



ABBEYCONSULTANTS

Sunlight and Daylight Report

20 Chalmers Way, Twickenham, TW1 1QG

Sarah Lancashire Salmon

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About Abbey Consultants (Southern) Ltd

Abbey Consultants (Southern) Ltd is an established consultancy practice specialising in providing building solutions throughout the UK.

We offer a full range of independent energy and sustainability services from pre-planning through to completion for both residential and commercial buildings from small individual properties through to highly complex mixed-use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations, the public sector and private householders.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

Abbey Consultants maintains its position at the forefront of changes in building regulations as well as technological advances. Our clients, large or small are therefore assured of a cost effective, cohesive and fully integrated professional service.

About the Authors

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Assessment Information

Nature of Assessment:	Sunlight and Daylight Report-20 Chalmers Way
Project Name:	20 Chalmers Way
Project Address:	20 Chalmers Way, Twickenham, TW1 1QG
Client:	Sarah Lancashire Salmon
Architect:	50 Degrees North Architects
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1. CONTENTS

CONTENTS

1. Contents.....	2
2. Glossary.....	4
3. Proposed Development.....	5
4. Executive Summary.....	6
5. Information Sources.....	7
5.1 Documents Considered.....	7
5.2 Application of the daylight tests.....	7
6. National Planning Policy Framework.....	8
7. Methodology of the Study.....	9
7.1 BRE Guide: Site Layout Planning for Daylight and Sunlight.....	9
7.2 Daylight to Windows.....	10
7.2.1 Test 1 Vertical Sky Component.....	10
7.2.2 Test 2 Daylight Distribution.....	10
7.3 Sunlight availability to Windows.....	10
7.4 Overshadowing to Gardens and Open Spaces.....	10
8. Results.....	11
8.1 Daylight to Windows.....	11
8.2 Sunlight to Windows.....	11
8.3 Shadow Study.....	11
9. Conclusion.....	12
Appendix 1: Vertical Sky Component Analysis for the proposed development.....	13
Appendix 2: Vertical Sky Component Results for the existing properties at 21 Chalmers Way and the 4 apartments blocks off Corsellis Square.....	15
Appendix 3: Annual Probable Sunlight Hours Results for the existing properties at 21 Chalmers Way and the 4 apartments blocks off Corsellis Square.....	16
Appendix 4: Winter Probable Sunlight Hours Results for the existing properties at 21 Chalmers Way and the 4 apartments blocks off Corsellis Square.....	17
Appendix 5: Shadow Analysis for the proposed development.....	18

Figure 1: 21 Chalmers Way VSC Analysis	14
Figure 2: 4 Apartments blocks off Corsellis Square VSC Analysis	14
Figure 3: Shadow Analysis for March 21st at 10am.....	19
Figure 4: Shadow Analysis for March 21st at 4pm	19
Figure 5: Shadow Analysis for June 21st at 10am.....	20
Figure 6: Shadow Analysis for June 21st at 4pm	20
Figure 7: Shadow Analysis for September 21st at 10am	21
Figure 8: Shadow Analysis for September 21st at 4pm	21
Table 1: Documents Considered	7
Table 2: VSC Results for the existing properties at 21 Chalmers Way and the 4 apartments blocks off Corsellis Square	15
Table 3: Annual Probable Sunlight Hours Results for 21 Chalmers Way and the 4 apartments blocks off Corsellis Square	16
Table 4: Winter Probable Sunlight Hours Results for 21 Chalmers Way and the 4 apartments blocks off Corsellis Square	17

2. GLOSSARY

Average daylight factors (ADF) - Ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% ADF would mean that the average indoor illuminance would be one hundredth the outdoor unobstructed illuminance.

Daylight, natural light – Combined skylight and sunlight

Probable sunlight hours – The long-term average of the total number of hours during a year in which direct sunlight reaches the unobstructed ground (when clouds are taken into account)

CIE standard overcast sky – A completely overcast sky for which the ratio of its luminance L_y at an angle of elevation y above the horizontal to the luminance L_z at the zenith is given by:

$$L_y = L_z (1+2\sin y)/3$$

A CIE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead)

Vertical sky component (VSC) – Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of the sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings

Annual probable sunlight hours (APSH) – The number of annual sunlight hours an unobstructed area would receive.

Winter probable sunlight hours (APSH) – The number of winter sunlight hours an unobstructed area would receive.

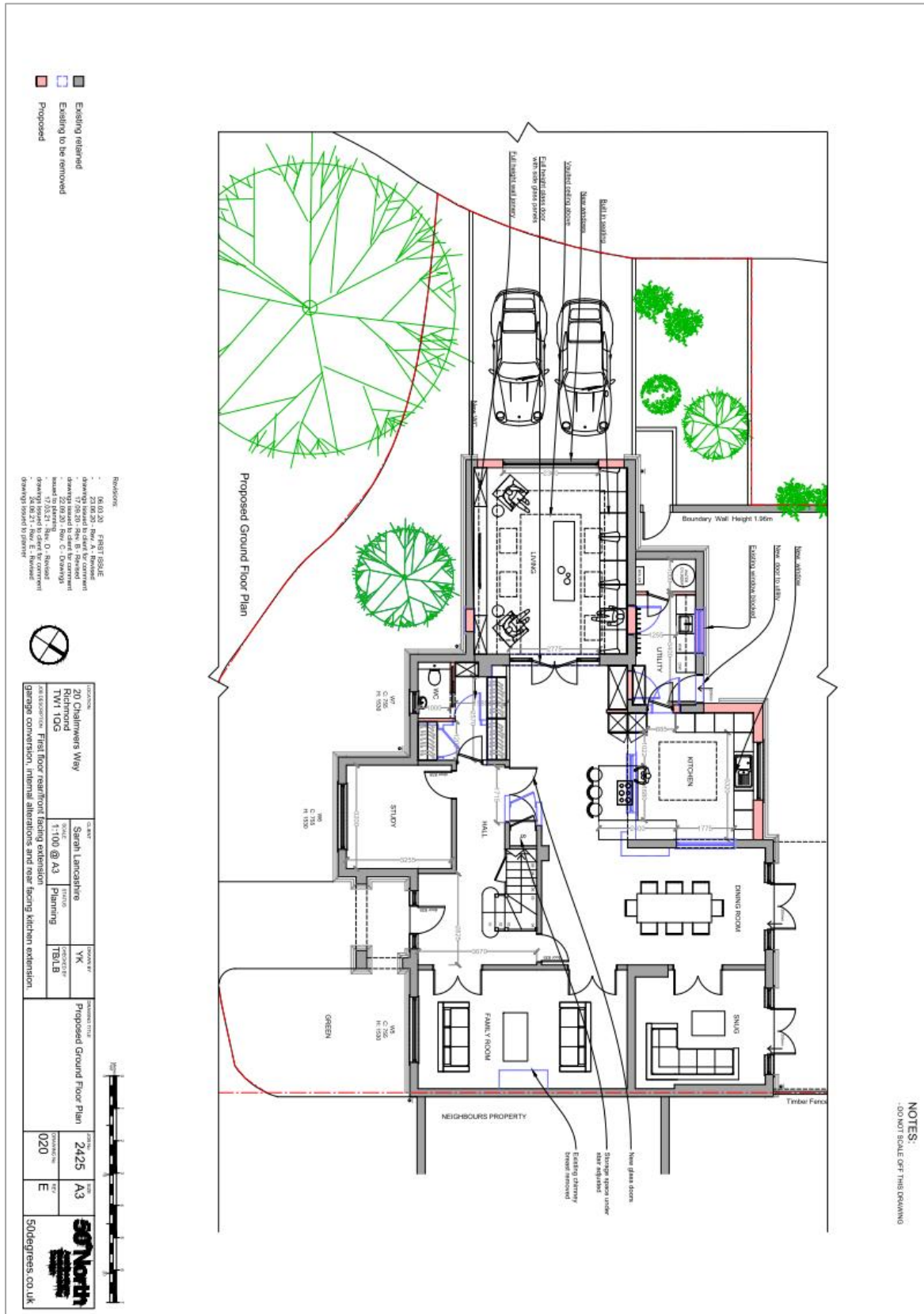
No sky line – The outline on the working plane of the area from which no sky can be seen

Obstruction angle – The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

Sky Factor – Ratio of the parts of illuminance at a point on a given plane that would be received directly through unglazed openings from a sky of uniform luminance, to illuminance on a horizontal plane due to the unobstructed hemisphere of this sky. The sky factor does not include reflected light, either from outdoor or indoor surfaces.

Working Plane – Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85m above the floor in houses and factories, 0.7m above the floor in offices.

3. PROPOSED DEVELOPMENT



4. EXECUTIVE SUMMARY

Abbey Consultants (Southern) Ltd have been instructed by Sarah Lancashire Salmon to review the Sunlight and Daylight impacts on the 20 Chalmers Way development to determine if the proposed scheme complies with good practice guidelines.

The aim of the study is to assess how the proposals impact the external daylight available for 21 Chalmers Way and the 4 apartment blocks off Corsellis Square. The study is based on the various numerical tests laid down in the Building Research Establishments (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a guide to good practice' by P J Littlefair 2011.

The VSC analysis to the existing dwellings concluded that 100% of the window casements to all the existing dwellings exceed the good practice figure of 0.8x the pre-development values, averaging 0.998x pre-development levels across the assessment with the most impacted window achieve 0.945x pre-development values, well in excess of good practice guidance and therefore satisfying the BRE daylight requirements

All windows which face within 90 degrees of due south have been tested for direct sunlight. All windows pass both the total annual sunlight hours test and the winter sunlight hours test with an average of 1.00x and 1.00x pre-development values respectively. The proposed development is therefore in full compliance with the BRE direct sunlight to windows requirements.

The overshadowing study concludes that due to the site orientation and the proposed flat roof design for the first floor extension to, there would be minimal additional overshadowing of the existing dwelling at 21 Chalmers Way and only late into the evening as a result of the proposed development. The separation to the apartment block opposite results in no overshadowing occurring.

The above numerical results confirm that the proposed development will have a low impact on the light receivable by its neighbouring properties and therefore the development design satisfies all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'.

5. INFORMATION SOURCES

5.1 DOCUMENTS CONSIDERED

This report has been produced based on the following drawings:

Table 1: Documents Considered

Drawing Title	Issue Date	Drawing Number
Site Plans	22.09.20	001
Existing Ground Floor Plan	22.09.20	002A
Existing First Floor Plan	22.09.20	003A
Existing Loft Plan	22.09.20	004A
Existing Roof Plan	22.09.20	005A
Existing Elevations	22.09.20	006A
Existing Sections 1-1 & 2-2	22.09.20	007A
Existing Sections 3-3	22.09.20	008A
Proposed Ground Floor Plan	24.06.21	020E
Proposed First Floor Plan	24.06.21	021E
Proposed Loft Plan	24.06.21	022D
Proposed Roof Plan	24.06.21	023C
Proposed Elevations	24.06.21	030E
Proposed Elevations	24.06.21	031E

5.2 APPLICATION OF THE DAYLIGHT TESTS

The internal layouts of the existing dwellings adjacent to the proposed development are unknown at the time of writing this report, so have all been assumed to be servicing habitable rooms for the purposes of this report.

6. NATIONAL PLANNING POLICY FRAMEWORK

The BRE numerical guidelines should be considered in the context of the National Planning Policy Framework (NPPF) 2019, which stipulates that local planning authorities should take a flexible approach to daylight and sunlight to ensure the efficient use of land. The NPPF states in paragraph 123(c):

“Local planning authorities should refuse applications which they consider fail to make efficient use of land, taking into account the policies in this Framework. In this context, when considering applications for housing, authorities should take a flexible approach in applying policies or guidance relating to daylight and sunlight, where they would otherwise inhibit making efficient use of a site (as long as the resulting scheme would provide acceptable living standards).”

7. METHODOLOGY OF THE STUDY

7.1 BRE GUIDE: SITE LAYOUT PLANNING FOR DAYLIGHT AND SUNLIGHT

The study is based on the various numerical tests laid down in the Building Research Establishment (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a guide to good practice' by P J Littlefair 2011. In general, the BRE tests are based on the requirements of the British Standard, BS 8206 Part 2.

The standards set out in the BRE guide are intended to be used flexibly. The following sentiments are taken from the BRE guide:

(Its) "main aim is... to help to ensure good conditions in the local environment, considered broadly, with enough sunlight and daylight on or between buildings for good interior and exterior conditions." (Para 1.1)

"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and this document should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer." (Para 1.6)

"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design." (Para 1.6)

The BRE guide is an advisory document, not a rigid set of rules. Care must therefore be taken to apply its recommendations in a manner fitting to the location of the proposed development.

In theory the BRE report's numerical guidelines may be applied to any setting, whether that is a city centre, suburban area or rural village. However, it notes, "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... The calculation methods...are entirely flexible in this respect." (Para 1.6)

At paragraph 2.2.3 it states "Note that numerical values given here are purely advisory. Different criteria may be used, based upon the requirements for daylighting in an area viewed against other site layout constraints." Appendix F of the BRE Guide gives advice on setting alternative target values for skylight access. At page 62 it states "different targets may be used, based on the special requirements of the proposed development or its location".

Rigid application of the numerical guidelines could well give rise to an inappropriate answer and form of development for city centre sites, in which case it may be appropriate to adopt lower target values that are more appropriate to the location concerned.

In line with Appendix H of the BRE guide, trees have not been included within the assessment as "Where the effect of a new building on existing buildings nearby is being analysed, it is usual to ignore the effect of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."

7.2 DAYLIGHT TO WINDOWS

Diffuse daylight is the light received from the sun which has been diffused through the sky. Even on a cloudy day when the sun is not visible, a room will continue to be lit with light from the sky. This is diffuse daylight.

Diffuse daylight calculations should be undertaken to all rooms where daylight is required, including living rooms, kitchens and bedrooms. Usually, if a kitchen is less than 13m² it is considered to be a non-habitable room and the daylight tests need not be applied. The BRE guide states that windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed.

The BRE guide contains two tests which measure diffuse daylight:

7.2.1 Test 1 Vertical Sky Component

The percentage of the sky visible from the centre of a window is known as the Vertical Sky Component. Diffuse daylight may be adversely affected if after a development the Vertical Sky Component is both less than 27% and less than 0.8 times its former value.

7.2.2 Test 2 Daylight Distribution

The BRE guide states that where room layouts are known, the impact on the daylighting distribution can be found by plotting the 'no sky line' in each of the main rooms. The no-sky line is a line which separates areas of the working plane that can and cannot have a direct view of the sky. Daylight may be adversely affected if after the development the area of the working plane in a room which can receive direct skylight is reduced to less than 0.8 times its former value.

7.3 SUNLIGHT AVAILABILITY TO WINDOWS

The BRE sunlight tests should be applied to all main living rooms and conservatories which have a window which faces within 90 degrees of due south. The guide states that kitchens and bedrooms are less important, although care should be taken not to block too much sunlight.

The BRE guide states that sunlight availability may be adversely affected 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 21 September and 21 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

7.4 OVERSHADOWING TO GARDENS AND OPEN SPACES

The availability of sunlight should be checked for all open spaces where sunlight is required. This would normally include:

- Gardens, usually the main back garden of a house
- Parks and playing fields
- Children's playgrounds
- Outdoor swimming pools and paddling pools
- Sitting out areas, such as those between non-domestic buildings and in public squares
- Focal points for views such as a group of monuments or fountains.

The BRE guide recommends that at least 50% of the area of each amenity space listed above 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, then the loss of light is likely to be noticeable.

8. RESULTS

8.1 DAYLIGHT TO WINDOWS

Vertical Sky Component is a measure of the amount of sky visible from a centre point of a window. A window that achieves 27% or more is considered to provide good levels of light, but if with the proposed development in place the figure is both less than 27% and would be reduced by 20% or more than pre-development values, the loss would be noticeable.

Pre and post development VSC calculations have been undertaken for the following dwellings, adjacent to the proposed re-development to determine to what extent the existing dwellings would be affected by the proposals:

- 21 Chalmers Way
- 4 Apartment blocks off of Corsellis Square

In the paper by Paul Littlefair "Site Layout Planning for Daylight and Sunlight: A guide to good practice" (2011), good practice in relation to VSC calculations to existing dwellings is defined as the post-development VSC achieving a minimum of 0.8x the pre-development value, which would be unnoticeable to the human eye and therefore not have a significant effect on the existing dwellings.

The VSC analysis to the existing dwellings concluded that 100% of the window casements to all the existing dwellings exceed the good practice figure of 0.8x the pre-development values, averaging 0.998x pre-development levels across the assessment with the most impacted window achieve 0.945x pre-development values, well in excess of good practice guidance and therefore satisfying the BRE daylight requirements

As the internal layouts of the existing dwellings were unknown the daylight distribution test could not be applied, however given the small degree of impact determined by the VSC, APSH and WPSH calculations it is unlikely that daylight distribution tests would show any results below the good practice thresholds.

8.2 SUNLIGHT TO WINDOWS

Probable sunlight hours refers to the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

BS8206-2 recommends that interiors where the occupants expect sunlight should receive at least 25% of annual probable sunlight hours (APSH); in addition to, in the winter months between 21st September and 21st March at least 5% of APSH, otherwise known as Winter Probable Sunlight Hours (WPSH)

All windows which face within 90 degrees of due south have been tested for direct sunlight. All windows pass both the total annual sunlight hours test and the winter sunlight hours test with 100% of the pre-development values. The proposed development is therefore in full compliance with the BRE direct sunlight to windows requirements.

8.3 SHADOW STUDY

The overshadowing study concludes that due to the site orientation and the proposed flat roof design for the first floor extension to, there would be minimal additional overshadowing of the existing dwelling at 21 Chalmers Way and only late into the evening as a result of the proposed development. The separation to the apartment block opposite results in no overshadowing occurring.

9. CONCLUSION

Abbey Consultants (Southern) Ltd have been instructed by Sarah Lancashire Salmon to review the Sunlight and Daylight impacts on the 20 Chalmers Way development to determine if the proposed scheme complies with good practice guidelines.

The aim of the study is to assess how the proposals impact the external daylight available for 21 Chalmers Way and the 4 apartment blocks off Corsellis Square. The study is based on the various numerical tests laid down in the Building Research Establishments (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a guide to good practice' by P J Littlefair 2011.

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All windows which face within 90 degrees of due south have been tested for direct sunlight. All windows pass both the total annual sunlight hours test and the winter sunlight hours test with an average of 1.00x and 1.00x pre-development values respectively. The proposed development is therefore in full compliance with the BRE direct sunlight to windows requirements.

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The above numerical results confirm that the proposed development will have a low impact on the light receivable by its neighbouring properties and therefore the development design satisfies all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'.

APPENDIX 1: VERTICAL SKY COMPONENT ANALYSIS FOR THE PROPOSED DEVELOPMENT

Figure 1: 21 Chalmers Way VSC Analysis



Figure 2: 4 Apartments blocks off Corsellis Square VSC Analysis



APPENDIX 2: VERTICAL SKY COMPONENT RESULTS FOR THE EXISTING PROPERTIES AT 21 CHALMERS WAY AND THE 4 APARTMENTS BLOCKS OFF CORSELLIS SQUARE

Table 2: VSC Results for the existing properties at 21 Chalmers Way and the 4 apartments blocks off Corsellis Square

Dwelling	Floor Name	Window Name	Window Orientation	Pre-development VSC	Post-development VSC	Overall Compliance	Meets BRE Criteria
21 Chalmers Way	First	W1	331°N		29.98	29.98	1 Pass
21 Chalmers Way	First	W2	331°N		33.79	33.682	0.997 Pass
21 Chalmers Way	First	W3	331°N		27.135	26.774	0.987 Pass
21 Chalmers Way	First	W4	331°N		32.006	31.16	0.974 Pass
21 Chalmers Way	Ground	W1	331°N		28.752	28.744	1 Pass
21 Chalmers Way	Ground	W2	331°N		28.899	28.888	1 Pass
21 Chalmers Way	Ground	W3	331°N		22.196	22.196	1 Pass
21 Chalmers Way	Ground	W4	331°N		27.044	25.557	0.945 Pass
21 Chalmers Way	Second	W1	331°N		37.454	37.454	1 Pass
21 Chalmers Way	Second	W2	331°N		37.497	37.497	1 Pass
Corsellis Square NE End Terrace	First	W1	151°		28.448	28.447	1 Pass
Corsellis Square NE End Terrace	First	W2	151°		38.068	38.065	1 Pass
Corsellis Square NE End Terrace	First	W3	151°		38.376	38.376	1 Pass
Corsellis Square NE End Terrace	First	W4	151°		29.821	29.821	1 Pass
Corsellis Square NE End Terrace	Ground	W1	151°		24.792	24.787	1 Pass
Corsellis Square NE End Terrace	Ground	W2	186°		35.072	35.053	0.999 Pass
Corsellis Square NE End Terrace	Ground	W3	151°		37.359	37.35	1 Pass
Corsellis Square NE End Terrace	Ground	W4	151°		37.876	37.866	1 Pass
Corsellis Square NE End Terrace	Ground	W5	112°		39.299	39.299	1 Pass
Corsellis Square NE End Terrace	Ground	W6	151°		27.298	27.298	1 Pass
Corsellis Square NE End Terrace	Second	W1	151°		39.197	39.197	1 Pass
Corsellis Square NE End Terrace	Second	W2	151°		39.268	39.268	1 Pass
Corsellis Square NE End Terrace	Second	W3	151°		39.357	39.357	1 Pass
Corsellis Square NE End Terrace	Second	W4	151°		39.403	39.403	1 Pass
Corsellis Square NE Mid Terrace	First	W1	151°		27.508	27.508	1 Pass
Corsellis Square NE Mid Terrace	First	W2	151°		36.909	36.909	1 Pass
Corsellis Square NE Mid Terrace	First	W3	151°		37.167	37.167	1 Pass
Corsellis Square NE Mid Terrace	First	W4	151°		24.831	24.831	1 Pass
Corsellis Square NE Mid Terrace	Ground	W1	151°		22.996	22.987	1 Pass
Corsellis Square NE Mid Terrace	Ground	W2	186°		33.684	33.674	1 Pass
Corsellis Square NE Mid Terrace	Ground	W3	151°		34.762	34.757	1 Pass
Corsellis Square NE Mid Terrace	Ground	W4	151°		35.565	35.559	1 Pass
Corsellis Square NE Mid Terrace	Ground	W5	112°		33.246	33.246	1 Pass
Corsellis Square NE Mid Terrace	Ground	W6	151°		22.096	22.096	1 Pass
Corsellis Square NE Mid Terrace	Second	W1	151°		38.905	38.905	1 Pass
Corsellis Square NE Mid Terrace	Second	W2	151°		38.932	38.932	1 Pass
Corsellis Square NE Mid Terrace	Second	W3	151°		38.609	38.609	1 Pass
Corsellis Square NE Mid Terrace	Second	W4	151°		34.558	34.558	1 Pass
Corsellis Square SW End Terrace	First	W1	151°		29.051	29.051	1 Pass
Corsellis Square SW End Terrace	First	W2	151°		37.761	37.76	1 Pass
Corsellis Square SW End Terrace	First	W3	151°		36.627	36.615	1 Pass
Corsellis Square SW End Terrace	First	W4	151°		20.644	20.618	0.999 Pass
Corsellis Square SW End Terrace	Ground	W1	151°		26.318	26.257	0.998 Pass
Corsellis Square SW End Terrace	Ground	W2	186°		37.84	37.771	0.998 Pass
Corsellis Square SW End Terrace	Ground	W3	151°		36.107	36.014	0.997 Pass
Corsellis Square SW End Terrace	Ground	W4	151°		35.527	35.418	0.997 Pass
Corsellis Square SW End Terrace	Ground	W5	112°		29.145	29.046	0.997 Pass
Corsellis Square SW End Terrace	Ground	W6	151°		16.346	16.245	0.994 Pass
Corsellis Square SW End Terrace	Second	W1	151°		39.146	39.146	1 Pass
Corsellis Square SW End Terrace	Second	W2	151°		39.015	39.015	1 Pass
Corsellis Square SW End Terrace	Second	W3	151°		37.978	37.978	1 Pass
Corsellis Square SW End Terrace	Second	W4	151°		31.772	31.772	1 Pass
Corsellis Square SW Mid Terrace	First	W1	151°		27.995	27.969	0.999 Pass
Corsellis Square SW Mid Terrace	First	W2	151°		36.899	36.887	1 Pass
Corsellis Square SW Mid Terrace	First	W3	151°		36.322	36.322	1 Pass
Corsellis Square SW Mid Terrace	First	W4	151°		21.359	21.359	1 Pass
Corsellis Square SW Mid Terrace	Ground	W1	151°		24.303	24.207	0.996 Pass
Corsellis Square SW Mid Terrace	Ground	W2	186°		34.798	34.715	0.998 Pass
Corsellis Square SW Mid Terrace	Ground	W3	151°		34.335	34.281	0.998 Pass
Corsellis Square SW Mid Terrace	Ground	W4	151°		34.342	34.327	1 Pass
Corsellis Square SW Mid Terrace	Ground	W5	112°		29.93	29.927	1 Pass
Corsellis Square SW Mid Terrace	Ground	W6	151°		17.593	17.593	1 Pass
Corsellis Square SW Mid Terrace	Second	W1	151°		38.91	38.91	1 Pass
Corsellis Square SW Mid Terrace	Second	W2	151°		38.832	38.832	1 Pass
Corsellis Square SW Mid Terrace	Second	W3	151°		38.016	38.016	1 Pass
Corsellis Square SW Mid Terrace	Second	W4	151°		32.226	32.226	1 Pass

APPENDIX 3: ANNUAL PROBABLE SUNLIGHT HOURS RESULTS FOR THE EXISTING PROPERTIES AT 21 CHALMERS WAY AND THE 4 APARTMENTS BLOCKS OFF CORSELLIS SQUARE

Table 3: Annual Probable Sunlight Hours Results for 21 Chalmers Way and the 4 apartments blocks off Corsellis Square

Building Name	Floor Name	Window Name	Window Orientation	Pre-development APSH	Post-development APSH	Overall Compliance	Meets BRE Criteria
21 Chalmers Way	First	W1	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	First	W2	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	First	W3	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	First	W4	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W1	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W2	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W3	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W4	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Second	W1	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Second	W2	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
Corsellis Square NE End Terrace	First	W1	151°	62	62	1 Pass	1 Pass
Corsellis Square NE End Terrace	First	W2	151°	82	82	1 Pass	1 Pass
Corsellis Square NE End Terrace	First	W3	151°	81	81	1 Pass	1 Pass
Corsellis Square NE End Terrace	First	W4	151°	49	49	1 Pass	1 Pass
Corsellis Square NE End Terrace	Ground	W1	151°	58	58	1 Pass	1 Pass
Corsellis Square NE End Terrace	Ground	W2	186°	79	79	1 Pass	1 Pass
Corsellis Square NE End Terrace	Ground	W3	151°	80	80	1 Pass	1 Pass
Corsellis Square NE End Terrace	Ground	W4	151°	80	80	1 Pass	1 Pass
Corsellis Square NE End Terrace	Ground	W5	112°	63	63	1 Pass	1 Pass
Corsellis Square NE End Terrace	Ground	W6	151°	46	46	1 Pass	1 Pass
Corsellis Square NE End Terrace	Second	W1	151°	82	82	1 Pass	1 Pass
Corsellis Square NE End Terrace	Second	W2	151°	82	82	1 Pass	1 Pass
Corsellis Square NE End Terrace	Second	W3	151°	82	82	1 Pass	1 Pass
Corsellis Square NE End Terrace	Second	W4	151°	82	82	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	First	W1	151°	62	62	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	First	W2	151°	82	82	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	First	W3	151°	81	81	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	First	W4	151°	41	41	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Ground	W1	151°	56	56	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Ground	W2	186°	76	76	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Ground	W3	151°	78	78	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Ground	W4	151°	79	79	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Ground	W5	112°	60	60	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Ground	W6	151°	37	37	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Second	W1	151°	82	82	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Second	W2	151°	82	82	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Second	W3	151°	80	80	1 Pass	1 Pass
Corsellis Square NE Mid Terrace	Second	W4	151°	72	72	1 Pass	1 Pass
Corsellis Square SW End Terrace	First	W1	151°	61	61	1 Pass	1 Pass
Corsellis Square SW End Terrace	First	W2	151°	81	81	1 Pass	1 Pass
Corsellis Square SW End Terrace	First	W3	151°	79	79	1 Pass	1 Pass
Corsellis Square SW End Terrace	First	W4	151°	33	33	1 Pass	1 Pass
Corsellis Square SW End Terrace	Ground	W1	151°	59	59	1 Pass	1 Pass
Corsellis Square SW End Terrace	Ground	W2	186°	87	87	1 Pass	1 Pass
Corsellis Square SW End Terrace	Ground	W3	151°	80	80	1 Pass	1 Pass
Corsellis Square SW End Terrace	Ground	W4	151°	80	80	1 Pass	1 Pass
Corsellis Square SW End Terrace	Ground	W5	112°	61	61	1 Pass	1 Pass
Corsellis Square SW End Terrace	Ground	W6	151°	29	29	1 Pass	1 Pass
Corsellis Square SW End Terrace	Second	W1	151°	82	82	1 Pass	1 Pass
Corsellis Square SW End Terrace	Second	W2	151°	82	82	1 Pass	1 Pass
Corsellis Square SW End Terrace	Second	W3	151°	78	78	1 Pass	1 Pass
Corsellis Square SW End Terrace	Second	W4	151°	64	64	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	First	W1	151°	61	61	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	First	W2	151°	81	81	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	First	W3	151°	80	80	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	First	W4	151°	37	37	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Ground	W1	151°	58	58	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Ground	W2	186°	78	78	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Ground	W3	151°	78	78	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Ground	W4	151°	79	79	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Ground	W5	112°	60	60	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Ground	W6	151°	33	33	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Second	W1	151°	82	82	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Second	W2	151°	82	82	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Second	W3	151°	78	78	1 Pass	1 Pass
Corsellis Square SW Mid Terrace	Second	W4	151°	65	65	1 Pass	1 Pass

APPENDIX 4: WINTER PROBABLE SUNLIGHT HOURS RESULTS FOR THE EXISTING PROPERTIES AT 21 CHALMERS WAY AND THE 4 APARTMENTS BLOCKS OFF CORSELLIS SQUARE

Table 4: Winter Probable Sunlight Hours Results for 21 Chalmers Way and the 4 apartments blocks off Corsellis Square

Building Name	Floor Name	Window Name	Window Orientation	Pre-development WPSH	Post-development WPSH	Overall Compliance	Meets BRE Criteria
21 Chalmers Way	First	W1	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	First	W2	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	First	W3	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	First	W4	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W1	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W2	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W3	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Ground	W4	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Second	W1	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
21 Chalmers Way	Second	W2	331°N	N/A - North Facing	N/A - North Facing	N/A - North Facing	Pass
Corsellis Square NE End Terrace	First	W1	151°	26	26	1	Pass
Corsellis Square NE End Terrace	First	W2	151°	28	28	1	Pass
Corsellis Square NE End Terrace	First	W3	151°	27	27	1	Pass
Corsellis Square NE End Terrace	First	W4	151°	15	15	1	Pass
Corsellis Square NE End Terrace	Ground	W1	151°	24	24	1	Pass
Corsellis Square NE End Terrace	Ground	W2	186°	26	26	1	Pass
Corsellis Square NE End Terrace	Ground	W3	151°	26	26	1	Pass
Corsellis Square NE End Terrace	Ground	W4	151°	26	26	1	Pass
Corsellis Square NE End Terrace	Ground	W5	112°	20	20	1	Pass
Corsellis Square NE End Terrace	Ground	W6	151°	12	12	1	Pass
Corsellis Square NE End Terrace	Second	W1	151°	28	28	1	Pass
Corsellis Square NE End Terrace	Second	W2	151°	28	28	1	Pass
Corsellis Square NE End Terrace	Second	W3	151°	28	28	1	Pass
Corsellis Square NE End Terrace	Second	W4	151°	28	28	1	Pass
Corsellis Square NE Mid Terrace	First	W1	151°	26	26	1	Pass
Corsellis Square NE Mid Terrace	First	W2	151°	28	28	1	Pass
Corsellis Square NE Mid Terrace	First	W3	151°	27	27	1	Pass
Corsellis Square NE Mid Terrace	First	W4	151°	15	15	1	Pass
Corsellis Square NE Mid Terrace	Ground	W1	151°	22	22	1	Pass
Corsellis Square NE Mid Terrace	Ground	W2	186°	23	23	1	Pass
Corsellis Square NE Mid Terrace	Ground	W3	151°	24	24	1	Pass
Corsellis Square NE Mid Terrace	Ground	W4	151°	25	25	1	Pass
Corsellis Square NE Mid Terrace	Ground	W5	112°	18	18	1	Pass
Corsellis Square NE Mid Terrace	Ground	W6	151°	11	11	1	Pass
Corsellis Square NE Mid Terrace	Second	W1	151°	28	28	1	Pass
Corsellis Square NE Mid Terrace	Second	W2	151°	28	28	1	Pass
Corsellis Square NE Mid Terrace	Second	W3	151°	28	28	1	Pass
Corsellis Square NE Mid Terrace	Second	W4	151°	28	28	1	Pass
Corsellis Square SW End Terrace	First	W1	151°	25	25	1	Pass
Corsellis Square SW End Terrace	First	W2	151°	27	27	1	Pass
Corsellis Square SW End Terrace	First	W3	151°	26	26	1	Pass
Corsellis Square SW End Terrace	First	W4	151°	14	14	1	Pass
Corsellis Square SW End Terrace	Ground	W1	151°	25	25	1	Pass
Corsellis Square SW End Terrace	Ground	W2	186°	28	28	1	Pass
Corsellis Square SW End Terrace	Ground	W3	151°	26	26	1	Pass
Corsellis Square SW End Terrace	Ground	W4	151°	26	26	1	Pass
Corsellis Square SW End Terrace	Ground	W5	112°	19	19	1	Pass
Corsellis Square SW End Terrace	Ground	W6	151°	10	10	1	Pass
Corsellis Square SW End Terrace	Second	W1	151°	28	28	1	Pass
Corsellis Square SW End Terrace	Second	W2	151°	28	28	1	Pass
Corsellis Square SW End Terrace	Second	W3	151°	28	28	1	Pass
Corsellis Square SW End Terrace	Second	W4	151°	26	26	1	Pass
Corsellis Square SW Mid Terrace	First	W1	151°	25	25	1	Pass
Corsellis Square SW Mid Terrace	First	W2	151°	27	27	1	Pass
Corsellis Square SW Mid Terrace	First	W3	151°	26	26	1	Pass
Corsellis Square SW Mid Terrace	First	W4	151°	15	15	1	Pass
Corsellis Square SW Mid Terrace	Ground	W1	151°	24	24	1	Pass
Corsellis Square SW Mid Terrace	Ground	W2	186°	24	24	1	Pass
Corsellis Square SW Mid Terrace	Ground	W3	151°	24	24	1	Pass
Corsellis Square SW Mid Terrace	Ground	W4	151°	25	25	1	Pass
Corsellis Square SW Mid Terrace	Ground	W5	112°	18	18	1	Pass
Corsellis Square SW Mid Terrace	Ground	W6	151°	11	11	1	Pass
Corsellis Square SW Mid Terrace	Second	W1	151°	28	28	1	Pass
Corsellis Square SW Mid Terrace	Second	W2	151°	28	28	1	Pass
Corsellis Square SW Mid Terrace	Second	W3	151°	28	28	1	Pass
Corsellis Square SW Mid Terrace	Second	W4	151°	26	26	1	Pass

APPENDIX 5: SHADOW ANALYSIS FOR THE PROPOSED DEVELOPMENT

Figure 3: Shadow Analysis for March 21st at 10am

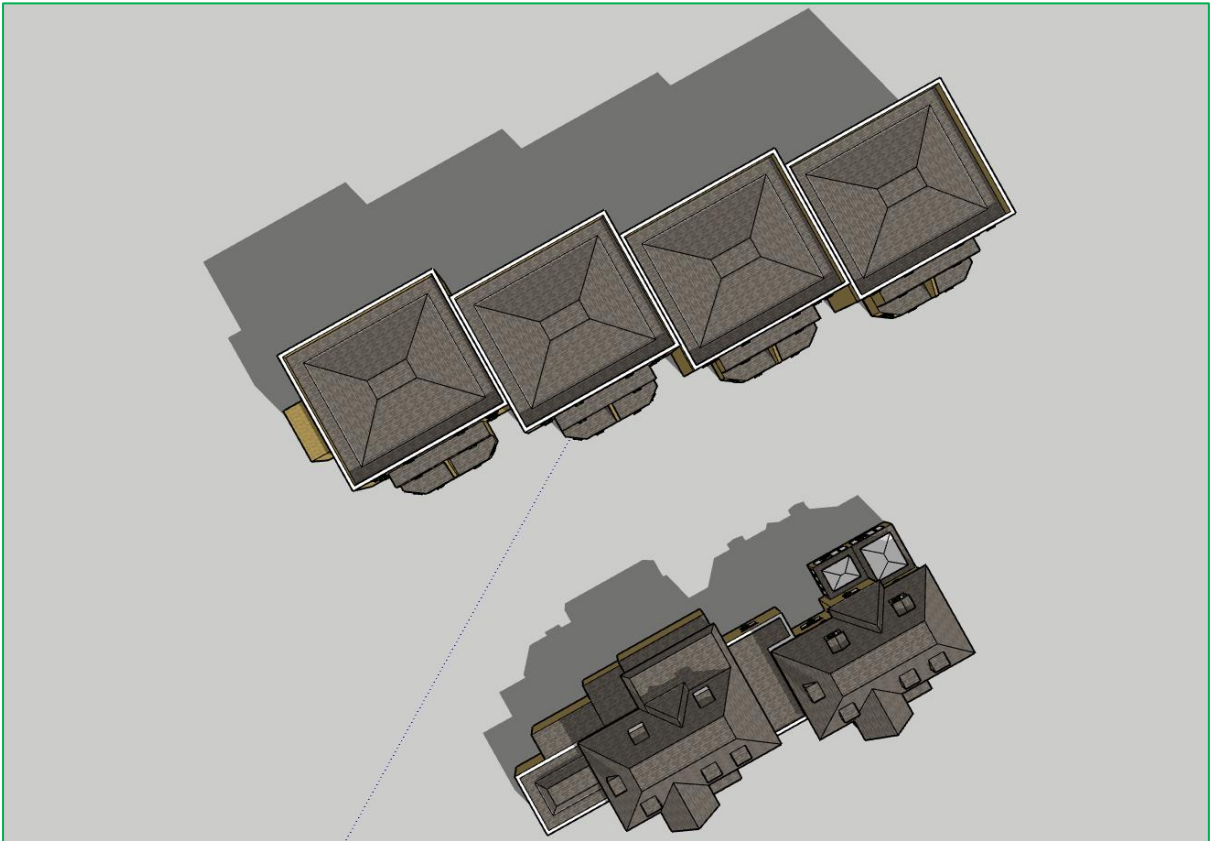


Figure 4: Shadow Analysis for March 21st at 4pm

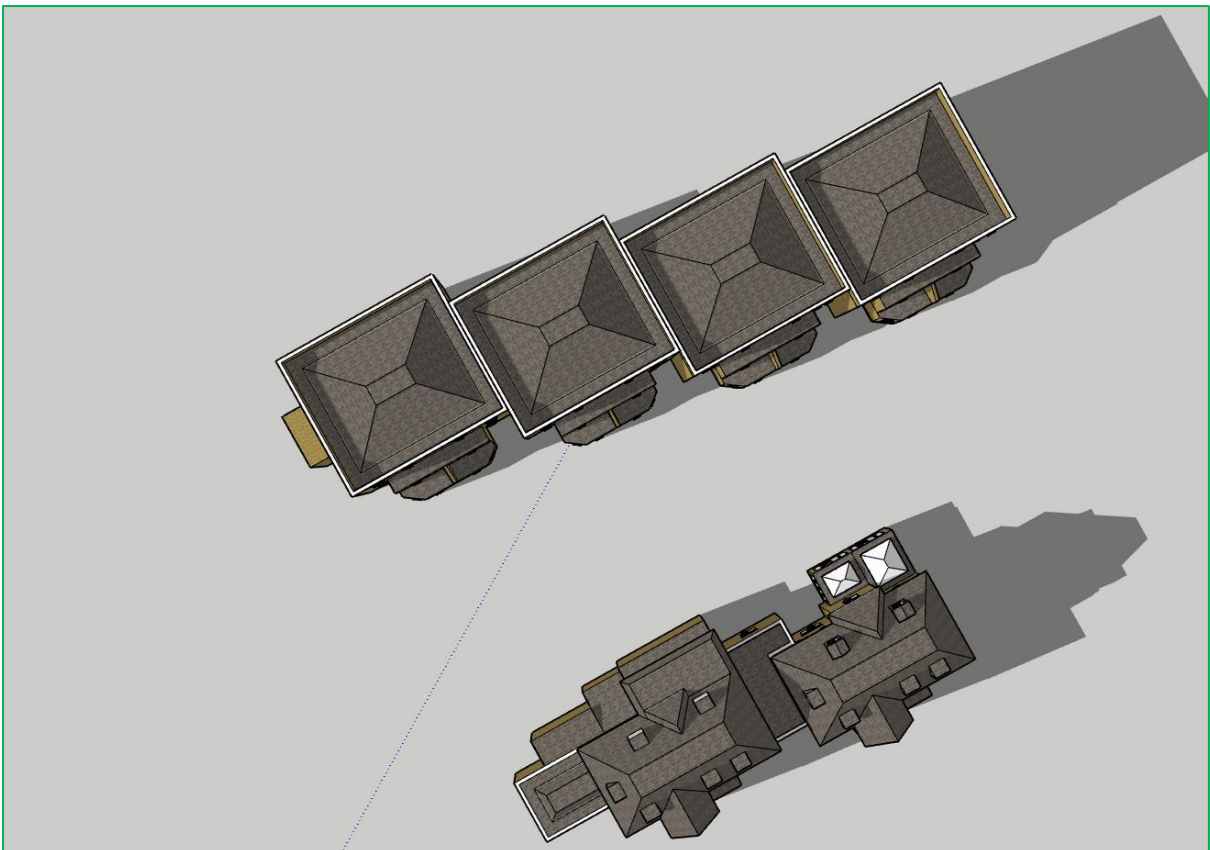


Figure 5: Shadow Analysis for June 21st at 10am

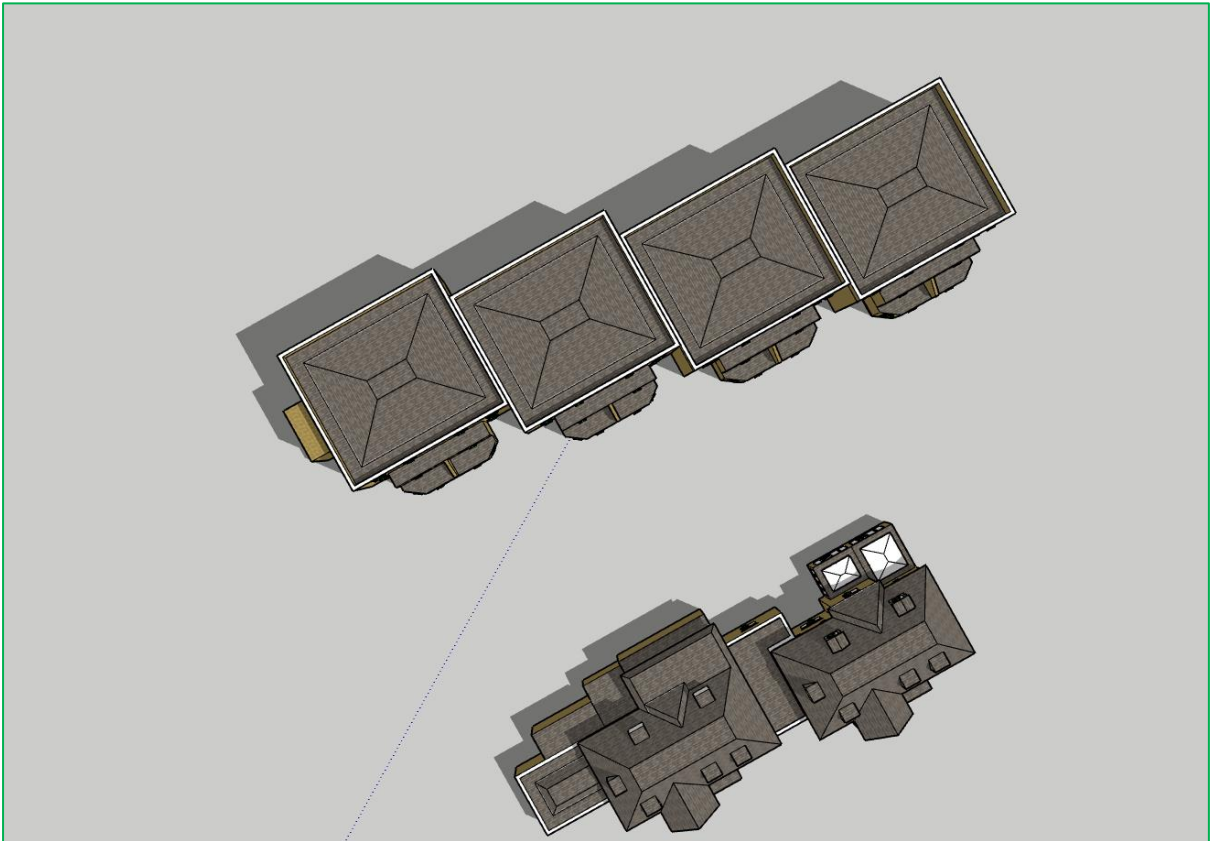


Figure 6: Shadow Analysis for June 21st at 4pm

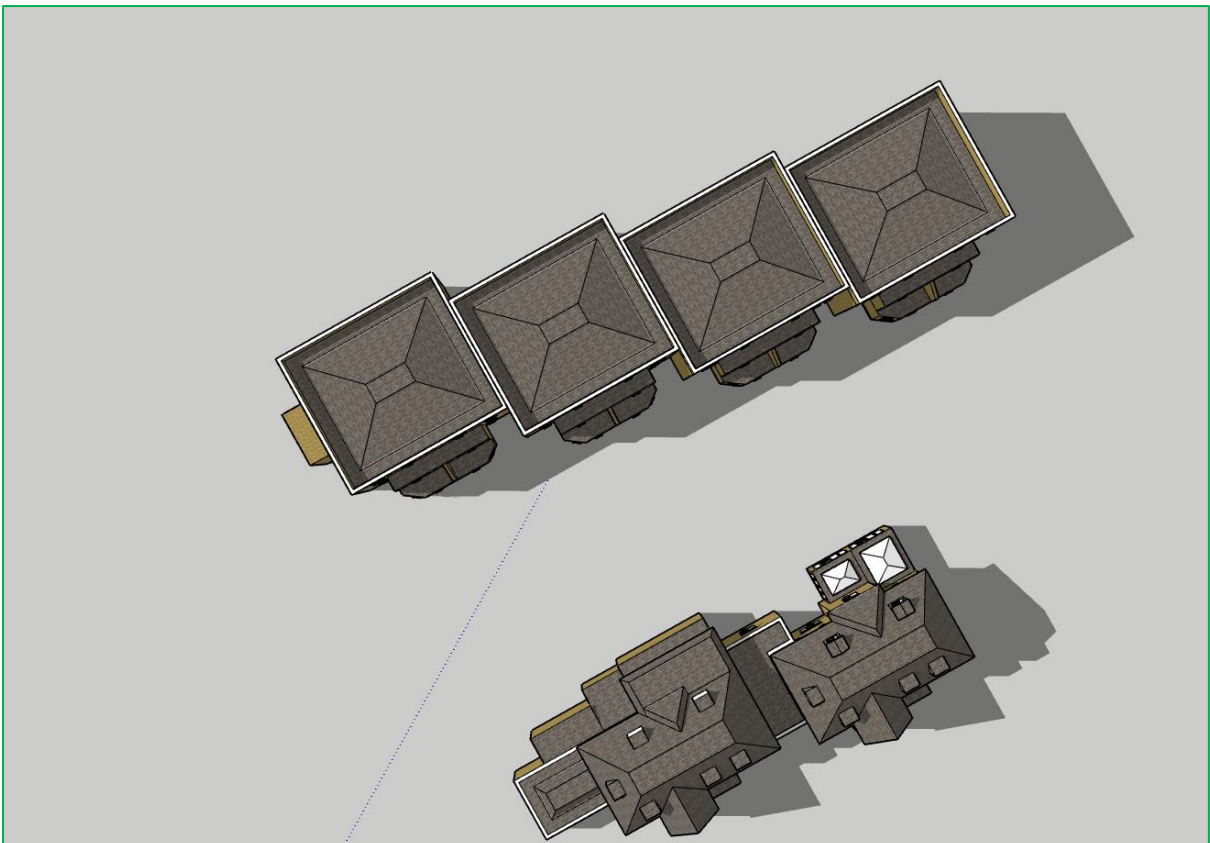


Figure 7: Shadow Analysis for September 21st at 10am

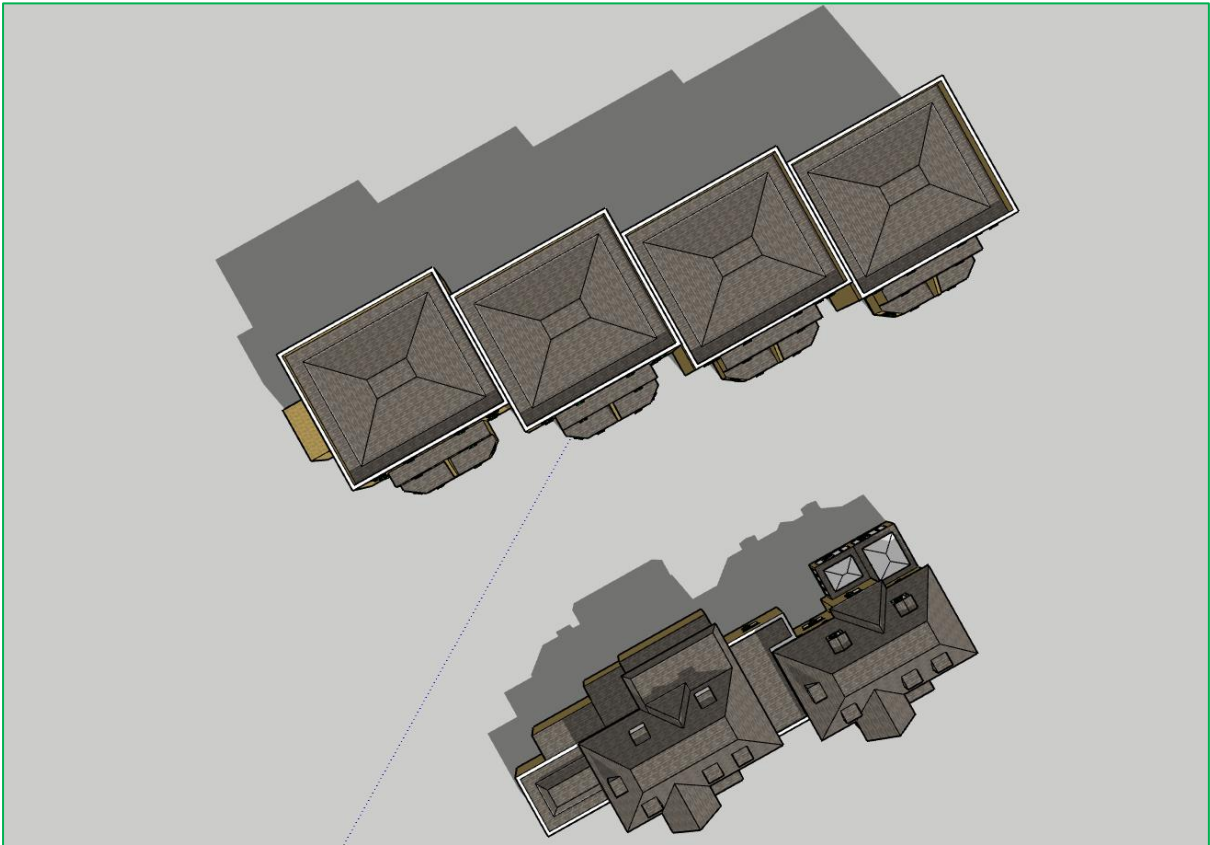


Figure 8: Shadow Analysis for September 21st at 4pm

