

Gas Works Road, Reading RG1 3EE

Daylight and Sunlight Assessment

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Executive Summary

Price & Myers have been instructed by Entran Ltd. to carry out a daylight and sunlight impact assessment and internal daylight calculations to support the planning application of the proposed properties at Gas Works Road in Reading.

The proposed site is located in between Gas Works Road and River Kennet and it is composed of two separate buildings which have different heights. The taller one is currently comprised 2 storeys and situated along the River Kennet and the other is situated behind the taller one facing the Gas Works Road. These existing blocks will be constructed to respectively 6 and 3 storey residential development accommodating 34 units in total over the two blocks.

This report is an assessment of the impact of the proposed scheme on the availability of daylight and sunlight of the existing surrounding buildings and amenity spaces. It determines whether the proposed design meets the criteria set out in Building Research Establishment Report 'Site layout planning for daylight and sunlight: A guide to good practice' 2011 and British Standard BS 8206-02 'Lighting for buildings – Part 2: Code of practice for daylighting' (2008).

The impact assessment was carried out on the windows of the adjacent residential properties at Blakes Quay and 121 King's Road which are expected to be most affected by the proposed building. The results of the assessment show that all the identified windows receive a good level of daylight and sunlight that are higher than the minimum required values with the proposed building in place. Therefore, it can be concluded that the proposed development is likely to have **no impact** on all other surrounding buildings.

Daylight levels within the residential units of the proposed development were also tested. These levels were checked against the British standard BS 8206-02 to support the planning application. The assessment confirms that almost all of habitable rooms in the development receive a good level of daylight exceeding the minimum requirements throughout the year. The only exceptions are the kitchen cum living room of Unit 2 on level 1 and Unit 9 on level 2. The achieved daylight level is however more than the minimum daylight required for a living room (1.5%).

The sunlight assessment for the proposed development indicates that all the living rooms in the proposed scheme will have at least one window facing 90° of due south. The sunlight assessment indicates that these windows will receive adequate level of sunlight throughout the year including winter months as the APSH and WPSH values are more than the levels recommended by BRE.

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1 Introduction

Price & Myers have been instructed by Entran Ltd. to carry out a daylight and sunlight impact assessment and internal daylight calculations in order to support the planning application of the proposed development at Gas Works Road in Reading.

The proposed scheme comprises two separate buildings which have different heights and they are obliquely facing each other shown in Figure 1-1 below. Building 1 is 3 storeys higher than building 2 and the nearest distance between two diagonal points is approx. 4.3 metre. The proposed scheme will comprise 34 residential units over two blocks.

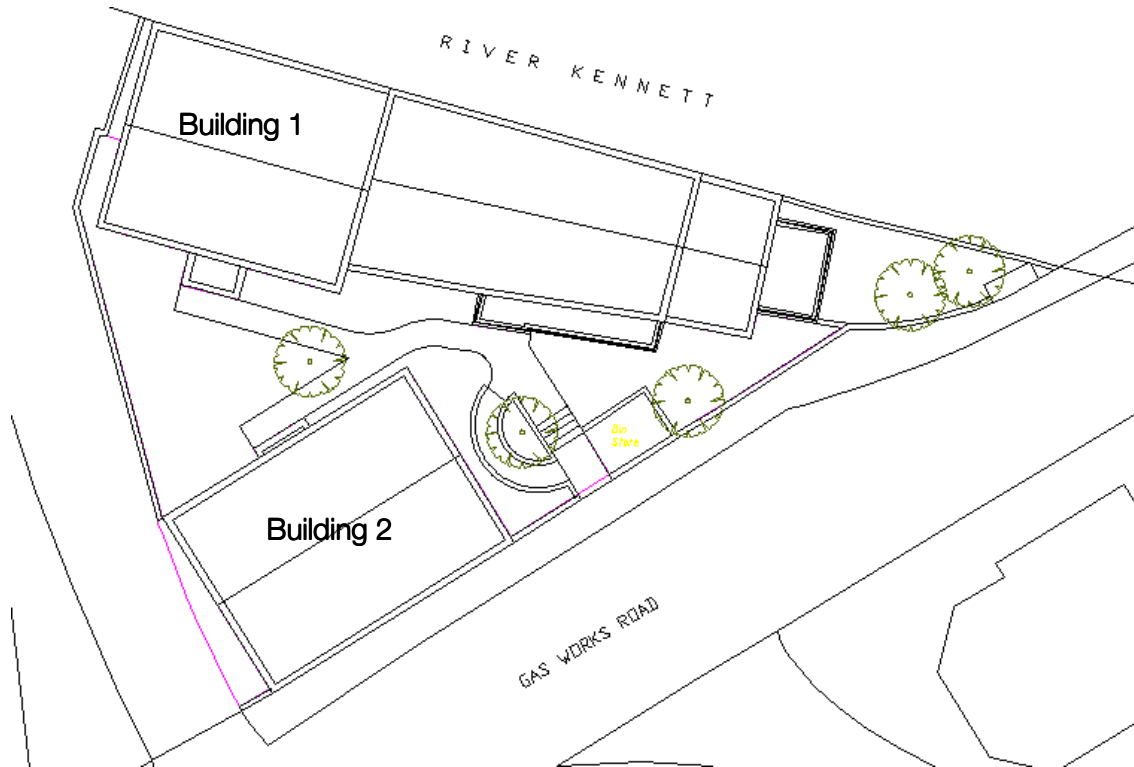


Figure 1-1 Proposed site scheme

This report is an assessment of the impact of the proposed scheme on the availability of daylight and sunlight of the adjacent building and amenities. The purpose of this report is to determine whether the proposed design meets the criteria set out in the Building Research Establishment Report 'Site layout planning for daylight and sunlight - A guide to good practice' (2011) and British Standard BS 8206-02 'Lighting for buildings – Part 2: Code of practice for daylighting' (2008).

The assessment was undertaken based on the drawings provided by the architects and with respect to the outstanding information street views and site photos from Google map were used to model the surroundings of the project site.

2 Site Analysis

2.1 Site surrounding buildings

Figure 2-1 shows the site surroundings. The building 1 is parallel to the River Kennet on its north and the building 2 is parallel to Gas Works Road on its south. As the buildings on due south from the site are located beyond the assessment boundary, only few properties which are almost aligned with the proposed site have been included for the assessment.



Figure 2-1 Site surroundings

2.2 Site Model

A three-dimensional model was built in AutoCAD using drawings provided by the architects for the proposed development at Gas Works Road and the site plan. Other surrounding buildings were modelled on the basis of information available from site pictures and internet mapping.

The proposed building is expected to have some level of impact on the daylight and sunlight availability through the windows of the adjacent properties at Blakes Quay and 121 King's Road. The rest of the surroundings in the vicinity are located out of range specified in the spacing guidelines and are therefore not tested.

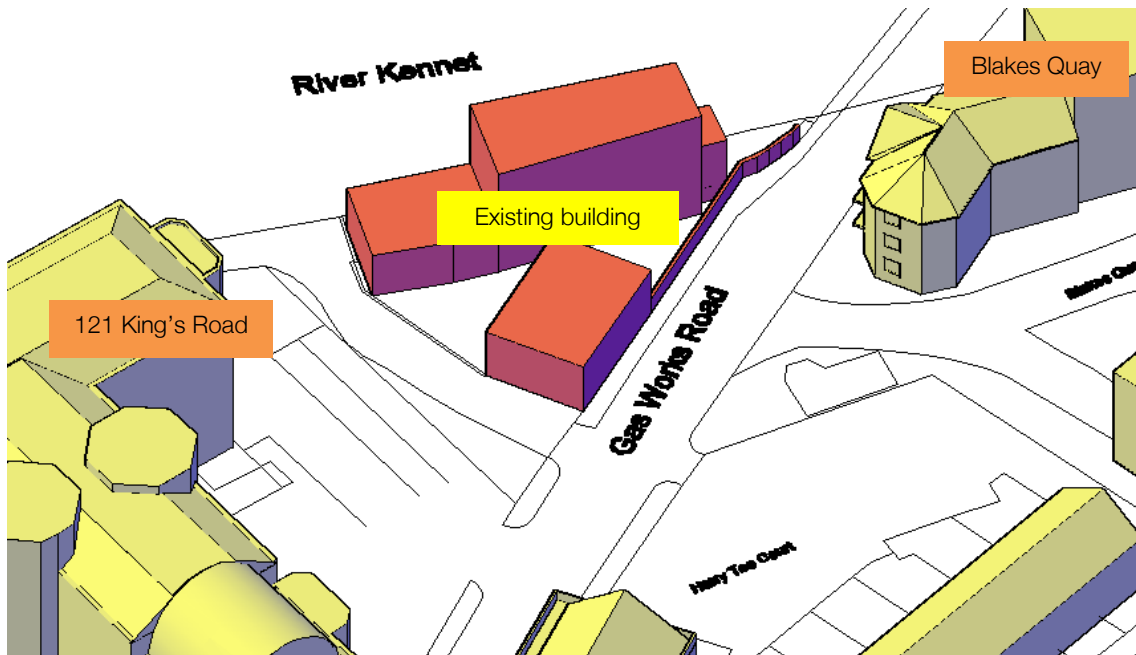


Figure 2-2 Model of the Existing building on site and surrounding buildings



Figure 2-3 Model of the Proposed building on site and surrounding buildings

3 Daylight and Sunlight Assessment

The BRE guide is intended to aid designers in considering the relationship between new and existing buildings to ensure that each retains the potential to achieve good daylighting and sunlight levels. The author of the guide, Dr Paul Littlefair states in the introduction that:

"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and should not be used as an instrument of planning policy. Its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly because natural lighting is only one of many factors in site layout design".

In designing a new development or extension to a building, care should be taken to safeguard the access to daylight and sunlight for existing buildings. The guidelines given in the BRE guide are intended for use for rooms in adjoining dwellings where daylight and sunlight 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 and sunlight, like schools, hospital and offices

Based on the site analysis and BRE spacing guidelines, the properties at Blakes Quay and 121 King's Road were identified to be tested as those fall within the assessment boundary (Figure 3-1). And therefore these existing developments are likely to have some potential daylight and sunlight impact by the proposed development. All other developments located outside the limits that identified by the spacing guidelines are not tested. Also some windows on the 121 King's Road property have been excluded in the assessment as they are classified as non-habitable rooms.



Figure 3-1 Extent of daylight and sunlight assessment

3.1 Daylight

Daylight can be described as the diffused light from the sky. It is assumed to be uniform and non-directional in nature. There are various methods of measuring and assessing daylight in buildings and the choice of test depends upon the circumstances of each particular window.

Vertical Sky Component (VSC)

A quantitative indicator of the amount of daylight available at the window wall requires the calculation of the Vertical Sky Component (VSC). The VSC is the ratio of the direct sky illuminance falling on a vertical wall at a reference point to the simultaneous horizontal illuminance under an unobstructed sky. The maximum value is almost 40% for a completely unobstructed vertical wall.

The VSC has been calculated using the Waldram tools through MBS Survey in AutoCAD. A Waldram diagram has azimuth angle on the horizontal scale and altitude on vertical scale. As explained in the BRE guide, for each vertical plane obstructions from the surrounding buildings should be plotted on the Waldram diagram. The remaining area on the diagram is then proportional to the sky component value on that plane. The software plots a Waldram diagram for each of the identified window and thus gives the VSC value for both the existing and the proposed scenario.

The BRE guide states that if the VSC is greater than 27% with the proposed development then enough daylight should still be reaching the existing windows. If the VSC calculated at the centre of the windows is less than 27% with the proposed development, then the BRE guide suggests that the former VSC (that is, the VSC without the proposed development) should be calculated. If the VSC with the proposed development in place is both less than 27% and less than 0.8 times its former value, then occupants of the existing building will notice the reduction in daylight and electric lighting will be needed more of the time.

VSC calculations have been carried out on the windows of the potentially affected properties. Windows of properties at Blakes Quay and 121 King's Road facing proposed development have been tested. These are illustrated in **Error! Reference source not found..**

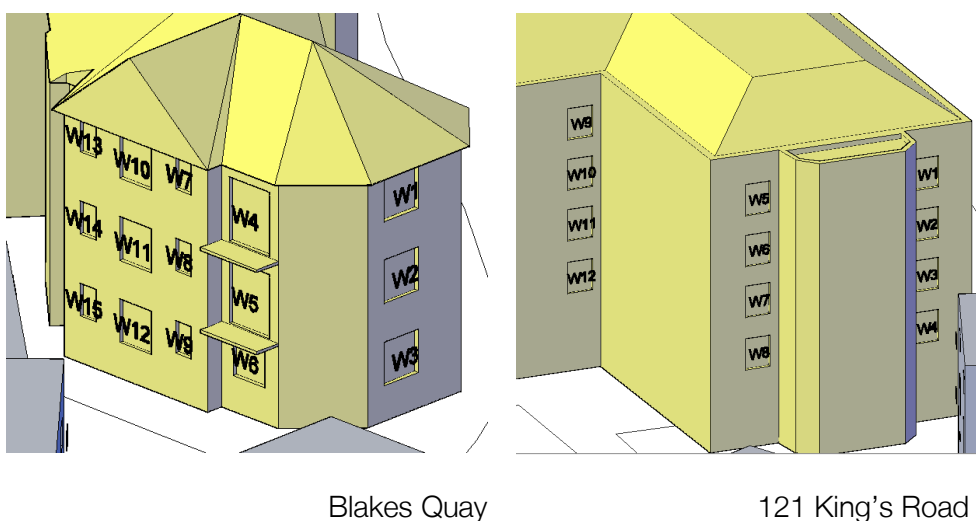


Figure 3-2 Windows assessed for daylight

The calculated values of VSC measured at the identified windows in Figure 3-2 are shown in the following table.

Property	Tested windows	VSC (%) Proposed	VSC (%) Existing	% of existing case (80% and above acceptable)	BRE Criteria Met?
Blakes Quay	W1	34.07	—	—	PASS
	W2	35.18	—	—	PASS
	W3	33.31	—	—	PASS
	W4	31.56	—	—	PASS
	W5	24.66	26.47	93%	PASS
	W6	13.93	16.21	86%	PASS
	W7	31.38	—	—	PASS
	W8	33.48	—	—	PASS
	W9	31.56	—	—	PASS
	W10	33.34	—	—	PASS
	W11	34.41	—	—	PASS
	W12	32.85	—	—	PASS
	W13	32.34	—	—	PASS
	W14	35.33	—	—	PASS
	W15	34.14	—	—	PASS
121 King's Road	W1	32.23	—	—	PASS
	W2	30.44	—	—	PASS
	W3	29.24	—	—	PASS
	W4	28.03	—	—	PASS
	W5	32.57	—	—	PASS
	W6	30.64	—	—	PASS
	W7	29.12	—	—	PASS
	W8	27.21	—	—	PASS
	W9	26.54	26.55	100%	PASS
	W10	23.06	23.14	100%	PASS
	W11	21.69	21.81	99%	PASS
	W12	20.55	20.77	99%	PASS

Table 3-1 VSC results of the tested windows identified properties

The result of the daylight assessment indicates that all the identified windows of the surrounding properties either have VSC values above the recommended levels, or have a reduction in their VSC values from the baseline scenario that is within the limits set by BRE. This means that the rooms associated with these windows will continue to receive good level of daylight even with the proposed development in place. Therefore, it can be concluded that the proposed development is likely to have **no impact** on all other surrounding buildings.

3.2 Sunlight

Unlike daylight, sunlight is dependent upon direction. The UK lies in the northern hemisphere and we receive our sun from a southerly direction- with the sun rising in the east and setting in the west. The availability of sunlight is therefore dependent upon the orientation of the window or area in question relative to the position of due south.

Sunlight assessment is only applicable where some part of the new development is situated within 90° of due south of a main window wall of an existing building and if any part of the new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window.

Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH)

The criterion to assess sunlight suggests that an interior space appears reasonably sunlit when a window serving these spaces receives at least 25% of the Annual Probable Sunlight Hours (APSH) and at least 5% of the Winter Probable Sunlight Hours (WPSH) during the winter months of 21st September to 21st March.

The APSH and WPSH have been calculated using MBS Survey in AutoCAD. Sunlight availability can also be represented on a Waldram diagram. The software calculates the shading patterns from the surrounding buildings on a vertical plane and based on the unobstructed area of the Waldram diagram calculates the percentage of total sunlight hours reaching the plane, annually and in winter.

The BRE guide suggests minimum figures of 25% and 5% respectively. If a window fails this test then the BRE guide states that the former values of APSH and WPSH (i.e. the values without the proposed development) should be calculated. If the values with the proposed development in place are less than 0.8 times of their former value then occupants of the existing building will notice the loss of sunlight.

Site analysis indicates that the proposed development does not lie within 90° of due south of the identified windows and only few windows fall into the required test criteria. These are 3 south-west facing windows of Blakes Quay properties highlighted in Figure 3-3.

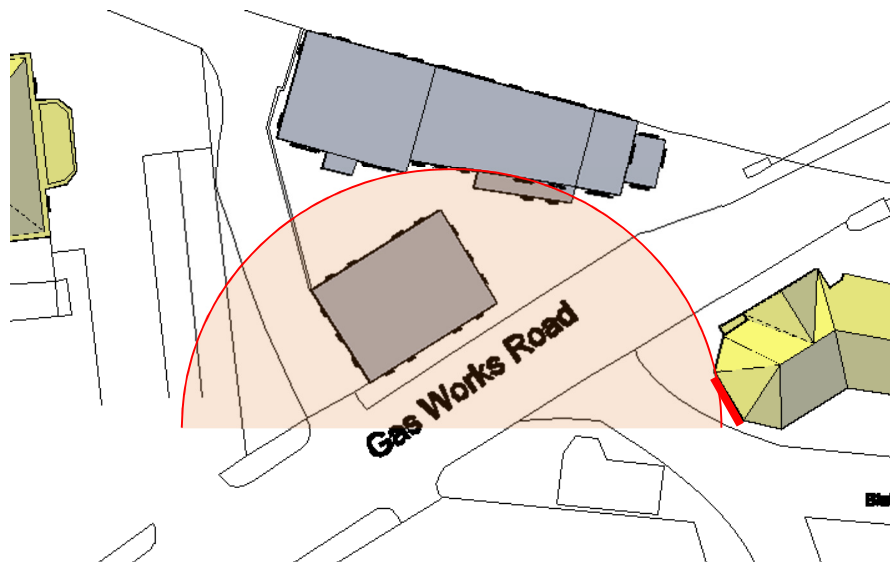


Figure 3-3 Facades likely to be affected

The results of the APSH of surrounding buildings are shown in Table 3-2 below.

Property	Tested windows	APSH(%) Proposed	APSH(%) Existing	% of existing case (80% and above acceptable)	BRE Criteria Met?	WPSH(%) Proposed	WPSH(%) Existing	% of existing case (80% and above acceptable)	BRE Criteria Met?
Blakes Quay	W1	55.00	55.00	100%	PASS	20.00	20.00	100%	PASS
	W2	64.00	64.00	100%	PASS	23.00	23.00	100%	PASS
	W3	57.00	59.00	100%	PASS	19.00	19.00	100%	PASS

Table 3-2 VSC results of the tested windows identified properties

The annual sunlight assessment for the development at Blakes Quay indicates that most of the tested windows receive adequate levels of sunlight (APSH>25%, WPSH 5%). Therefore, the proposed development will have no impact on the sunlight availability within the surrounding properties.

3.3 Daylight and Sunlight Provision in the Proposed Units

The quality and quantity of daylighting in an interior space depends on two main factors. The design of the interior environment is important: the size and position of windows, the depth and shape of the rooms and the colours of the internal surfaces are all important aspects. The design of the external environment also plays a major role and the presence of surrounding buildings will affect the amount of sunlight and daylight that is available.

Average daylight factor (ADF) is used as the measure of general illumination from skylight. The average daylight factor is the ratio of total daylight flux incident on a reference area to the total area of the reference plane, expressed as a percentage of outdoor illuminance on a horizontal plane due to an unobstructed hemisphere of sky of assumed or known luminance distribution.

It is considered general good practice to ensure that rooms in most buildings should have a predominantly daylight appearance.

The analysis of the required spaces was carried out under an overcast sky scenario (4000 lux), which is the predominant sky type in London, and is effectively the worst-case scenario. The daylighting levels are measured on the working plane level that is assumed at 0.85m for residential developments as defined in Building Research Establishment Report 'Site layout planning for daylight and sunlight: A guide to good practice' 2011.

In addition to the BRE guide, the British Standard BS 8206-02 'Lighting for buildings – Part 2: Code of practice for daylighting' (2008) has also been used for guidance in the assessment. As per the BS 8206-02, the minimum ADF values in a dwelling should be as following:

- 2% in kitchens,
- 1.5% in living rooms, and
- 1% in bedrooms

According to the general guidance, if the average daylight factor in a room is at least 5% then artificial lighting is usually not required during day time. If the ADF is between 2% and 5% then some supplementary artificial lighting may be required even though the room will have a daylight appearance.

The assessment needs to be carried out only for the habitable rooms where occupants have a reasonable expectation of daylight. As the BRE guide states that

'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.'

BRE guide states that sunlight is an important requirement for the living room of a dwelling, especially in the afternoon. It is less important in bedrooms and kitchens, where people prefer it in the morning rather than the afternoon. The guide suggests that a space would appear reasonably sunlit if at least one main window faces within 90° of due south and receives 25% of annual sunlight probable hours and 5% of annual sunlight hours in the winter months between 21st September and 21st March.

Daylight and Sunlight calculations

ADF and probable sunlight hours have been calculated using the Waldram tools through MBS Survey in AutoCAD. The software plots a Waldram diagram for each of the identified windows and gives the daylight factor based on total sky component and the percentage of sunlight hours annually and in winter using the BRE methodology.

Table 3-3 shows average daylight factors for all the habitable rooms within the proposed building. In the case of typical rooms at different floors, the rooms at the lowest floor have been selected to be tested as it would represent the worst case for that layout of room. The surface and glazing properties used for this assessment as agreed with the design team are presented in Appendix A and tested rooms are illustrated in Appendix-B.

Tested rooms	Unit No.	Room No.	Room Use.	ADF	Minimum ADF required
Building 1					
Level 1	1	R1	LK	2.12	2.00
		R2	Bed	2.41	1.00
	2	R3	LK	1.70	2.00
		R4	Bed	2.40	1.00
	3	R5	Bed	2.29	1.00
		R6	Bed	1.59	1.00
		R7	LK	2.93	2.00
	4	R8	LK	3.59	1.00
		R9	Bed	3.21	1.00
	5	R10	Bed	1.74	1.00
		R11	Bed	2.42	2.00
		R12	LKD	3.49	2.00
Level 2	8	R1	LK	2.92	1.00
		R2	Bed	4.12	2.00
	9	R3	LK	1.78	2.00
		R4	Bed	2.89	1.00
	10	R5	Bed	2.02	1.00
		R6	Bed	1.41	1.00
		R7	LK	3.33	2.00
	11	R8	LK	4.05	2.00
		R9	Bed	3.87	1.00
		R10	Bed	1.47	1.00

	12	R11	Bed	2.02	1.00
		R12	LK	3.76	2.00
Level 3	15	R2	Bed	2.49	1.00
		R3	Bed	3.18	1.00
	16	R1	LK	2.16	2.00
		R4	Bed	3.17	1.00
		R5	Bed	2.49	1.00
Level 5	27	R1	LK	3.49	2.00
		R2	Bed	4.06	1.00
	28	R3	LK	3.65	2.00
		R4	Bed	2.11	1.00
	29	R5	LK	3.59	2.00
	30	R6	Bed	5.51	1.00
		R7	Bed	3.30	1.00
		R8	Bed	3.34	1.00
R9		LK	4.22	1.00	
level 6	31	R1	LK	2.56	2.00
		R2	Bed	1.38	1.00
	32	R3	LK	2.93	2.00
		R4	Bed	1.39	1.00
	33	R5	Bed	2.87	1.00
		R7	Bed	2.14	1.00
	34	R8	Bed	2.54	1.00
		R9	Bed	3.47	1.00
Building 2					
level 1	7	R1	LK	3.67	2.00
		R2	Bed	2.58	1.00
	6	R3	LK	3.2	2.00
		R4	Bed	1.67	1.00

Table 3-3 ADF of the proposed building

The internal daylight calculations show that almost all of main habitable rooms within the units meet and exceed the BS 8206-02 criteria for minimum average daylight. The only exceptions are the kitchen cum living room of Unit 2 on level 1 and Unit 9 on level 2. The achieved daylight level is however more than the minimum daylight required for a living room (1.5%).

Therefore, based on the analysis it can be concluded that 98% of habitable rooms in the proposed development will be able to receive a good level of daylight throughout the year.

4 Conclusion

An assessment of the daylight and sunlight impacts from the proposed Gas Works Road development carried out with existing surrounding buildings.

This report is an assessment of the impact of the proposed scheme on the availability of daylight and sunlight of the existing surrounding buildings and amenity spaces. It determines whether the proposed design meets the criteria set out in Building Research Establishment Report 'Site layout planning for daylight and sunlight: A guide to good practice' 2011 and British Standard BS 8206-02 'Lighting for buildings – Part 2: Code of practice for daylighting' (2008).

The result of the daylight and sunlight assessment indicates that all the identified windows of the surrounding properties either have VSC values above the recommended levels, or have a reduction in their VSC values from the baseline scenario that is within the limits set by BRE. This means that the rooms associated with these windows will continue to receive good level of daylight and sunlight even with the proposed development in place. Therefore, it can be concluded that the proposed development is likely to have **no impact** on all other surrounding buildings.

Daylight levels within the residential units of the proposed development were also tested. These levels were checked against the British standard BS 8206-02 to support the planning application. The assessment confirms that 98% of the main habitable rooms in the proposed development receive ADF values exceeding the minimum standards.

5 Appendix A

The ADF value in some of the rooms in the proposed development is very close to the minimum recommended value. Therefore, it is suggested that the surface reflectance and transmittance values that have been assumed for the assessment should be achieved in design. These values are presented in the Appendix A.

Average Surface Reflectance (0-1) by BRE	0.75
Glass Transmittance (0-1)	0.70
Below Working Plane Factor	0.15

6 Appendix B

Plans indicating the tested rooms for the internal daylight calculations

