



**Reading Borough Council
New Build Ph1: Wensley Road**

Daylight, Sunlight and
Overshadowing Assessment

January 2020





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Figure 1: Proposed development - Gable elevation

Executive Summary

HTA Sustainable Futures have been appointed to carry out a Daylight, Sunlight and Overshadowing Assessment for the proposed development at Wensley Road, in Reading.

The proposed scheme has been carefully designed to provide future occupants with adequate daylight and sunlight levels throughout the year, with particular attention to not impact negatively on the natural daylight received by the neighbouring buildings. The main scope of the Daylight and Sunlight study is to assess the performance of both the proposed development and the existing surrounding properties in terms of daylight and sunlight availability.

To ensure that this assessment can be appropriately evaluated against Reading Council's planning policies, the analysis has been carried out in accordance with BRE's guide 'Site Layout Planning for Sunlight and Daylight: A Guide to Good Practice', P J Littlefair (2011). According to the BRE guide:

'...the advice given here is not mandatory and this document should not be seen as an instrument of planning policy. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design. In special circumstances the developer or planning authority may wish to use different target values' such as a dense urban environment.'

The Daylight and Sunlight assessment was carried out using the following checks:

Daylight Assessment:

- **Existing properties:**
 - 25 degree angular check, and
 - Vertical Sky Component (VSC)
- **Proposed dwellings:**
 - Average Daylight Factor (ADF), and
 - View of the Sky.

Sunlight Assessment:

- **Existing properties and proposed dwellings:**
 - 25 degree angular check
 - Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH) (if required)
- **External spaces:**
 - Sunlight on the ground and Overshadowing.

Daylight

Impact on the existing buildings

The daylight analysis considered all the **surrounding buildings** with main windows facing the development. Initially, the 25 degree angular check was undertaken. Secondly, a more accurate analysis was performed testing the Vertical Sky Component availability. The test was conducted on the external facade of the buildings assuming a grid size of 0.5 m. The BRE guide states that if the VSC at the centre of the main windows is greater than 27%, then enough skylight will be reaching the window of the existing building. Any reduction below this level should be kept to a minimum. The facade analysis shows that the VSC values of the points on the facade of the existing properties surrounding the proposed scheme would achieve and exceed this value.

Table 1: Summary results of the Daylight Assessment - Impact on existing surrounding properties

	Properties meeting the BRE criteria (%)
VSC test	100%

Assessment of the proposed development

Daylight levels of the **proposed units** have also been tested. The Average Daylight Factor (ADF) and the No-Sky Line (NSL) tests have been carried out to assess the daylight availability within each habitable room of the scheme. All the habitable rooms of the houses meet the minimum targets for both Average Daylight Factor and No-Sky Line. Regarding the flats, the majority of the units meet and exceed the targets. Some habitable rooms fall below the recommendations. These are kitchen and living spaces, which have a balcony above their main window and for which a minimum target of 2% is applied. The daylight availability of their living space, excluding the kitchen area, was also calculated and the ADF of was found suitable for this activity, i.e. The ADF value was found to be at least 1.5%, which is the target set for a living room. Regarding the No-Sky line test, all the units meet the recommended targets. As noted, the reason for lower daylight values in the units is the presence of the balconies. In apartments, balconies have a beneficial effect in controlling solar gains. They provide some shading and reduce the solar radiation in the coming months. This is particularly important in highly insulated flats, where achieving thermal comfort conditions might result to be challenging. Overall, it can be concluded that the daylight availability of the scheme is good. Almost all the units will achieve daylight values well above the recommended targets and they will all achieve

a direct view of the sky. The units achieving lower values of ADF were also tested excluding the kitchen area and all spaces were found suitable for a living room.

Table 2: Summary results of the Daylight Assessment - Proposed development

	Rooms meeting the BRE criteria (%)
Average Daylight Factor	96.42%
View of the Sky	100%

Sunlight

Impact on the existing buildings

The impact of the proposed development on the **existing surrounding buildings** has been assessed in terms of sunlight provision. The annual and winter sunlight availability has been tested calculating the Annual and Winter Percentage of Sunlight Hours as described in the BRE guidelines. The test was carried out on the south-facing facades of the existing properties directly facing the proposed development. The results indicate that appropriate sunlight levels are achieved on all the relevant points of the facades.

Assessment of the proposed development

To assess the sunlight provision **within the scheme** the BRE guide recommends that only living rooms that face within 90° due south should be tested. The APSH and WPSH was calculated for windows in all living rooms facing south. The results show that all the assessed windows of the houses meet the BRE targets in both the winter and the annual conditions. The results of the flats show that appropriate sunlight values are achieved in winter for all units. Some habitable rooms achieve lower sunlight values in the annual configuration. This is because the balconies create some obstruction when the sun is higher. As explained in the previous section, lower sunlight values can help tackle overheating. Houses can generally benefit from cross ventilation, while it is more likely that flats get overheated, particularly when their fabric performance is of high level. Given the positive results achieved for the winter conditions, it can be said that lower sunlight values in the annual configuration are acceptable because of their contribution in regulating the temperatures in the warmer months.

Table 3: Summary results of the Sunlight Assessment - Existing spaces and Proposed development

	Windows meeting the BRE criteria (%)
Surrounding buildings	100%
Proposed development	84%

Sunlight on the ground - Overshadowing

Impact on the existing buildings

Most of the **existing external spaces** are located to the northern part of the development. The overshadowing analysis shows that these spaces are not impacted by the proposed buildings. There is also an open space to the southern part of the proposed units. Because of

the orientation, this space will not be affected by the new buildings. However, an accurate analysis has been performed to show the expected levels of sunlight. All the surrounding amenity areas will achieve the criteria for the sun-on-the-ground analysis.

Therefore, the impact of the proposed development on the existing external spaces is considered to be negligible in terms of provision of sunlight on the ground.

Assessment of the proposed development

The study of the external amenity areas includes the **new external spaces** proposed in the new development.

A total of 29 spaces have been tested on 21st March in line with the guidelines. They include the external communal spaces and the proposed private gardens. The communal spaces achieve and exceed the minimum criteria for sunlight provision and similar results are achieved for all the south-facing private gardens. North-facing gardens achieve lower values of sunlight as expected for their orientation. This is in line with the nature of such spaces.

The sunlight assessment was also undertaken testing the sunlight availability on 21st June to assess the conditions in summer. All the spaces, including the north facing gardens, achieve at least two hours of sun in at least 50% of their area.

Overall, the impact of the new development on the existing properties and the performance of the proposed scheme is considered acceptable in terms of daylight and sunlight access.

Table 4: Summary results of the Sunlight on the ground test - Existing spaces and Proposed development

	Spaces that pass BRE criteria (%)	
	21 st March	21 st June
Existing external spaces	73%	100%
Proposed external space	100%	100%

1.0 Introduction

HTA Sustainable Futures have been instructed to prepare a Daylight and Sunlight study to assess the impact of the proposed development at Wensley Road, in Reading on the existing surrounding properties and open spaces in terms of daylight and sunlight availability. Daylight and sunlight in main living areas, i.e. kitchens, living rooms and bedrooms, of the proposed development as well as sunlight provision in outdoor amenity spaces have been also assessed.

Daylight and sunlight calculations have been carried out in accordance with BRE's 'Site Layout Planning for Sunlight and Daylight: A Guide to Good Practice' (2011) by P J Littlefair, which is generally accepted as good practice by planning authorities.

The BRE Guide gives advice on site layout to achieve provision of daylight and sunlight both within buildings and in the open spaces between them. It aims to aid designers in considering the relationship between new and existing buildings to ensure that each retains the potential to achieve good daylight and sunlight levels.

BRE guidelines have been drafted primarily for use with low-density suburban developments and should be used flexibly when dealing with dense urban sites and extensions to existing buildings. The Guide states in the introduction:

"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and the guide should not be seen 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 since natural lighting is only one of many factors in site layout design. In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings."

Section 4 of this report briefly describes the BRE methodology and the design standards. Sections 6, 7 and 8 provide a summary of the outcome of the analysis.

2.0 Site description

The site is located within the loop at the end of Wensley Road, within the Coley Park Estate. Currently three 15 storey tower blocks are located within the site itself. On the neighbouring site within the loop there are terrace and semi-detached houses.

There are three parking courts serving each of the three towers, each of which are accessed directly from Wensley Road. There are no vehicular routes across the loop.

There are existing open grass amenity spaces adjacent to each of the towers. They are fenced off from the loop road and are only accessible from within the site boundary.

Between the three tower blocks, there is a play space for 5-11yr olds, which is publicly accessible via pedestrian footpath. A further larger play space for the local neighbourhood is within Courage Park.

The daylight and sunlight provision of both the existing surrounding properties and the proposed residential spaces has been carried out against the criteria described in BRE document 'Site Layout Planning for Daylight and Sunlight: a guide to good practice - 2nd edition', by P. Littlefair. The sunlight availability on the external spaces has also been evaluated.



Figure 2: Aerial photo of the site - site boundary in red

3.0 Planning policy

The new Local plan asks designers to ensure that new developments and their neighbouring properties receive adequate daylight and sunlight levels.

Reading Borough Local Plan (2019)

CC8: Safeguarding amenity

Development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties, in terms of:

- Privacy and overlooking;
- Access to sunlight and daylight;
- Visual dominance and overbearing effects of a development;
- Harm to outlook;
- Noise and disturbance;
- Artificial lighting; [...]

The policy specifies that reference should be made to the 'BRE Site Layout Planning for Daylight and Sunlight: A guide to good practice' document may be of use in ensuring that new development adjacent to residential properties is not of adverse bulk and does not block out sunlight and daylight to habitable rooms and outdoor living spaces.

The Council's Supplementary Planning Guidance on House Extensions provides some useful guidance on how extensions can be designed to accord with the principles of this policy, and that SPG continues to be current. For instance, the SPG sets out a basic way to protect light to main rooms in adjoining dwellings, through avoiding extensions that would infringe on an area measured at an angle of 45° from the midpoint of the closest window to a habitable room in a neighbouring property.

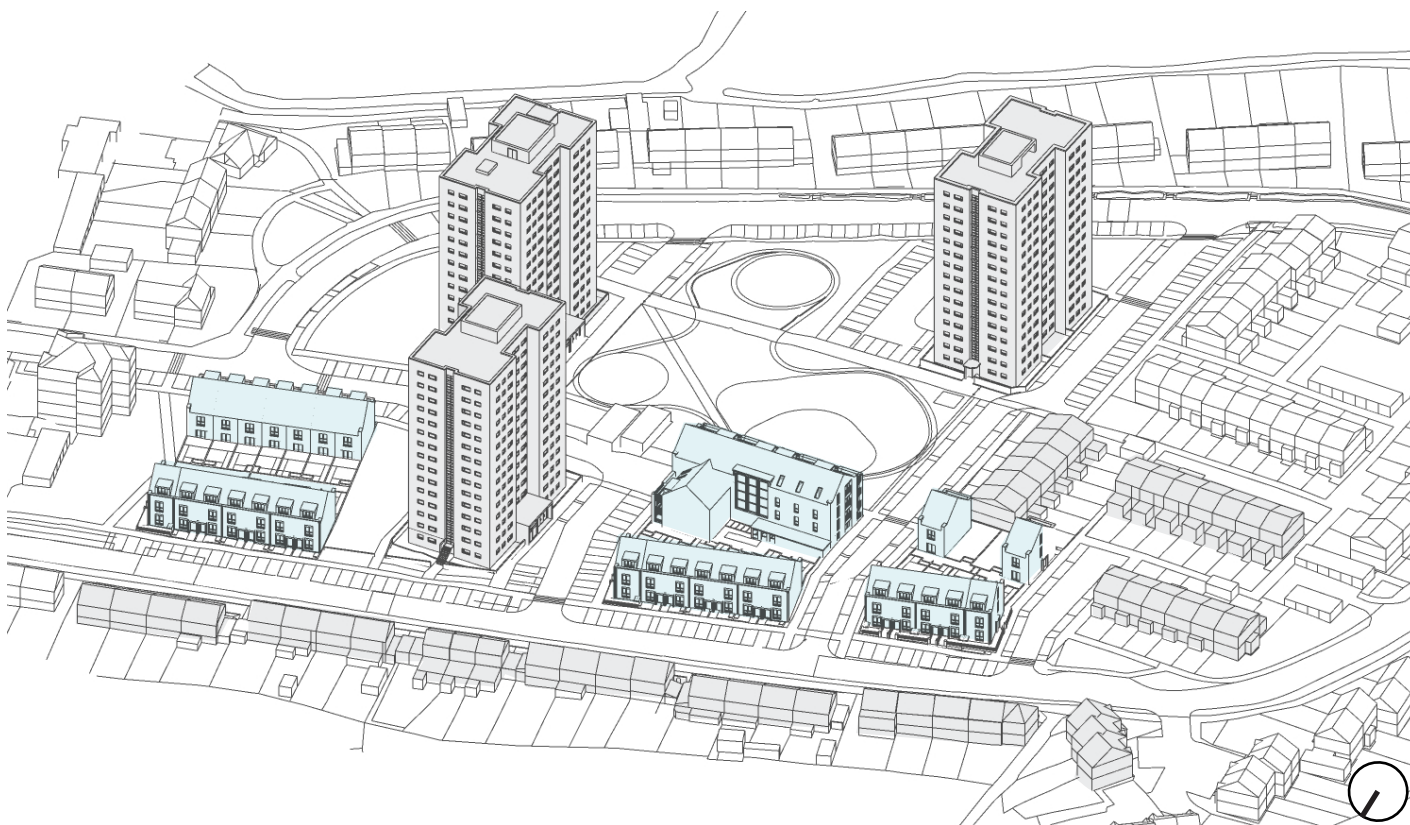


Figure 3: Aerial view of the development

4.0 Methodology - Assessment criteria

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).

4.1 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 the 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 25°, 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.

4.2 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 for the proposed development.

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.

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.

Table 5: Daylight criteria for the assessment of the daylight levels of new buildings

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.

4.3 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 25°, 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 90° 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.

4.4 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 90° 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 90° 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.

4.5 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, 21st of June and 21st of December can be found in Appendix B.

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.

5.0 Site model

The Daylight/Sunlight analysis was carried out by creating a three-dimensional model of the proposed development and its surroundings (Figure 4).

The proposed residential units have been analysed and assessed against the BRE standards. For each unit only kitchens, dining rooms, living rooms and bedrooms were assessed in terms of daylight and sunlight provision.

Floor layouts of the proposed development, shown in Appendix A, highlight those units included in the daylight and sunlight study described in the following sections.

The model was also used to assess the impact on the surrounding buildings in terms of daylight, sunlight and overshadowing.

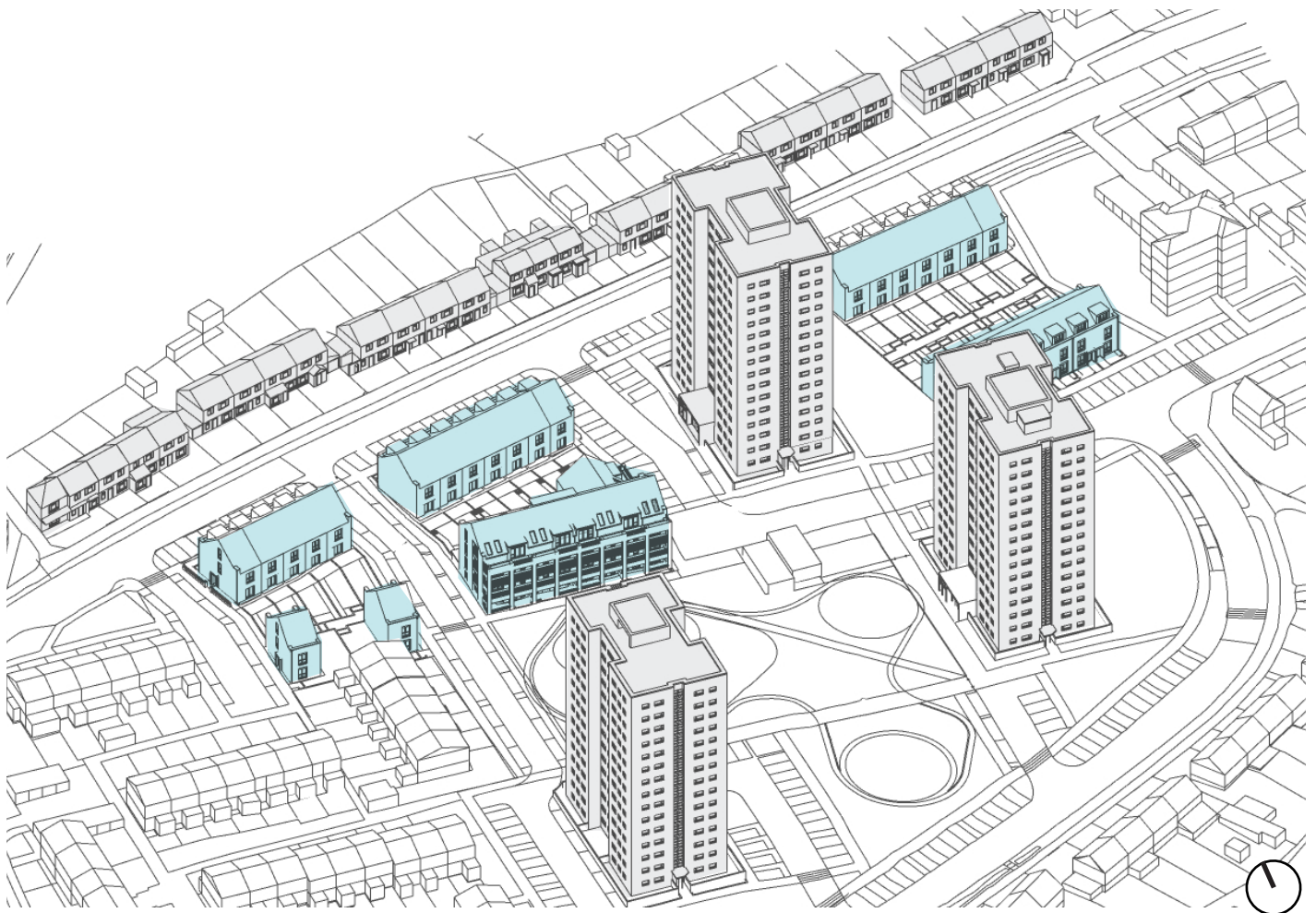


Figure 4. 3D model of the proposed development and its surroundings

6.0 Daylight assessment

6.1 Impact on existing properties

A daylight analysis has been carried out to assess the impact of the new development on the surrounding existing properties in terms of availability of daylight. Figure 5 shows the location of the existing buildings that surround the proposed development and whose daylight availability may be affected by the new blocks and houses.

The assessment was performed in two steps as explained in the methodology. Firstly, an angular check was done to evaluate if the development will cause a substantial effect on the diffuse skylight enjoyed by the existing buildings. Secondly, the Vertical Sky Component was calculated at each point of the facade assuming a grid size of 0.5 m.

The results of the analysis show that all the relevant points of the existing properties achieve a VSC value of at least 27%. The following images show the results of the analysis. The yellow colour indicates areas of the facade that meet the minimum targets suggested by the BRE guidelines.

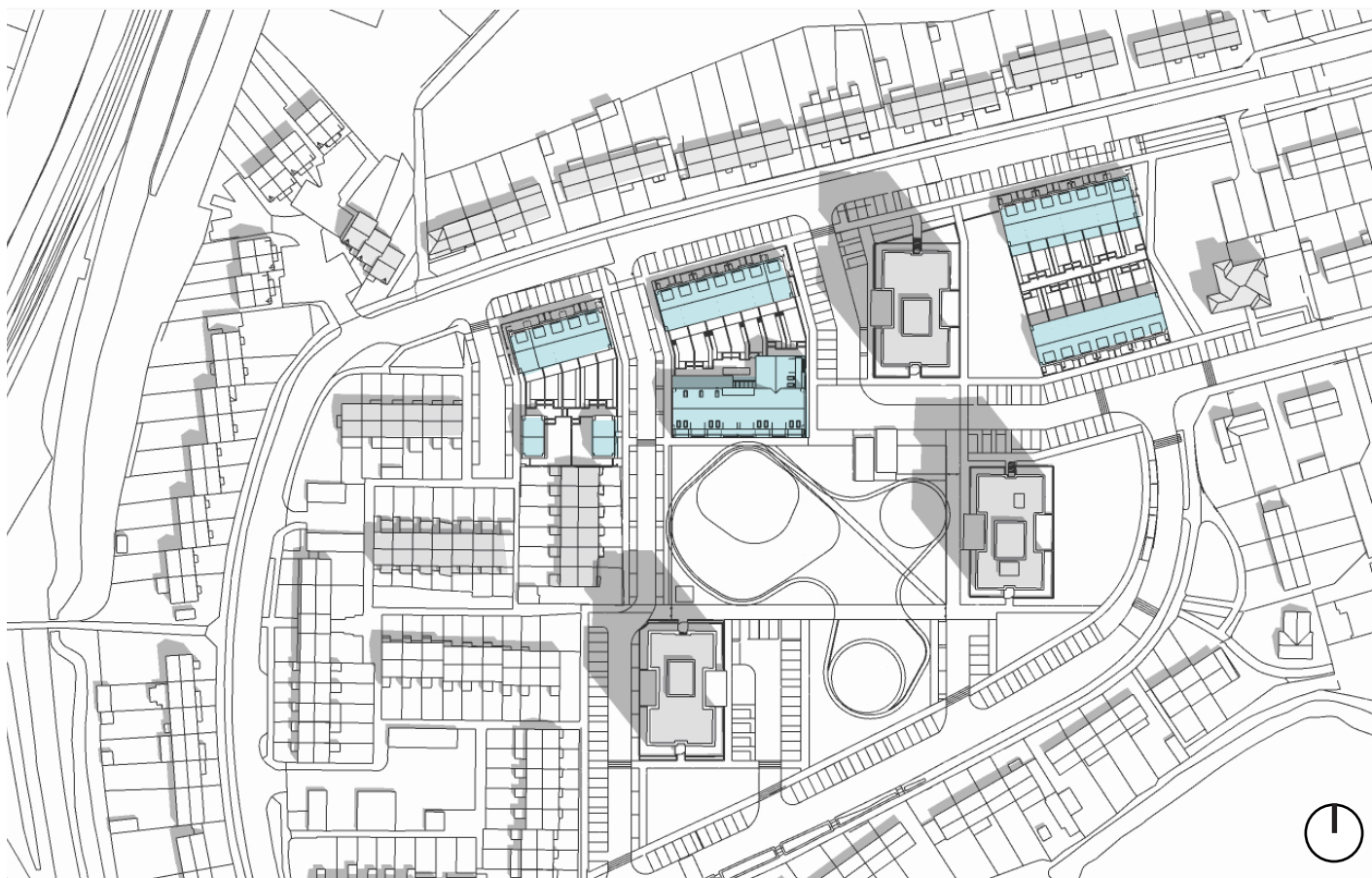


Figure 5. Site plan with surrounding buildings

Existing surrounding buildings Proposed buildings

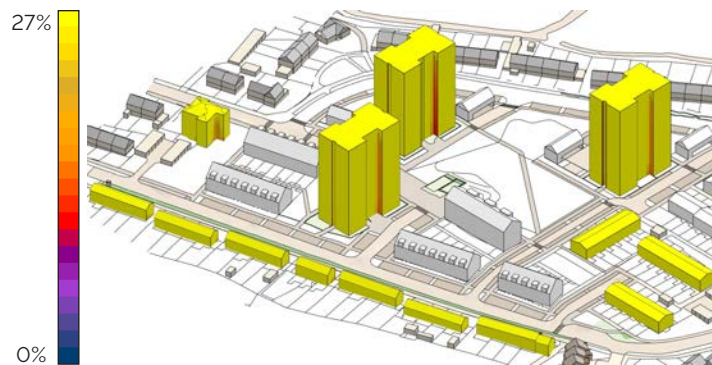


Figure 6. Vertical Sky Component analysis - Existing site North-West view



Figure 7. Vertical Sky Component analysis - Existing site South-West View

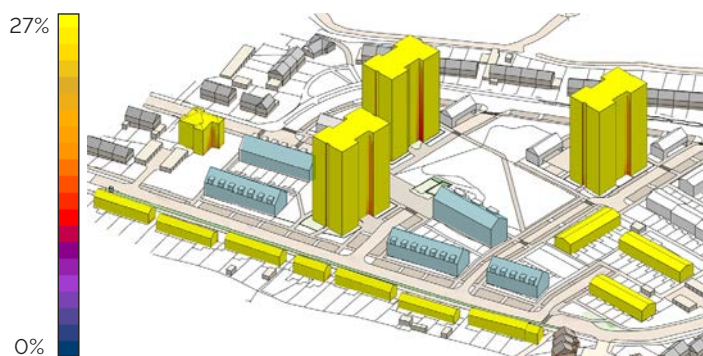


Figure 8. Vertical Sky Component analysis - Proposed Site North-West view

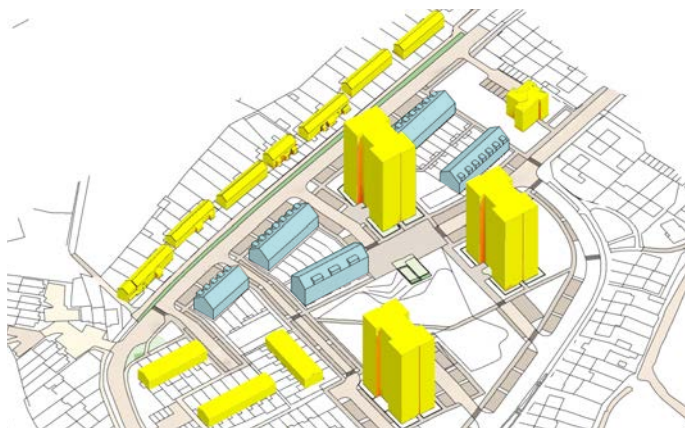


Figure 9. Vertical Sky Component analysis - Proposed Site South-West View

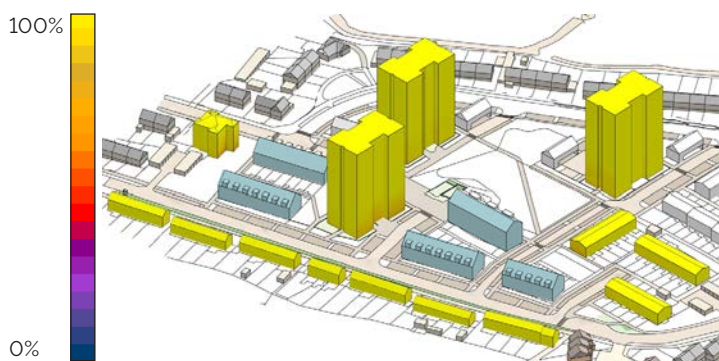


Figure 10. Vertical Sky Component analysis - Ratio North-West view

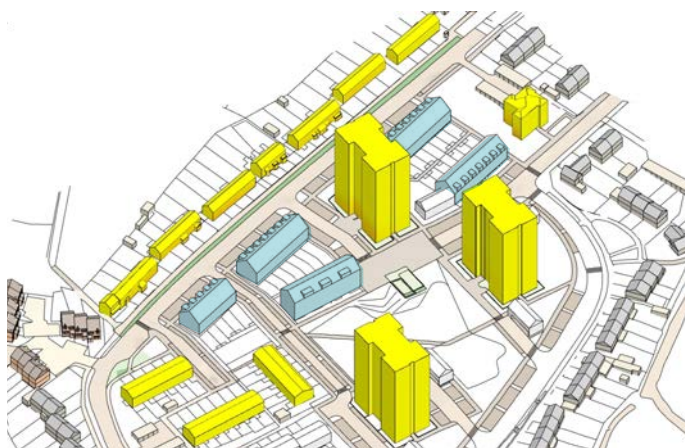


Figure 11. Vertical Sky Component analysis - Ratio South-West View

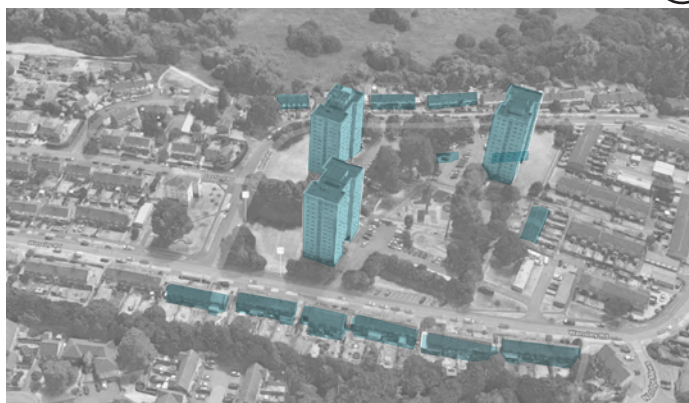


Figure 12. Existing site North-West view



Figure 13. Existing site -South-West View

6.2 Proposed development

A daylight analysis was carried out for the proposed development to ensure good daylight levels according to the BRE guidelines. Preliminary tests were conducted to test the potential for daylight. The images below show the results of the preliminary analysis. However, more accurate testing was also conducted to test the Average Daylight Factor and the percentage of Non-Sky Line achieved in each representative unit.

The results show that the houses achieve and exceed the BRE criteria for both the ADF and NSL tests. The results of the flats show that all the rooms achieve the minimum targets set for the NSL. Most of the rooms also exceed the targets for the ADF criteria. However, some habitable rooms fall below the recommendations. This is because of

the balconies above the main window of the rooms. Interim analyses have been performed to increase the daylight availability and an overall improvement upon the initial results has been achieved (Appendix A).

In addition, a separate exercise has been conducted to assess the daylight availability of the failing open spaces excluding the kitchen area. The results of the study demonstrate that excluding the kitchens would provide sufficient daylight in the living areas. It should also be noted that balconies help reduce the solar gains in the summer months by providing some shading to the windows below. This strategy is particularly beneficial in highly insulated flats as in this case. Therefore, the lower daylight values can be defined as acceptable. Detailed results of the testing can be found in Appendix A, including information on the internal layout of each unit tested.

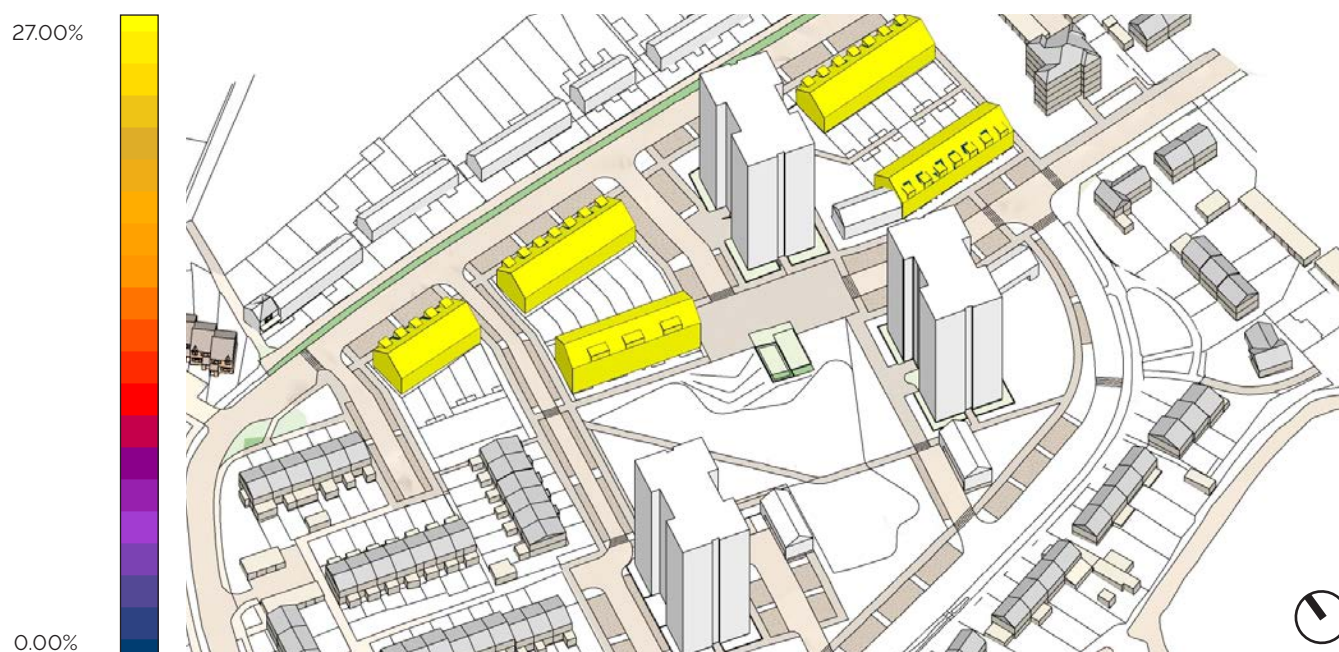


Figure 14. Vertical Sky Component analysis - Proposed Site - South-West View



Figure 15. Vertical Sky Component analysis - Proposed Site - North-West view

7.0 Sunlight Assessment

7.1 Impact on existing properties

Sunlight is an important issue to consider for the quality of an internal space. The orientation of windows and the position of a building on a site will have an impact on the amount of sunlight it receives but will also have an effect on the sunlight which neighbouring buildings receive. Unlike daylight, which is non-directional and assumes that light from the sky is uniform, the availability of sunlight is dependent on the orientation of the window or area of ground being assessed relative to the position of the sun.

In accordance with the BRE Guide, only windows facing within 90 degrees of due south need to be assessed. All the existing surrounding properties have been analysed.

The images below show the results of the analysis. The yellow colour indicates the area achieving sunlight values as recommended in the BRE guidelines.

The images also show the results of the ratio, which indicates the difference between the current and the future configurations.

Overall, the sunlight analysis of the impact on the existing surrounding properties can be classified as negligible.

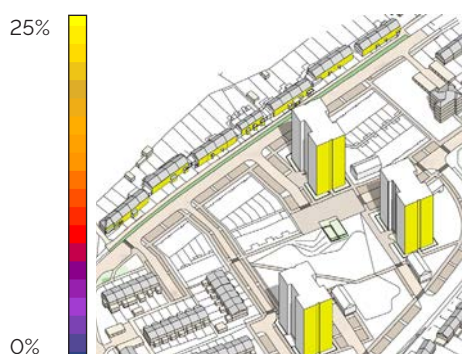


Figure 16. Sunlight analysis - APSH-Existing site South-West View

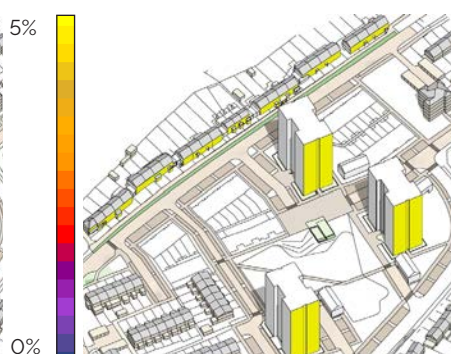


Figure 17. Sunlight analysis - WPSH- Existing site South-West View

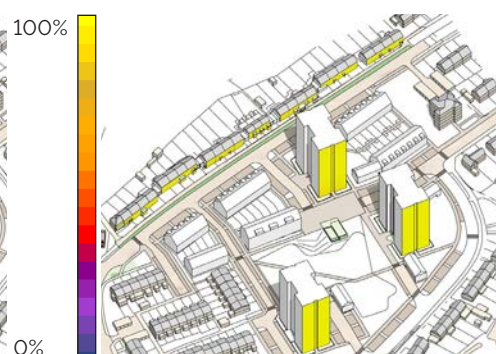


Figure 18. Sunlight analysis - APSH Ratio- Proposed site South-West View

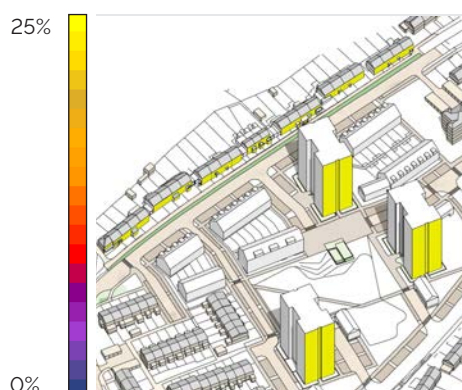


Figure 19. Sunlight analysis- APSH - Proposed site South-West View

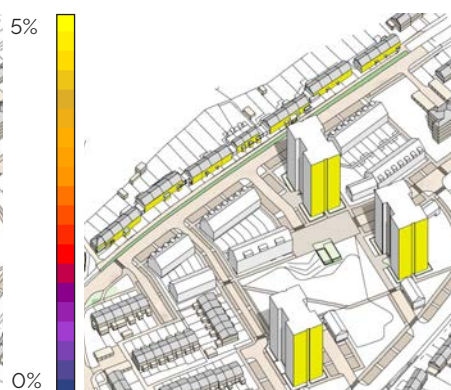


Figure 20. Sunlight analysis - WPSH- Proposed site South-West View

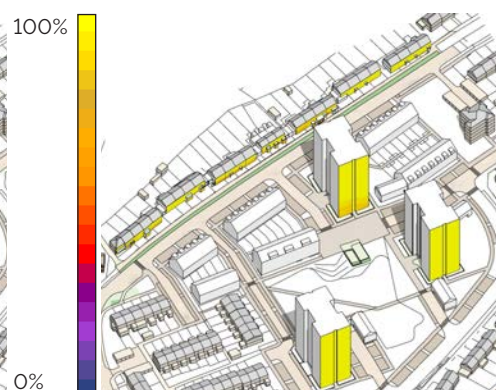


Figure 21. Sunlight analysis - WPSH Ratio- Proposed site South-West View

7.2 Proposed development

The main requirement for sunlight in dwellings is in living rooms. Where possible, these should have at least one window that faces 90° of due south. As sunlight provision depends highly on the units' orientation, for a development of this size, BRE recognizes that not all living areas will achieve compliance due to orientation constraints. Therefore, BRE guidance applies mainly to south-facing living rooms, because rooms that face significantly north of due east or west are unlikely to meet the BRE standards.

A preliminary sunlight analysis was conducted on the facade of the massing of the proposed buildings to show the sunlight potential.

Further testing was conducted at the centre of the main

south-facing windows serving a living room. A total of 49 rooms were assessed. For the houses, all the windows achieve the minimum sunlight requirements both in winter and throughout the year. For the flats, all the windows achieve good sunlight availability in the winter condition. There are some windows with lower sunlight levels in the annual configuration. This is because of the balcony above the window which blocks the solar gains. As noted in the previous section, lower sunlight availability also reduces the amount of solar gains thus reducing the risk of overheating. The flats are designed to be zero carbon and are highly insulated. Strategies that help to tackle overheating can reduce the need for cooling and provide other benefits. Therefore, lower sunlight levels can be acceptable. Detailed results of the testing are provided on the following pages.

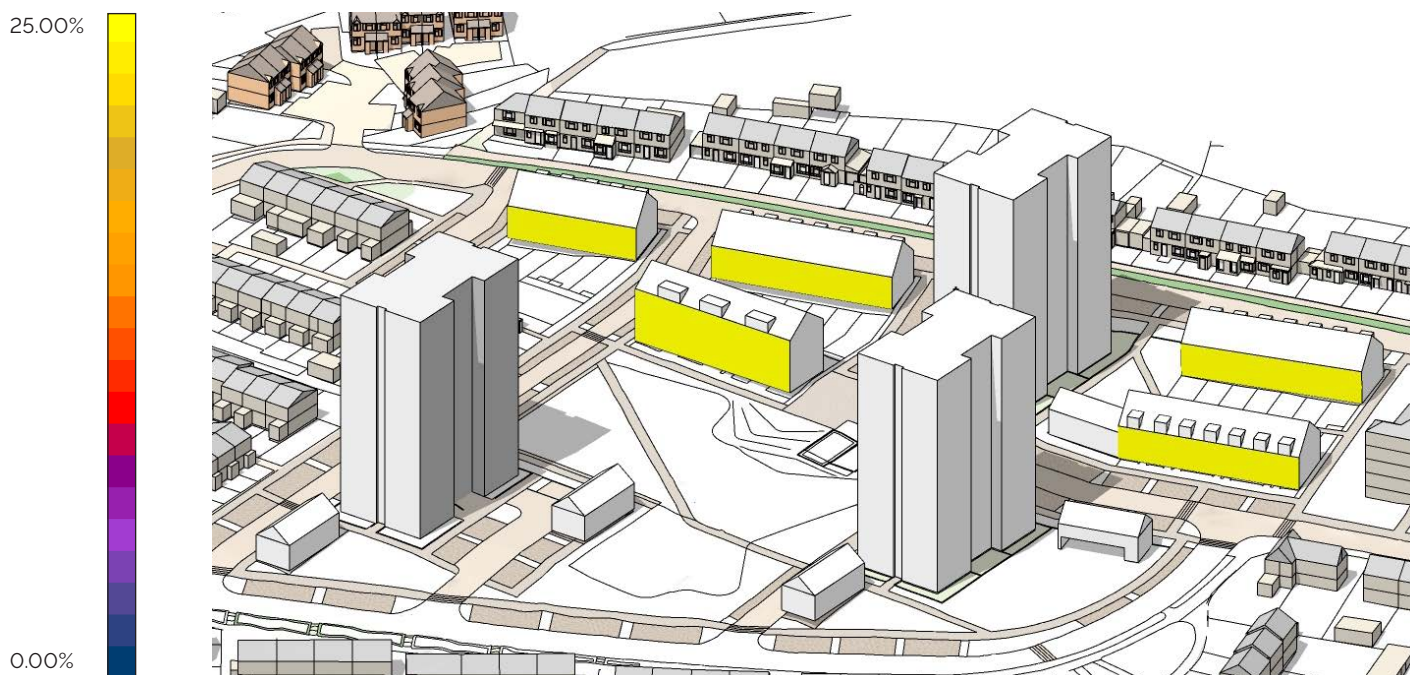


Figure 22. APSH analysis - Proposed Site - South-East View

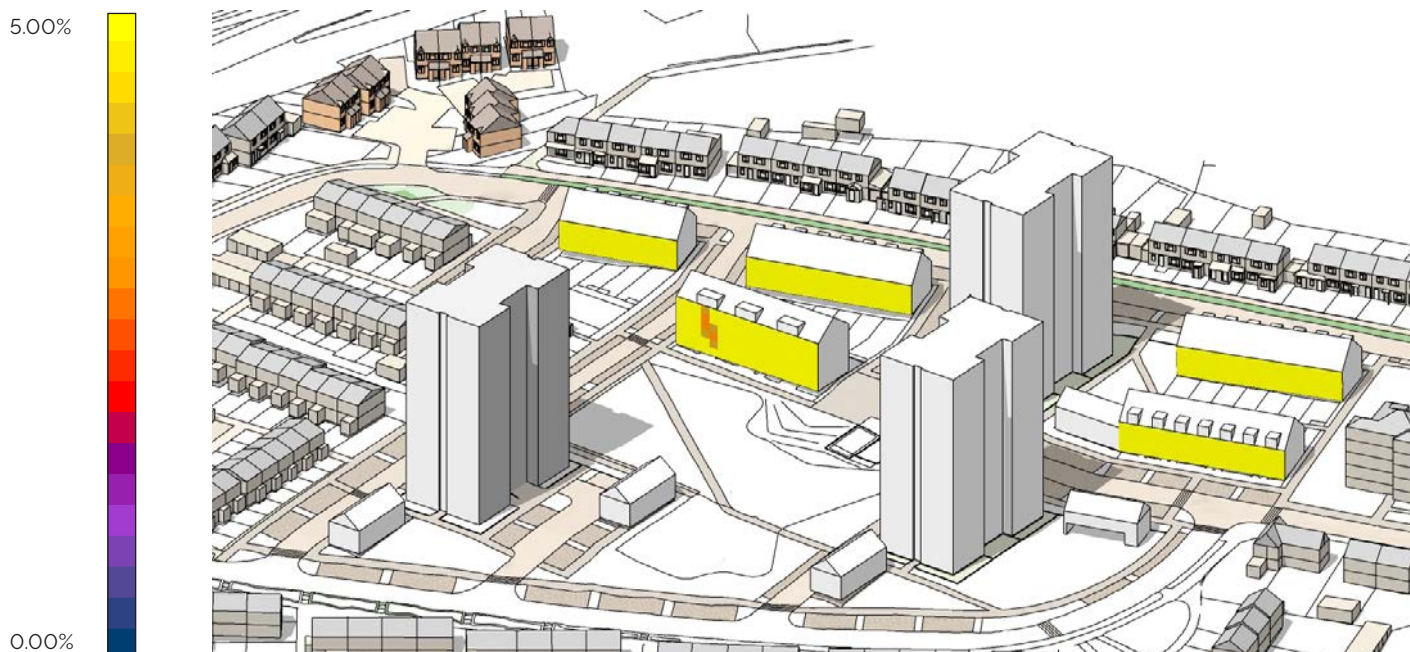


Figure 23. WPSH analysis - Proposed Site - South-East View

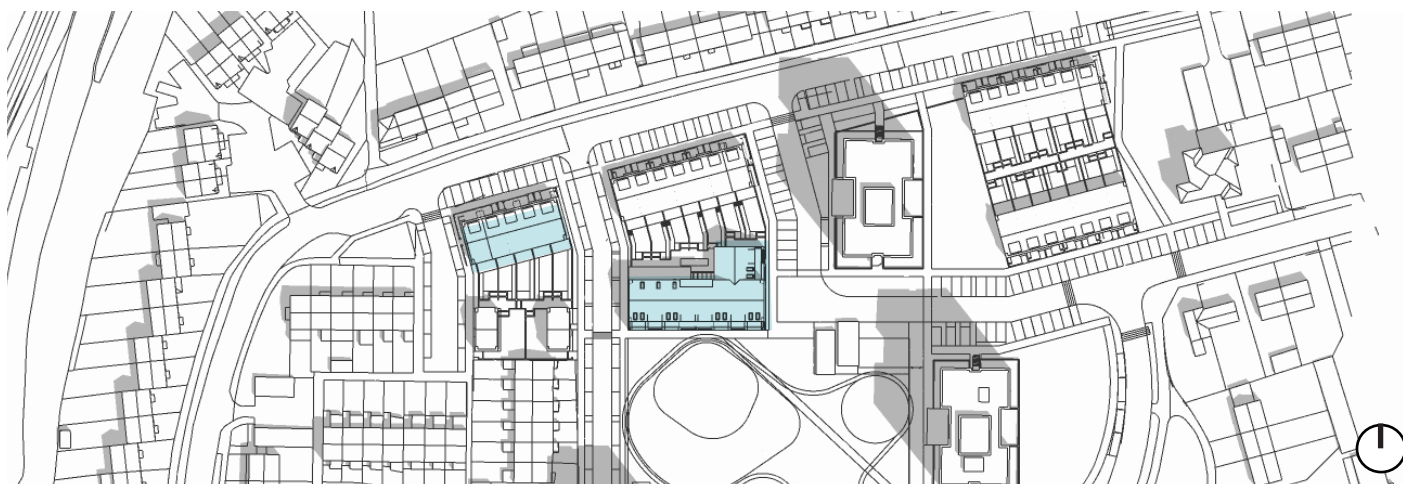


Table 6: Detailed results of the Sunlight Assessment - Impact on Block A

Window Ref	APSH (Target 25%)	Meets BRE Criteria	WPSH (Target 5%)	Meets BRE Criteria	Window Ref	APSH (Target 25%)	Meets BRE Criteria	WPSH (Target 5%)	Meets BRE Criteria
1	73	YES	19	YES	15	14	No	10	YES
2	82	YES	27	YES	16	11	No	11	YES
3	74	YES	20	YES	17	6	No	6	YES
4	81	YES	26	YES	18	11	No	10	YES
5	76	YES	22	YES	19	25	YES	15	YES
6	79	YES	25	YES	20	17	No	15	YES
7	77	YES	23	YES	21	16	No	13	YES
8	78	YES	23	YES	22	24	YES	15	YES
9	76	YES	21	YES	23	86	YES	24	YES
10	78	YES	23	YES	24	85	YES	24	YES
11	11	No	10	YES	25	80	YES	24	YES
12	10	No	10	YES	26	78	YES	22	YES
13	10	No	10	YES	27	78	YES	22	YES
14	13	No	12	YES	28	84	YES	22	YES



Figure 24. Labelled windows for APSH - Proposed building

Table 7: Detailed results of the Sunlight Assessment - Impact on Block A

Window Ref	APSH (Target 25%)	Meets BRE Criteria	WPSH (Target 5%)	Meets BRE Criteria
1	67	YES	18	YES
2	64	YES	15	YES
3	66	YES	18	YES
4	63	YES	16	YES
5	60	YES	16	YES
6	57	YES	14	YES
7	56	YES	14	YES
8	59	YES	15	YES
9	61	YES	15	YES
10	61	YES	14	YES

Window Ref	APSH (Target 25%)	Meets BRE Criteria	WPSH (Target 5%)	Meets BRE Criteria
11	63	YES	13	YES
12	66	YES	17	YES
13	67	YES	17	YES
14	74	YES	20	YES
15	72	YES	21	YES
16	74	YES	20	YES
17	77	YES	22	YES
18	77	YES	22	YES
19	77	YES	21	YES
20	78	YES	21	YES
21	81	YES	24	YES

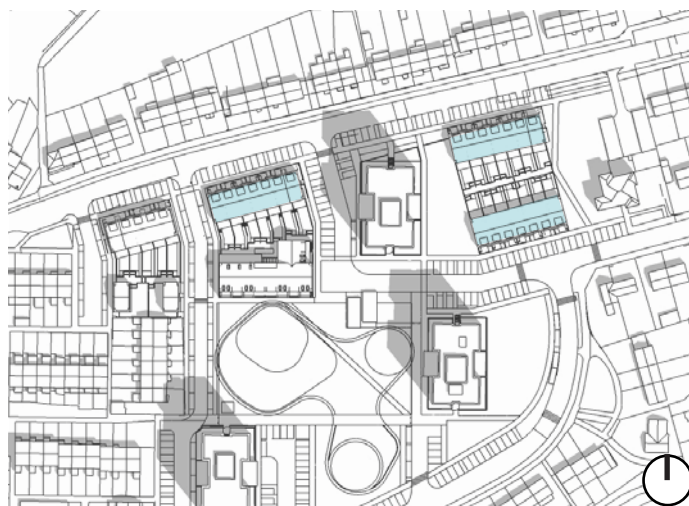
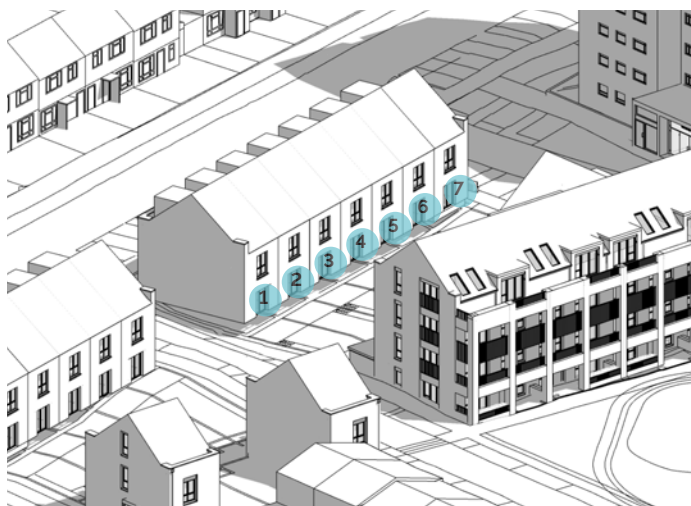


Figure 25. Labelled windows for APSH - Proposed building

8.0 Sun-on-the ground Analysis

The overshadowing analysis shows that the proposed buildings do not overshadow the surrounding existing properties (Appendix B).

A sunlight assessment was carried out for the external spaces within the site boundary. Figure 26 shows the location of the assessed spaces. Figure 28 shows in yellow the areas achieving at least 2 hours of sun on the 21st March. The analysis was also carried out during summertime (21st June) when these spaces are mostly in use.

The results show that most of the spaces achieve and exceed the minimum criteria for sunlight availability on 21st March. The north-facing private gardens are the only spaces achieving less sunlight availability. This result is unavoidable given the orientation of these areas. These private gardens are overshadowed by their houses to the south. However, good sunlight levels are achieved during the summer months, where these spaces are most likely to be used.



Figure 26. Site plan with proposed external spaces





Figure 27 - Site plan with existing external spaces

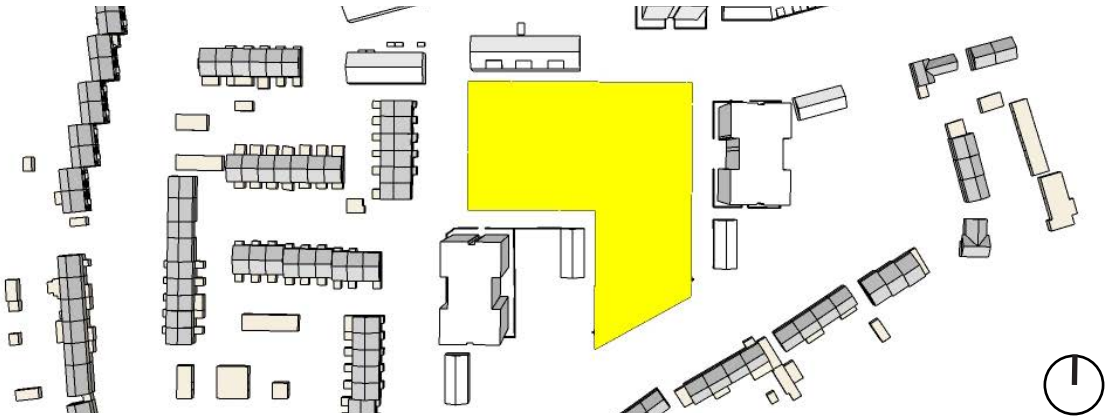


Figure 28 - Hours of sun on the ground on existing external spaces - 21st of March - Existing configuration

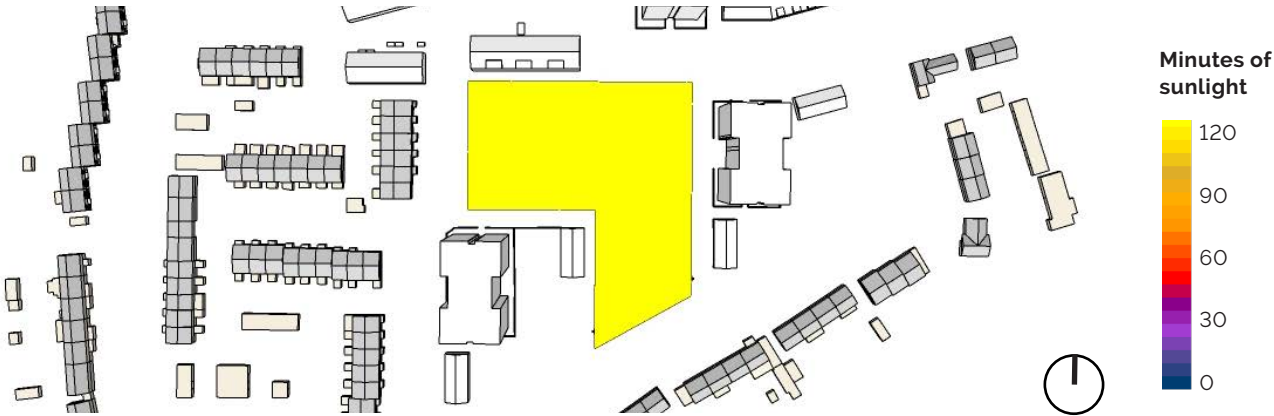


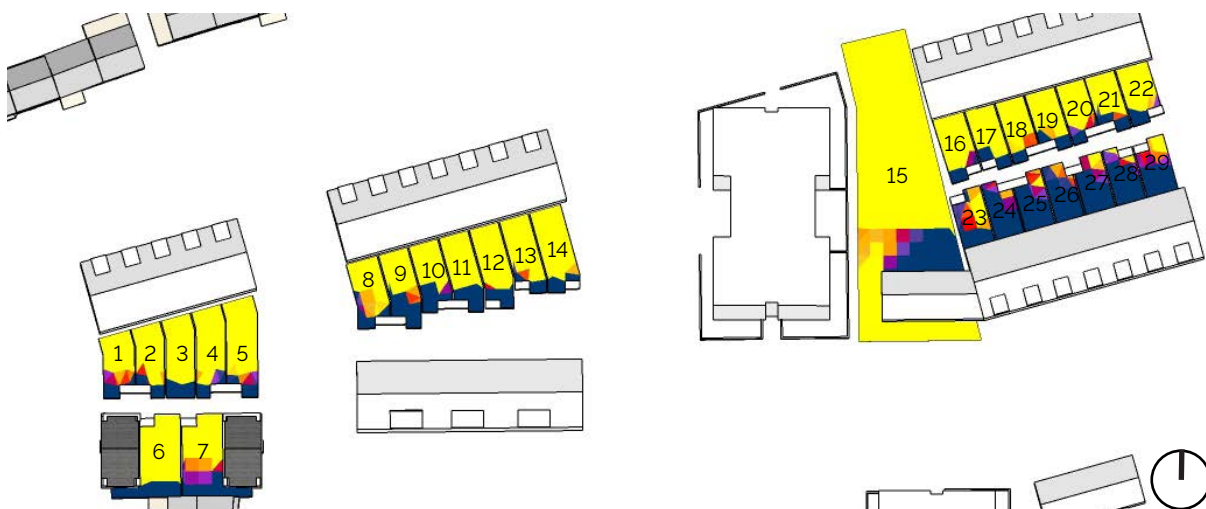
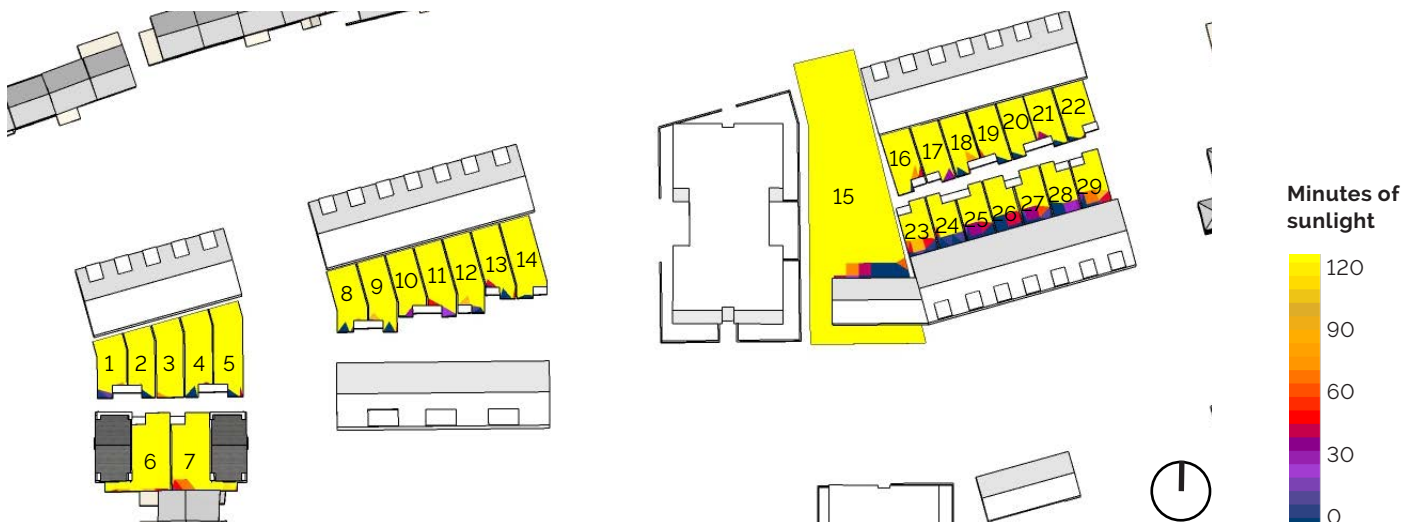
Figure 29 - Hours of sun on the ground on existing external spaces - 21st of June - Existing configuration

Table 8: Sunlight on the ground - Proposed spaces

Area with at least 2 hours of sun (%)			
Space	21 st March	21 st June	Condition
1	100%	100%	Pass

Table 9: Sunlight on the ground - Proposed spaces

Area with at least 2 hours of sun (%)				Area with at least 2 hours of sun (%)			
Space	21 st March	21 st June	Condition	Space	21 st March	21 st June	Condition
1	63.71%	92.18%	Pass	16	80.67%	93%	Pass
2	76.05%	93.30%	Pass	17	78.59%	94.37%	Pass
3	80.24%	97.87%	Pass	18	72.44%	89.65%	Pass
4	80.21%	95.05%	Pass	19	74.28%	93.82%	Pass
5	78.42%	97.13%	Pass	20	77.45%	95.69%	Pass
6	72.49%	94.61%	Pass	21	73.92%	91.90%	Pass
7	45.71%	88.27%	Fail	22	76.14%	96.73%	Pass
8	55.98%	94.58%	Pass	23	5.17%	61.43%	Fail
9	54.94%	92.90%	Pass	24	0%	50.45%	Fail
10	66.09%	93.57%	Pass	25	0%	60.99%	Fail
11	72.77%	92.01%	Pass	26	0.61%	66.19%	Fail
12	79.31%	93.38%	Pass	27	7.64%	66.66%	Fail
13	82.33%	92.43%	Pass	28	0.69%	66.91%	Fail
14	82.64%	97.71%	Pass	29	12.48%	66.60%	Fail
15	68.04%	79.74%	Pass				

Figure 30 - Hours of sun on the ground on proposed external spaces - 21st of MarchFigure 31 - Hours of sun on the ground on proposed external spaces - 21st of June

Code naming conventions: GF-01-KLD

Activity
Unit number
Level

Appendix A - Daylight assessment on the proposed development

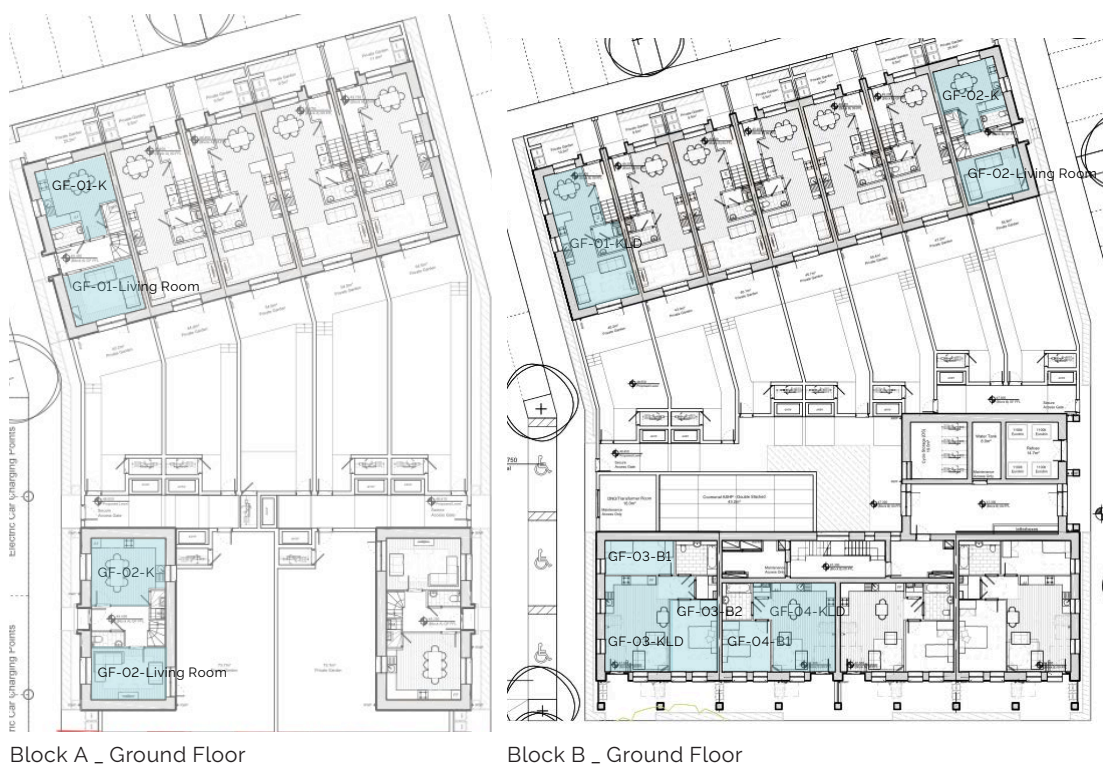
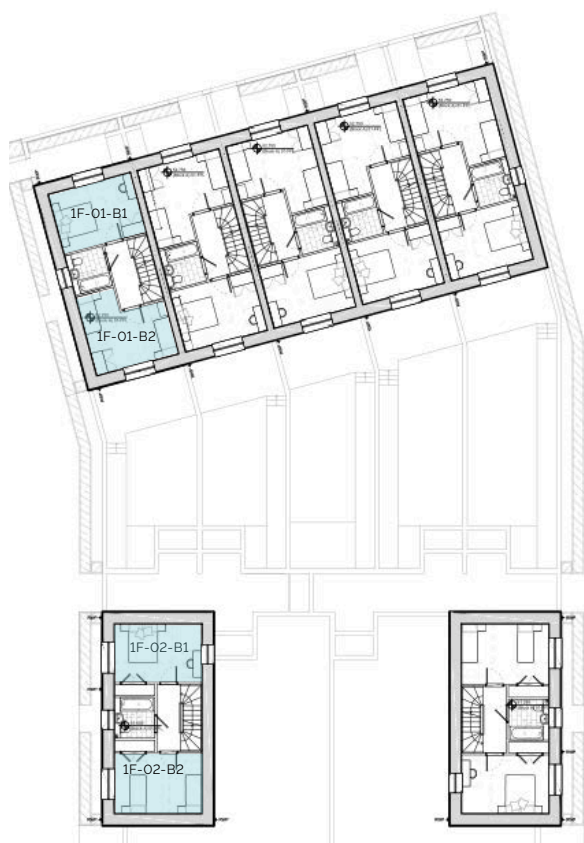


Table A.1: Detailed results of the Daylight Assessment - Proposed development

Average Daylight Factor						No-Sky Line	
	Room	ADF	Target value	Pass/Fail	Sky view	No-Sky Line	Pass/Fail
GF-Block A	GF_01_K	6.1%	2%	Pass	100%	0%	Pass
	GF_01_Living Room	4.6%	1.5%	Pass	97%	3%	Pass
	GF_02_K	5.1%	2%	Pass	100%	0%	Pass
	GF_02_Living Room	7.1%	1.5%	Pass	97%	3%	Pass
	GF-01-KLD	4.3%	2%	Pass	100%	0%	Pass
GF-Block B	GF-02-K	4.0%	2%	Pass	100%	0%	Pass
	GF-02-Living Room	3.5%	1.5%	Pass	100%	0%	Pass
	GF-03-B1	3.7%	1%	Pass	100%	0%	Pass
	GF-03-KLD	2.3%	2%	Pass	100%	0%	Pass
	GF_03-B2	1.5%	1%	Pass	100%	0%	Pass
	GF_04-B1	2.0%	1%	Pass	100%	0%	Pass
	GF-04-KLD	1%	2%	Fail	84%	16%	Pass
Rooms: 12		Passing rooms:		11	Passing rooms:		12



Block A _ First Floor



Block B _ First Floor

Table A.2: Detailed results of the Daylight Assessment - Proposed development

Average Daylight Factor					No-Sky Line		
	Room	ADF	Target value	Pass/Fail	Sky view	No-Sky Line	Pass/Fail
1F-Block A	1F_01_B1	5.3%	1%	Pass	100%	0%	Pass
	1F_01_B2	4.9%	1%	Pass	100%	0%	Pass
	1F_02_B1	7.1%	1%	Pass	100%	0%	Pass
	1F_02_B2	5.1%	1%	Pass	100%	0%	Pass
	1F_01_B1	5.2%	1%	Pass	100%	0%	Pass
1F-Block B	1F_01_B2	4.8%	1%	Pass	82%	18%	Pass
	1F_05_B1	5.1%	1%	Pass	100%	0%	Pass
	1F_05_Living Room	2.1%	1.5%	Pass	97%	3%	Pass
	1F_05-B2	1.3%	1%	Pass	82%	18%	Pass
	1F-06-B1	4.9%	1%	Pass	100%	0%	Pass
	1F-06-B2	5.3%	1%	Pass	100%	0%	Pass
Rooms: 11		Passing rooms:		11	Passing rooms:		11



Block A _ Second Floor

Block B _ Second Floor

The units in Block C are identical to the units to the northern side of Block B. Given that the obstruction from the surrounding properties of Block C is similar to Block B, the daylight availability will also be similar, and no failures are expected. It should be noted that daylight is non-directional. Therefore, similar daylight conditions are expected for both the north and the south-facing units. Section 7.0 of the report describes the level of sunlight availability for all the south-facing living rooms.

Table A.3: Detailed results of the Daylight Assessment - Proposed development

Average Daylight Factor

					No-Sky Line		
	Room	ADF	Target value	Pass/Fail	Sky view	No-Sky Line	Pass/Fail
L2-Block A	2F_01_B3	3.8%	1%	Pass	100%	0%	Pass
	2F_02_B3	4.2%	1%	Pass	100%	0%	Pass
	2F_02_B4	4.6%	1%	Pass	100%	0%	Pass
L2-Block B	2F_01_B3	3.9%	1%	Pass	100%	0%	Pass
	2F_02_B3	3.8%	1%	Pass	100%	0%	Pass
Rooms: 05		Passing rooms:		05	Passing rooms:		05

Appendix B - Shadow plots

In accordance with the BRE guide we have undertaken overshadowing assessments to the amenity spaces. The results of the overshadowing analysis are shown in the

following pages. The model was tested on 21 March (the Spring Equinox) and 21 June (mid-summer's day).

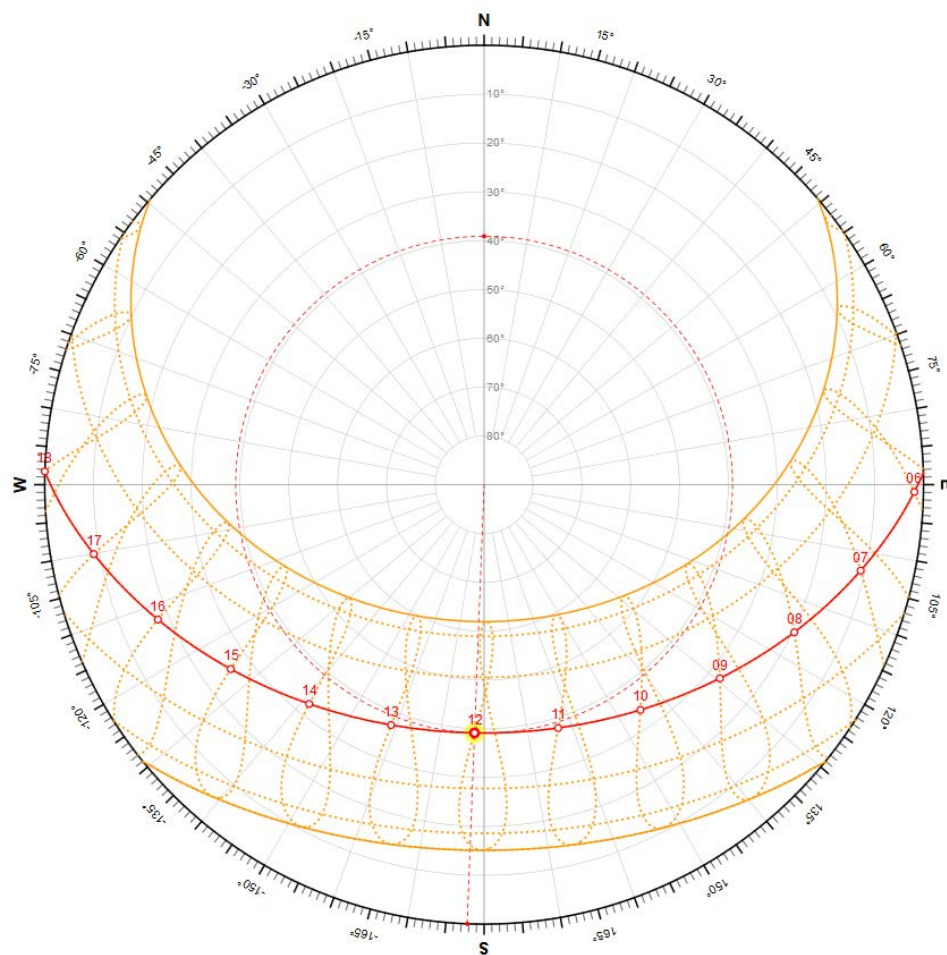
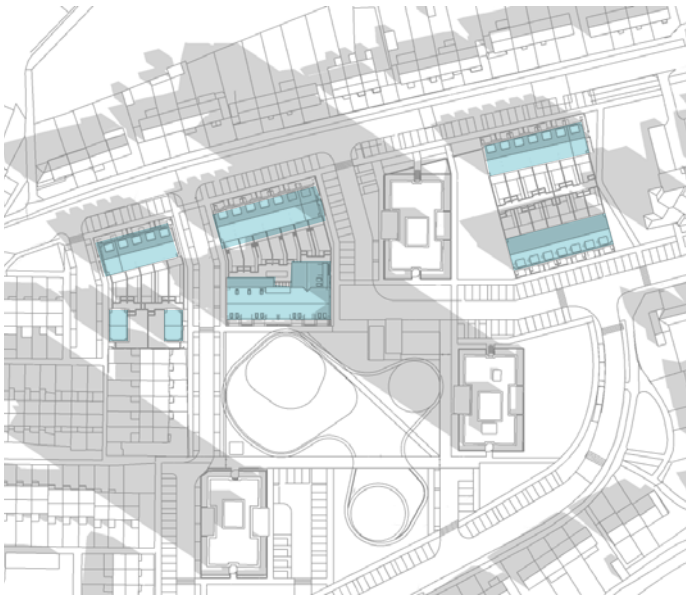
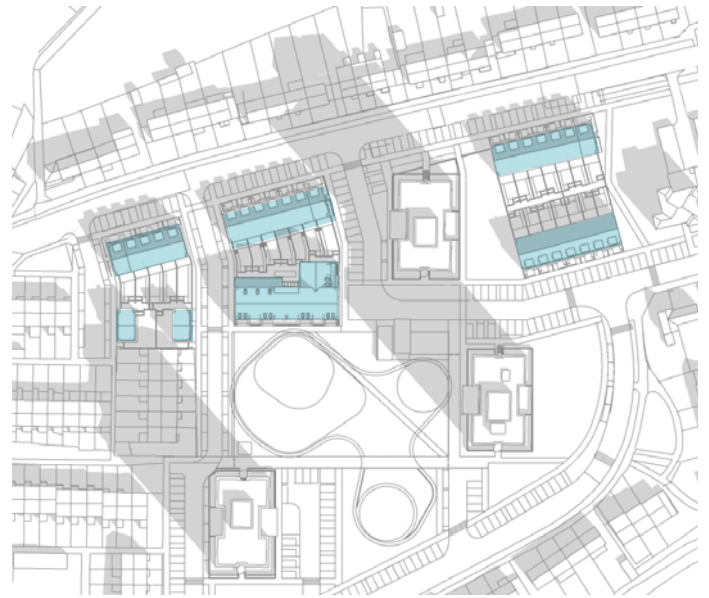


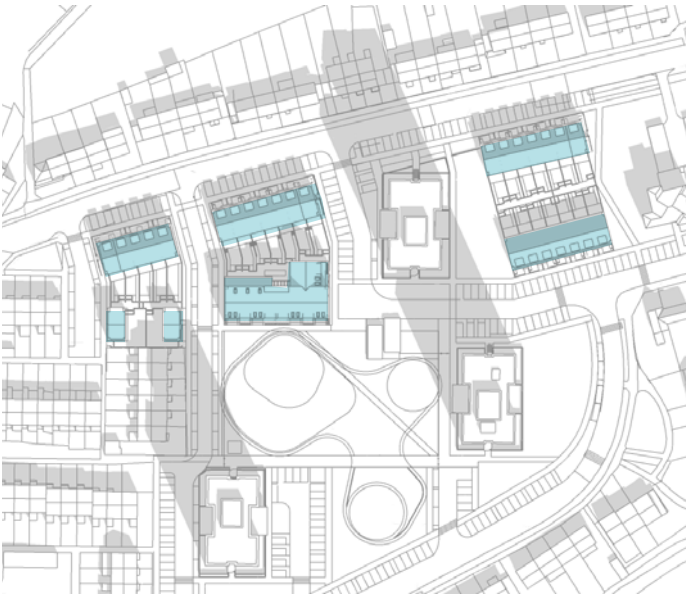
Figure B.1 - Sun path diagram for London, UK



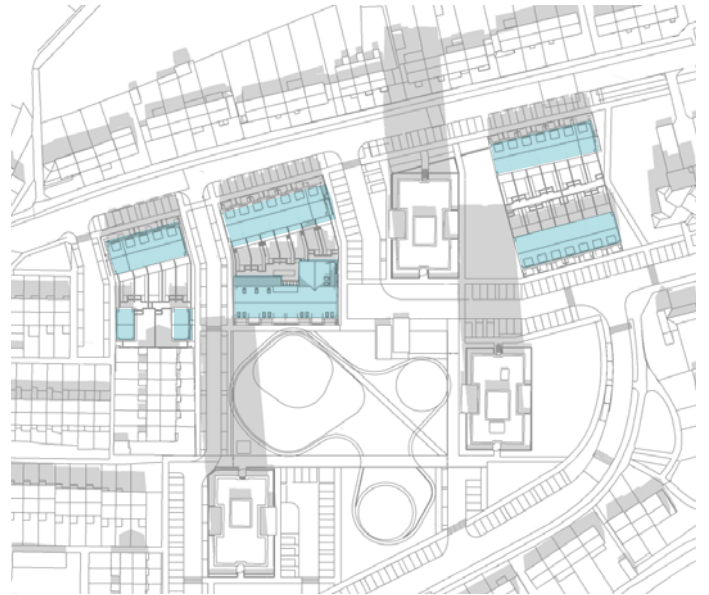
21 March - 9:00



21 March - 10:00



21 March - 11:00



21 March - 12:00



21 March - 13:00

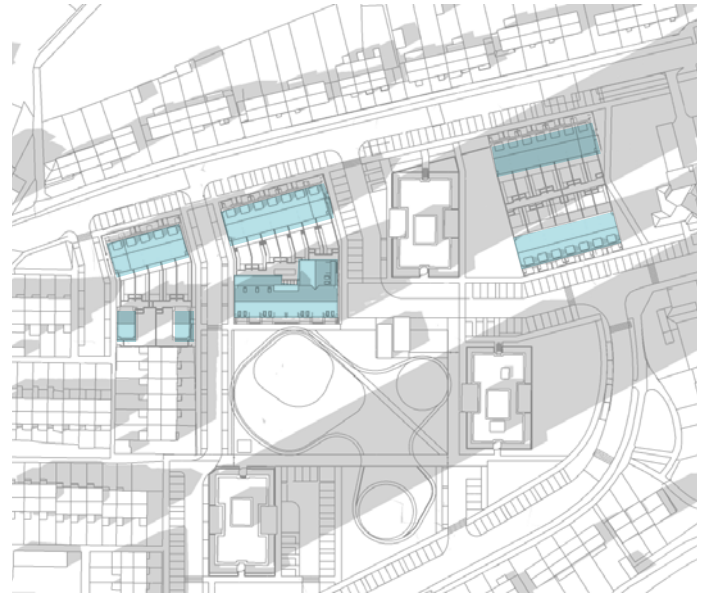


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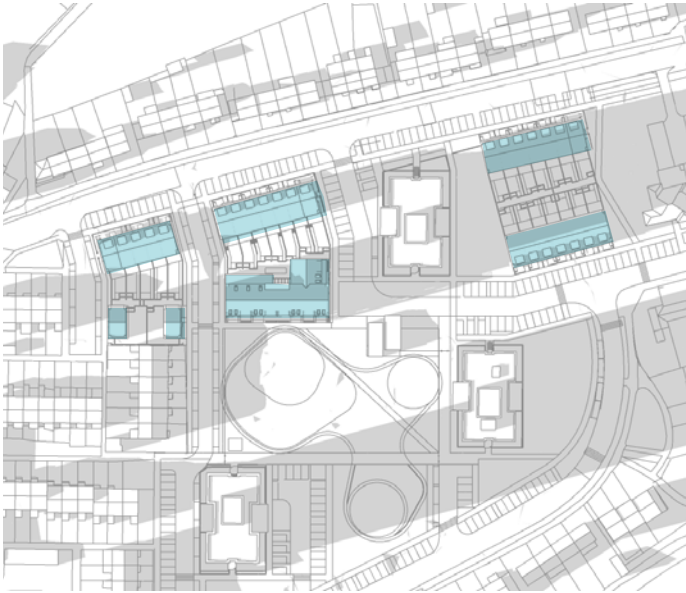




21 March- 15:00

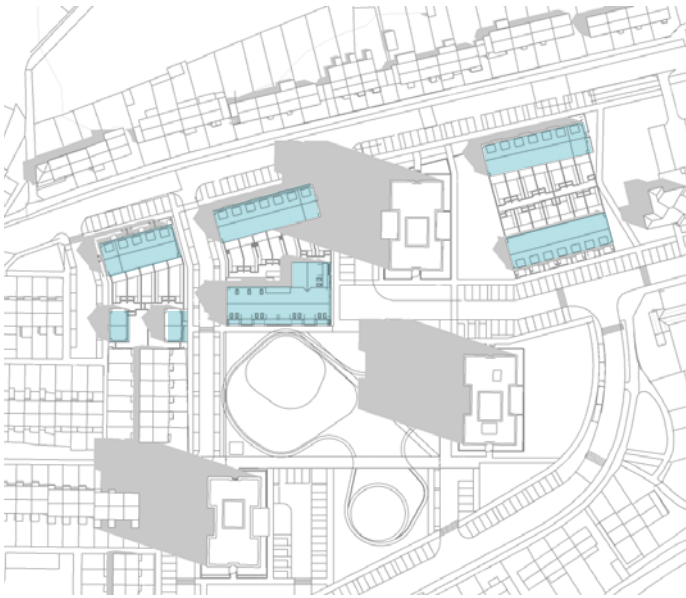


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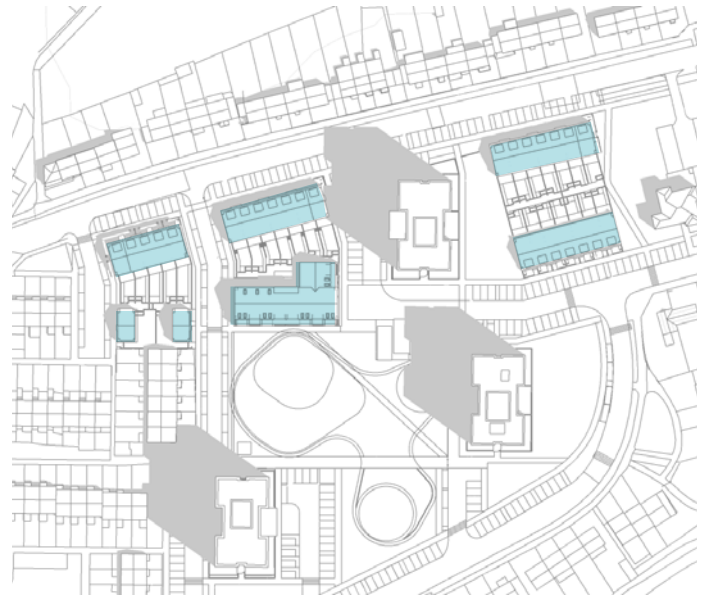


21 March - 17:00

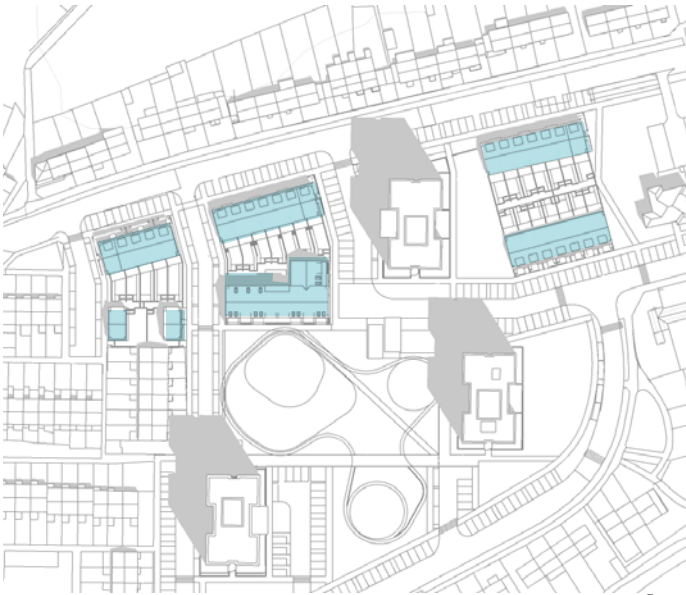




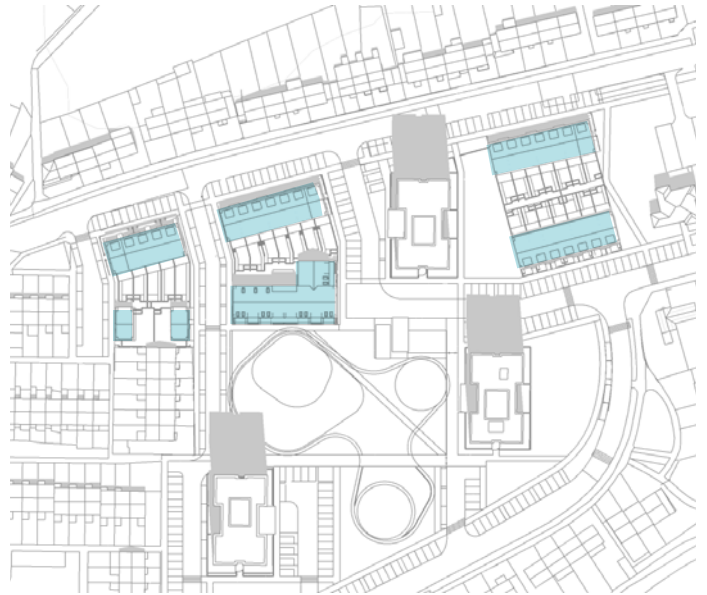
21 June- 9:00



21 June - 10:00



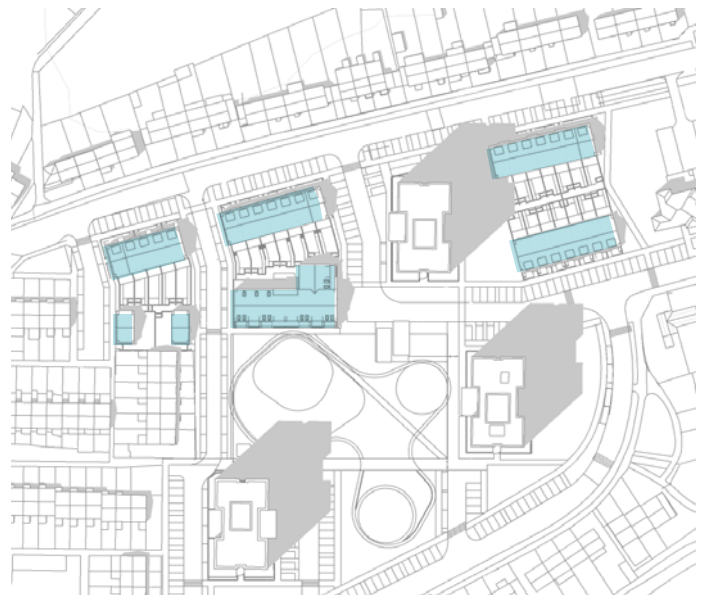
21 June - 11:00



21 June - 12:00

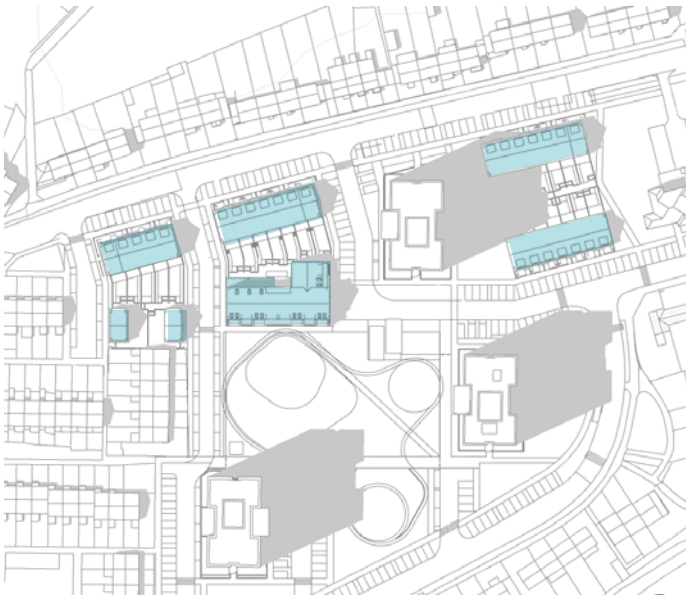


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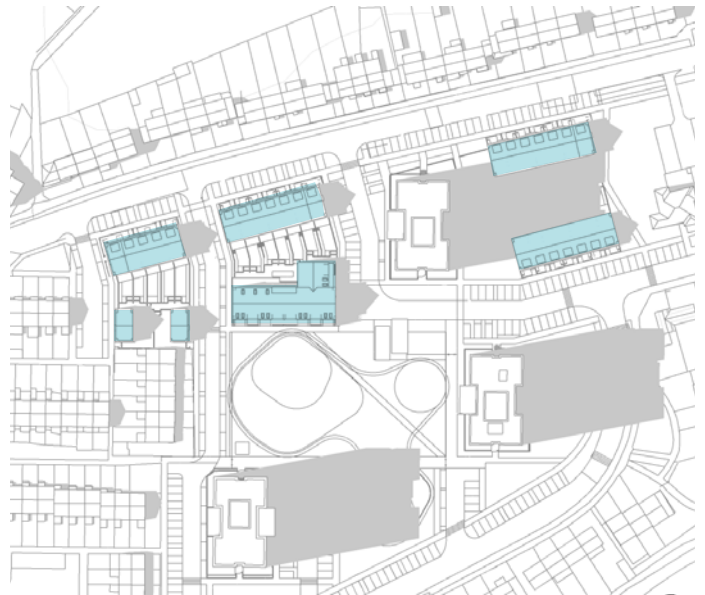


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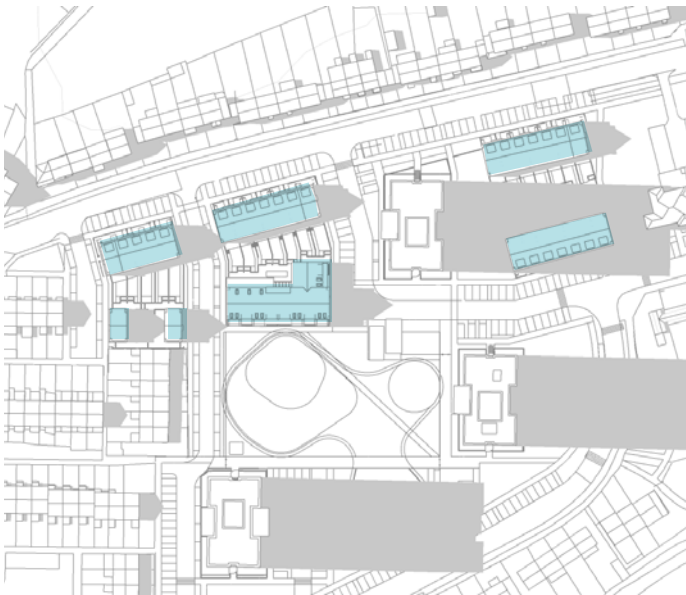




21 June- 15:00



21 June - 16:00



21 June - 17:00



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