Hydrock

Hampton Waterworks

Daylight & Sunlight Assessment

For Waterfall Hampton Investment Ltd

Date: *November 2023*

Doc ref: *12193-HYD-ZZ-00-RP-ME-0003*

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited Merchants House NorthMerchants House North Wapping Road Bristol BS1 4RW United Kingdom T +44 (0)117 9459225T +44 (0)117 9459225 E bristolcentral@hydrock.com www.hydrock.com	Client	Waterfall Hampton Investment Ltd
		Project name	Hampton Waterworks
		Title	Daylight & Sunlight Assessment
		Doc ref	12193-HYD-ZZ-00-RP-ME-0003
		Project no.	12193
		Status	S4S4
		Date	11/2023

Document Production Record

Issue Number	P07	Name
Prepared by		Francesca Canfield-Payne
Checked by		Rebecca Lydon
Approved by		Marcos DeCastro

Document Revision Record

Issue Number	Status	Date	Revision Details
P01	S3	30/08/19	Draft for comment
P02	S3	24/09/19	Issued for comment
P03	S3	24/04/20	Updated following scheme updates
P04	S3	04/05/20	Updated to address comments
P05	S3	28/05/20	Updated to address comments
P06	S4	01/06/20	Updated to address comments
P07	S4	13/10/22	Updated following scheme change and BR209 update
P08	S4	13/02/23	Final issue

CONTENTS

Tables

Figures

Appendices

Hampton Waterworks

1. INTRODUCTION

1.1 Purpose of Report

This report provides the results of a daylight and sunlight assessment that has been undertaken for the proposed development including any adverse impact assessment on surrounding buildings.

The development and impact have been assessed using the criteria set out in the Building Research Establishment's (BRE) 'Site layout planning for daylight and sunlight - a guide to good practice' (BR 209) (Littlefair, 2022. Whilst the guide itself states that its guidelines are not mandatory, they are those predominately referenced for daylight and sunlight standards in the UK.

1.2 Site and Location

The development site is located within the authority boundary of the London Borough of Richmond Upon Thames and is bounded by Upper and Lower Sunbury Roads to the north and east. To the West lies an existing residential development as well as the Water Treatment works reservoirs and buildings which are also found to the South of the site.

The site currently houses Grade II Listed former waterworks buildings comprising former engine houses with a single storey between as well as existing cottages and a storehouse.

The existing site location and red line boundary is shown in Figure 1.

1.3 Development Details

The development proposals include the refurbishment of four existing buildings into a mixed-use residential led development consisting of 36 apartments and ground floor commercial spaces. The key elements of the scheme are as follows:

- 16no. of 1-bedroom apartments;
- 11no. of 2-bedroom apartments;
- 7no. of 3-bedroom apartments;
- 2no. of 4-bedroom apartments;
- Flexible commercial area; and
- 39no. car parking spaces.

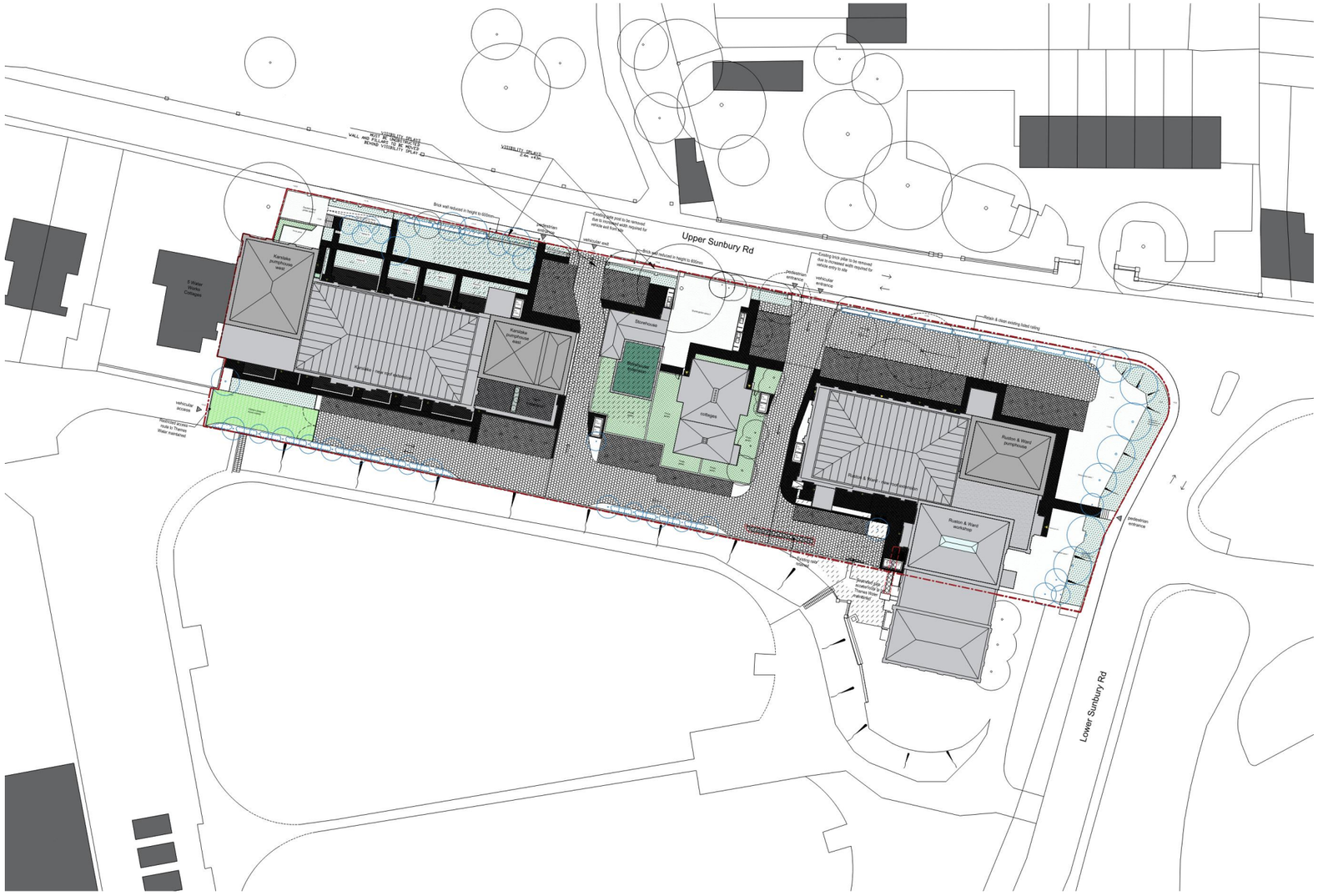


Figure 1: Site Location Plan

2. METHODOLOGY

2.1 Background

Overshadowing occurs when buildings are in close proximity relative to their size. This results in reduced levels of daylight and sunlight in part, or all, of the affected buildings. Daylight refers to the level of diffuse natural light coming from the surrounding sky or reflected off adjacent surfaces, whereas sunlight refers to direct sunshine. A key difference between the two is that sunlight is highly dependent on orientation, whereas orientation has no effect on daylight.

The potential for daylight at a particular point may be quantified by assessing the proportion of the sky that is 'visible' from that point, i.e. not obscured by objects such as buildings. For points located on vertical surfaces such as walls, this proportion of visible sky is termed the 'vertical sky component' or VSC.

After the VSC, the no sky line (NSL) can also be used to assess daylight performance. The no sky line is the point on the working plane at which no sky can be viewed. This is often expressed as the percentage of working plane from which the sky can be viewed such as 80% or 0.8.

However, if the details of the building are known, then daylight can be more accurately quantified by calculating the average daylight factor (ADF). This gives a more precise measure of daylight, the results of which can in effect over-ride the VSC results. The ADF is generally only used to calculate daylight in new buildings.

Further, climate based modelling (CBM) techniques can be utilised to provide a more accurate assessment of predictive visual comfort within buildings. These techniques include spatial daylight autonomy (SDA), which considers percentage of time across a given year where appropriate illuminance levels are achieved, in addition to glare risk assessment.

These CBM techniques require more complex modelling and are more appropriate where the usage and task requirement of the space are known in more detail. For this reason, and the relative modern emergence of CBM modelling techniques, assessment at planning is rare.

Direct sunlight can be calculated by testing the 'annual probable sunlight hours' that a point receives. This is achieved by considering both the complete annual shading variation at the point, and the statistical sunshine averages for the location in question.

The average daylight factor, vertical sky component, no sky line and number of annual probable sunlight hours form the basis of the overshadowing assessment methodology used in the analysis. The average daylight factor is generally only relevant when the internal room layout and use is known.

To achieve objectivity in quantifying daylight and sunlight, the guidelines laid down in the widely accepted BRE guidebook 'Site layout planning for daylight and sunlight: a guide for good practice', 2022 by Paul Littlefair.

2.2 Existing Buildings - Desktop Assessment

The BRE recommend that daylight is safeguarded to nearby buildings to avoid making adjoining properties appear gloomy or unattractive.

Following the recommendations contained in the BRE guide, an initial desktop assessment can be undertaken to confirm which existing dwellings require assessment. This assessment is shown in Figure 2.

A section is drawn in plane perpendicular to each potential affected window wall of the existing building. The angle to the horizontal subtended by the new development at the level of the centre of the lowest window is drawn.

If this angle is less than 25° for the whole of the development, then it is unlikely to have a significant effect on the daylight enjoyed by the existing building. If for any part of the new development, this angle is greater than 25°, a more detailed check is needed to find the loss of skylight to the existing building. Both the total amount of skylight and its distribution within the building are important.

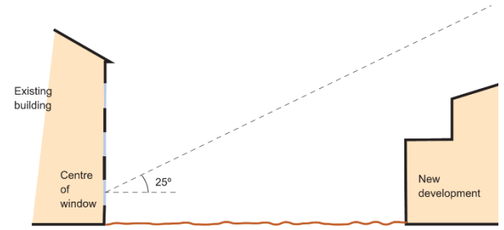


Figure 2: Existing buildings 25° check.

2.3 Existing Buildings - Detailed Assessment

If the proposed development is deemed to have a significant impact on existing buildings, or adjoining developments, a more detailed assessment of daylight is required. In this case, the existing buildings should be tested using the VSC criteria in the first instance, then the NSL, and finally ADF as the final option. It should be noted the NSL and ADF can only be used if internal room layouts are known.

2.3.1 Daylight Access

The BRE guidelines provide three different methods for assessing daylight for existing residential accommodation: the Vertical Sky Component (VSC) method, No Sky Line (NSL) and the Average Daylight Factor (ADF) method. In the first instances the VSC is tested, and if required the NSL and ADF can then be tested.

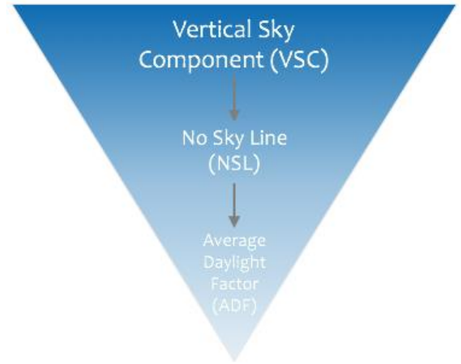
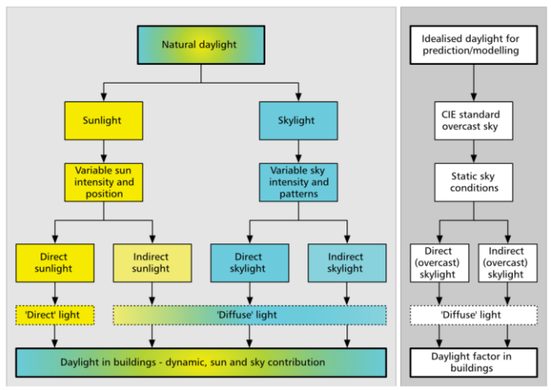


Figure 4: Sequential testing for daylight.

The BRE states that for the effect of the proposed building to be minimal, the VSC including the new development needs to be greater than 27%. If the VSC is less than 27% this is acceptable so long as the VSC with the new development is not less than 0.8 of the VSC without the proposed development.

2.3.2 Sunlight Availability

Window sunlight availability will be assessed using the Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH). The sun lighting of the existing



Criteria	Further Testing
25° rule	If angle from new development to existing is greater than 25 degrees additional testing of the VSC will be required.
43° rule	If angle from new development to proposed adjoining development is above 43 degrees, additional testing of VSC will be required.

Table 1: BRE testing criteria for existing developments.

dwelling may be adversely affected. This will be the case if the centre of the window:

- Receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21st September and 21st March; and
- Receives less than 0.8 times its former sunlight hours during either period; and
- Has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

For amenity spaces it is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21st March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21st March is less than 0.8 times its former value, the loss of sunlight is potentially significant and the garden or amenity area will tend to look more heavily overshadowed.

2.4 Calculating Daylight in New Development

2.4.1 Dwellings

The BRE guide cites the recommendations for daylight in BS EN 17037 - Daylight in buildings as the minimum values for target daylight factors (DT) and minimum target daylight factors (DTM) to be achieved. They are shown in Table 2.

The target daylight factor should be exceeded for more than half of the daylight hours, 50% of the reference plane and the minimum target daylight factor should be exceeded for more than half of the daylight hours, over 95% of the space. A margin of 0.5m should be applied to all walls, unless otherwise specified.

2.4.2 Recommendations for view

BS EN 17037 - Daylight in buildings states that openings should provide a sufficient view from within the room, and gives recommendations for three levels of view out through vertical, inclined and horizontal openings. These levels depend on the horizontal sight angle, the distance to outside view, and the number of layers (content of the view).

Table 2: BS recommended Daylight factors

	D to exceed 100 lux (minimum target)	D to exceed 300 lux (target)	D to exceed 500 lux	D to exceed 750 lux
London, UK	0.7 %	2.1 %	3.5 %	5.3 %

Table 3: BS recommended assessment of the view outwards

	Parameter		
Level of recommendation for view out	Horizontal sight angle	Outside distance of the view	Number of layers to be seen from at least 75 % of utilized area: Sky, landscape (urban and/or nature) or ground
Minimum	*≥ 14°*	*≥ 6,0 m*	*At least landscape layer is included*
Medium	*≥ 28°*	*≥ 20,0 m*	*Landscape layer and one additional layer is included in the same view opening*
High	*≥ 54°*	*≥ 50,0 m*	*all layers are included in the same view opening*

2.4.3 Non-Domestic Buildings

There is a clear link between adequate daylight access and increased occupant visual comfort for working environments.

In addition, suitable provision of daylight will mean that the use of artificial lighting can be reduced and consequently energy consumption. CIBSE estimate (LG10) that if a daylight factor of 5% is achieved in the space then it is commonly found that electric lighting is not needed during the day time. An ADF of between 2% and 5% will result in reduced artificial lighting usage and daylight controls will be suitable as a means to achieve this end.

Climate Based Modelling (CBM) techniques, such as useful illuminance and spatial daylight autonomy provide a more accurate assessment of the potential for design of daylight and glazing systems and these may be utilised at the next design stage. Initially, the VSC, NSL and ADF metrics will be utilised to approximate daylight performance of each space.

2.5 Calculating Sunlight in New Development

2.5.1 Sunlight Availability

Window sunlight availability is assessed using sunlight exposure and the sun lighting of a dwelling may be adversely affected if centre of the window receives less than 1.5 hours of sunlight on March 21st.

Table 4: BS recommended daily sunlight exposure

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1.5 h
Medium	3.0 h
High	4.0 h

For amenity spaces it is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21st March.

2.6 Summary

2.6.1 New Development

The proposed Hampton Water Works development will be assessed against the following criteria, which have been detailed in Section 5.

2.6.2 Existing Buildings

The existing buildings surrounding the Hampton Water Works development will be assessed using the above criteria, with the result set out in Section 4.

3. DAYLIGHT AND SUNLIGHT MODEL

3.1 Accuracy

It is important to note that with any modelling exercise there are assumptions and approximations made. While building performance modelling techniques include detailed hourly simulations, they are predictive methods only, and should note be relied upon as a measure of final building performance. The latter is subject to detailed design, installation, commissioning and operational profiles which are all subject to development. As far as possible, details of all assumptions and approximations used are supplied as part of the report. These should be read and considered carefully.

3.2 Software

The calculations have been carried out using IES Virtual Environment 2022, an accredited Building Performance Modelling (BPM) tool in accordance with CIBSE Guide AM11 (CIBSE, 2015).

IES uses a Radiance based calculation simulation for daylight. This predicts the transport of light in a virtual 3D scene using physically based models for the emission, transmission, reflection and scattering of light. The output, therefore, can inform on how the building might perform; for example, in terms of visual impression and predicted illuminance levels for particular sky conditions. Radiance is capable of producing highly accurate predictions, within 10% of measured illuminance values.

In practical terms however, there are a number of factors that will affect the accuracy and reliability of modelling predictions:

- Model geometry;
- Physical properties;
- Luminous environment;
- Sensor grid/points;
- Simulation parameters; and
- Data output.

3.3 Geometry

Three-dimensional numerical models suitable for daylight/sunlight analysis were constructed to represent the current site conditions and the proposed development. The models included a representation of buildings adjacent to the development site up to a distance judged to have an influence on the availability of natural light. In addition:

- All overhangs have been taken from architect's plans issued on 30th August 2022.
- All existing glazing levels have been estimated based on architect's CAD drawings and existing asset information; and
- The surrounding context has been drawn based on the site survey plans and google maps.

3.4 Weather

In accordance with BRE and CIBSE guidelines, the ADF has been assessed based on a uniform overcast sky in line with BS EN 17037 and CIE guidelines.

Solar calculations, for the purpose of sunlight availability, have been carried out based on the most suitable local weather file at the development.

3.5 Glazing and Room Layout

Glazing properties have been assigned in accordance with BS EN 17037

- Light transmittance (T) = 0.6 (typical new double-glazed casement); and
- Internal Reflectance (R) = 0.80 (pale).

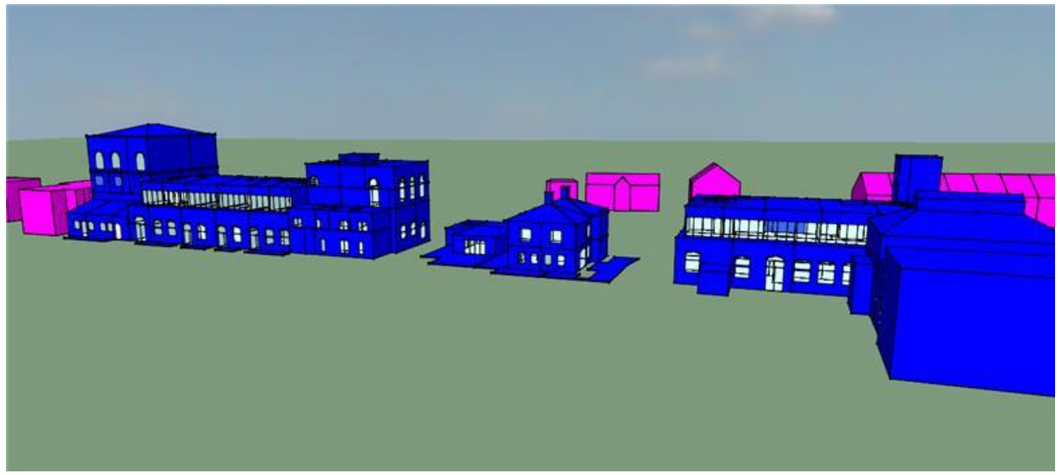


Figure 5: Proposed development - IES massing model.

4. EXISTING BUILDINGS IMPACT ASSESSMENT

4.1 Introduction

The impact of the proposed development on the existing dwellings in the vicinity of the site has been assessed. This has been undertaken using a desktop-based approach as outlined in Section 2 of this report. For there to be no significant impact on the existing buildings, the obstruction angle from the window on the lowest floor of the existing building must be less than 25 degrees. The adjacent buildings which have been assessed are:

- Rose Hill Lodge, directly north of the site;
- 1-7 Isabel Hill; and
- 3 River View Cottages.

It is estimated that facades north west of the site along Upper Sunbury Road will not be impacted by the development.

4.2 25 Degree Check

An initial desktop assessment of the existing surrounding buildings has been carried out. Buildings identified as being within 25 degrees of the proposed buildings have been highlighted as needing further assessment and assessed in section 4.3.

4.3 Vertical Sky Component Check

The reduction in VSC caused by the proposed development in the existing buildings has been assessed. It is worth noting that the assessment outline within the BRE guidance, that forms the basis of this assessment, is for existing residences. The VSC check determined that all windows pass the assessment.

4.3.1 River View Cottage 1

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
38.67%	38.83%	1.00	Pass
38.61%	38.64%	1.00	Pass
38.27%	38.40%	1.00	Pass
38.25%	38.36%	1.00	Pass

Table 5: River View Cottage 1 VSC results.

4.3.2 River View Cottage 2

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
39.04%	38.73%	0.99	Pass
39.2%	39.11%	1.00	Pass
38.93%	38.74%	1.00	Pass
38.91%	38.72%	1.00	Pass
38.8%	38.65%	1.00	Pass

Table 6: River View Cottage 2 VSC results.

4.3.3 River View Cottage 3

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
39.32%	39.13%	1.00	Pass
39.23%	39.15%	1.00	Pass
38.8%	38.68%	1.00	Pass
38.90%	38.84%	1.00	Pass
38.89%	38.84%	1.00	Pass

Table 7: River View Cottage 3 VSC results.

4.3.4 1 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
36.97%	36.81%	1.00	Pass
37.78%	37.71%	1.00	Pass
37.82%	37.57%	1.00	Pass

Table 8: 1 Isabel Hill VSC results.

4.3.5 2 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
37.23%	37.07%	1.00	Pass
38.06%	37.63%	0.99	Pass
37.95%	37.77%	1.00	Pass

Table 9: 2 Isabel Hill VSC results.

4.3.6 3 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
37.33%	37.29%	1.00	Pass
38.21%	38.06%	1.00	Pass
38.03%	38.01%	1.00	Pass

Table 10: 3 Isabel Hill VSC results.

4.3.7 4 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
37.41%	37.39%	1.00	Pass
38.23%	38.16%	1.00	Pass
38.23%	38.19%	1.00	Pass

Table 11: 4 Isabel Hill VSC results.

4.3.8 5 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
37.12%	37.26%	1.00	Pass
38.1%	38.1%	1.00	Pass
38.13%	38.06%	1.00	Pass

Table 12: 5 Isabel Hill VSC results.

4.3.9 6 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
37.12%	37.06%	1.00	Pass
37.91%	37.79%	1.00	Pass
38.09%	38.05%	1.00	Pass

Table 13: 6 Isabel Hill VSC results.

4.3.10 7 Isabel Hill

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
36.58%	36.5%	1.00	Pass
37.4%	37.26%	1.00	Pass
37.61%	37.51%	1.00	Pass

Table 14: 7 Isabel Hill VSC results.

4.3.11 Rose Hill Lodge

Existing VSC	Proposed VSC	Reduction Factor	Pass/Fail
35.84%	35.45%	0.99	Pass
36.51%	36.13%	0.99	Pass
36.26%	36.27%	1.00	Pass
31.83%	31.74%	1.00	Pass
35.13%	35.22%	1.00	Pass
34.61%	34.68%	1.00	Pass
32.23%	31.99%	0.99	Pass
34.83%	35.24%	1.00	Pass
34.33%	34.61%	1.00	Pass
37.03%	35.45%	0.96	Pass
36.86%	36.13%	0.98	Pass
37.79%	36.27%	0.96	Pass
36.59%	31.74%	0.87	Pass

Table 15: Hampton House VSC results.

4.4 No Sky Line (NSL)

As internal layouts were not obtained, the NSL calculation could not be carried out for residential properties surrounding the site. As all dwellings are passing the VSC criteria it is considered unlikely that the NSL would be altered beyond recommended guidelines.

4.5 Annual Probable Sunlight Hours (APSH)

Relevant existing buildings have also been assessed for potential reduction in sunlight availability.

It is recommended that dwellings have at least one main window to habitable rooms which receive at least 25% of APSH, or 5% winter possible sunlight hours (WPSH). For existing buildings in order to safe guard sunlight availability, it is recommended that the window receives at least 0.8 times its former sunlight hours, and any reduction in sunlight availability is limited to 4% of APSH. If these criteria are not met, the dwelling's sunlight availability may be adversely affected.

All residential units pass the requirements and the assessment is deemed acceptable. The ASPH results pre and post development are shown on the next page.

4.6 Impact Assessment

Following detailed review of daylight and sunlight reduction, the impact on the existing buildings has been classified according to the methodology outlined in Appendix I of BR 209.

This is shown in the Table 16 below. It is worth noting that the assessment of impact depends on a combination of factors and there is no simple rule of thumb that can be applied.

The following is given as guidance:

- Negligible - Where reduction in skylight is well within the guidelines set out within BR 209.
- Minor Adverse – Where loss of skylight only just meets guidelines or areas that fall outside of guidelines are not critical.
- Moderate Adverse – Where loss of skylight is marginally outside the guidelines or a large area of open space/windows are affected.
- Major Adverse – A large number of open space/windows are affected and the loss of skylight is substantially outlines the guidance.

Based on the above approach, the categories have been applied to each building and shown below. All units are well within guidelines.

Existing Building	Overall Impact
River View Cottage 1	Negligible
River View Cottage 2	Negligible
River View Cottage 3	Negligible
1 Isabel Hill	Negligible
2 Isabel Hill	Negligible
3 Isabel Hill	Negligible
4 Isabel Hill	Negligible
5 Isabel Hill	Negligible
6 Isabel Hill	Negligible
7 Isabel Hill	Negligible
Rose Hill Lodge	Negligible

Table 16: Summary of impact assessment.

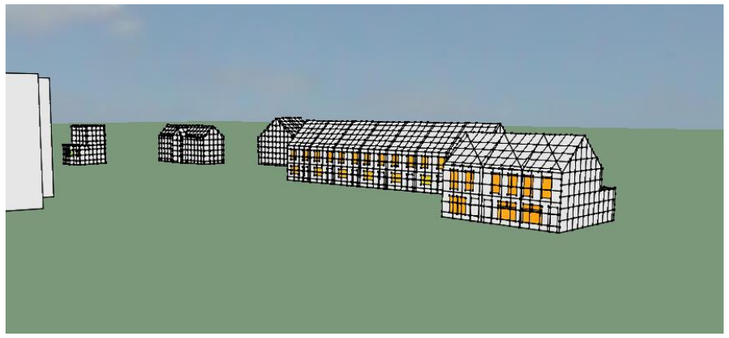


Figure 6: Isabel Hill properties and River View cottage properties APSH Results (Post-development)

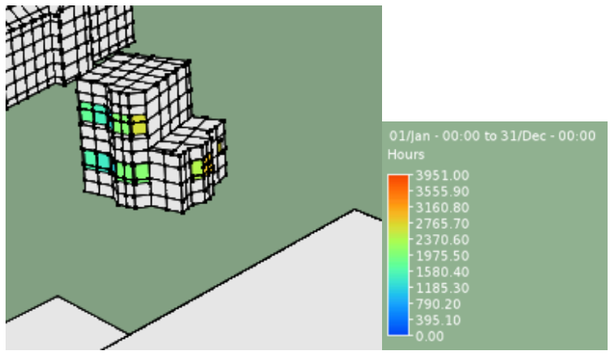


Figure 7: Rose Hill Lodge properties APSH Results (Post-development)

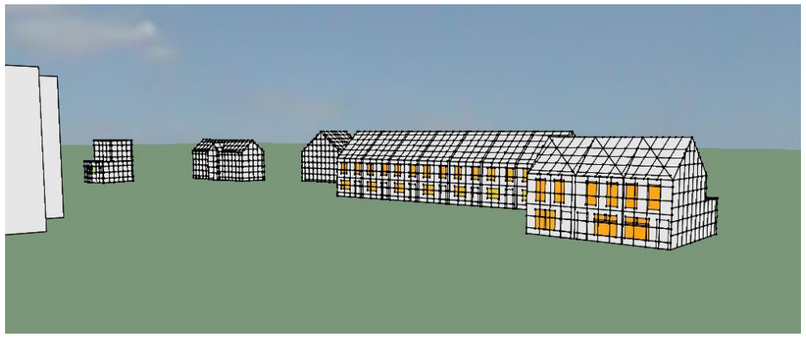


Figure 8: Isabel Hill properties and River View cottage properties APSH Results (Pre-development)

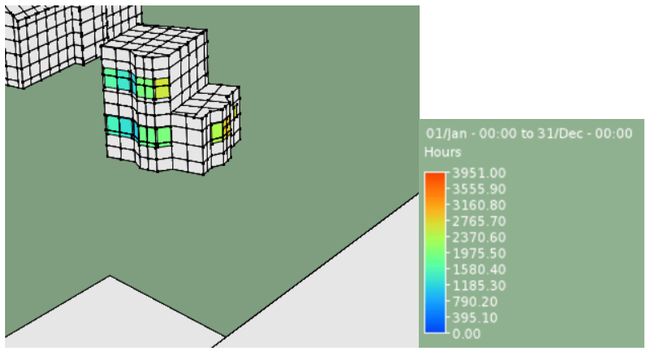


Figure 9: Rose Hill Lodge properties APSH Results (Pre-development)

5. PROPOSED BUILDING DAYLIGHT ASSESSMENT

This section of the report will provide an analysis of the proposed development daylight performance. This will be quantified in terms of daylight factor and view out. To carry out this assessment a representative sample of units (those which have been redesigned for the resubmission) have been tested to provide an overview of the building's daylight performance.

5.1 Daylight Factor

The daylight factor for each unit have been calculated and assessed against the BRE criteria. The results are shown in Table 18.

BS EN 17037 (the British Standard for Daylight) recommends that habitable rooms should achieve a daylight factor of 2.1% for at least 50% of the space, and 0.7% daylight factor (minimum) for at least 95% of the space.

Majority of the living rooms achieve sufficient daylight access, achieving the daylight factor across more than 50% of the room. However, some units on the lower floors do not achieve sufficient daylight across the spaces, achieving below 50%. A large proportion of the bedrooms do not achieve sufficient daylight, with 4 of the tested units having at least one bedroom that achieves adequate daylight across over 50% of the room. Similarly, most of the spaces to not achieve the minimum daylight level across 95% of the room, rather achieving in the region of 50-85% for the living rooms and 25-75% for the bedrooms.

However, these levels of daylight are deemed acceptable in respect to their intended use and the nature of the refurbishment maintaining the existing window openings due to the Grade II listed status.

Table 17: Daylight results

Room		Target Daylight Factor across % of room	Minimum Daylight Factor across % of room
K Unit 1	Living Room / Kitchen	47%	100%
	Bedroom	38%	100%
K Unit 8	Living Room / Kitchen	28%	58%
	Bedroom 1	0%	22%
	Bedroom 2	0%	0%
K Unit 12	Living Room / Kitchen	39%	67%
	Bedroom 1	32%	100%
	Bedroom 2	38%	67%
	Bedroom 3	37%	56%
K Unit 13	Living Room / Kitchen	39%	49%
	Bedroom	81%	100%
K Unit 14	Living Room / Kitchen	78%	88%
	Bedroom 1	34%	75%
	Bedroom 2	11%	36%
	Bedroom 3	0%	0%
K Unit 15	Living Room / Kitchen	59%	81%
	Bedroom 1	55%	75%
	Bedroom 2	68%	98%
K Unit 19	Living Room / Kitchen	88%	100%
	Bedroom 1	52%	86%
	Bedroom 2	18%	38%
	Bedroom 3	12%	27%
	Bedroom 4	9%	37%
K Unit 20	Living Room / Kitchen	86%	86%
	Bedroom 1	54%	78%
	Bedroom 2	90%	100%
	Bedroom 3	50%	88%
R&W Unit 13	Living Room / Kitchen	78%	98%
	Bedroom 1	56%	93%
	Bedroom 2	0%	24%
	Bedroom 3	0%	0%
	Bedroom 4	0%	0%

5.2 Sky view

The sky view factors for each unit have been calculated and assessed against the BRE criteria. The results are shown in Table 18.

BS EN 17037 (the British Standard for Daylight) recommends that habitable rooms should achieve a minimum horizontal sight angle, outside distance of the view and number of layers for at least 75% of the space.

The outside distance of the view has not been stated as all the rooms assessed have at least one window that is not obstructed by another building or structure.

Majority of living rooms (first floor and second floor flats) achieve sufficient views out, all achieving a horizontal sight angle above 14° and a sky view of 100%. However, some units do not achieve above 14° of horizontal sight angle, rather achieving between 6° and 12°. Majority of the bedrooms achieve sufficient view out, however a number of bedrooms only achieves a horizontal sight angle of between 10° and 12° and two bedrooms in R&W Unit 13 achieve low sky view, which is due to the height of the existing window in the space. However, all the spaces are deemed acceptable in respect to their view, due the nature of the refurbishment maintaining the existing window openings.

5.3 Observations

Across the site 63% of kitchens and living rooms and 35% of all bedrooms are achieving the required daylight factor criteria. 55% of kitchens and living rooms and 91% of bedrooms achieve the view out criteria. The BRE guidance does not provide a target pass rate as performance in this area heavily depends on the site context. The site is deemed to be acceptable within the limitations of the existing building.

Table 18: Sky view results

Room		Horizontal sight angle	Number of layers (Sky view)
K Unit 1	Living Room / Kitchen	17.80	1.00
	Bedroom	17.80	0.91
K Unit 8	Living Room / Kitchen	6.30	1.00
	Bedroom 1	15.38	0.79
	Bedroom 2	10.89	0.00
K Unit 12	Living Room / Kitchen	22.38	1.00
	Bedroom 1	23.98	1.00
	Bedroom 2	32.34	1.00
	Bedroom 3	22.41	1.00
K Unit 13	Living Room / Kitchen	8.05	1.00
	Bedroom	18.28	1.00
K Unit 14	Living Room / Kitchen	21.50	1.00
	Bedroom 1	22.42	1.00
	Bedroom 2	18.24	1.00
	Bedroom 3	24.09	0.97
K Unit 15	Living Room / Kitchen	19.62	1.00
	Bedroom 1	31.90	1.00
	Bedroom 2	25.13	1.00
K Unit 19	Living Room / Kitchen	12.46	1.00
	Bedroom 1	35.82	1.00
	Bedroom 2	31.42	1.00
	Bedroom 3	16.91	1.00
	Bedroom 4	15.62	1.00
K Unit 20	Living Room / Kitchen	15.17	1.00
	Bedroom 1	29.01	1.00
	Bedroom 2	26.84	1.00
	Bedroom 3	27.52	1.00
R&W Unit 13	Living Room / Kitchen	11.77	1.00
	Bedroom 1	24.13	1.00
	Bedroom 2	19.53	1.00
	Bedroom 3	18.35	0.16
	Bedroom 4	10.65	0.00

6. PROPOSED DEVELOPMENT - SUNLIGHT ANALYSIS

This section of the report provides an analysis of the development performance in terms of access to sunlight. This will be quantified in terms of sunlight hours. As with the daylight assessment, a representative sample of dwellings have been assessed.

6.1 Window Sunlight Assessment

6.1.1 Sunlight Hours

BRE recommends that habitable rooms should be provided with:

- at least one main window wall faces within 90° of due south; and
- a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March.

The units which are situated on the south-facing facades achieve sufficient sunlight levels, achieving above 1.5 hours of sunlight on March 21st. However, due to the orientation of the existing buildings, a number of units, mostly north facing, do not achieve acceptable levels of sunlight, achieving below 1.5 hours on March 21st.

However, as the majority of the units have at least one living space and one bedroom facing within 90° of due south, the development is deemed acceptable in respect to their sunlight, due the nature of the refurbishment maintaining the existing window openings and the existing orientation of the development.

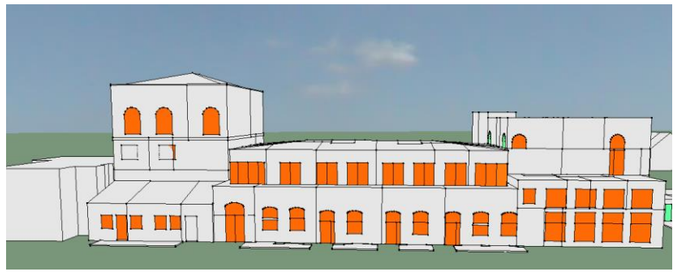


Figure 12: APSH results - Karslake (South)

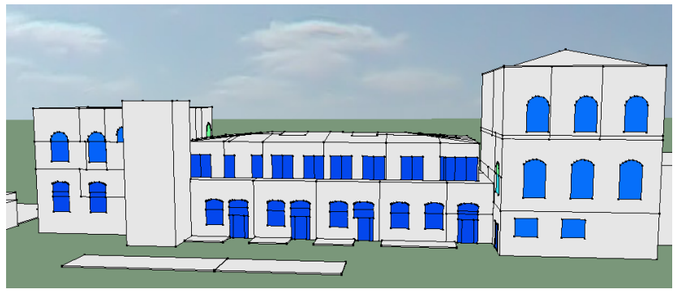


Figure 13: APSH results - Karslake (North)

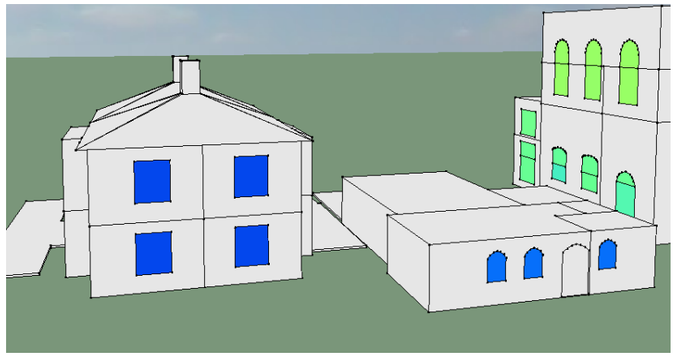


Figure 14: APSH results - Cottage and Workshop (North)

Figure 15: APSH - Cottage and Workshop (South)

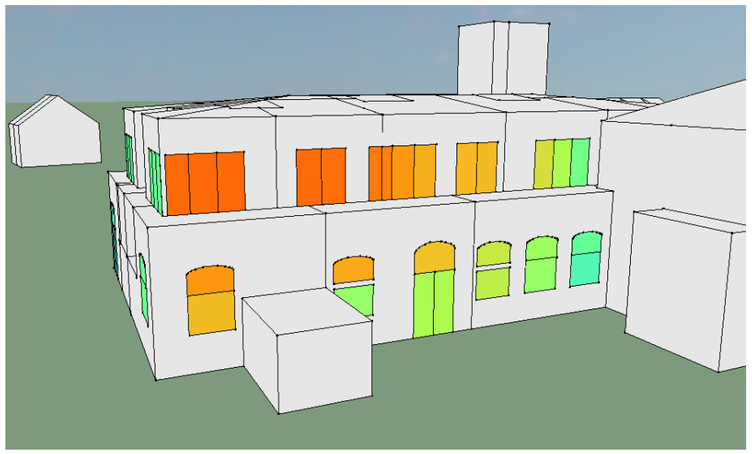


Figure 10: APSH results - Rushton & Ward (South)

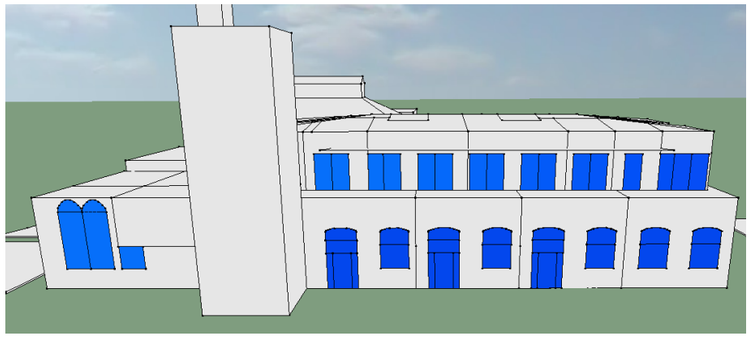
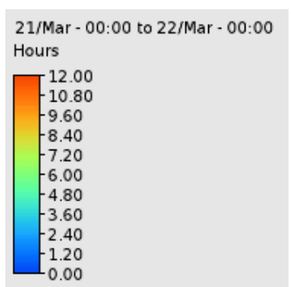


Figure 11: APSH results - Rushton & Ward (North)



6.2 Amenity Sunlight

A number of spaces on the site have been allocated for private and shared amenity use. Each space has been tested for compliance with the BRE guidelines which state that amenity spaces should receive at least 2 hours of sunlight on March 21st in 50% of the space.

Figure 16 shows the amenity sunlight results of the development. Most spaces are receiving upwards of 2 hours of sunlight on March 21st, with the exception of the northern private garden spaces allocated to Karslake units 2, 4, 6 and 8. This is deemed acceptable as there are a number of shared amenity spaces on site, including the shared garden space and children's play space located south of Karslake.

6.3 Observations

The development is performing well in terms of sunlight with most of the amenity spaces achieving the BRE guidance of at least 50% of the space receiving 2 hours of sunlight or more on March 21st.

Where possible direct north facing units have been minimised with bedrooms oriented east and west where possible to maximise the amount of direct sunlight. 66% of units are passing the sunlighting criteria.

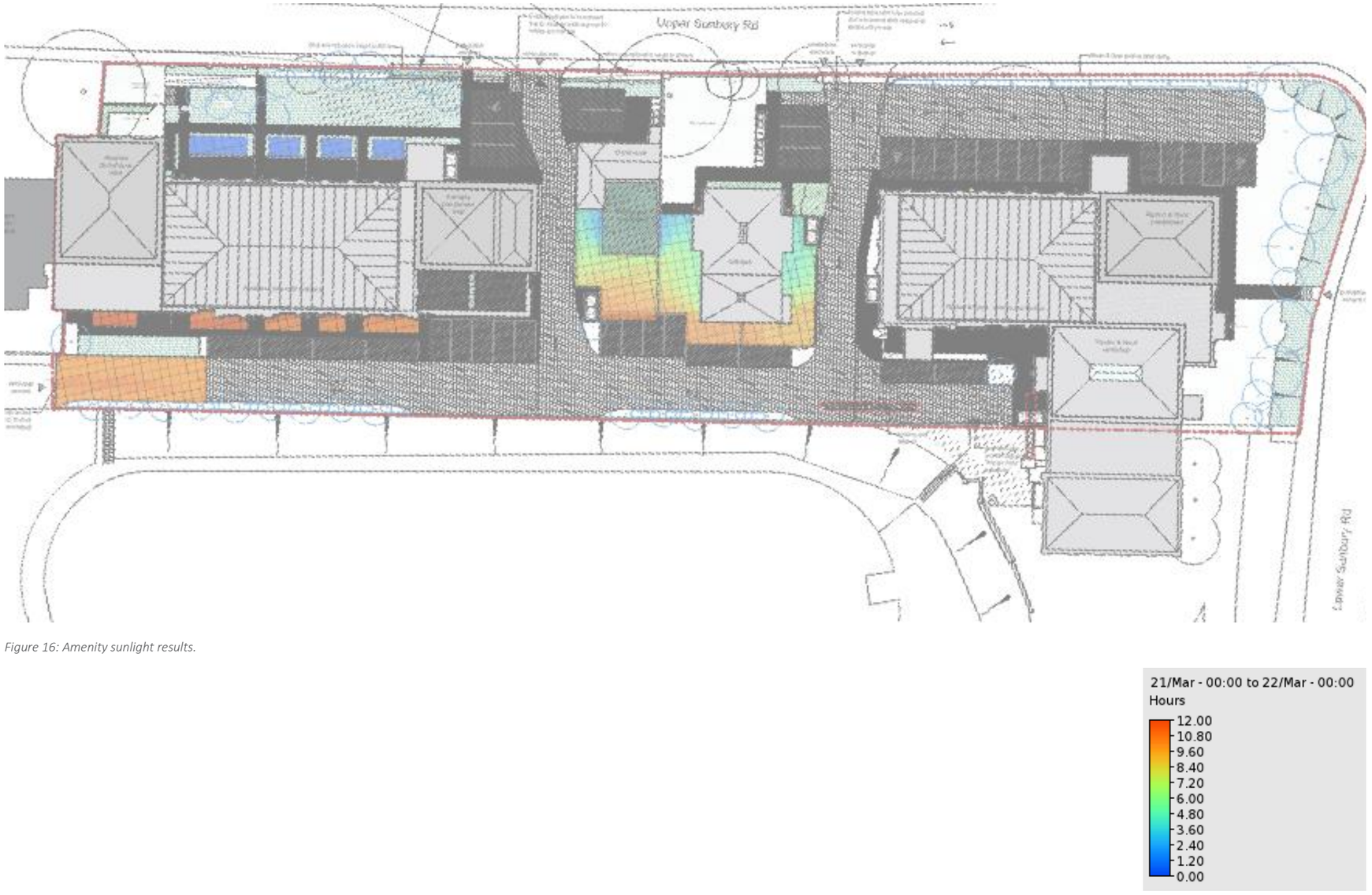


Figure 16: Amenity sunlight results.

Appendix A Glossary of Terms

Daylight Factor

The daylight factor is the indoor illuminance (from daylight) on the working plane within a room, expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane. It is calculated based on a uniform overcast sky.

Glare

Glare is the sensation produced by bright areas within the visual field, such as lit surfaces, parts of the luminaires, windows and/or roof lights. Glare shall be limited to avoid errors, fatigue and accidents. Glare can be experienced either as discomfort glare or as disability glare. In interior work places disability glare is not usually a major problem if discomfort glare limits are met. Glare caused by reflections in specular surfaces is usually known as veiling reflections or reflected glare.

Illuminance

The amount of light falling on a surface per unit area, measured in lux.

Point daylight factor

A point daylight factor is the ratio between the illuminance (from daylight) at a specific point on the working plane within a room, expressed as a percentage of the illuminance received on an outdoor unobstructed horizontal plane.

Uniformity

The uniformity is the ratio between the minimum illuminance (from daylight) on the working plane within a room (or minimum daylight factor) and the average illuminance (from daylight) on the same working plan (or average daylight factor).

View of sky/no sky line

Areas of the working plane have a view of sky when they receive direct light from the sky, i.e. when the sky can be seen from working plane height. The no-sky line

divides those areas of the working plane, which can receive direct skylight, from those that cannot.

Working plane

CIBSE LG10 defines the working plane as the horizontal, vertical or inclined plane in which a visual task lies. The working plane is normally taken as 0.7m above the floor for offices and 0.85 m for industry.