FDS Application
‘Supporting Statement’

Internal daylight and sunlight assessment

1. Introduction

This Daylight, Sunlight and Overshadowing Assessment report has been prepared by HTA Design LLP and includes the considerations of the likely significant environmental effect of the proposed scheme changes on the daylight, sunlight availability and overshadowing in the context of the 2014/2015 ES. It has been prepared to provide an assessment relating to the Proposed Development with regard to the national, regional and local planning policy framework.

The main changes concern the effect of the development on the daylight availability to 147 rooms spread over Sites 01, 02, 05 and 06.

2. Methodology

The Daylight and Sunlight Assessment, presented in this report, has been carried out in compliance with the methodology outlined in the Building Research Establishment (BRE) Guide 'Site Layout Planning for Sunlight and Daylight: A Guide to Good Practice' by P J Littlefair (2011).

2.1. Daylight - Impact on existing properties

The design of a new development should safeguard potential for daylight to nearby buildings. Otherwise, obstruction caused by new built sites may make surrounding properties look gloomy and unattractive.

BRE guidelines are intended for use for living areas in adjoining dwellings or main occupied spaces in non-domestic buildings where daylight is required. The methodology to assess the impact on daylight access of the properties surrounding Phase 5 is as follows:

Angular check

This test should only be used where the proposed development is of a reasonably uniform profile and is directly opposite the existing building. A plane is drawn at 25 degrees from the horizontal at the centre of an existing window. If the new development intersects with this plane, i.e. the obstruction angle is greater than 25o, daylight access of the assessed window may be reduced. A more detailed assessment should be then carried out to calculate the loss of daylight to the existing window.

Buildings that are not directly facing the new development may still experience a change to their lighting condition and therefore the 45o approach method should be applied to assess the impact. A horizontal plane should be drawn from the highest point of the proposed development angled at 45 degrees downward. If existing windows fall within the area created by the existing building, proposed development and the angled plane, these should be also included in the assessment.

Vertical Sky Component method (VSC)

The Vertical Sky Component (VSC) quantifies the amount of available daylight, received at a particular window and measured on the outer pane of the window. This is the ratio, expressed as a percentage, of the direct illuminance falling on a reference point (usually the centre of the window) to the simultaneous horizontal illuminance under an unobstructed sky (overcast sky conditions). The maximum value of VSC for a completed unobstructed vertical window pane is 40%.

In order to maintain good levels of daylight the BRE guidance recommend that the VSC of a window should be 27% or greater. However, the 2011 BRE Handbook makes allowance for different target values in cases where a higher degree of obstruction may be unavoidable such as historic city centres or modern high rise buildings. The guide states that the 27% value is:

"..purely advisory and different targets may be used on the special requirements of the proposed development or its location".

If the VSC is less than 27% then further assessment should be carried out to compare existing and proposed daylight levels received by an existing window.

Comparison method

The comparison test considers the VSC results of the baseline/existing condition and the VSC results assuming that the new development is in place. The 2011 BRE Handbook states that where the proposed VSC is less than 27%, the comparison with the existing situation should be analysed and if the VSC is less than 0.8 times its former value, occupants of the existing building may notice a reduction in the amount of daylight.

Daylight - New Development

The quality and quantity of daylighting in an interior space depends on two main factors: external environment and internal layout. External environment, e.g. obstruction from neighbouring buildings or topographical features has an impact on daylight provision whereas internal layout and windows' size affects daylight distribution within a living area.

Section 2.1 and Appendix C of the BRE guide provide several methods for calculating daylight levels within new developments.

According to the BRE guide and BS8206, only main living areas within a dwelling, i.e. kitchens, living/dining rooms and bedrooms, should be assessed against the criteria provided, as these are occupied for a long period throughout the day and daylighting is essential for carrying out tasks. Therefore, secondary spaces, e.g. circulation areas, bathrooms and storerooms, are excluded from this study.

Vertical Sky Component

According to BRE Guide, if VSC as measured at the centre of a window is at least 27% then the living space is expected to receive good daylight levels.

The VSC, however, is a general measure of potential for daylight in a space that does not take into consideration the function of the space being assessed and should be carried out at early design when rooms' layout is not yet determined and the optimum position of windows is being assessed. Therefore, VSC calculation has been omitted from this study.

Average Daylight Factor

The most effective way to assess 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 a 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 takes into account the 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.

Position of the No-Sky Line

A measure to assess the distribution of daylight in a space is the percentage of area that lays beyond the no-sky line i.e. the area that receives no direct skylight. This is important as it indicates how good the distribution of daylight is in a room. If more than 20% of the working plane lies beyond the no-sky line poor daylight levels are expected within the space.

The following table (Table 5) summarises the assessment criteria as described in the BRE Guide that should be applied to new developments in order to ensure good daylight levels within the main living areas of residential units.

Measure of Interior Daylight	Benchmark	Daylight Criterion
Vertical Sky Component (VSC)	27%	If VSC is at least 27% then conventional window design will usually give reasonable results
Average Daylight Factor (ADF)	2.0% 1.5% 1.0%	Minimum value of ADF for Kitchens Minimum value of ADF for Living rooms Minimum value of ADF for Bedrooms
No-Sky View	80%	There will be a good distribution of light in the room if at least 80% of the working plane receives direct skylight.

For the purposes of this study, only the Average Daylight Factor and No-Sky view methods described above have been considered. Contrary to the VSC that measures daylight levels only on the window pane, the ADF is a more complex and

representative calculation as it takes into account the angle of visible sky reaching the windows as well as the room layout, use and surface reflectance. Section 6 of this report provides analysis of the results.

2.2. Sunlight - Impact of existing properties

The impact of the new development on the sunlight levels received by the neighbouring residential buildings has been carried out In accordance with the BRE Guide.

The methodology is based on guidelines set out in the 2011 BRE Handbook. Only windows facing 90° of due south have been considered in the analysis. The methodology to assess the impact on the sunlight access of the properties surrounding the new development is as follows:

Angular check

This test should only be used where the proposed development is of a reasonably uniform profile and is directly opposite the existing building. A plane is drawn at 25 degrees from the horizontal at the centre of an existing window. If the new development intersects with this plane, i.e. the obstruction angle is greater than 25o, daylight access of the assessed window may be reduced. A more detailed assessment should be then carried out to calculate the loss of daylight to the existing window.

Annual Probable Sunlight Hours

BRE have produced sunlight templates for London, Manchester and Edinburgh indicating the Annual Probable Sunlight Hours (APSH) for these regions. The London template has been selected for this study which has an APSH of 1,486 hours and a Winter Probable Sunlight Hours of 446 hours. The same VSC reference points are used for the calculation of the APSH and WPSH. It should be considered that sunlight is deemed less important in kitchens and bedrooms. The 2011 BRE Handbook states:

"In houses, the main requirement for sunlight is in living rooms, where it is valued at any time of day, but especially in the afternoon".

The 2011 BRE Handbook also states:

"...a south facing window will, in general, receive most sunlight, while a north facing one will receive it only on a handful of occasions. East and west facing windows will receive sunlight only at certain times of day".

According to the BRE guide, for a space to be reasonably sunlit:

- at least one main window wall should face within 90o of due south and
- the centre of at least one window to a main living room should receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken. If a room has two windows on opposite walls, the APSH due to each can be added together.

If the available sunlight hours are below the above thresholds then an additional assessment should be carried out.

Comparison method

The comparison test considers the APSH and WPSH results of the baseline condition and the APSH and WPSH results of the Development in place. The BRE guidance say that if the reduction in sunlight between the baseline condition and the future one results in an APSH and WPSH of at least 0.8 times its former value, then it is considered that the sunlight received is adequate.

2.3. Sunlight - New development

Sunlight is valued as it provides dwellings with light and warmth and it also allows for passive heating through solar gains that reduces heating energy consumption. Optimum arrangement of the site to produce the best orientation (within 90o of due south) and reduce overshadowing should be considered in order to take advantage of solar energy during winter time.

According to BRE Guide, the main requirement for sunlight in housing is in living rooms, whereas in bedrooms and kitchens sunlight is viewed as less important. Therefore for a space to be reasonably sunlit at least one main window wall should face within 90o of due south and the centre of at least one window to a main living room should receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken. If a room has two windows on opposite walls, the APSH due to each can be added together.

According to the BRE Guide, at high-density developments it becomes difficult to avoid some dwellings being seriously obstructed or having a poor orientation. Where prolonged access to sunlight is available, measures to avoid overheating and unwanted glare from the sun should be considered.

2.4. Overshadowing - Gardens and open spaces

Existing spaces

The methodology is based on guidelines set out in the 2011 BRE Handbook that states the following:

> *"The availability of sunlight should be checked for all open spaces where it will be required. This would normally include: private gardens (usually the main back garden of a house), parks and playing fields, children's playgrounds..."*

BRE Guide recommends that for a garden or amenity to appear adequately sunlit throughout the year, at least half of it should receive at least two hours of sunlight on 21 March (Spring Equinox).

The Guide suggests that where large buildings are proposed which may affect a number of amenity spaces it is useful to plot a shadow plan to show the location of shadows at different times of the day on 21st March. Shadow plans for the 21st of March and 21st of June can be found in Appendix C.

The methodology to assess the sunlight impact of the amenity spaces is as follows: sunlight provision is considered adequate if at least 50% of the amenity space receives two hours of sunlight on 21 March. If otherwise, then a comparison between the existing and proposed conditions is required to test whether the amenity space receives at least 80% of sunlight of its former value. If this is the case the BRE guidance states that the loss of sunlight is negligible.

Proposed development

Good site layout planning should be able to provide not only interiors but also spaces between buildings with adequate levels of daylight and sunlight. This will have an important impact on the overall appearance and ambience of a development by providing attractive sunlit views, making outdoor activities more pleasant, encouraging plant growth etc.

BRE Guide recommends that for a garden or amenity to appear adequately sunlit throughout the year, at least half of it should receive at least two hours of sunlight on 21 March.

3. Impact on surrounding buildings

The design of a new development should safeguard potential for daylight and sunlight to nearby buildings. Otherwise, obstruction caused by new built sites may make surrounding properties look gloomy and unattractive.

The impact of the proposed development on its surrounding has been undertaken in the context of 2014/2015ES, and the results are presented in Chapter 10 ‘Daylight, Sunlight, and Overshadowing’ and Appendix 10.1 of the 2014/2015 ES.

The changes following the 2014/2015 planning applications do not affect the heights of the proposed buildings, which have not been subject to amendment. Therefore, the impact on the surrounding buildings remains the same. No further analysis has been undertaken regarding the impact of the proposed development on its surroundings at this stage.

4. Proposed development

4.1. Daylight

The assessment takes into account the changes in internal layouts 147 rooms across Sites 01, 02, 05 and 06.

The overall results for Aylesbury regeneration, including these additional units, are presented in Table 01 below.

	Aylesbury Regeneration Phase 1B/1C - SUMMARY	No. of rooms	No. of rooms that pass	% of rooms that pass
Daylight	**Average Daylight Factor criterion**	3347	2688	80%
	Aylesbury Regeneration Phase 1B/1C - SUMMARY	No. of rooms	No. of rooms that pass	% of rooms that pass
	View of the Sky criterion	2559	1925	75%

The table below shows the ADF and the Sky-view results, broken down block by block.

	Average Daylight Factor			View of the Sky				
Aylesbury Regeneration	No. of spaces	No. of spaces that pass	% of spaces that pass	No. of rooms tested	No. of rooms that pass	% of rooms that pass	No. Of rooms with more than 5% of ADF	No. Of rooms with more than 5% of ADF (%)
Block 1	402	300	75%	285	202	71%	29	10%
Block 2A	21	18	86%	20	15	75%	0	0%
Block 2B	191	185	97%	171	122	71%	25	15%
Block 3A	135	134	99%	120	79	66%	25	21%
Block 3B	77	64	83%	57	54	95%	7	12%
Block 4A	313	290	93%	221	209	95%	110	50%
Block 4B	202	164	81%	158	146	92%	5	3%
Block 4C	96	72	75%	70	39	56%	6	9%
Block 4D	167	136	81%	137	107	78%	11	8%
Block 4E	72	72	100%	52	52	100%	0	0%
Block 5A	272	238	88%	192	180	94%	51	27%
Block 5B	55	31	56%	42	14	33%	1	2%
Block 5C	187	129	69%	142	99	70%	11	8%
Block 5D	121	87	72%	87	55	63%	8	9%
Block 5E	295	214	73%	231	152	66%	18	8%
Block 6A	230	183	80%	167	117	70%	14	8%
Block 6B	139	92	66%	111	56	50%	4	4%
Block 6C	129	111	86%	97	66	68%	0	0%
Block 6D	222	150	68%	181	143	79%	25	14%
Block 6E	21	18	100%	18	18	100%	9	50%
Total	3347	2688	80%	2559	1925	75%	350	14%

The results presented in the table show that the percentage of rooms meeting the BRE guidelines in terms of daylight levels remains unchanged; in particular the following has been found:

- 80% of the spaces meet the ADF target set by the BRE
- 75% of the room meet the View of the sky target set by the BRE

4.2. Sunlight

In accordance with the BRE Guide, only windows facing within 90 degrees of due south need to be assessed. The location and size of the south facing windows of the development have not changed. Therefore no further assessment has been carried out at this stage.

Overshadowing

The sun-on-the-ground test of the proposed external spaces remain unchanged as the additional units in Block 6 are located to the north, thus not affecting the sunlight levels on the internal courtyard.