VSA is between 45 and $65^{o}$ then larger windows and shallow plan internal layouts would be needed to provide adequate daylight. For VSA between 25 and $45^{o}$ it is very difficult to provide adequate daylight unless large windows are used. In situations where the VSA is lower than $25^{o}$ no adequate daylight is possible even with a fully glazed wall.

## 2.2 VERTICAL SKY COMPONENT

When the obstruction is not continuous, the visible sky angle ($\theta$) is complex to calculate and the Vertical Sky Component (VSC) may be used instead. The calculation of VSC usually requires specialist computer software. The VSC measures the amount of sky that can be viewed from the centre of a window accounting for all external obstructions, (with 40% being the maximum value for an unobstructed window). The minimum recommended figure for VSC is 27% or greater to maintain good levels of daylight. For existing surrounding windows if the VSC is lower, then a comparison of existing and proposed VSC levels with the new development in place is calculated.

## 2.3 PROBABLE SUNLIGHT HOURS

Access to sunlight is measured from the windows of habitable rooms, facing within 90° of due south. The Probable Sunshine Hours (PSH) calculation method measures the proportion of the window assessed that is sunlit for a period of time. In new developments each dwelling should ideally have at least one main living room within 90° of due south to receive a reasonable amount of sunlight. The BRE Guide and BS 8206-02 recommend that the PSH is calculated for the whole year (APSH) and for the winter months (WPSH) (21st September to 21st March). The recommended sunlight criteria is as follows:

— The window reference point should receive more than 25% of APSH, including at least 5% of WPSH .

— If the available sunlight hours are both less than the amount given above and less than 0.8 times their former value, either over the whole year or during the winter, then the occupants of the existing building will notice some loss of sunlight.

— The overall loss of sunlight should be maintained below 4%.

## 2.4 METHODOLOGY FOR DAYLIGHT ASSESSMENT WITHIN THE PROPOSED DEVELOPMENT

### *2.4.1 AVERAGE DAYLIGHT FACTOR*

The VSC described earlier provides an indication of the potential for daylight entering the space; however, it does not quantify the actual daylight levels inside the rooms. If the VSC standard is not met on any window, a more detailed assessment based on the Average Daylight Factor (ADF) should be undertaken, as below.

The CIBSE Guide LG10 defines the Average Daylight Factor as:

> *"…the measure of the amount of skylight in a room. If the room is not too deep or obstructed, an average daylight factor of 5% or more will ensure that an interior looks substantially daylit, except early in the morning, late in the afternoon or on exceptionally dull days. An average daylight factor below 2% generally makes a room look dull; electric lighting is likely to be in frequent use"*

In dwellings, the following minimum ADF values should be achieved as per the BS 8206-02 (BSI, 1992):

- 1% in bedrooms,
- 1.5% in living rooms,
- 2% in kitchens, and
- where living and kitchens are integrated into one room, 2% should be used as the target.

The daylight assessment for the internal spaces is a two-stepped process requiring initially the calculation of the VSC at the face of each window to assess the level of obstruction / availability of daylight in relation to the proposed massing and other obstructions such as balconies.

The ADF calculations have been carried out for the additional proposed units only and are based on room layouts derived from drawings provided by MAA Architects and glazing characteristics from the National Calculation Methodology (NCM) modelling guide. The following assumptions were taken for the calculation of the ADF calculations:

- Glass transmittance: 0.69;
- Maintenance factor: 0.9;
- Frame factor: 0.85;
- Reflectance of walls, floor and ceiling: 50%

For floor-to-ceiling windows a factor has been applied for the portion of window below the working plane height of 850 mm, in line with the BRE Guidelines.

## 2.5 SENSITIVE RECEPTORS

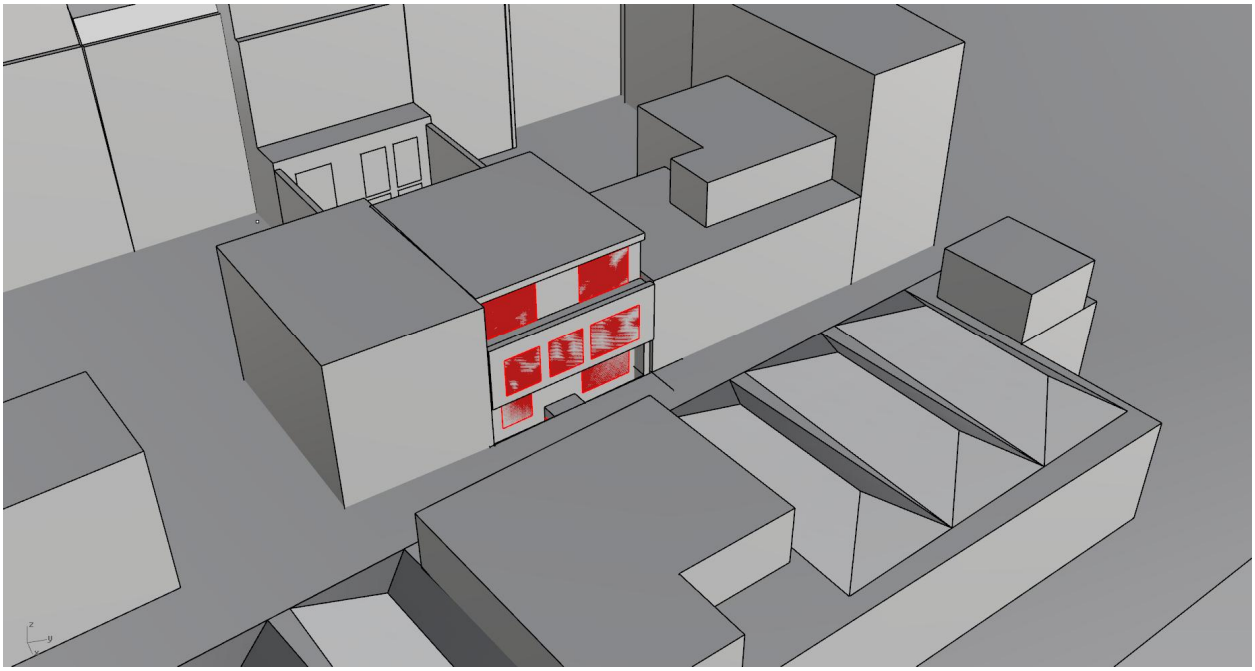
For the daylight calculations, sensitive receptors are described as windows to habitable rooms where the occupants have a reasonable expectation of natural light. As the BRE Guide states:

*'The guidelines given here are intended for use in adjoining dwellings where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed. The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices.'*

## 2.6 ASSESSMENT MODELLING

The daylight and sunlight impact calculations have been undertaken using the specialist software Ecotect 2011 by AutoDesk in which a three dimensional model comprising the existing surrounding properties, the existing buildings on the Site and the proposed extensions.

**Figure 2-1 – Aerial view of the model used for the daylight analyses**



# 3 ASSESSMENT OF DAYLIGHT AND SUNLIGHT WITHIN THE PROPOSED DEVELOPMENT

## 3.1 DAYLIGHT ASSESSMENT

The daylight assessment included the calculation of VSCs for each window to measure the level of obstruction and the potential available daylight at the window, and based on the internal rooms' characteristics, the Average Daylight Factor (ADF) was calculated for each room. The results are summarised below in table 3-1 and detailed in Appendix 1.

**Table 3-1 Daylight Summary Results**

| | Rooms tested | Above BRE CRiteria | Below BRE Criteria |
|---|---|---|---|
| Receptor | Num | Num | Num |
| Living spaces | 7 | 3 | 4 |
| Bedrooms | 10 | 7 | 3 |
| Total | 17 | 10 | 7 |

The results of the internal daylight assessment show that in 10 of the 17 rooms tested, the daylight levels are greater than the minimum recommended standards. This is on the basis that in these 10 rooms the ADF is 1% or higher in bedrooms, and 2% or higher for Kitchen/Living rooms.

The rooms failing the BRE criteria are located at the basement and ground level where VSC levels, especially facing the boundary wall, are very low given the massing of the surrounding properties.

WSP worked along with the design team in order to improve the daylight levels within the proposed properties and where possible meet the BRE criteria by incorporating in the design several mitigation strategies which are:

- Allocating the living area where the daylight availability is greater (King's Mews)
- Increasing window sizes
- Reducing floor to ceiling height

The proposed design is a result of an iterative process that improved daylight conditions by a significant margin in at least 5 rooms and from the original design.

The results shows that 7 rooms below the recommended BRE criteria,3 bedrooms in the basement fail by a small margin (0.7%-0.8%) even if the VCS levels are below 2%. It is worth also adding that despite the constraints imposed by the surrounding obstructions, the ADF of one of the failing living area at the ground floor is still within acceptable levels for living rooms (1.5%) without kitchen. The above is the evidence of the effort being placed by the team in order to produce the best possible outcome on the daylight of the proposed dwellings.

## 3.2 SUNLIGHT ASSESSMENT

The BRE guide recommends that for new buildings, access to sunlight is measured on the windows to habitable rooms, facing within 90° of due south. Sunlight calculations have been carried out in line with the BRE recommendations and the results are summarised in table 3.2 and detailed in Appendix 1.

**Table 3-2 Sunlight Summary Results**

| | Rooms tested | Above BRE CRiteria | Below BRE Criteria |
|---|---|---|---|
| Receptor | Num | Num | Num |
| Living spaces | 7 | 4 | 3 |

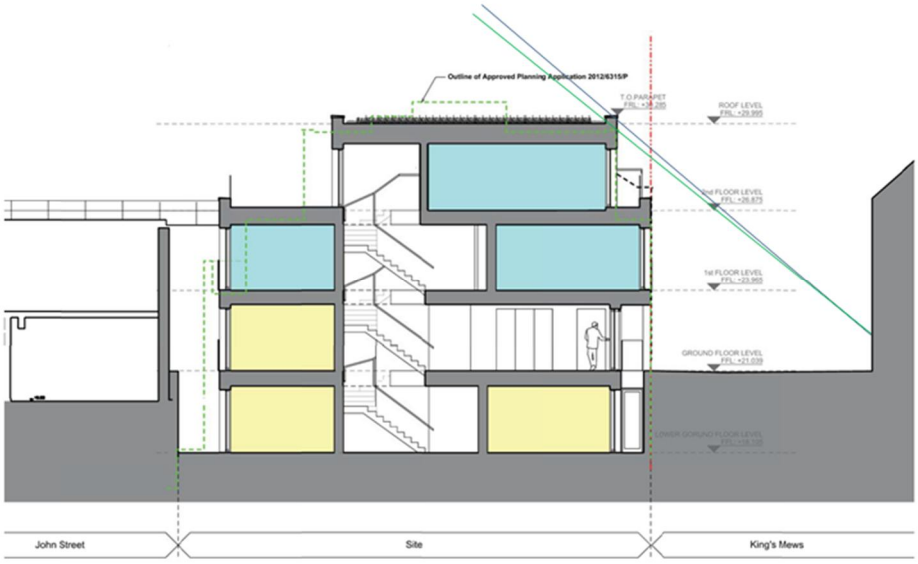
The Results show that only the living areas on the first and second floor receive adequate levels of sunlight, while given the obstruction caused by the surrounding buildings the living areas on ground and basement levels do not meet the BRE requirements.

However it is important to note that due to the orientation of the building there are no south facing windows and the level of sunlight will always be limited in refurbishment sites such as this one. The windows tested east and west facing windows at each level which will only have access to direct sunlight either in the morning (east facing) or afternoon (west facing) limiting the overall number of sunlight hours. However as indicated above, the proposed development reflects a level of design which has taken access to natural light as feasible as possible within the constraints of the site.

# 4 DAYLIGHT AND SUNLIGHT IMPACTS ON THE SURROUNDINGS

An assessment of the massing of the scheme in relation to the surroundings properties has been undertaken. The proposed massing at 10-11 King's Mews, shown in Figure 4.1 overlaid against the outline of the previously consented scheme, does not significantly differ from the massing of the consented scheme.

**Figure 4-1 – Section showing the proposed and consented schemes**




From the analysis carried out, it can be determined that the change of massing of the proposed scheme from the consented scheme is minimal with a negligible effect on the obstruction angle which represents the amount of sky view that windows on the properties facing the site will be subject to. Therefore on the basis of this assessment, it can be concluded that the proposed development does not represent any adverse impacts to the level of daylight and sunlight to the surrounding adjacent properties from the consented condition.

# 5 SUMMARY AND CONCLUSIONS

This report presents the results of the Daylight and Sunlight assessment carried out to support the planning application of the proposed amendments at N 10-11 King's Mews located in Bloomsbury, London. The purpose of this study is to determine the level of daylight and sunlight within the proposed development.

The assessment has been undertaken following the guidance given in the BRE's Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice. In addition to the BS 8206-2:2008 has also been used for guidance in this assessment. These are the most complete set of criteria for the assessment of daylight effects both for new and existing buildings.

The results of the internal daylight assessment show that in 10 of the 17 rooms tested, the daylight levels are greater than the minimum recommended standards. This is on the basis that in these 11 rooms the ADF is 1% or higher in bedrooms, and 2% or higher for Kitchen/Living rooms.

The rooms failing the BRE criteria are located at the basement and ground level where VSC levels, especially facing the boundary wall, are very low given the massing of the surrounding properties.

WSP worked along with the design team in order to improve the daylight levels within the proposed properties and where possible meet the BRE criteria.

The proposed design is a result of an iterative process that improved daylight conditions by a significant margin in at least 5 rooms and from the original design.

Out of 7 rooms below the recommended BRE criteria, 3 bedrooms in the basement only fail by a small margin (0.7%-0.8%) even if the VCS levels are below 2%. It is worth also adding that despite the constraints imposed by the surrounding obstructions, the ADF of one of the failing living area at the ground floor is still within acceptable levels for living rooms (1.5%) without kitchen.

The results of the internal sunlight assessment show that only the living areas on the first and second floor receive adequate levels of sunlight, while given the obstruction caused by the surrounding buildings the living areas on ground and basement level do not meet the BRE requirements.

With regards to the potential impacts on the existing adjacent properties the analysis carried out indicated that the change of massing of the proposed scheme from the consented scheme is minimal with a negligible effect on the obstruction angle which represents the amount of sky view that windows on the properties facing the site will be subject to. On the basis of this assessment, it can be concluded that the proposed development does not represent any adverse impacts to the level of daylight and sunlight to the surrounding adjacent properties from the consented condition

# 6 LIMITATIONS

All calculations have been based on best practice guidance and on drawing or models of the proposed development provided by the architects. Where required, estimations have been made with regards to the height and massing of surrounding properties, based on available satellite photographs and mapping.

# 7 GLOSSARY

VSC – Vertical Sky Component - A measure of the percentage of skylight incident at a point on a vertical plane in relation to the unobstructed skylight incident on the horizontal plane.

APSH – Annual Probable Sunlight Hours – The total no. of sunlight hours in a year falling on a window or a vertical surface expressed as a percentage of total no. of unobstructed sunlight hours.

WPSH – Winter Probable Sunlight Hours - The total no. of sunlight hours falling on a window or a vertical surface between 21st September and 21st March expressed as a percentage of total no. of unobstructed sunlight hour.

ADF – Average Daylight Factor – It is the ratio of the average indoor illuminance on a working plane to the outdoor illuminance.

CIE – Commission Internationale De L'Eclairage – It is an authority which has developed a number of standard sky distributions (e.g. overcast, uniform) based on very specific mathematical formula.

$\theta$ – Angle of visible sky – It is the angle subtended in the vertical plane normal to the window by sky visible from centre of the window.

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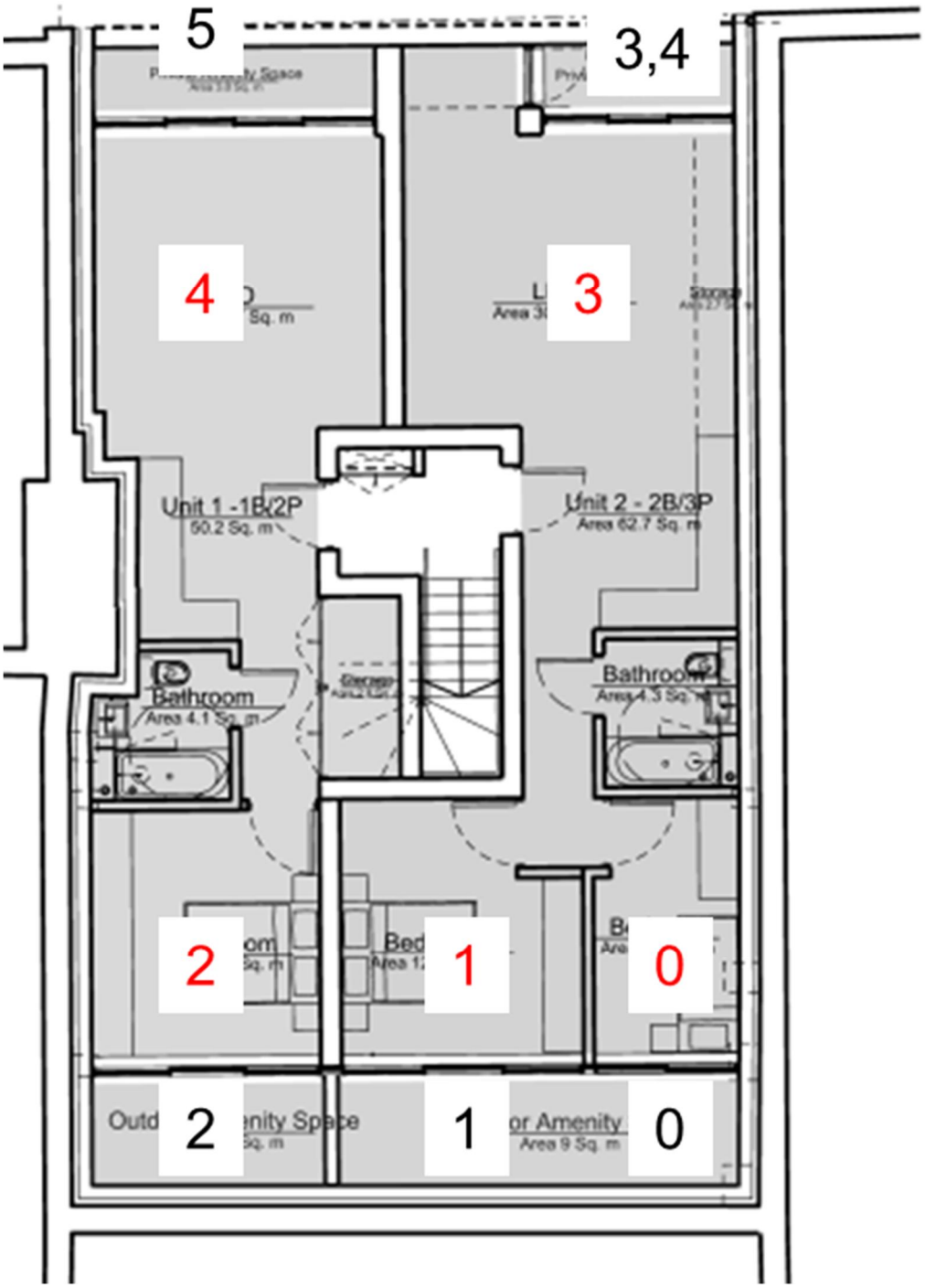
5 The Chartered Institution of Building Services Engineers London (1999). CIBSE Guide 'A'. Yale Press ltd. London
6 National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England) 2013 Edition

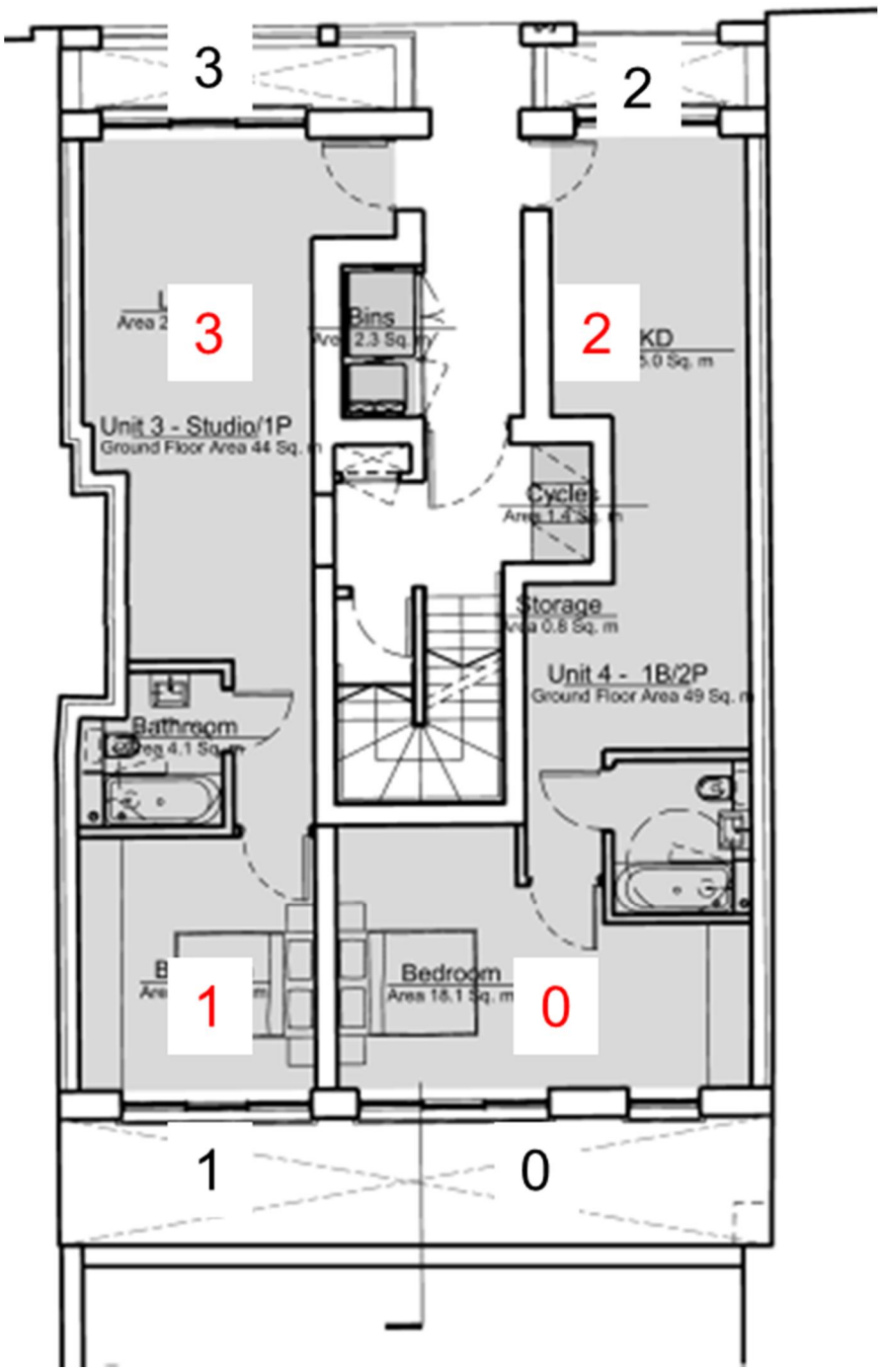
**Appendix 1 Detailed Daylight and Sunlight Results**

**Basement**



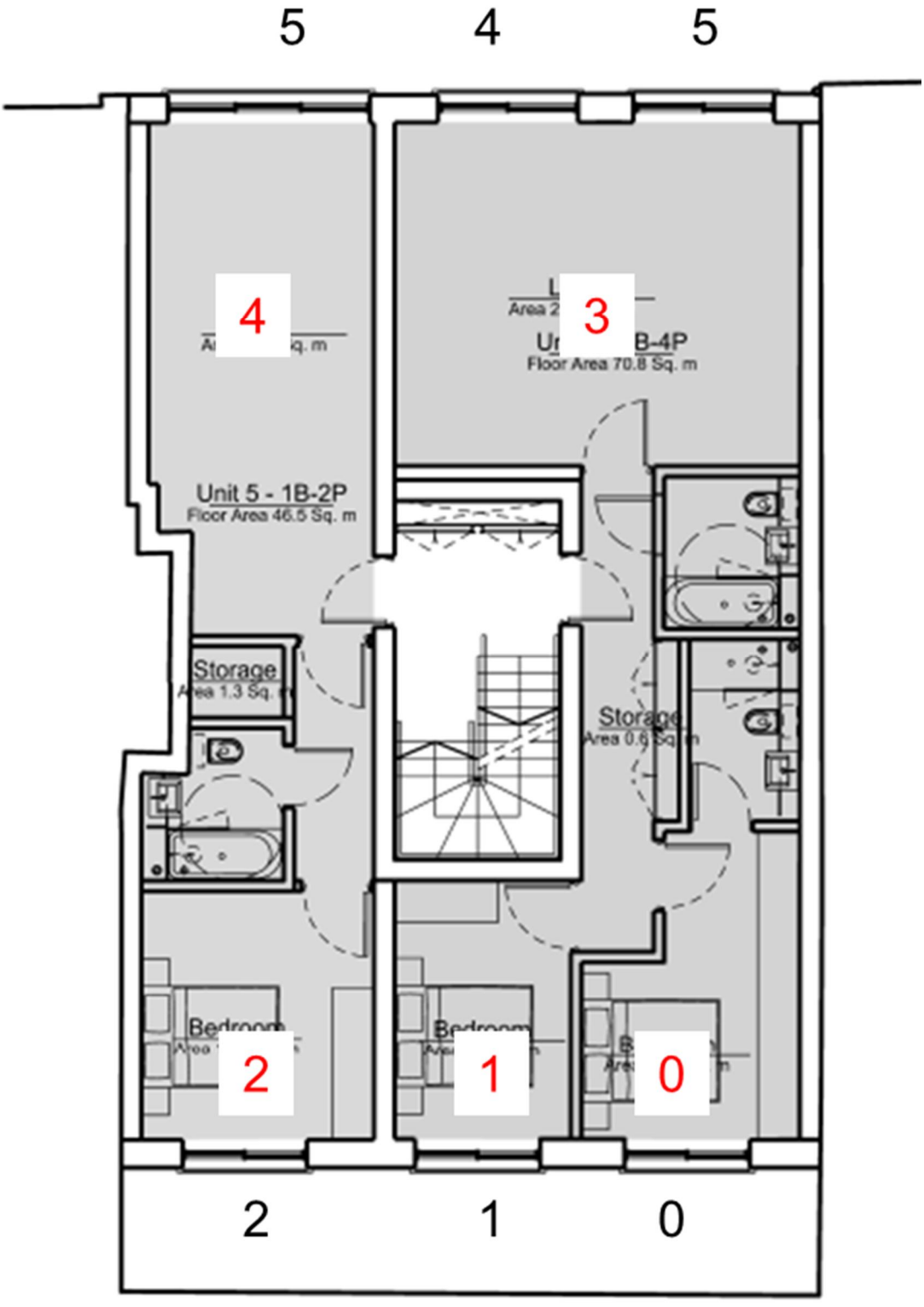

Room number
Window number

**Ground Floor**



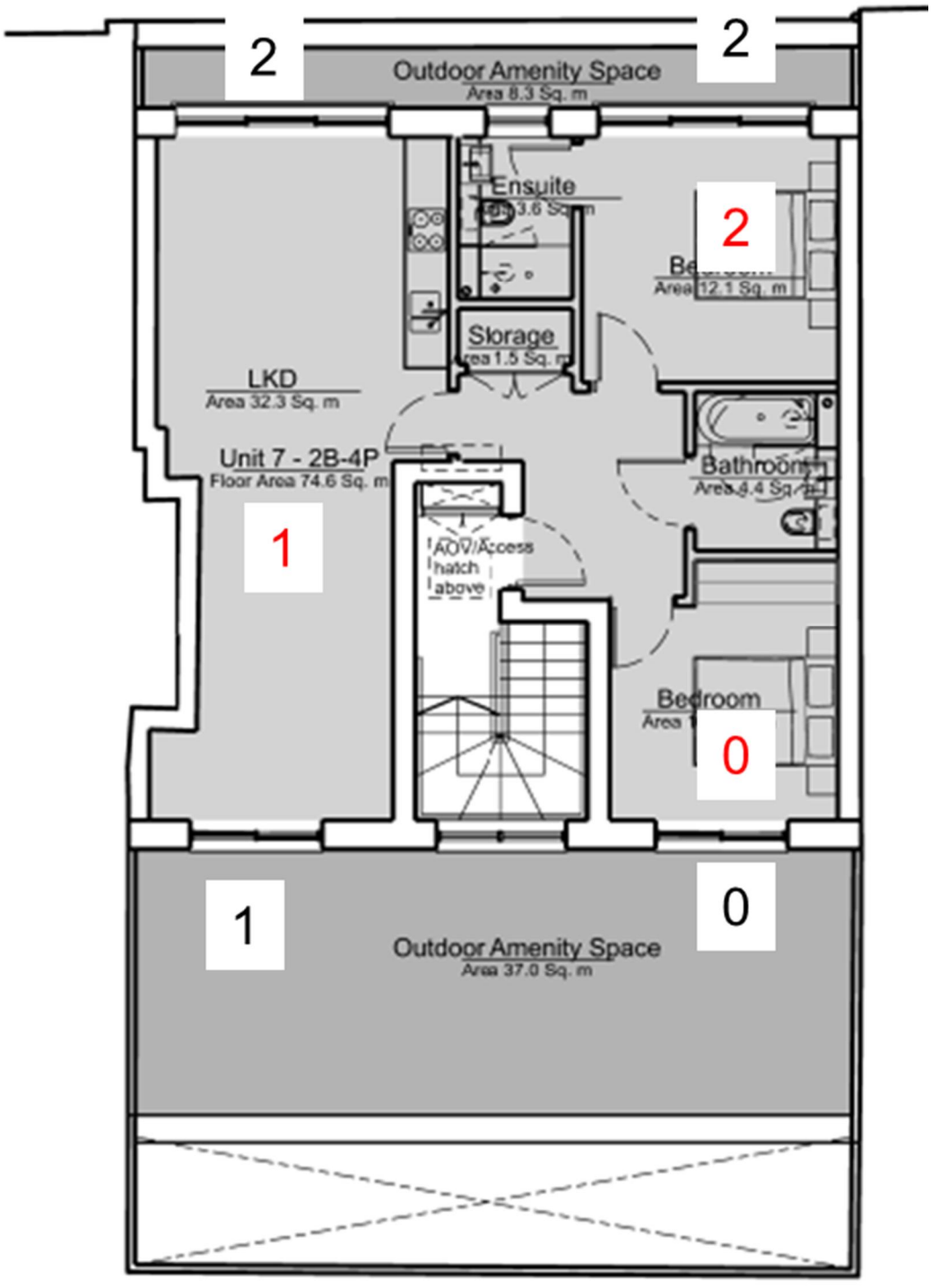

Room number
Window number

**First Floor**




Room number
Window number

**First Floor**




Room number
Window number

| Floor | Room | Window | VSC | ADF | ADF Target | BRE | APSH | WPSH | BRE | Orientation | BRE | Orientation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | Number | Number | % | % | % | Compliance | % | % | Compliance Window | Window | Compliance Room | Room |
| Basement | 0 | 0 | 1.2 | 0.7 | 1 | Below | | | | | | |
| | 1 | 1 | 1.3 | 0.8 | 1 | Below | | | | | | |
| | 2 | 2 | 1.1 | 0.8 | 1 | Below | | | | | | |
| | 3 | 3 | 2.7 | 0.5 | 2 | Below | 2.3 | 0 | Below | North Facing | Below | |
| | | 4 | 1.5 | | | | 0 | 0 | Below | | | |
| | 4 | 5 | 2.6 | 0.7 | 2 | Below | 1.7 | 0 | Below | North Facing | Below | North Facing |
| Ground | 0 | 0 | 5.3 | 1.4 | 1 | Above | | | | | | |
| | 1 | 1 | 4.3 | 1.1 | 1 | Above | | | | | | |
| | 2 | 2 | 12.5 | 0.9 | 2 | Below | 6.7 | 1 | Below | North Facing | Below | North Facing |
| | 3 | 3 | 12.1 | 1.5 | 2 | Above | 8.4 | 2.3 | Below | North Facing | Below | North Facing |
| First | 0 | 0 | 15.9 | 2.2 | 1 | Above | | | | | | |
| | 1 | 1 | 17 | 2.1 | 1 | Above | | | | | | |
| | 2 | 2 | 15.9 | 1.7 | 1 | Above | | | | | | |
| | 3 | 3 | 29.2 | 3 | 2 | Above | 24.9 | 7.3 | Below | North Facing | Above | North Facing |
| | | 4 | 29.9 | | | | 25.5 | 6.7 | Above | North Facing | | |
| | 4 | 5 | 30.6 | 2.4 | 2 | Above | 26.2 | 6.7 | Above | North Facing | Above | North Facing |
| Second | 0 | 0 | 20.1 | 1.5 | 1 | Above | | | | | | |
| | 1 | 1 | 22.4 | 2.2 | 2 | Above | 27.7 | 10.1 | Above | | Above | |
| | | 2 | 33.8 | | | | 27.5 | 7.2 | Above | North Facing | | |
| | 2 | 3 | 32.4 | 3.6 | 1 | Above | | | | | | |