Report for: Cairn Homes Properties Ltd
Project No.: 14510

Newcastle, Co. Dublin

Daylight, Sunlight and Overshadowing Study

Version History

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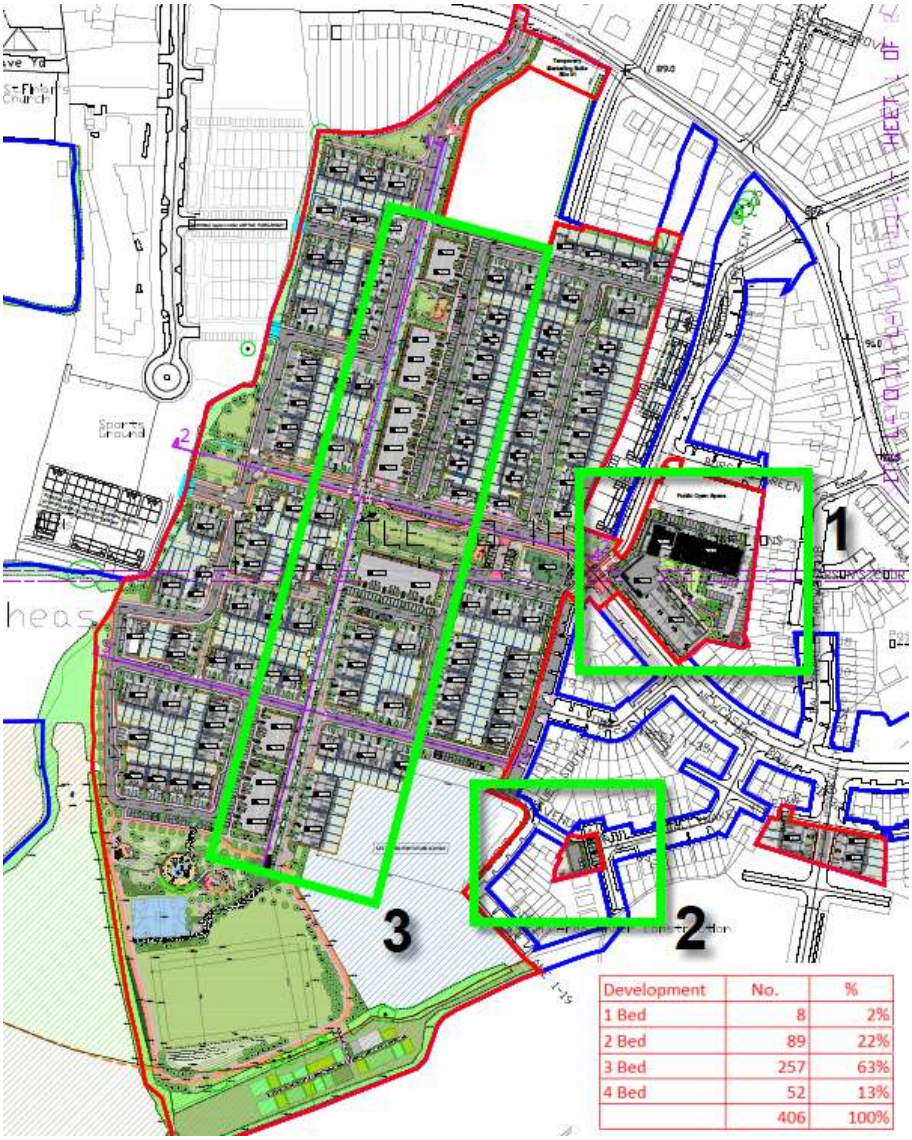
Introduction

This report was completed to quantify the Sunlight / Daylight impact of the proposed residential development at Newcastle, County Dublin on the neighbouring residential properties. As the development site is spread over a large area the report has been split up into three sections as detailed below.

Section 1: Apartments & Duplexes

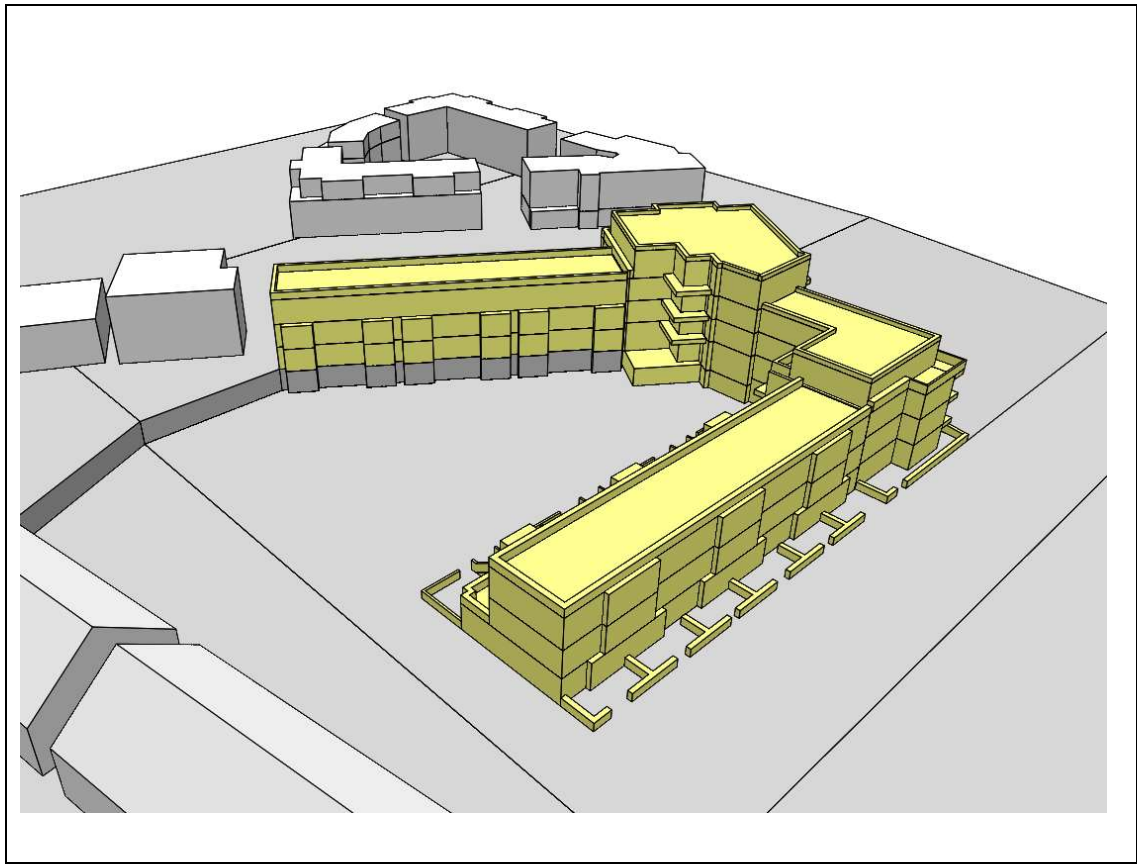
Section 2: Apartment Block C3

Section 3: Duplexes



Development	No.	%
1 Bed	8	2%
2 Bed	89	22%
3 Bed	257	63%
4 Bed	52	13%
	406	100%

Section1 - Apartments & Duplexes



Executive Summary

When considering the the impact of the proposed development of aprtaments and duplexes, the following can be concluded based on the studies undertaken.

Shadow Analysis

The Shadow analysis shows different shadows being cast at three periods within a year by the proposed scheme. The images highlight that within these time frames the proposed development has no shading on surrounding properties and therefore can be described as having a 'negligible to minor adverse impact' for the majority of the year.

Daylight Analysis of existing buildings

All of the residential points tested have a Vertical Sky Component (VSC) greater greater than 27%. Therefore these points exceed BRE recommendations.

The results show that the impact of the proposed development can be classified under the BRE as a 'negligible to minor adverse impacts' considering the guidelines in the BRE report are fully met.

Sunlight to the Existing and Proposed Amenity Spaces

Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

Existing Amenity Areas:

The images below show that on the 21st of March, the impact brought on about the proposed development on the quality of sunlight of the existing gardens is in line with the BRE recommendations as the loss of sunlight is not greater than 20% its former value (that of the Existing situation).

Therefore, any rear garden currently receiving at least 2 hours of sunlight for over half of its area on the 21st of March will continue to do so under the proposed scheme, in line with the BRE recommendations.

Proposed Amenity Spaces:

The analysis images show that on the 21st of March for the proposed scheme amenity areas, over half of all amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

Average Daylight Factors

The results above show that all of the rooms tested have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

It should be noted that the 'worst' case locations have been tested i.e. those looking into elevations with obstructed views. As the results indicate, the quality of daylight in each apartment increases going upwards through each level and as such, it would be expected that the entire development would be in line with the BRE recommendations.

Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report itself states ‘although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design.’

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite this, the site performs well in relation to the metrics considered in this report.

When comparing the proposed development against the existing situation the following can be concluded:

- Shading on surrounding properties can be described as having a ‘negligible to minor adverse impact’ for the majority of the year.
- All resultant VSC values for the residential properties tested exceed the BRE recommendations.

Also in terms of Sunlight to the Existing Amenity Spaces, any rear garden currently receiving at least 2 hours of sunlight for over half of its area on the 21st of March will continue to do so under the proposed scheme in line with the BRE recommendations.

I terms of Sunlight to the Existing and Proposed Amenity Spaces, over half of all proposed amenity areas would receive over 2 hours of sunlight on the 21st March in line with the BRE recommendations.

In addition, all of the rooms tested in the proposed development have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

Overall the results demonstrate that the proposed development performance is in line with BRE recommendations in the BRE ‘Site Layout Planning for Daylight and Sunlight’ guide, sometimes referred to as BRE Digest 209.

1 Introduction

As mentioned, this report was completed to quantify the Sunlight / Daylight impact of the proposed residential development at Newcastle, County Dublin on the neighbouring residential properties.

The focus of the study in this section considers the following items with respect to the proposed new development of apartments and duplexes:

- **Shadow Analysis** - a visual representation analysing any potential changes that may arise from the proposed development on to the neighbouring existing developments.
- **Daylight Analysis of Existing Buildings** - via consideration of Vertical sky component (VSC).
- **Sunlight to the Existing and Proposed Amenity Spaces** – via annual sunlight hours comparison.
- **Average Daylight Factor** – via consideration of the Average Daylight Factor (ADF) for the proposed development.

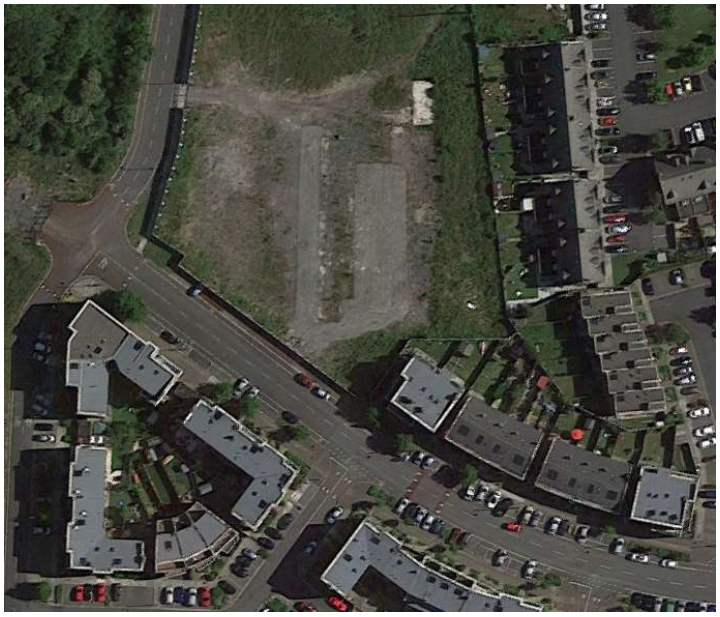
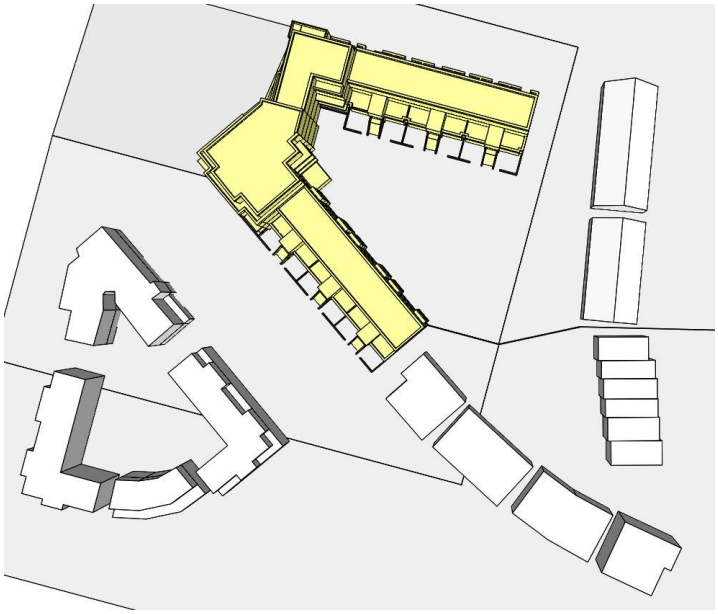
The analysis was completed using the IES VE software.

The assessment is based on recommendations given in BRE – Site Layout Planning for Daylight and Sunlight guide.

2 Methodology

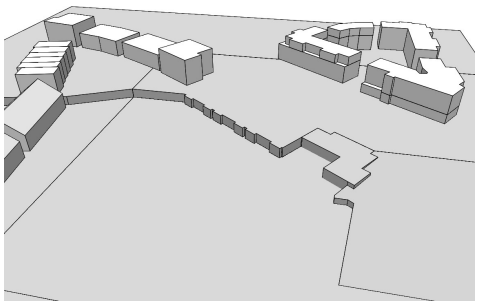
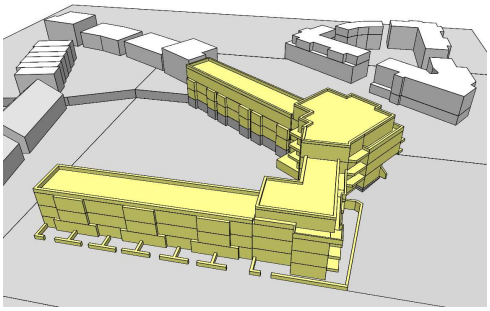
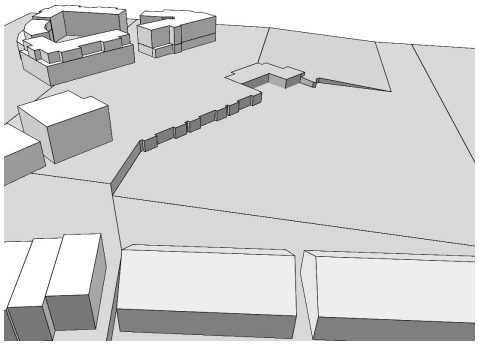
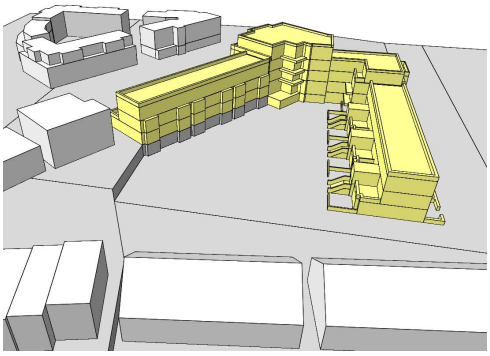
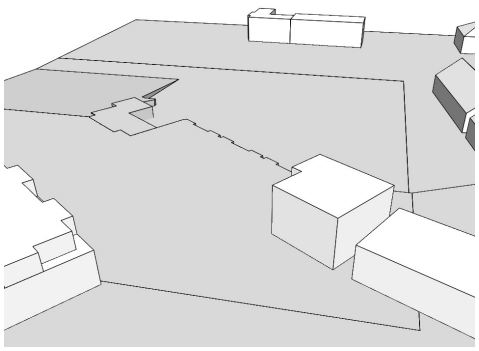
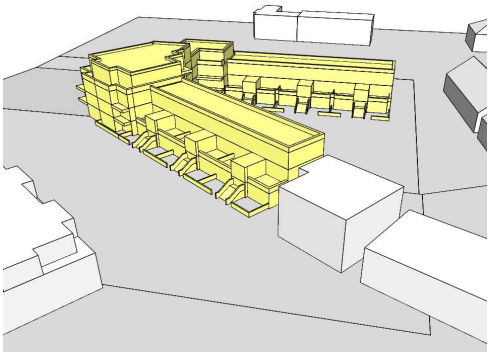
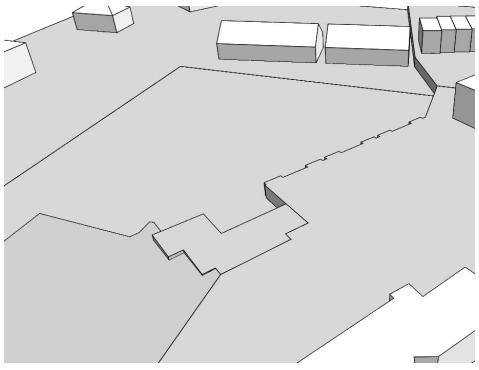
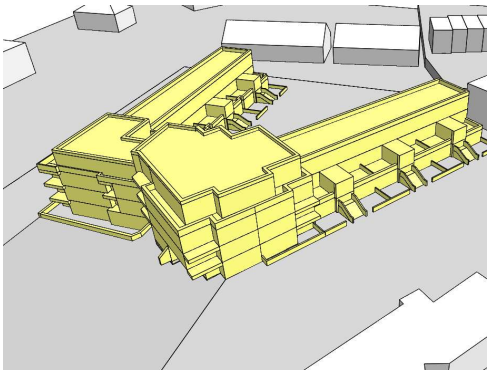
2.1 Orientation

The model orientation has been taken from Google Maps and the resulting angle shown below used in the analysis.

Orientation
 
 

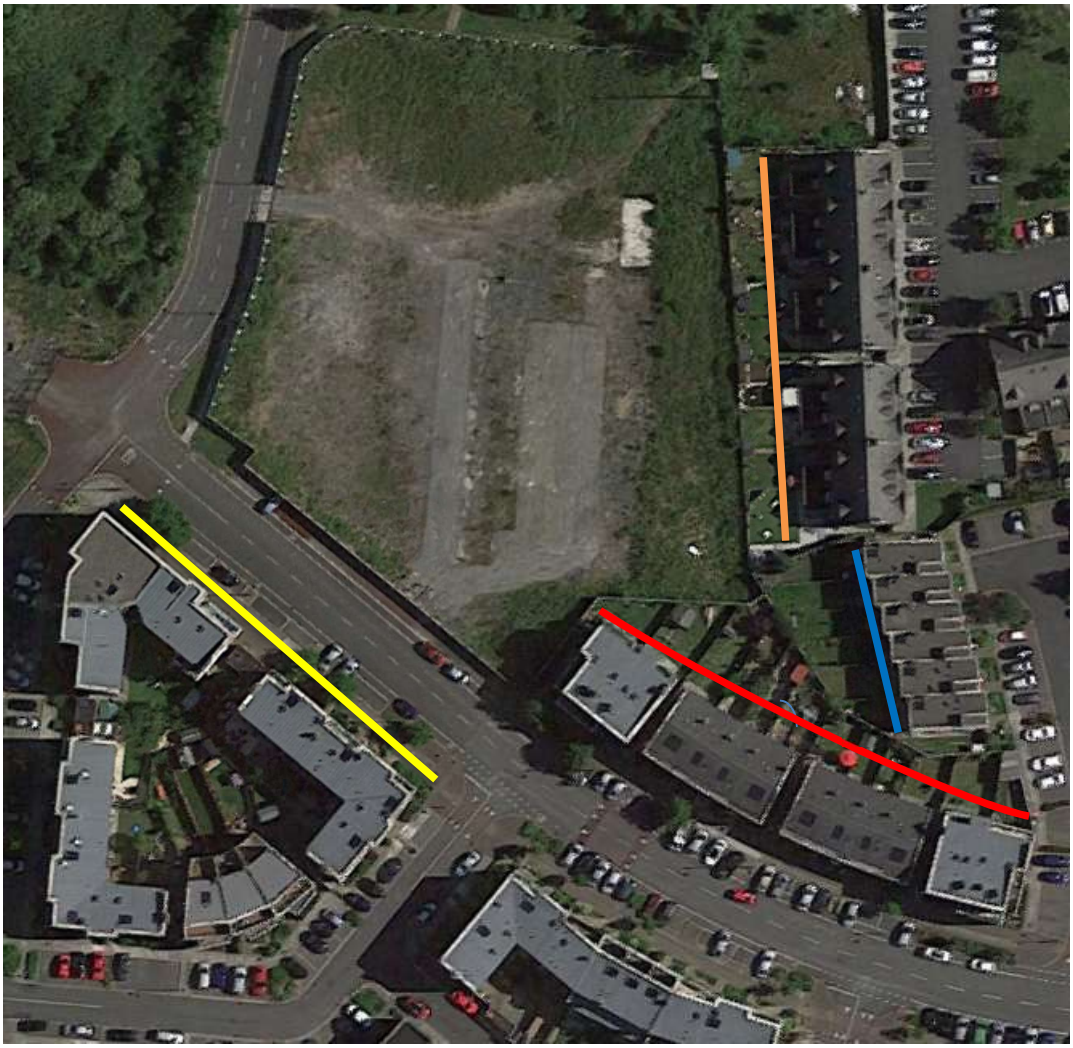
2.2 Proposed models

The following images show the models created for use across various views:

	Existing Situation	Proposed Scheme
View Looking from North of Site		
View looking from East of Site		
View looking from South of Site		
View looking from West of Site		

2.3 Potential Sensitive Receptors

To help understand the potential impact to surrounding buildings potential sensitive receptors were identified as illustrated below.



	Newcastle Blvd Dwellings – Residential
	Rear of Newcastle Blvd Dwellings – Residential
	Rear of Ballynakelly Mews Dwellings – Residential
	Rear of Parson's Ct Dwellings – Residential

3 BRE – Site Layout Planning for Daylight and Sunlight (2nd edition)

Access to daylight and sunlight is a vital part of a healthy environment. Sensitive design should provide sufficient daylight and sunlight to new housing while not obstructing light to existing homes nearby.

The BRE Report, Site layout planning for daylight and sunlight: a guide to good practice (BR209), advises on planning developments for good access to daylight and sunlight, and is widely used by local authorities to help determine the impacts of new developments.

3.1 Impact classification discussion

BRE guidance in Appendix I – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria as follows;

Negligible to minor adverse impacts	*Fully meets guidelines in BRE report*
Negligible adverse impact	• *Loss of light well within guidelines, or* • *only a small number of windows or limited area of open space losing light (within the guidelines)*
Minor adverse impact (a)	• *Loss of light only just within guidelines, or* • *A large number of windows or large areas of open space areas affected (within the guidelines)*
Minor adverse impact (b)	• *only a small number of windows or limited open space areas are affected* • *the loss of light is only marginally outside the guidelines* • *an affected room has other sources of skylight or sunlight* • *the affected building or open only has a low level requirement for skylight or sunlight* • *there are particular reason why an alternative, less stringent, guideline should be applied*
Major adverse impact	• *large number of windows or large open space areas are affected* • *the loss of light is only substantially outside the guidelines* • *all the windows in a particular property are affected* • *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)*

4 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that the sunniest months in Ireland are May and June.

The following can also be shown:

- During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours).
- During June, Dublin receives a mean daily duration of 6.4 hours of sunlight out of a potential 16.7 hours sunlight each day (i.e. only 38% of potential sunlight hours).

Therefore, impact caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months.

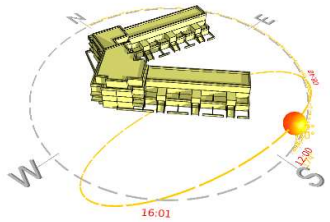
This section will consider the shadows cast for both the Existing Situation and the Proposed development for the following dates;

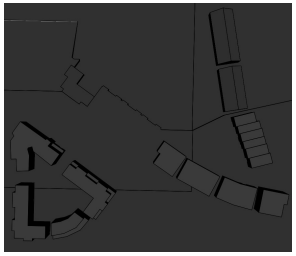
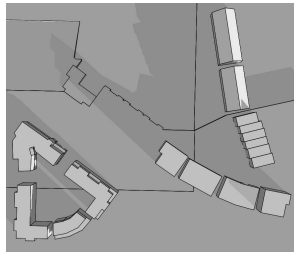
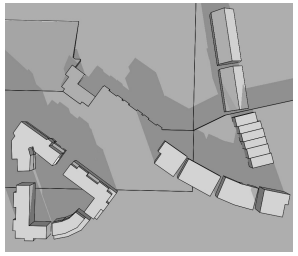
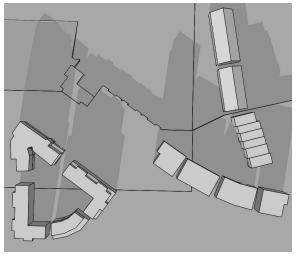
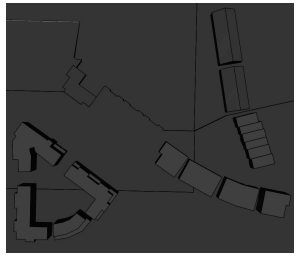
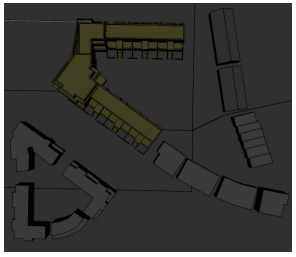
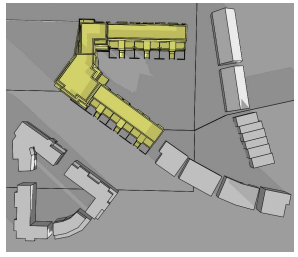
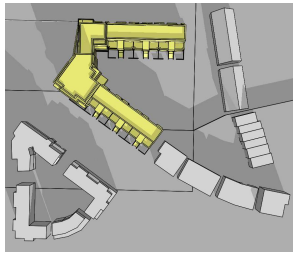
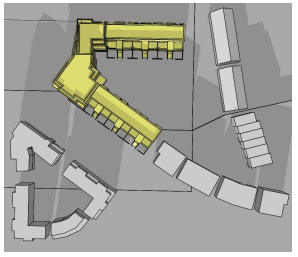
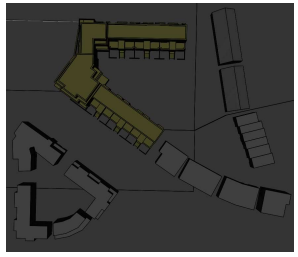
- December 21st (Winter Solstice)
- March 21st / September 21st (Equinox)
- June 21st (Summer solstice)

These images will show shadows cast for 'perfect sunny' conditions with no clouds and assumed that the sun is out for every hour shown. Given the discussion above it is important to remember that this is not always going to be the case.

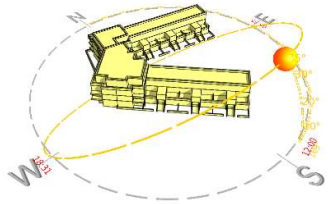
4.1 Plan View

4.1.1 December 21st



					Existing Situation
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

4.1.2 March 21st



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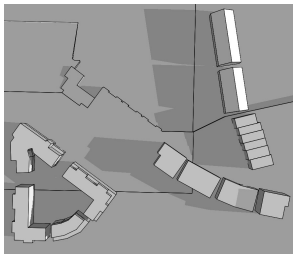
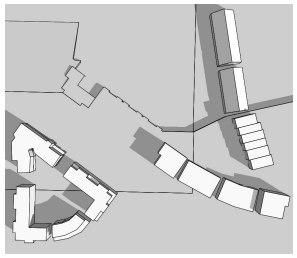
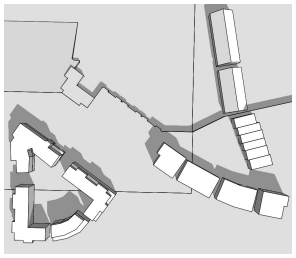
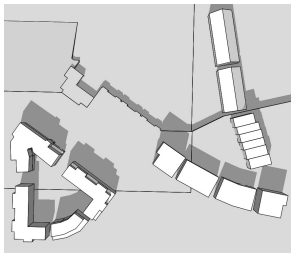
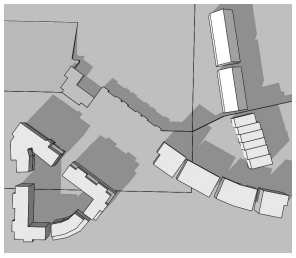
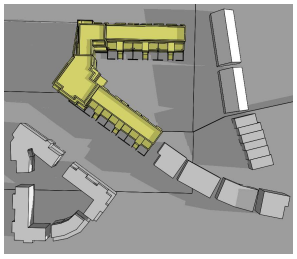
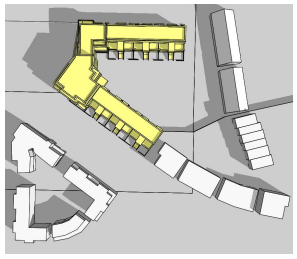
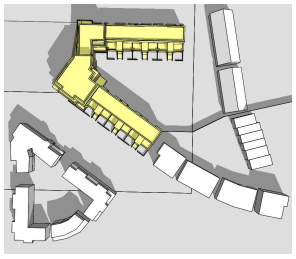
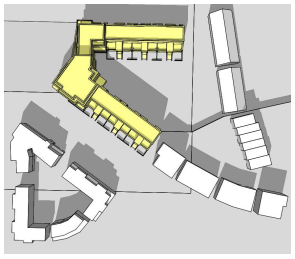
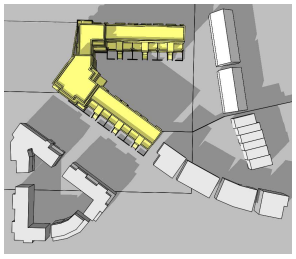
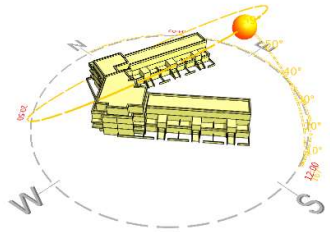
					Existing Situation
					Proposed Scheme

4.1.3 June 21st



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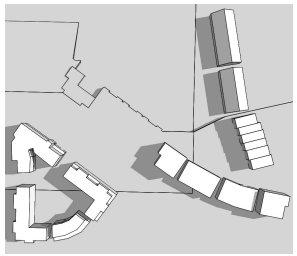
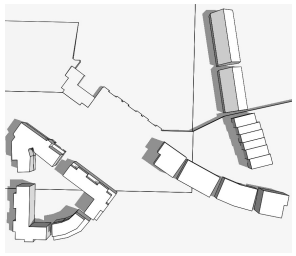
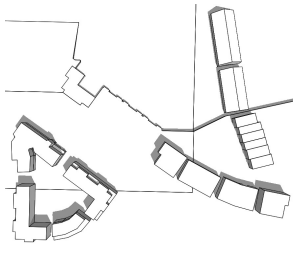
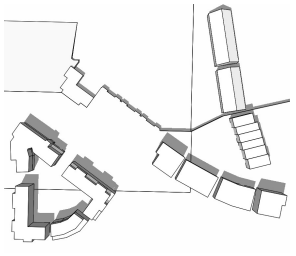
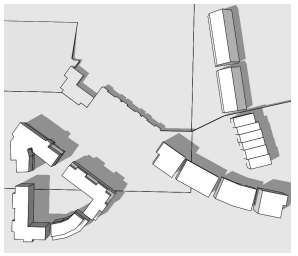
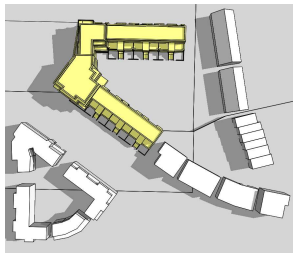
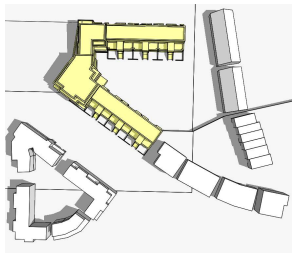
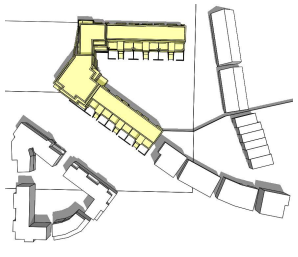
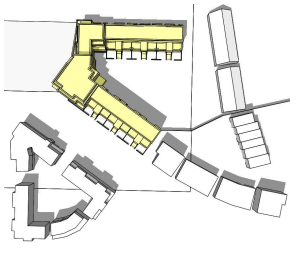
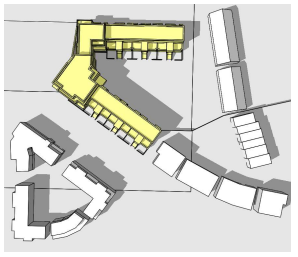
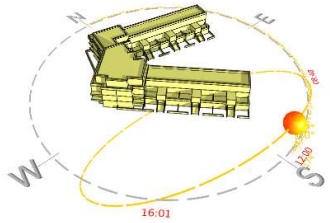
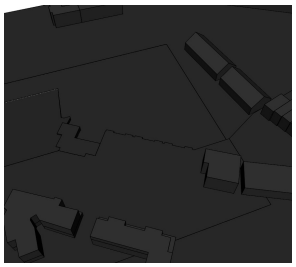
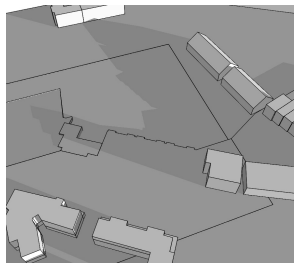
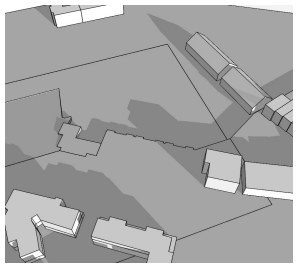
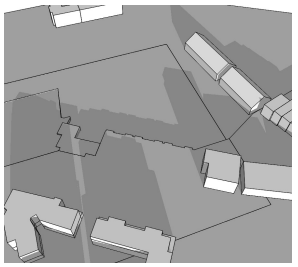
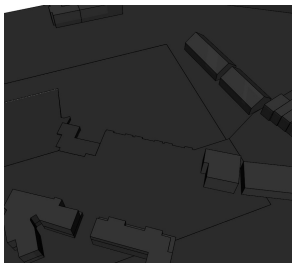
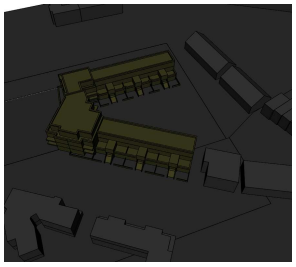
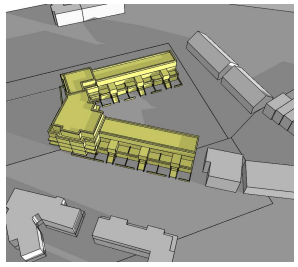
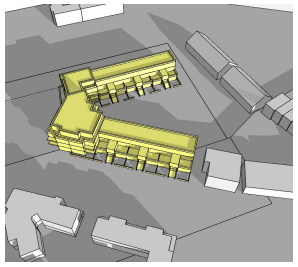
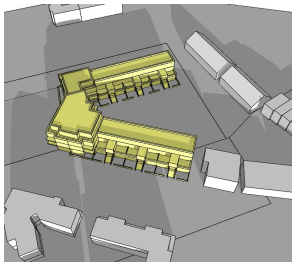
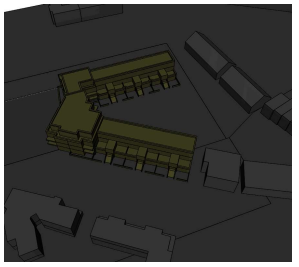
					Existing Situation
					Proposed Development

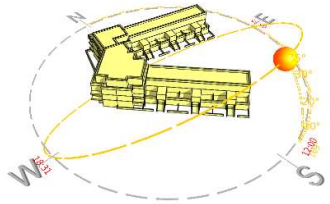
4.2 View 01: Looking over the Proposed Scheme

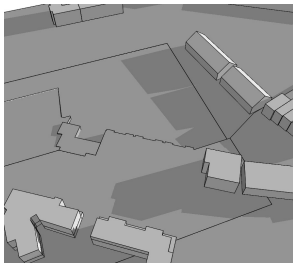
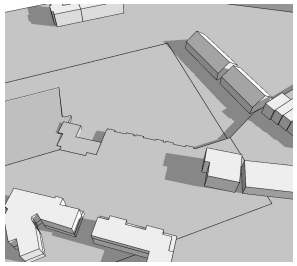
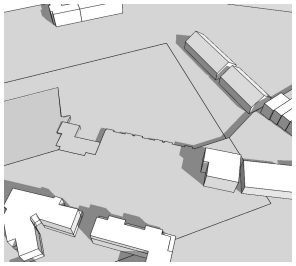
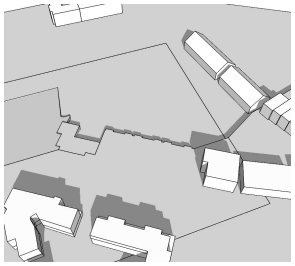
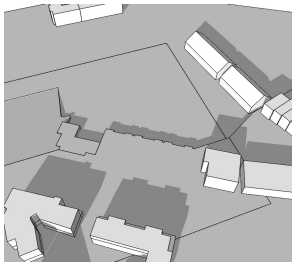
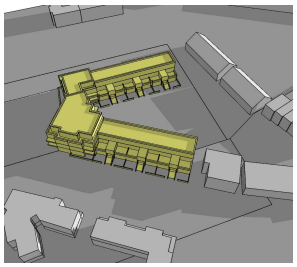
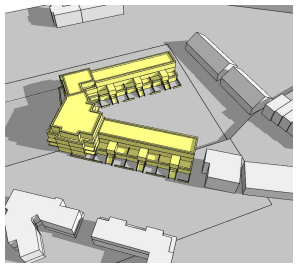
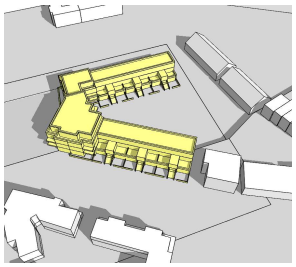
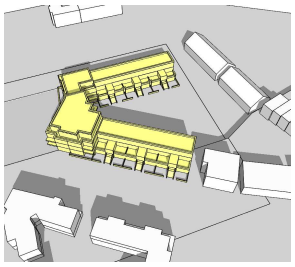
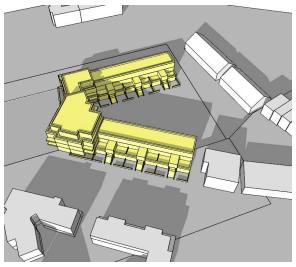
4.2.1 December 21st



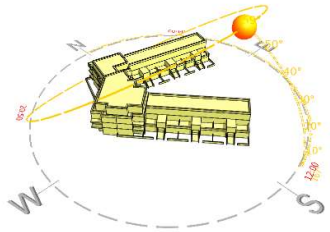
					Existing Situation
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

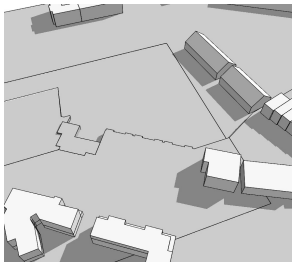
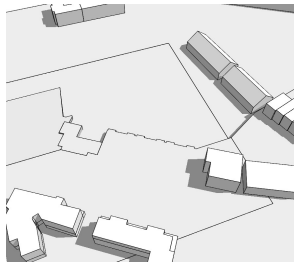
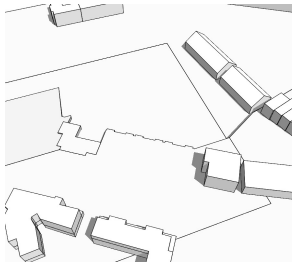
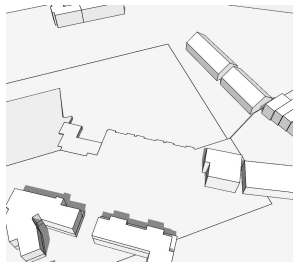
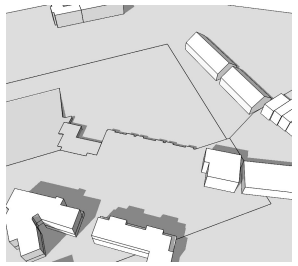
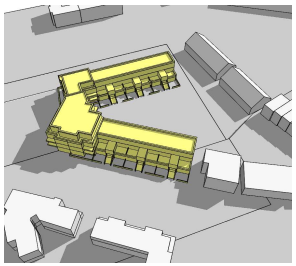
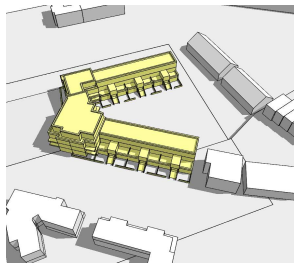
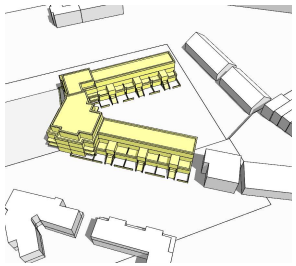
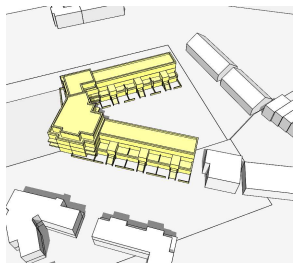
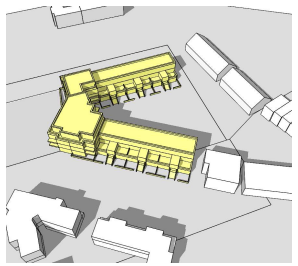
4.2.2 March 21st



					Existing Situation
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

4.2.3 June 21st



8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	
					Existing Situation
					Proposed Development

4.3 Discussion

Shading from the proposed development is summarised as follows based on the analysis of images above:

- **Morning (until 12h00); December, March & June**
  - **Newcastle Blvd Dwellings** – no additional shading visible from the proposed development on these existing residential properties as they sit to the South of the development site**.**
  - **Rear of Newcastle Blvd Dwellings** – no additional shading visible from the proposed development on these existing dwellings as they sit to the South East of the development site**.**
  - **Rear of Ballynakelly Mews Dwellings** – no additional shading visible from the proposed development on these existing dwellings as they sit distantly to the East of the development site.
  - **Rear of Parson's Ct Dwellings –** no additional shading visible from the proposed development on these existing dwellings as they sit distantly to the East of the development site.

- **Midday (from 12h00 until 14h00)**; **December, March & June**
  - **Newcastle Blvd Dwellings** – no additional shading visible from the proposed development on these existing residential properties as they sit to the South of the development site**.**
  - **Rear of Newcastle Blvd Dwellings** – no additional shading visible from the proposed development on these existing dwellings as they sit to the South East of the development site**.**
  - **Rear of Ballynakelly Mews Dwellings** – no additional shading visible from the proposed development on these existing dwellings as they sit distantly to the East of the development site.
  - **Rear of Parson's Ct Dwellings –** no additional shading visible from the proposed development on these existing dwellings as they sit distantly to the East of the development site.

- **Late Afternoon (from 16h00); December, March & June**
  - **Newcastle Blvd Dwellings** – no additional shading visible from the proposed development on these existing residential properties as they sit to the South of the development site**.**
  - **Rear of Newcastle Blvd Dwellings** – no additional shading visible from the proposed development on these existing dwellings as they sit to the South East of the development site**.**
  - **Rear of Ballynakelly Mews Dwellings** – no additional shading visible from the proposed development on these existing dwellings as they sit distantly to the East of the development site.
  - **Rear of Parson's Ct Dwellings –** no additional shading visible from the proposed development on these existing dwellings as they sit distantly to the East of the development site.

The potential impact is quantified within the Daylight Analysis of Existing Buildings section of this report.

5 Daylight Analysis of Existing Buildings

5.1 Guidance Requirements

BRE Site layout planning for daylight and sunlight (Section 2.2)

When designing a new development, it is important to safeguard the daylight to nearby buildings. The BRE's 2011 guidance provide numerical values that are purely advisory. Different criteria may be used based on the requirements for daylighting in an area viewed against other site layout constraints. Another issue is whether the Permitted building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light. Any reduction in the total amount of skylight can be calculated by finding the vertical sky component at the centre of key reference points. The vertical sky component definition from the BRE's 2011 is described below;

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 this 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.

The maximum possible VSC value for an opening in a vertical wall, assuming no obstructions, is 40%. This VSC at any given point can be tested in the Radiance module of the IES VE software.

For typical Schemes the BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight which states the following in Section 2.2.7

> 2.2.7 If this VSC is greater than 27% then enough skylight should still be reaching the window of the existing building. Any reduction below this level should be kept to a minimum. If the VSC, with the new development in place, is both less than 27% and less than 0.8 times its former value, occupants of the existing building will notice the reduction in the amount of skylight. The area lit by the window is likely to appear more gloomy, and electric lighting will be needed more of the time.

As such this study will compare the Existing Situation and Proposed Schemes and consider whether any reduction with be greater than 27% or less than 0.8 times its former value.

5.1.1 VSC values

The BRE Guide also states the following in Section 2.1.6 that the amount of daylight a room needs depends on what it is being used for, but roughly speaking if the VSC is:

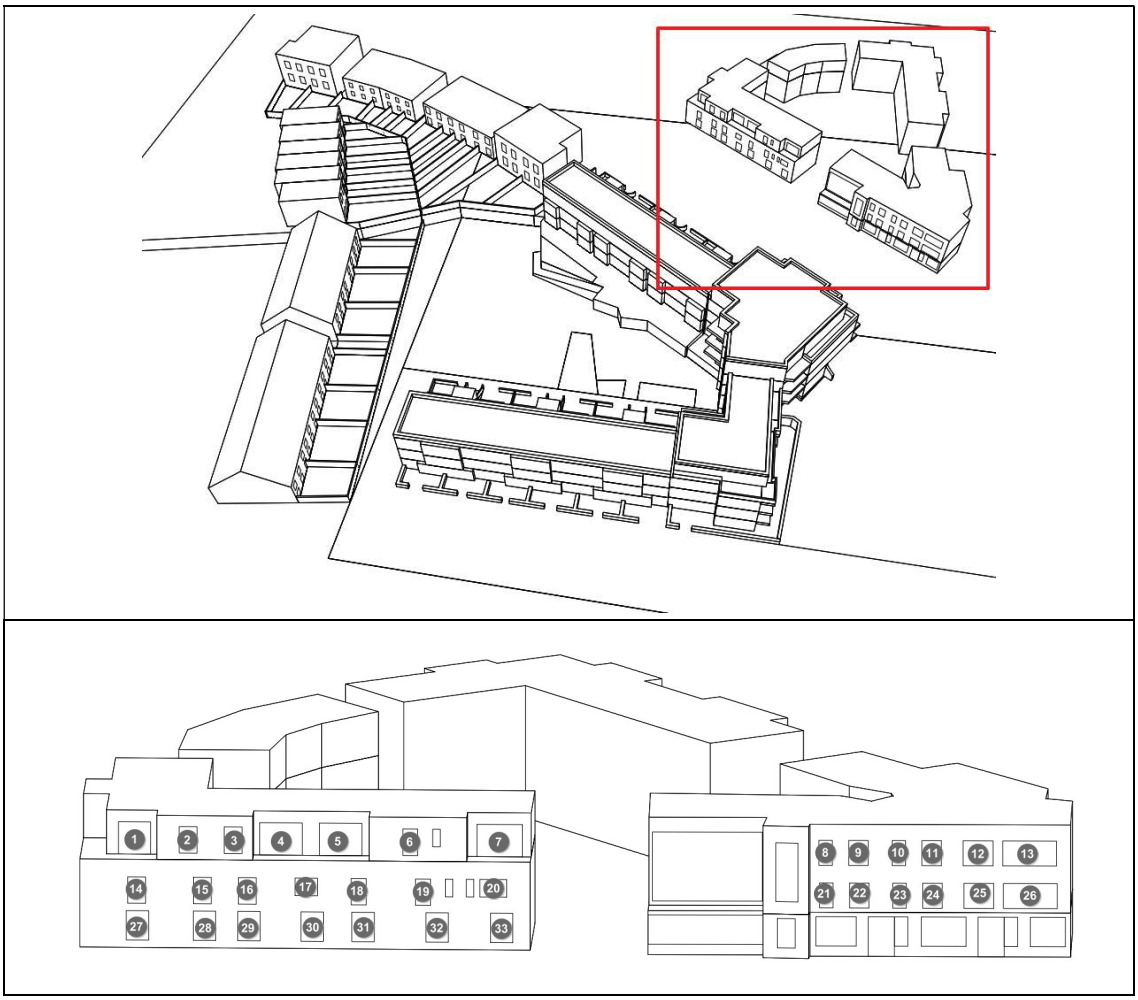
- ≥ 27%, conventional window design will usually give reasonable results
- between 15 % and 27 % special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight
- between 5 % and 15 % it is difficult to provide adequate daylight unless very large windows are used
- <5 % it is often impossible to achieve reasonable daylight even if the whole window wall is glazed

As such these values will be referred to as part of the analysis of the adjacent properties.

5.2 Assessment

5.2.1 Newcastle Blvd Dwellings

Based on the above the following locations have been modelled:



Points	Existing Situation VSC	Proposed Scheme VSC	Proposed VSC % of Existing Situation	Comment
1	33.93	33.55	99%	✓
2	38.86	37.80	97%	✓
3	38.99	37.58	96%	✓
4	35.40	33.90	96%	✓
5	35.55	34.23	96%	✓
6	39.12	37.36	96%	✓
7	36.47	34.62	95%	✓
8	36.02	32.92	91%	✓
9	38.82	36.17	93%	✓
10	39.10	36.58	94%	✓
11	39.24	36.66	93%	✓
12	39.15	36.90	94%	✓
13	39.16	37.12	95%	✓
14	37.96	35.45	93%	✓
15	38.02	35.44	93%	✓
16	38.28	35.40	92%	✓
17	38.21	35.34	92%	✓
18	38.23	34.91	91%	✓
19	38.27	35.18	92%	✓
20	38.69	34.99	90%	✓
21	35.23	31.75	90%	✓
22	38.43	34.12	89%	✓
23	38.88	34.70	89%	✓
24	38.78	34.89	90%	✓
25	38.77	35.27	91%	✓
26	38.85	35.67	92%	✓
27	36.76	33.78	92%	✓
28	37.18	33.64	90%	✓
29	37.44	33.67	90%	✓
30	37.66	33.72	90%	✓
31	37.80	33.42	88%	✓
32	37.93	33.21	88%	✓
33	38.06	33.03	87%	✓

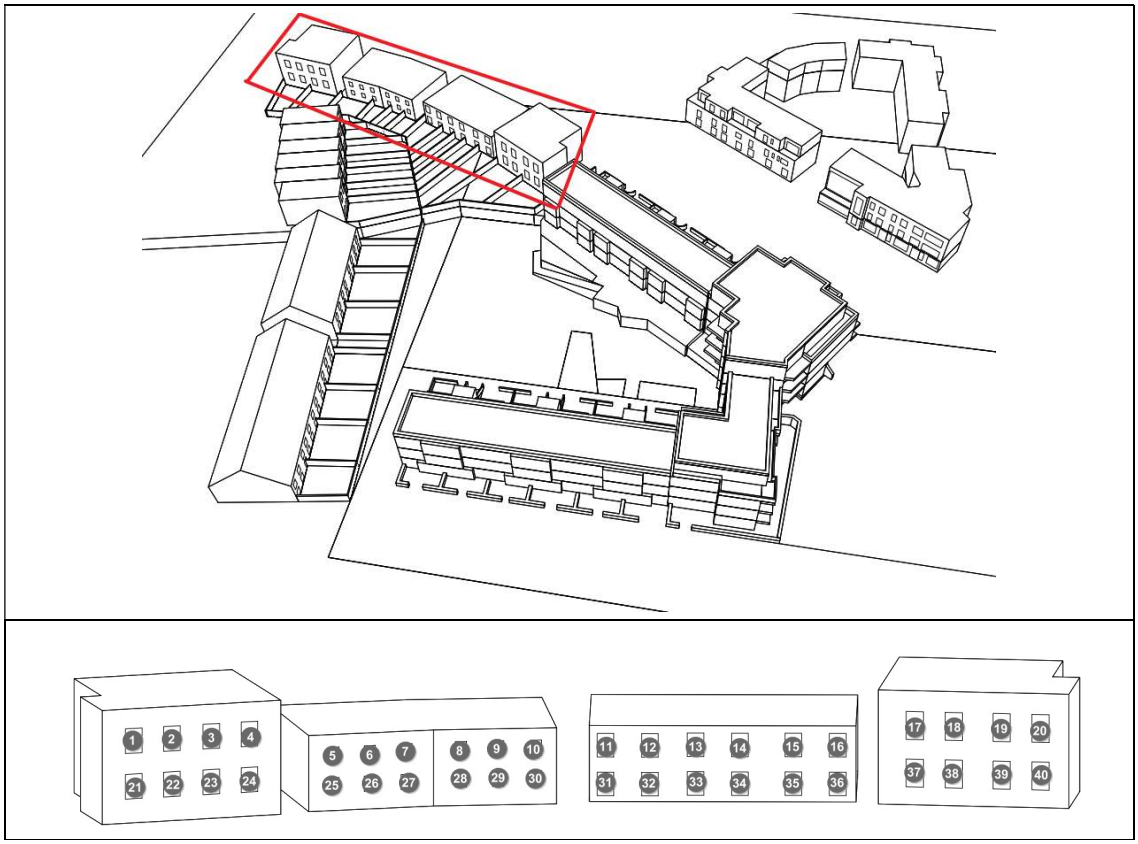
The following conclusions can be made:

✓ All of the tested points have a vertical sky component of greater than 27%.

Therefore these points exceed BRE recommendations.

5.2.2 Rear of Newcastle Blvd Dwellings

Based on the above the following locations have been modelled:



Points	Existing Situation VSC	Proposed Scheme VSC	Proposed VSC % of Existing Situation	Comment
1	39.05	38.97	100%	✓
2	38.98	38.98	100%	✓
3	39.03	38.93	100%	✓
4	38.80	38.80	100%	✓
5	36.42	36.42	100%	✓
6	36.54	36.44	100%	✓
7	36.52	36.35	100%	✓
8	36.93	36.72	99%	✓
9	36.93	36.74	99%	✓
10	37.25	36.90	99%	✓
11	37.41	37.33	100%	✓
12	37.50	37.32	100%	✓
13	37.79	37.51	99%	✓
14	38.00	37.69	99%	✓
15	37.81	37.72	100%	✓
16	37.99	37.23	98%	✓
17	38.95	38.67	99%	✓
18	38.87	38.80	100%	✓
19	38.77	38.38	99%	✓
20	38.95	37.59	97%	✓
21	37.88	37.57	99%	✓
22	37.42	37.24	100%	✓
23	36.68	36.30	99%	✓
24	35.64	35.64	100%	✓
25	34.02	33.57	99%	✓
26	33.60	33.08	98%	✓
27	33.67	33.56	100%	✓
28	34.17	33.77	99%	✓
29	34.20	34.20	100%	✓
30	34.87	34.48	99%	✓
31	33.54	33.53	100%	✓
32	24.67	24.67	100%	✓
33	30.94	30.94	100%	✓
34	29.81	29.81	100%	✓
35	28.87	28.84	100%	✓
36	35.49	35.48	100%	✓
37	37.33	36.68	98%	✓
38	37.46	36.79	98%	✓
39	37.66	36.33	96%	✓
40	37.75	34.95	93%	✓

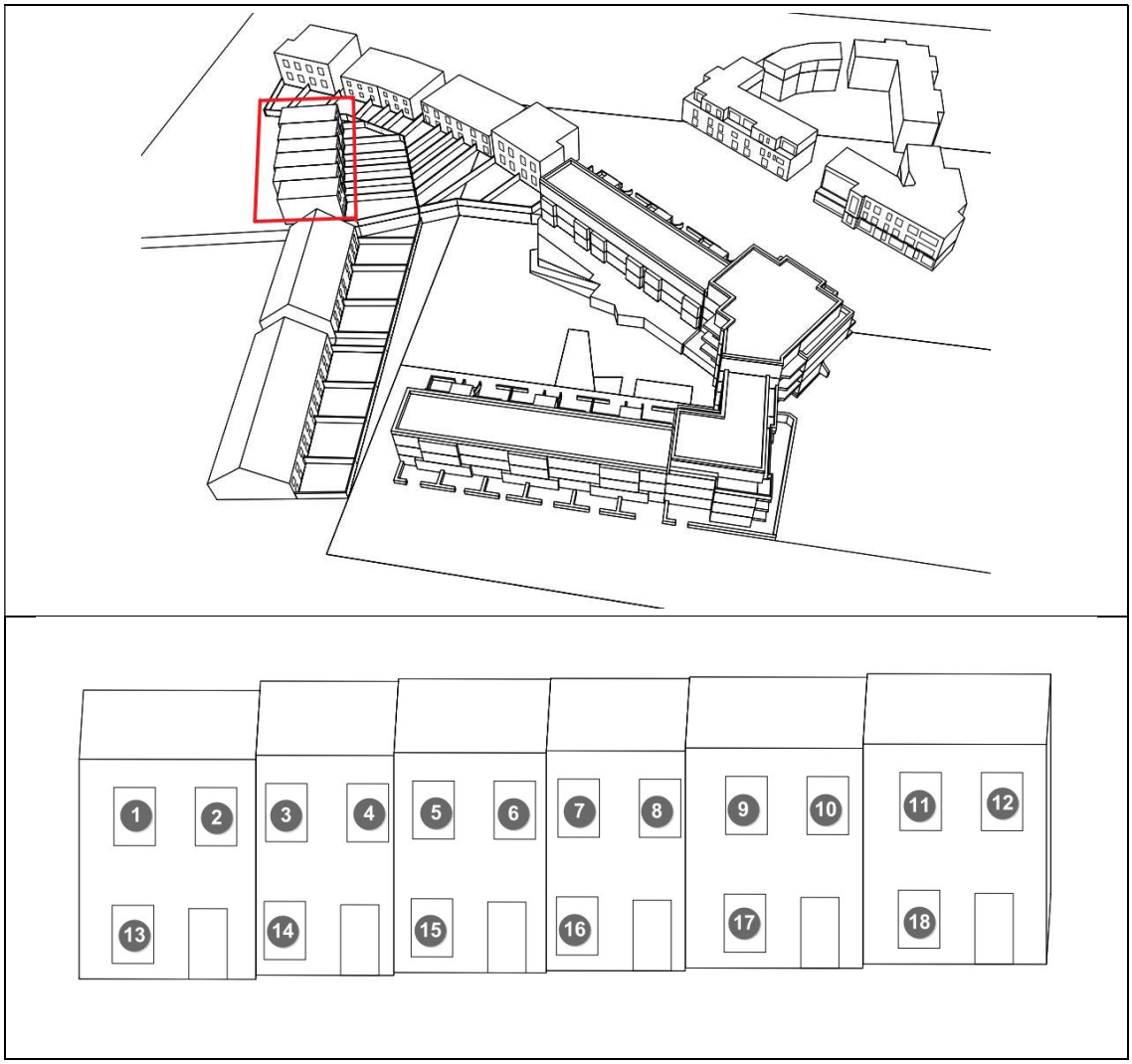
The following conclusions can be made:

✓ All of the tested points have a vertical sky component of greater than 27% or not less than 0.8 times their former value (that of the Existing Situation).

Therefore, these points are all compliant with BRE recommendations.

Rear of Ballynakelly Mews Dwellings

Based on the above the following locations have been modelled:



Points	Existing Situation VSC	Proposed Scheme VSC	Proposed VSC % of Existing Situation	Comment
1	38.24	37.37	98%	✓
2	38.36	37.45	98%	✓
3	34.75	33.82	97%	✓
4	38.18	37.39	98%	✓
5	36.89	36.53	99%	✓
6	38.23	37.58	98%	✓
7	37.30	36.60	98%	✓
8	37.99	37.67	99%	✓
9	37.67	37.25	99%	✓
10	38.10	37.55	99%	✓
11	36.97	36.39	98%	✓
12	37.90	37.47	99%	✓
13	35.67	34.51	97%	✓
14	30.41	29.67	98%	✓
15	32.60	32.20	99%	✓
16	31.71	31.71	100%	✓
17	33.32	33.13	99%	✓
18	31.08	31.08	100%	✓

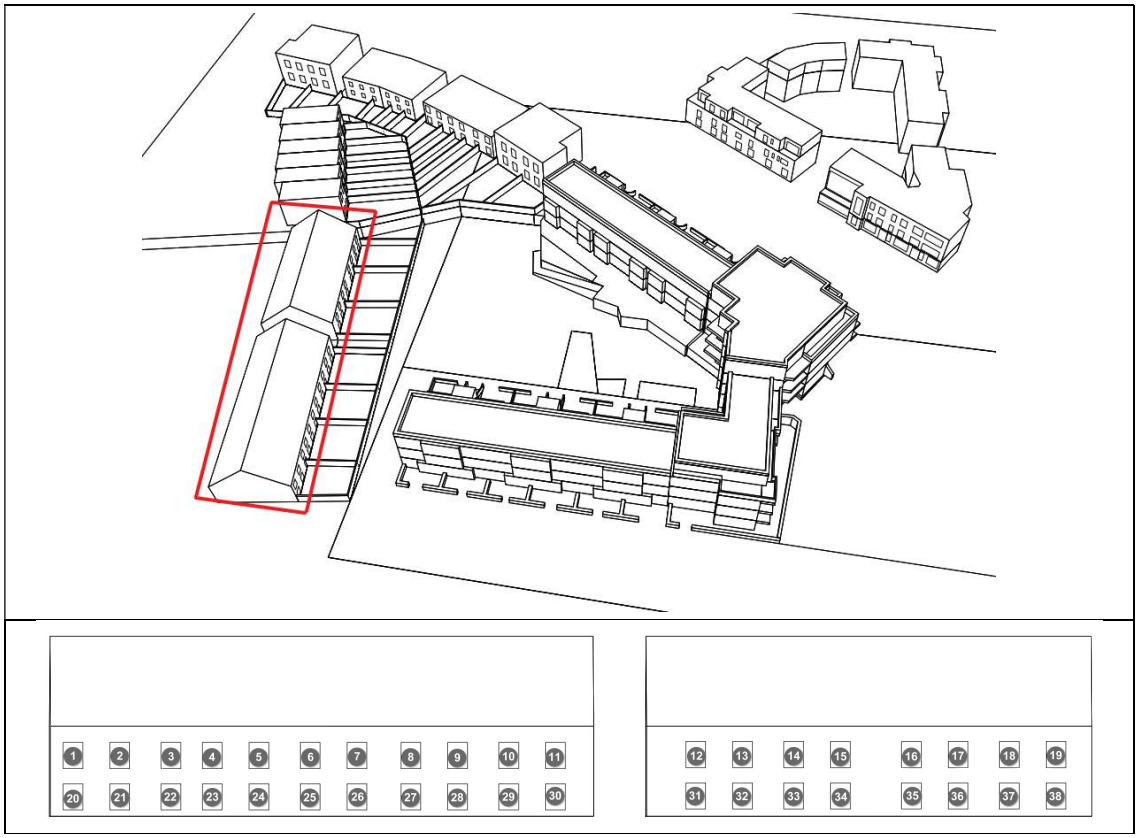
The following conclusions can be made:

✓ All of the tested points have a vertical sky component of greater than 27%.

Therefore, these points are all compliant with BRE recommendations.

5.2.3 Rear of Parson's Ct Dwellings

Based on the above the following locations have been modelled:



Points	Existing Situation VSC	Proposed Scheme VSC	Proposed VSC % of Existing Situation	Comment
1	38.20	34.79	91%	✓
2	38.29	34.80	91%	✓
3	38.27	34.53	90%	✓
4	38.19	34.38	90%	✓
5	38.12	34.26	90%	✓
6	38.28	33.92	89%	✓
7	38.17	33.87	89%	✓
8	38.20	34.04	89%	✓
9	38.13	34.16	90%	✓
10	38.05	34.37	90%	✓
11	37.86	34.07	90%	✓
12	37.74	34.46	91%	✓
13	37.63	34.58	92%	✓
14	37.55	34.49	92%	✓
15	37.46	34.69	93%	✓
16	37.28	34.26	92%	✓
17	37.07	34.22	92%	✓
18	36.93	34.26	93%	✓
19	36.41	33.73	93%	✓
20	31.97	28.07	88%	✓
21	35.40	31.43	89%	✓
22	0.00	0.00	100%	✓
23	35.38	30.50	86%	✓
24	36.03	31.34	87%	✓
25	22.42	18.39	82%	✓
26	35.46	30.68	87%	✓
27	34.72	31.05	89%	✓
28	28.17	26.53	94%	✓
29	36.10	32.21	89%	✓
30	34.98	31.38	90%	✓
31	35.46	32.70	92%	✓
32	35.92	32.60	91%	✓
33	20.35	19.06	94%	✓
34	35.09	32.66	93%	✓
35	35.29	32.57	92%	✓
36	20.30	19.05	94%	✓
37	33.60	31.56	94%	✓
38	32.71	30.30	93%	✓

The following conclusions can be made:

✓ All of the tested points have a vertical sky component of greater than 27% or not less than 0.8 times their former value (that of the Existing Situation).

Therefore, these points are all compliant with BRE recommendations.

Discussion

For the following residential locations considered:

- Newcastle Blvd Dwellings
- Rear of Newcastle Blvd Dwellings
- Rear of Ballynakelly Mews Dwellings

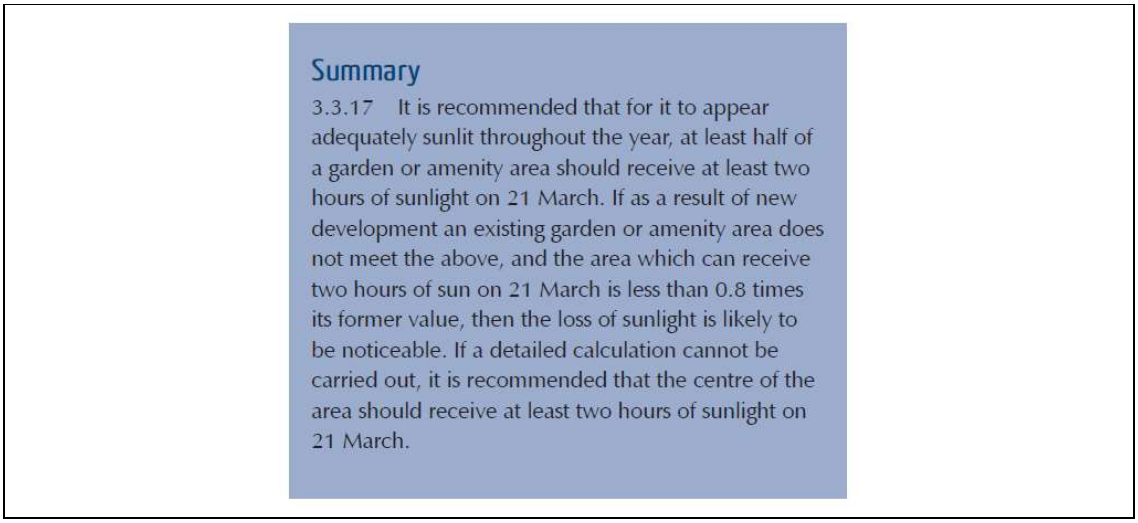
All of the residential points tested have a Vertical Sky Component (VSC) greater than 27% or not less than 0.8 times their former value (that of the Existing Situation)in line with BRE guidelines.

The results show that the impact of the proposed development can be classified under the BRE as a 'negligible to minor adverse impacts' considering the guidelines in the BRE report are fully met.

6 Sunlight to the Existing and Proposed Amenity Spaces

6.1 Requirements

The impact of the development proposal on the sunlight availability in the amenity areas will be considered to determine how they perform when assessed against the BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight which states the following in Section 3.3.17;



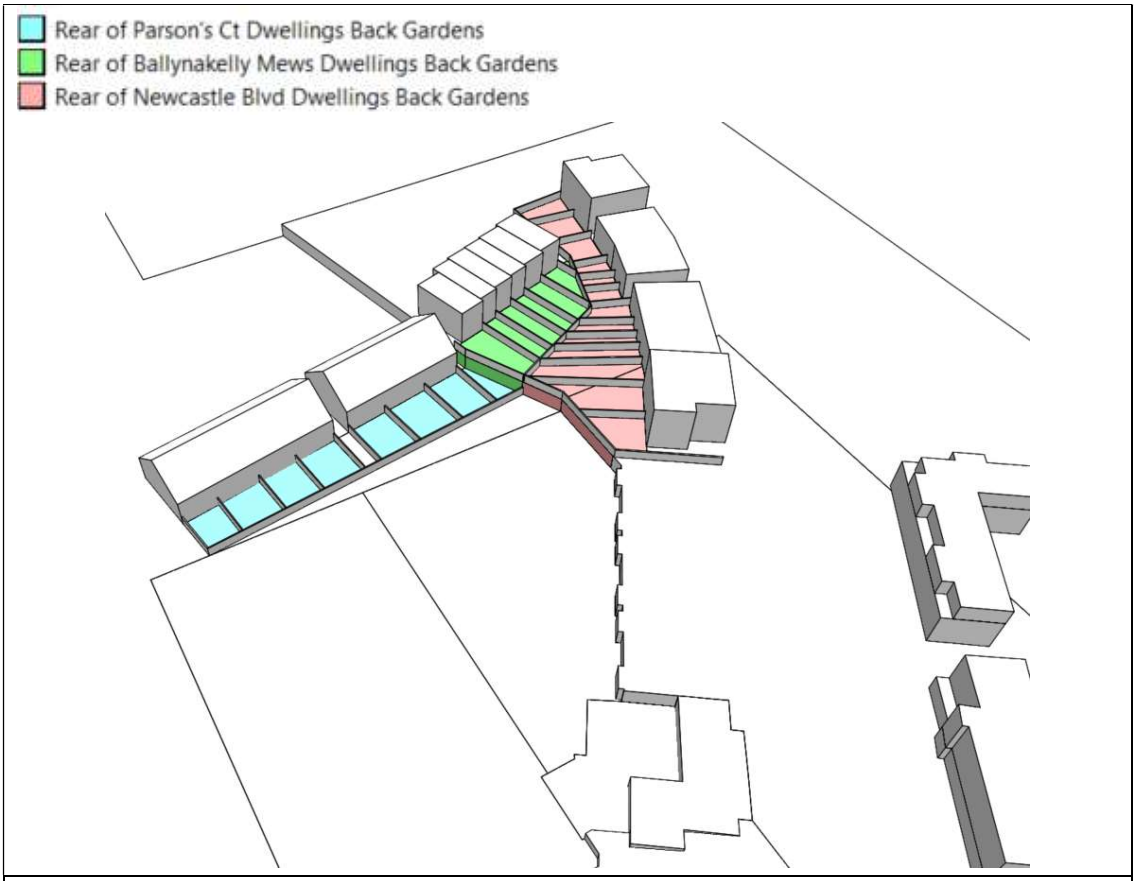
Summary

3.3.17 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 21 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 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March.

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states in 3.3.17 that for a space to, appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on 21st March.

6.2 Existing Amenity Areas

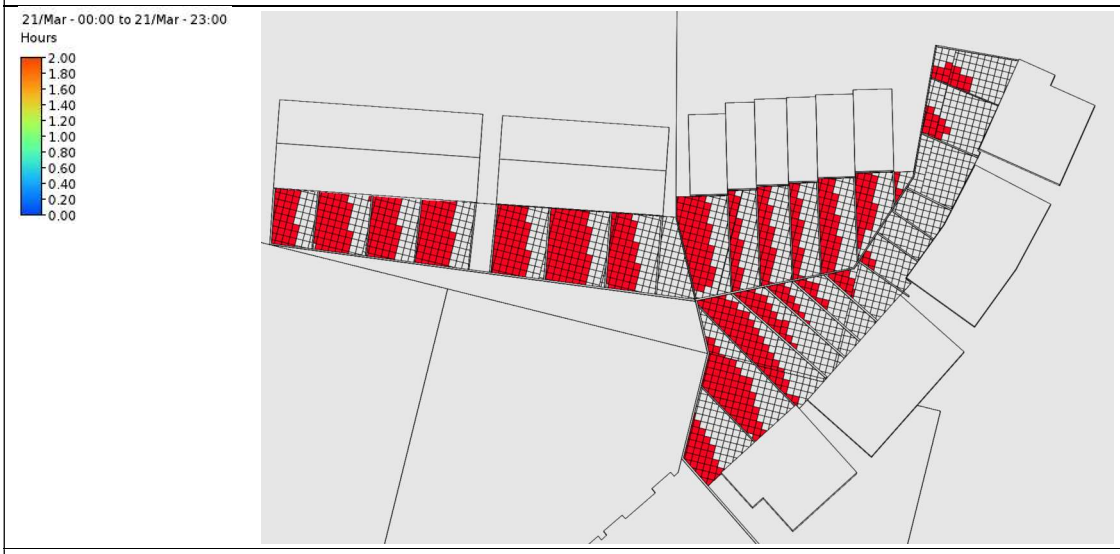
This analysis will be performed on the following existing amenity spaces shown in the images below:



Existing Site

The following images shows the predicted results with respect to this space receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

Existing Situation: showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)



Proposed Scheme: showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)

6.2.1 Discussion

As mentioned above under Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

The images above show that on the 21st of March for the dwellings back gardens considered, the impact brought on about the proposed development on the quality of sunlight of the gardens is in line with the BRE recommendations as the loss of sunlight is not greater than 20% its former value (that of the Existing situation).

Therefore, any rear garden currently receiving at least 2 hours of sunlight for over half of its area on the 21st of March will continue to do so under the proposed scheme, in line with the BRE recommendations.

6.3 Proposed Amenity Areas

As stated above for a space to, appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on 21st March.

This analysis will be performed on the following proposed amenity spaces shown in the images below:

6.3.1 Proposed Scheme

Proposed Scheme Amenity Areas

The following images shows the predicted results with respect to this space receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

Custom Scale - showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)

6.3.2 Discussion

As mentioned above under Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

The images above shows the following on the 21st of March for the proposed scheme amenity areas:

Communal Amenity Area: Over half of the amenity space would receive at least 2 hours of sunlight in line with the BRE recommendations.

Private Patio: Over half of each of the amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

Private Garden: Over half of each of the amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

7 Average Daylight Factors (ADF)

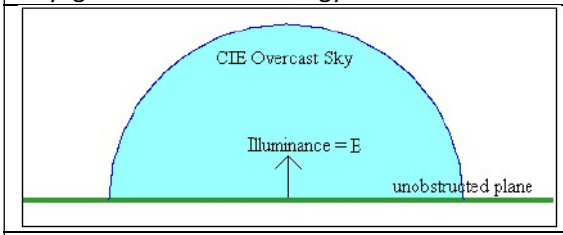
This section addresses daylight to the proposed house and apartments.

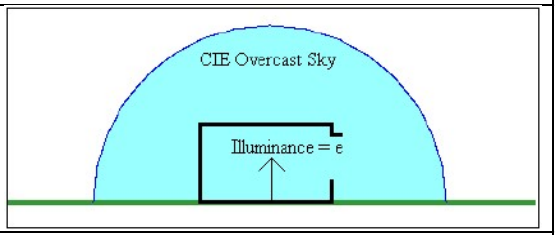
7.1 Introduction to ADF

Daylight is constantly changing, so its level at a point in a building is usually defined as an average daylight factor (ADF).

This is the ratio of the indoor illuminance at the point in question to the outdoor unobstructed horizontal illuminance.

Daylight Factor Methodology



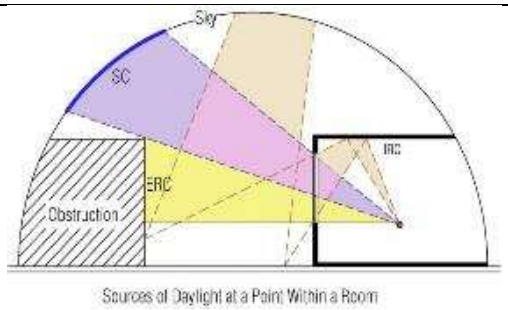


E = illuminance on unobstructed plane

e = illuminance at point in interior

Daylight Factor = e/E (often expressed as a percentage)

SC – Sky Component
ERC – Externally Reflected Component
IRC – Internally Reflected Component



Sources of Daylight at a Point Within a Room

Both illuminances are measured under the same standard sky, a CIE overcast sky. Since the sun is in a particular position for only a short period each day, direct sunlight is excluded. Instead diffuse sunlight is used for average daylight calculations. Diffuse sunlight describes the sunlight that has been scattered by molecules and particles in the atmosphere but has still made it down to surface of the earth.

For average daylight factor there are three possible paths along which diffuse light can get into a room through glazed windows.

Light from the patch of sky visible at the point considered, is expressed as the sky component.

Light reflected from opposing exterior surfaces and then reaches the point, is expressed as the externally reflected component.

Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

7.2 Reference and Metrics

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states the following in Appendix C with respect to Average Daylight Factors (ADF);

> C4 If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable.

From BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight

From this the recommended Average Daylight Factors (ADF) are therefore;

- Bedrooms – 1.0%
- Living Rooms – 1.5%

This study will consider the predicted average daylight factor to the proposed Houses and apartments. Analysis has been carried by using the Radiance module of IES VE software to quantify the metrics describe below.

7.3 Assumptions

The following assumptions are to be used in the study:

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September
- Working Plane: 0.85m
- Level 00: Floor to Ceiling Height: 2.70m
- Level 01: Floor to Ceiling Height: 2.50m

The following Surface Reflectance's are to be used in the study:

Material Surface	Reflectance
External Wall	0.50
Internal Partition	0.50
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.20
Floor/Ceiling (Ceiling)	0.70

Glazing Transmittance:

- Light Transmittance: 70%
- Window Frame thickness: 70 mm

7.4 Average Daylight Factor Results

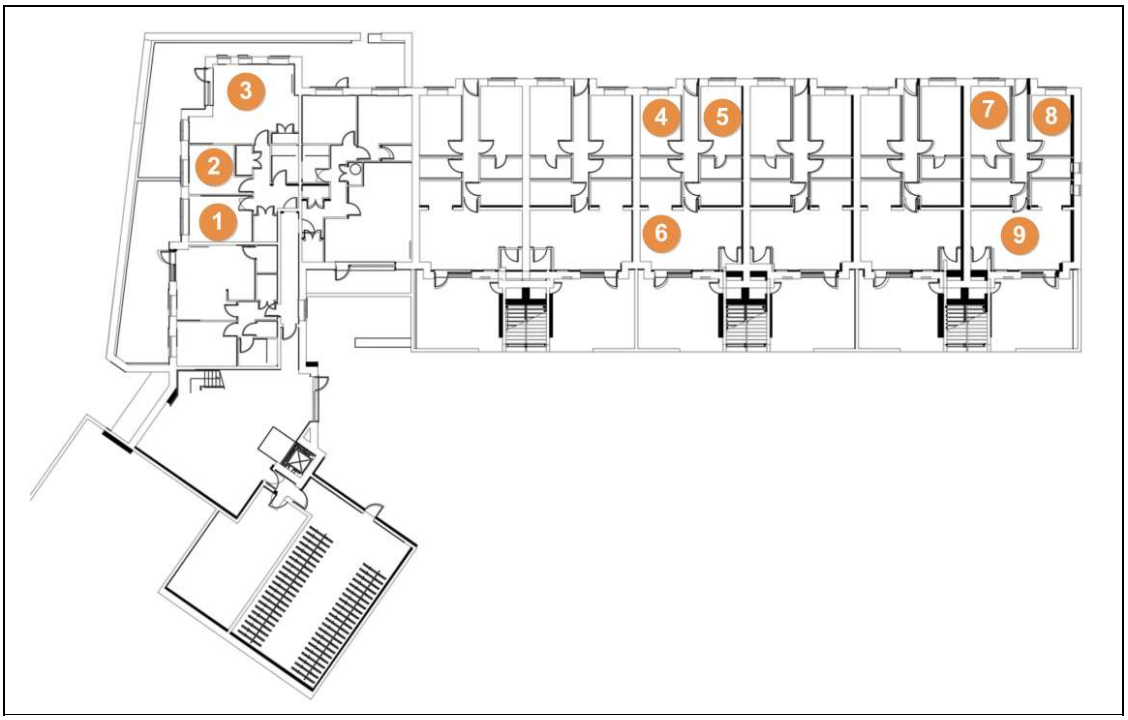
Based on the results below, the following conclusions can be made:

✓ All these rooms have an average daylight factor greater than the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight.

Therefore, these rooms are all in line with the BRE recommendations.

x These rooms have an average daylight factor below the recommended minimum values.

7.4.1 Lower Ground Floor

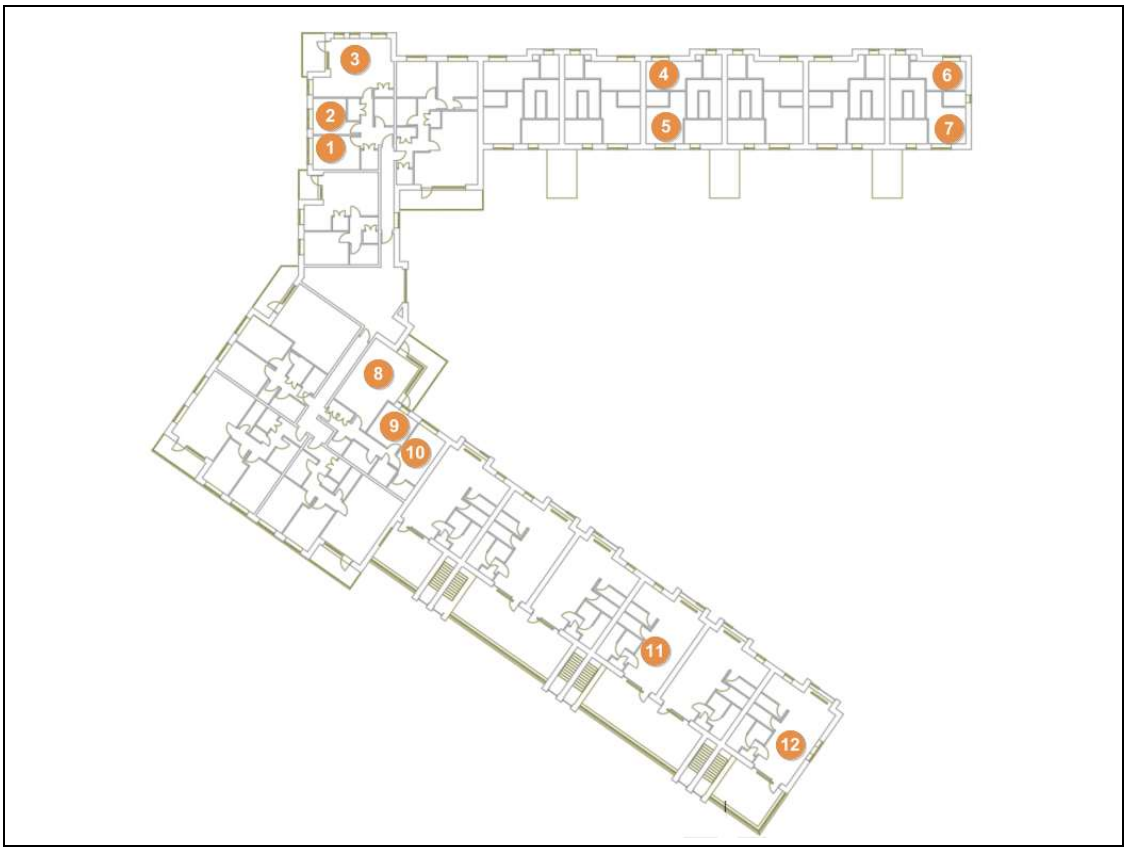


Ref.	Type	Room Reference	Room Activity	ADF	BRE Recommendation
1	Apartment	LG: Apartment 02_Bedroom 01	Bedroom	3.74	✓
2	Apartment	LG: Apartment 02_Bedroom 02	Bedroom	2.98	✓
3	Apartment	LG: Apartment 02_Living Room	Living Room	2.81	✓
4	Duplex	LG: Duplex B2_Bedroom 01	Bedroom	2.53	✓
5	Duplex	LG: Duplex B2_Bedroom 02	Bedroom	3.20	✓
6	Duplex	LG: Duplex B2_Living Room	Living Room	2.52	✓
7	Duplex	LG: Duplex B1_Bedroom 01	Bedroom	3.35	✓
8	Duplex	LG: Duplex B1_Bedroom 02	Bedroom	2.58	✓
9	Duplex	LG: Duplex B1_Living Room	Living Room	3.02	✓

7.4.2 Ground Floor

Ref.	Type	Room Reference	Room Activity	ADF	BRE Recommendation
1	Apartment	L0: Apartment 02_Bedroom 01	Bedroom	4.08	✓
2	Apartment	L0: Apartment 02_Bedroom 02	Bedroom	3.20	✓
3	Apartment	L0: Apartment 02_Living Room	Living Room	3.08	✓
4	Duplex	L0:Duplex B2_Living Room	Living Room	2.25	✓
5	Duplex	L0:Duplex B1_Living Room	Living Room	2.95	✓
6	Apartment	L0: Apartment 05_Living Room	Living Room	3.02	✓
7	Apartment	L0: Apartment 05_Bedroom 02	Bedroom	1.82	✓
8	Apartment	L0: Apartment 05_Bedroom 01	Bedroom	4.61	✓
9	Duplex	L0:Duplex A2_Bedroom 01	Bedroom	1.52	✓
10	Duplex	L0:Duplex A2_Living Room	Living Room	2.90	✓
11	Duplex	L0:Duplex A2_Bedroom 02	Bedroom	2.75	✓
12	Duplex	L0:Duplex A1_Bedroom 02	Bedroom	1.56	✓
13	Duplex	L0:Duplex A1_Living Room	Living Room	3.03	✓
14	Duplex	L0:Duplex A1_Bedroom 01	Bedroom	2.15	✓

7.4.3 First Floor



Ref.	Type	Room Reference	Room Activity	ADF	BRE Recommendation
1	Apartment	L1: Apartment 02_Bedroom 01	Bedroom	4.20	✓
2	Apartment	L1: Apartment 02_Bedroom 02	Bedroom	3.28	✓
3	Apartment	L1: Apartment 02_Living Room	Living Room	2.69	✓
4	Duplex	L1: Duplex B2_Bedroom 01	Bedroom	1.92	✓
5	Duplex	L1: Duplex B2_Bedroom 02	Bedroom	2.66	✓
6	Duplex	L1: Duplex B1_Bedroom 02	Bedroom	1.94	✓
7	Duplex	L1: Duplex B1_Bedroom 01	Bedroom	2.52	✓
8	Apartment	L1: Apartment 05_Living Room	Living Room	2.07	✓
9	Apartment	L1: Apartment 05_Bedroom 02	Bedroom	1.33	✓
10	Apartment	L1: Apartment 05_Bedroom 01	Bedroom	4.34	✓
11	Duplex	L1:Duplex A2_Living Room	Living Room	2.51	✓
12	Duplex	L1:Duplex A1_Living Room	Living Room	3.15	✓

7.5 Discussion

Full results for the rooms considered can be seen above. The results are summarised in the following table:

Lower Ground Floor:

Tested	9
Exceeds BRE recommendations	9
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

Ground Floor:

Tested	14
Exceeds BRE recommendations	14
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

First Floor:

Tested	12
Exceeds BRE recommendations	12
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

Summary:

Tested	35
Exceeds BRE recommendations	35
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

The results above show that all of the rooms tested have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

It should be noted that the 'worst' case locations have been tested i.e. those looking into elevations with obstructed views. As the results indicate, the quality of daylight in each apartment increases going upwards through each level and as such, it would be expected that the entire development would be in line with the BRE recommendations.

8 Conclusion

The following can be concluded based on the studies undertaken

8.1 Shadow Analysis

The Shadow analysis shows different shadows being cast at three periods within a year by the proposed scheme. The images highlight that within these time frames the proposed development has no shading on surrounding properties and therefore can be described as having a 'negligible to minor adverse impact' for the majority of the year.

8.2 Daylight Analysis of existing buildings

All of the residential points tested have a Vertical Sky Component (VSC) greater 27% or not less than 0.8 times their former value in line with BRE guidelines.

The results show that the impact of the proposed development can be classified under the BRE as a 'negligible to minor adverse impacts' considering the guidelines in the BRE report are fully met.

8.3 Sunlight to the Existing and Proposed Amenity Spaces

Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

Existing Amenity Areas:

The images above show that on the 21st of March, the impact brought on about the proposed development on the quality of sunlight of the existing gardens is in line with the BRE recommendations as the loss of sunlight is not greater than 20% its former value (that of the Existing situation).

Therefore, any rear garden currently receiving at least 2 hours of sunlight for over half of its area on the 21st of March will continue to do so under the proposed scheme surpassing the BRE recommendations.

Proposed Amenity Spaces:

The analysis images show that on the 21st of March for the proposed scheme amenity areas, over half of all amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations. Again, this exceeds the BRE recoomendtions.

8.4 Average Daylight Factors

The results above show that all of the rooms tested have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

It should be noted that the 'worst' case locations have been tested i.e. those looking into elevations with obstructed views. As the results indicate, the quality of daylight in each apartment increases going upwards through each level and as such, it would be expected that the entire development would be in line with the BRE recommendations.

8.5 Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report itself states ‘although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite this, the site performs well in relation to the metrics considered in this report.

When comparing the proposed development against the existing situation the following can be concluded:

- Shading on surrounding properties can be described as having a ‘negligible to minor adverse impact’ for the majority of the year.
- All resultant VSC values for the residential properties tested are in line with the BRE recommendations.

Also in terms of Sunlight to the Existing Amenity Spaces, any rear garden currently receiving at least 2 hours of sunlight for over half of its area on the 21st of March will continue to do so under the proposed scheme exceeding the BRE recommendations.

I terms of Sunlight to the Existing and Proposed Amenity Spaces, over half of all proposed amenity areas would receive over 2 hours of sunlight on the 21st March exceeding the BRE recommendations.

In addition, all of the rooms tested in the proposed development have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

Overall the results demonstrate that the proposed development performance (a mix of apartments and duplexes) is in line with BRE recommendations in the BRE ‘Site Layout Planning for Daylight and Sunlight’ guide, sometimes referred to as BRE Digest 209.

Section2 - Apartment Block C3

Executive Summary

As Apartment Block C3 is an existing building being refurbished, the Shadow & Daylight Analysis together with the sunlight analysis to the adjacent amenity areas assosciated with Apartment Block C3 have been excluded from this study.

With regards to Apartment Block C3, the following can be concluded based on the studies undertaken.

Average Daylight Factors

100% of the rooms tested are achieving an Average Daylight Factor above the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight. The only room achieving an Average Daylight Factor below the minimum recommended values is a living room located on the ground floor with limited glazing area.

Potential improvements to this living space could be the inclusion of additional side window(s) and/or a revised double door configuration with less framing and more glazing.

As the results indicate, the quality of daylight in each apartment increases going upwards through each level. As such, it would be expected that 100% of the overall development would be in line with the BRE recommendations.

Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report itself states ‘although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite this, the site performs well in relation to the metrics considered in this report.

As Apartment Block C3 is an existing building being refurbished, the Shadow & Daylight Analysis together with the sunlight analysis to the adjacent amenity areas assosciated with Apartment Block C3 have been excluded from this study.

100% of the rooms tested in the proposed development have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

Overall the results demonstrate that the proposed development performance is in line with BRE recommendations in the BRE ‘Site Layout Planning for Daylight and Sunlight’ guide, sometimes referred to as BRE Digest 209.

9 Introduction

This report was completed to quantify the Sunlight / Daylight impact of the existing residential development, Apartment Block C3, at Newcastle, County Dublin, on the neighbouring residential properties.

The focus of the study considers the following items with respect to the existing development:

- **Average Daylight Factor** – via consideration of the Average Daylight Factor (ADF) for the proposed development.

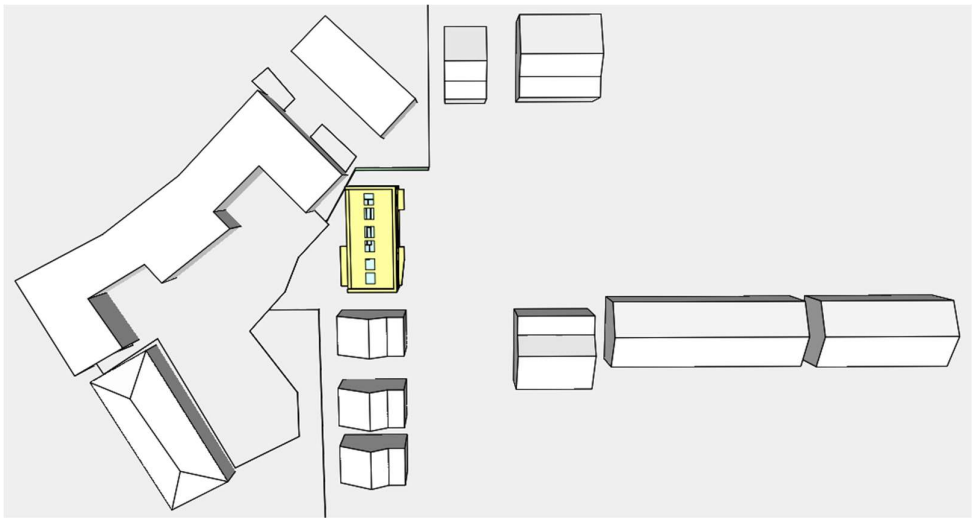
The analysis was completed using the IES VE software.

The assessment is based on recommendations given in BRE – Site Layout Planning for Daylight and Sunlight guide.

10 Methodology

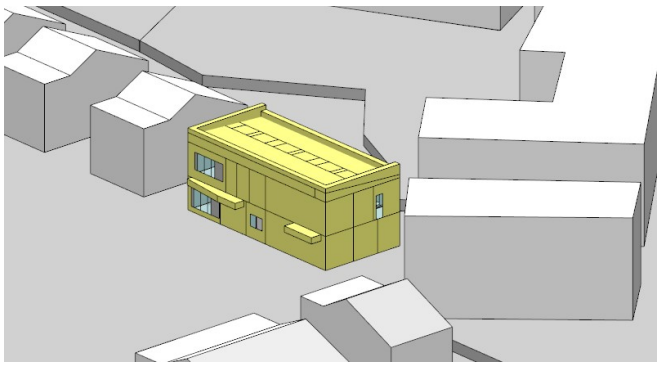
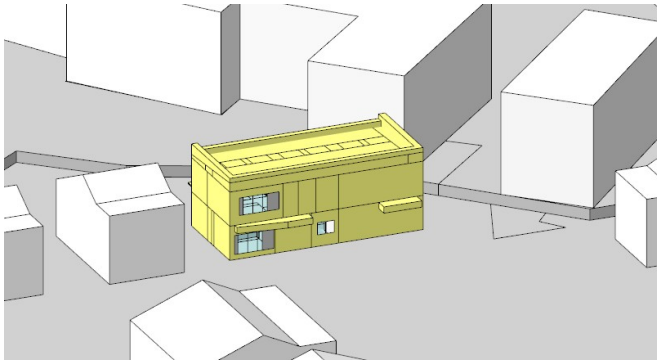
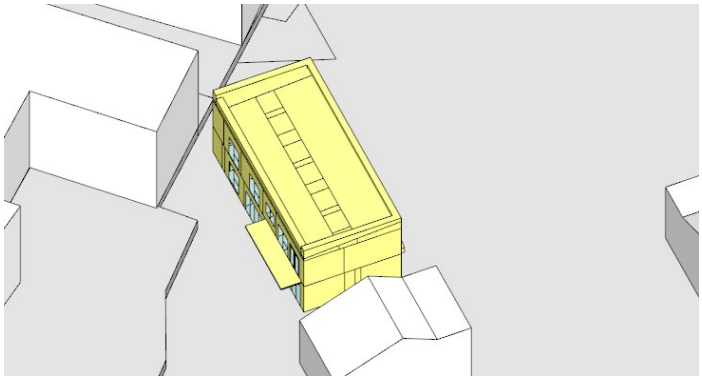
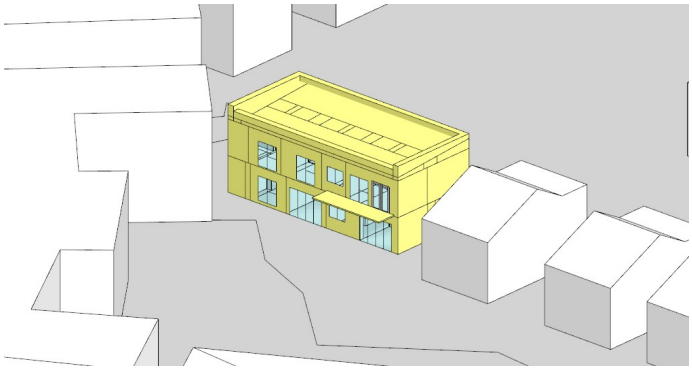
10.1 Orientation

The model orientation has been taken from Google Maps and the resulting angle shown below used in the analysis.

Orientation
 
 

10.2 Proposed models

The following images show the models created for use across various views:

	Proposed Scheme
View Looking from North of Site	
View looking from East of Site	
View looking from South of Site	
View looking from West of Site	

11 Average Daylight Factors (ADF)

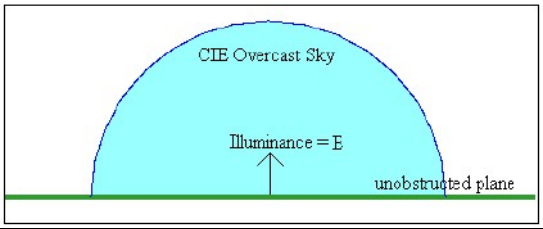
This section addresses daylight to the proposed house and apartments.

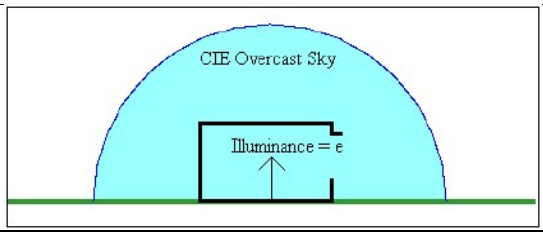
11.1 Introduction to ADF

Daylight is constantly changing, so its level at a point in a building is usually defined as an average daylight factor (ADF).

This is the ratio of the indoor illuminance at the point in question to the outdoor unobstructed horizontal illuminance.

Daylight Factor Methodology



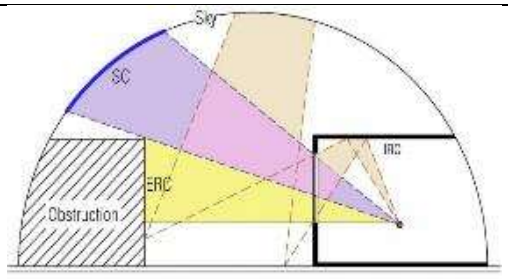


E = illuminance on unobstructed plane

e = illuminance at point in interior

Daylight Factor = e/E (often expressed as a percentage)

SC – Sky Component
ERC – Externally Reflected Component
IRC – Internally Reflected Component



Sources of Daylight at a Point Within a Room

Both illuminances are measured under the same standard sky, a CIE overcast sky. Since the sun is in a particular position for only a short period each day, direct sunlight is excluded. Instead diffuse sunlight is used for average daylight calculations. Diffuse sunlight describes the sunlight that has been scattered by molecules and particles in the atmosphere but has still made it down to surface of the earth.

For average daylight factor there are three possible paths along which diffuse light can get into a room through glazed windows.

Light from the patch of sky visible at the point considered, is expressed as the sky component.

Light reflected from opposing exterior surfaces and then reaches the point, is expressed as the externally reflected component.

Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

11.2 Reference and Metrics

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states the following in Appendix C with respect to Average Daylight Factors (ADF);

> C4 If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable.

From BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight

From this the recommended Average Daylight Factors (ADF) are therefore;

- Bedrooms – 1.0%
- Living Rooms – 1.5%

This study will consider the predicted average daylight factor to the proposed Houses and apartments. Analysis has been carried by using the Radiance module of IES VE software to quantify the metrics describe below.

11.3 Assumptions

The following assumptions are to be used in the study:

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September
- Working Plane: 0.85m
- Level 00: Floor to Ceiling Height: 2.90m
- Level 01: Floor to Ceiling Height: 2.90m

The following Surface Reflectance's are to be used in the study:

Material Surface	Reflectance
External Wall	0.50
Internal Partition	0.50
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.20
Floor/Ceiling (Ceiling)	0.70

Glazing Transmittance:

- Light Transmittance: 70%
- Window Frame thickness: 70 mm

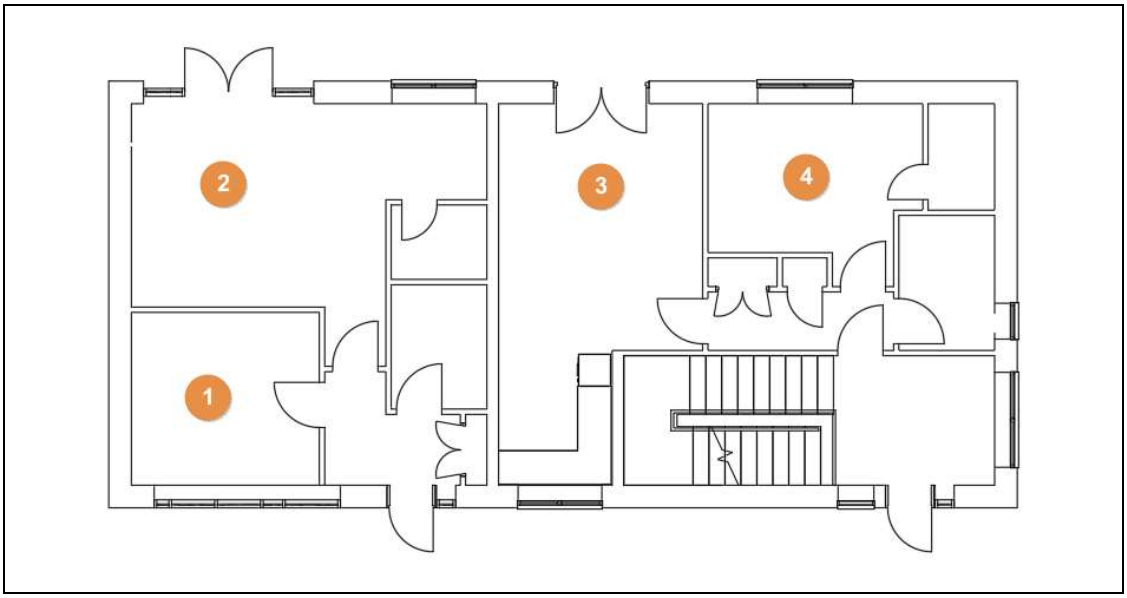
11.4 Average Daylight Factor Results

Based on the results below, the following conclusions can be made:

✓ All these rooms have an average daylight factor greater than the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight.

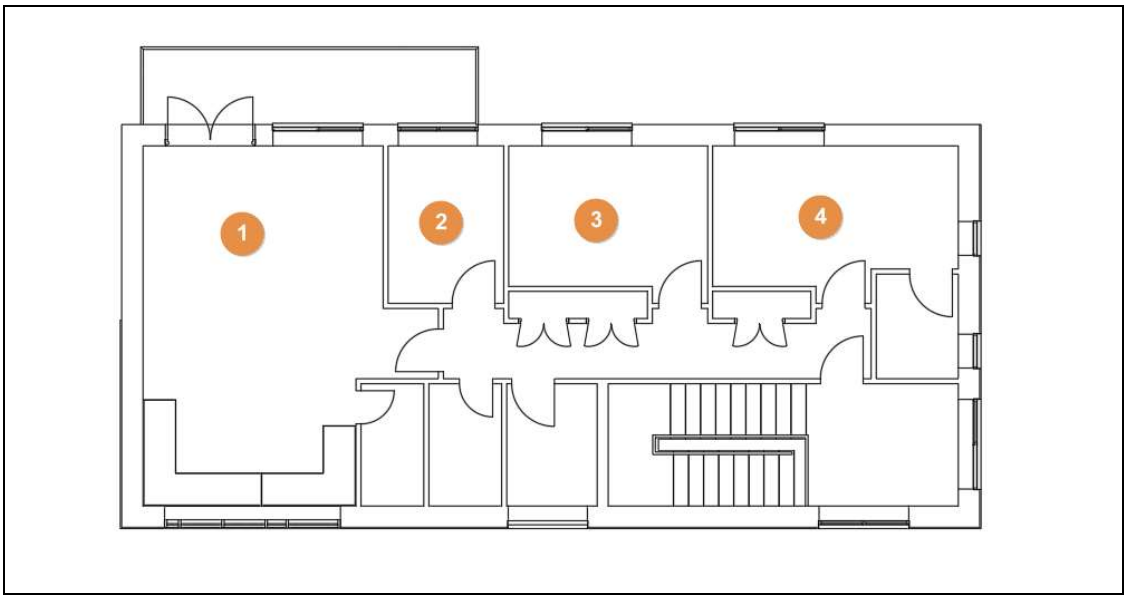
Therefore, these rooms are all in line with the BRE recommendations.

11.4.1 Ground Floor



Ref.	Type	Room Reference	Room Activity	ADF	BRE Recommendation
1	Apartment	L00: Bedroom 2	Bedroom	2.44	✓
2	Apartment	L00: Living Room 2	Living Room	2.56	✓
3	Apartment	L00: Living Room 1	Living Room	2.96	✓
4	Apartment	L00: Bedroom 1	Bedroom	1.57	✓

11.4.2 First Floor



Ref.	Type	Room Reference	Room Activity	ADF	BRE Recommendation
1	Apartment	L01: Living Room	Living Room	3.14	✓
2	Apartment	L01: Bedroom 3	Bedroom	3.04	✓
3	Apartment	L01: Bedroom 2	Bedroom	2.23	✓
4	Apartment	L01: Bedroom 1	Bedroom	2.24	✓

11.5 Discussion

Full results for the rooms considered can be seen above. The results are summarised in the following table:

Ground Floor:

Tested	4
Exceeds BRE recommendations	4
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

First Floor:

Tested	4
Exceeds BRE recommendations	4
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

Summary:

Tested	8
Exceeds BRE recommendations	8
Below BRE recommendations	0
% of Rooms above BRE recommendations	**100%**

Overall, this equates to a 100% success rate in the tested rooms. The only room achieving an Average Daylight Factor below the minimum recommended values is a living room located on the ground floor with limited glazing area.

As the results indicate, the quality of daylight in each apartment increases going upwards through each level. As such, it would be expected that 100% of the overall development would be in line with the BRE recommendations.

12 Conclusion

The following can be concluded based on the studies undertaken.

12.1 Average Daylight Factors

100% of the rooms tested are achieving an Average Daylight Factor above the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight.

As the results indicate, the quality of daylight in each apartment increases going upwards through each level. As such, it would be expected that 100% of the overall development would be in line with the BRE recommendations.

12.2 Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report itself states ‘although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite this, the site performs well in relation to the metrics considered in this report.

As Apartment Block C3 is an existing building being refurbished, the Shadow & Daylight Analysis together with the sunlight analysis to the adjacent amenity areas assosciated with Apartment Block C3 have been excluded from this study.

100% of the rooms tested in the proposed development have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

Overall the results demonstrate that the proposed development performance is in line with BRE recommendations in the BRE ‘Site Layout Planning for Daylight and Sunlight’ guide, sometimes referred to as BRE Digest 209.

Section 3 – Duplexes

Executive Summary

In this final section of the report, the impact the proposed duplexes will have on the rest of the proposed dwellings is considered and can be concluded based on the studies undertaken as detailed below.

Shadow Analysis

The Shadow analysis shows different shadows being cast at three periods within a year by the proposed scheme. The images highlight that within these time frames the proposed development has no shading on surrounding properties and therefore can be described as having a 'negligible to minor adverse impact' for the majority of the year.

Sunlight to the Proposed Amenity Spaces

Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

Proposed Amenity Spaces:

The analysis images show that on the 21st of March for the proposed scheme amenity areas, over half of all amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

Average Daylight Factors

100% of the rooms tested are achieving an Average Daylight Factor above the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight.

As the results indicate, the quality of daylight in each apartment increases going upwards through each level. As such, it would be expected that 100% of the overall development would be in line with the BRE recommendations.

Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report itself states ‘although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite this, the site performs well in relation to the metrics considered in this report.

When comparing the proposed development against the existing situation the following can be concluded:

- Shading on surrounding properties can be described as having a ‘negligible to minor adverse impact’ for the majority of the year.

In terms of Sunlight to the Proposed Amenity Spaces, over half of all proposed amenity areas would receive over 2 hours of sunlight on the 21st March in line with the BRE recommendations.

In addition, 100% of the rooms tested in the proposed development have Average Daylight Factors (ADF) that exceed the values as outlined in the BRE guidelines.

Overall the results demonstrate that the proposed development performance is in line with BRE recommendations in the BRE ‘Site Layout Planning for Daylight and Sunlight’ guide, sometimes referred to as BRE Digest 209.

13 Introduction

As mentioned previously, this section of the report was completed to quantify the Sunlight / Daylight impact of the proposed duplexes will have on the remaining proposed residential development dwellings at Newcastle, County Dublin.

As such, the focus of the study considers the following items with respect to the proposed new development:

- **Shadow Analysis** - a visual representation analysing any potential changes that may arise from the proposed development on to the neighbouring existing developments.
- **Sunlight to the Proposed Amenity Spaces** – via annual sunlight hours comparison.
- **Average Daylight Factor** – via consideration of the Average Daylight Factor (ADF) for the proposed development.

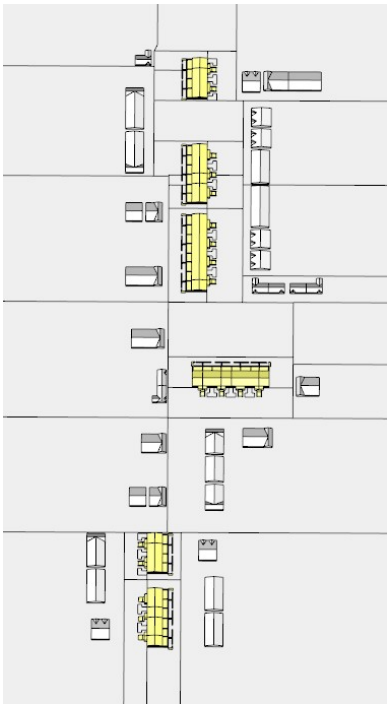
The analysis was completed using the IES VE software.

The assessment is based on recommendations given in BRE – Site Layout Planning for Daylight and Sunlight guide.

14 Methodology

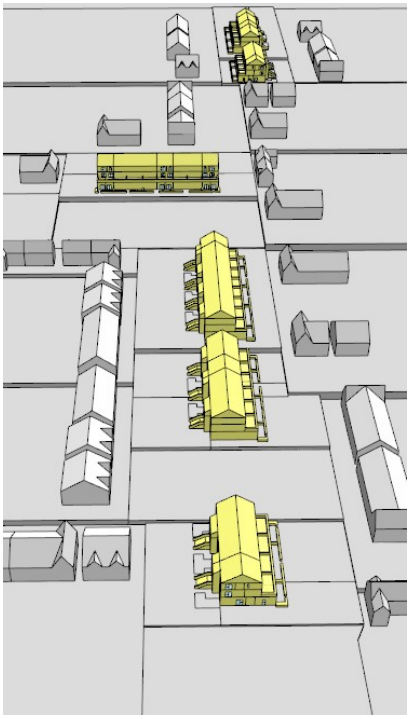
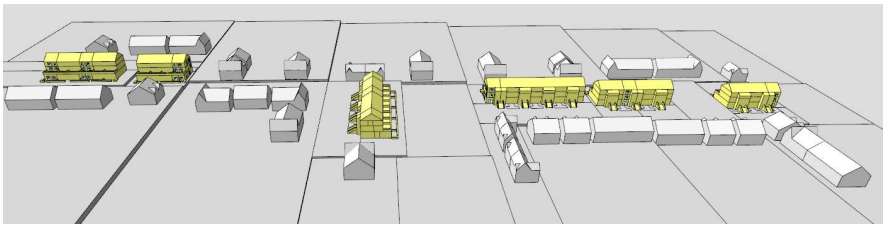
14.1 Orientation

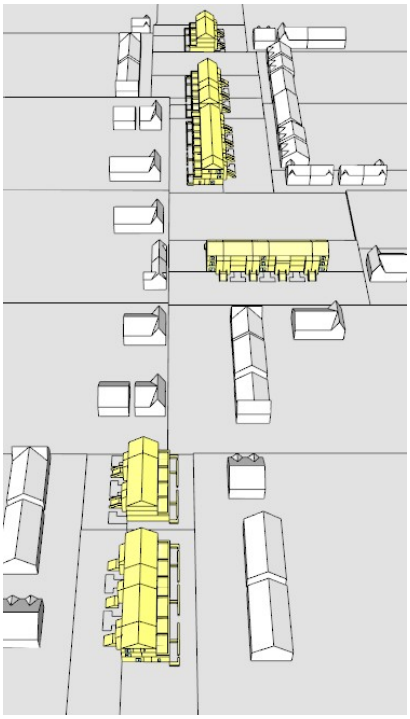
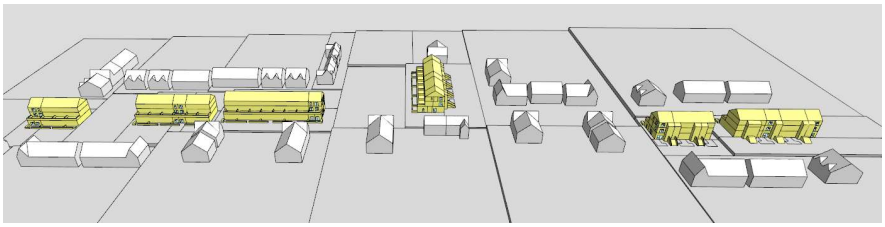
The model orientation has been taken from Google Maps and the resulting angle shown below used in the analysis.

Orientation
 
 

14.2 Proposed models

The following images show the models created for use across various views:

	Proposed Scheme
View Looking from North of Site	
View looking from East of Site	

View looking from South of Site	
View looking from West of Site	

15 BRE – Site Layout Planning for Daylight and Sunlight (2nd edition)

Access to daylight and sunlight is a vital part of a healthy environment. Sensitive design should provide sufficient daylight and sunlight to new housing while not obstructing light to existing homes nearby.

The BRE Report, Site layout planning for daylight and sunlight: a guide to good practice (BR209), advises on planning developments for good access to daylight and sunlight, and is widely used by local authorities to help determine the impacts of new developments.

15.1 Impact classification discussion

BRE guidance in Appendix I – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria as follows;

Negligible to minor adverse impacts	*Fully meets guidelines in BRE report*
Negligible adverse impact	• *Loss of light well within guidelines, or* • *only a small number of windows or limited area of open space losing light (within the guidelines)*
Minor adverse impact (a)	• *Loss of light only just within guidelines, or* • *A large number of windows or large areas of open space areas affected (within the guidelines)*
Minor adverse impact (b)	• *only a small number of windows or limited open space areas are affected* • *the loss of light is only marginally outside the guidelines* • *an affected room has other sources of skylight or sunlight* • *the affected building or open only has a low level requirement for skylight or sunlight* • *there are particular reason why an alternative, less stringent, guideline should be applied*
Major adverse impact	• *large number of windows or large open space areas are affected* • *the loss of light is only substantially outside the guidelines* • *all the windows in a particular property are affected* • *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)*

16 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that the sunniest months in Ireland are May and June.

The following can also be shown:

- During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours.
- During June, Dublin receives a mean daily duration of 6.4 hours of sunlight out of a potential 16.7 hours sunlight each day (i.e. only 38% of potential sunlight hours.

Therefore, impact caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months.

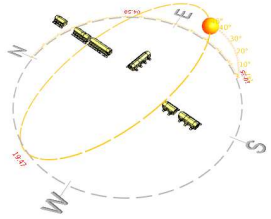
This section will consider the shadows cast for both the Existing Situation and the proposed development for the following dates;

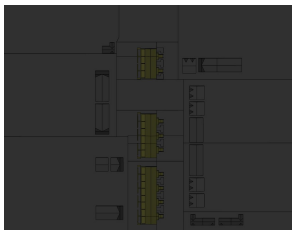
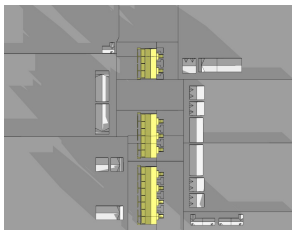
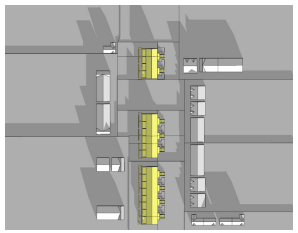
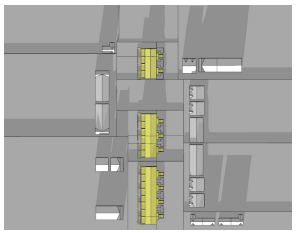
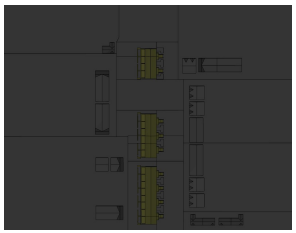
- December 21st (Winter Solstice)
- March 21st / September 21st (Equinox)
- June 21st (Summer solstice)

These images will show shadows cast for 'perfect sunny' conditions with no clouds and assumed that the sun is out for every hour shown. Given the discussion above it is important to remember that this is not always going to be the case.

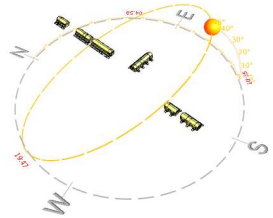
16.1 Plan View: Area 1

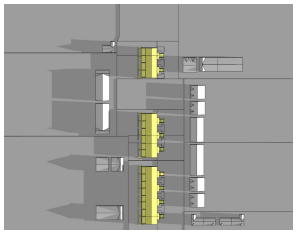
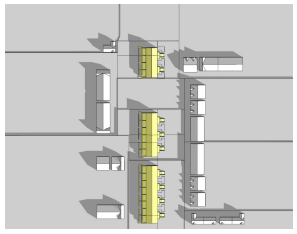
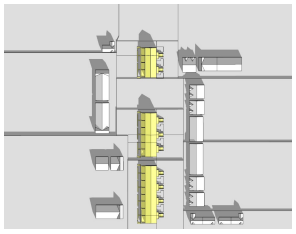
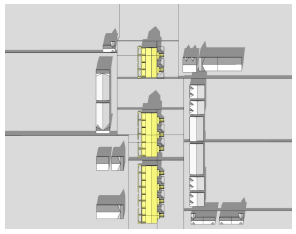
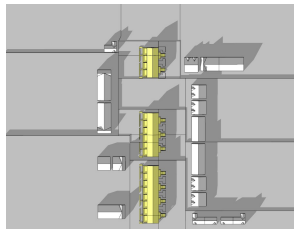
16.1.1 December 21st



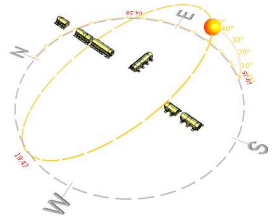
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	Proposed Scheme
					

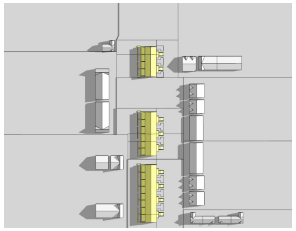
16.1.2 March 21st



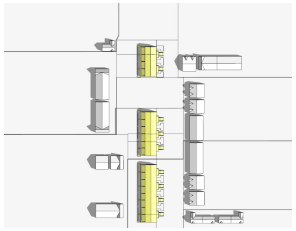
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

16.1.3 June 21st

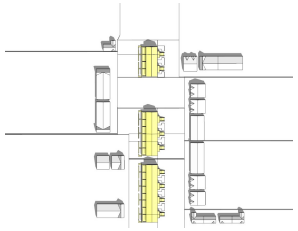




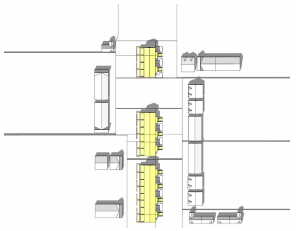
8:00 AM



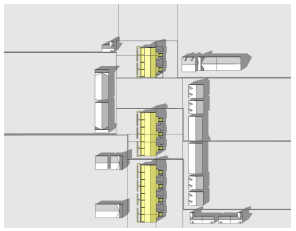
10:00 AM



12:00 PM



14:00 PM

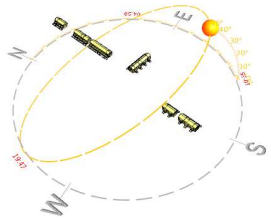


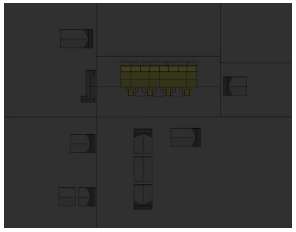
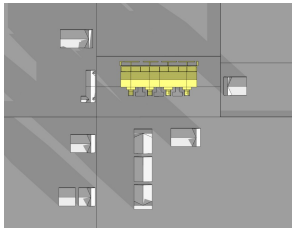
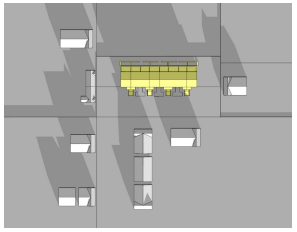
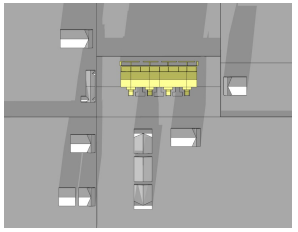
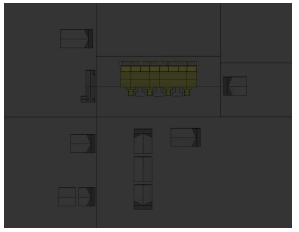
16:00 PM

Proposed Development

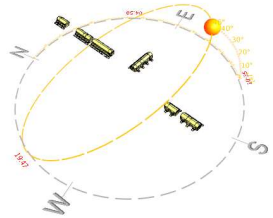
16.2 Plan View: Area 2

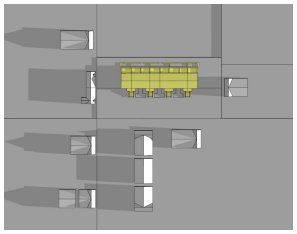
16.2.1 December 21st

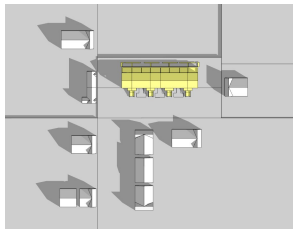


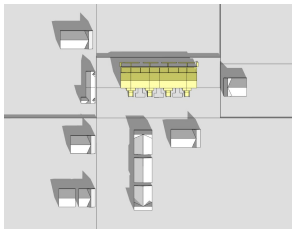
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

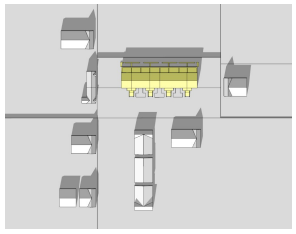
16.2.2 March 21st

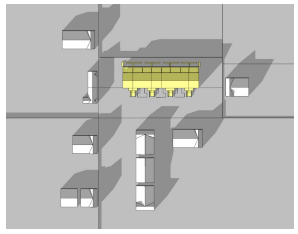






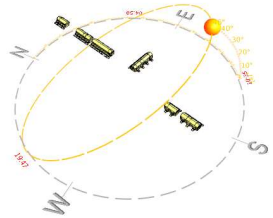


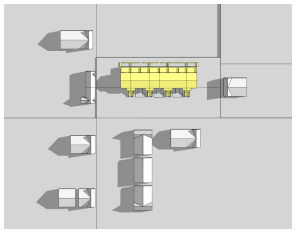
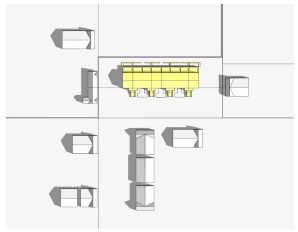
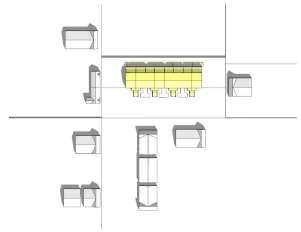
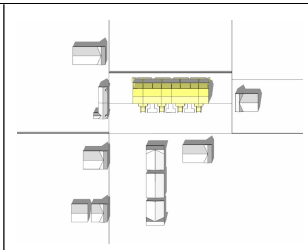
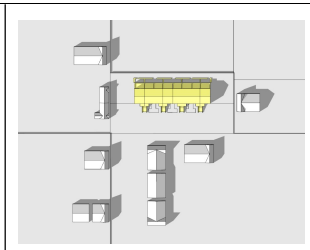




8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	Proposed Scheme

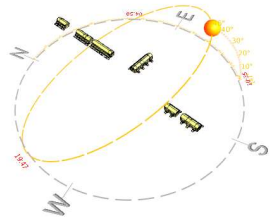
16.2.3 June 21st

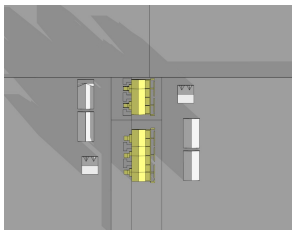
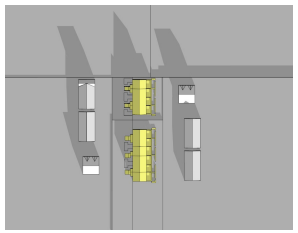
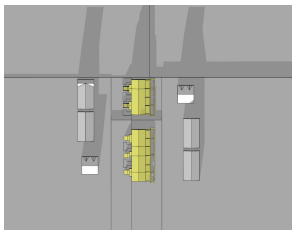


8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	Proposed Development
					

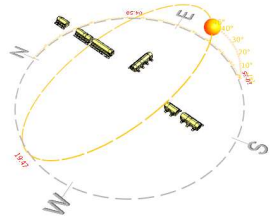
16.3 Plan View: Area 3

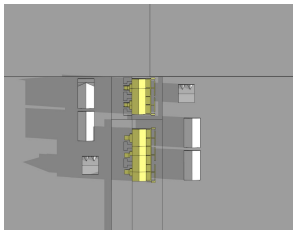
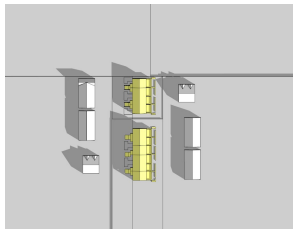
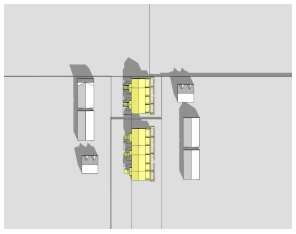
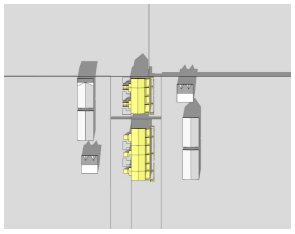
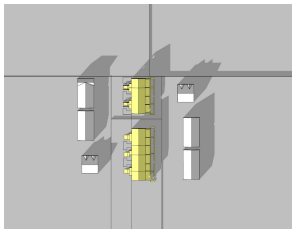
16.3.1 December 21st



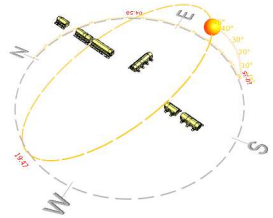
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

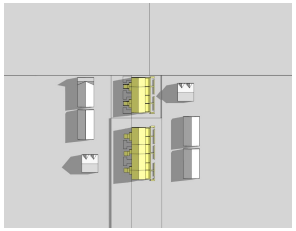
16.3.2 March 21st

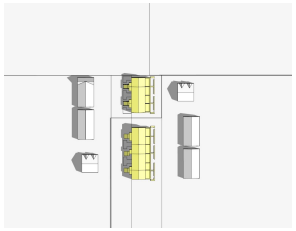


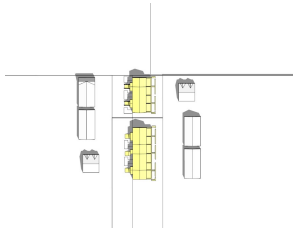
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

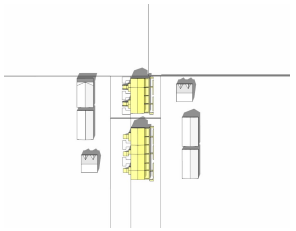
16.3.3 June 21st

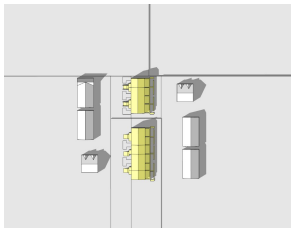












8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	Proposed Development

16.4 Discussion

Shading from the proposed development is summarised as follows based on the analysis of images above:

- **Morning (until 12h00); December, March & June**
  - Negligible impact on surrounding buildings.

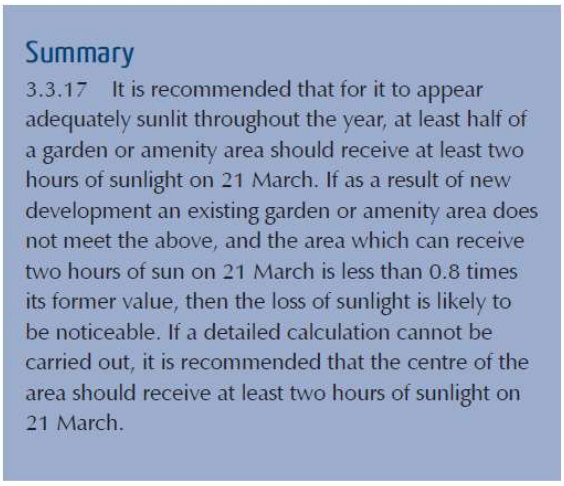
- **Midday (from 12h00 until 14h00); December, March & June**
  - Negligible impact on surrounding buildings.

- **Late Afternoon (from 16h00); December, March & June**
  - Negligible impact on surrounding buildings.

17 Sunlight to the Proposed Amenity Spaces

17.1 Requirements

The impact of the development proposal on the sunlight availability in the amenity areas will be considered to determine how they perform when assessed against the BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight which states the following in Section 3.3.17;



Summary

3.3.17 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 21 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 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March.

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states in 3.3.17 that for a space to, appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on 21st March.

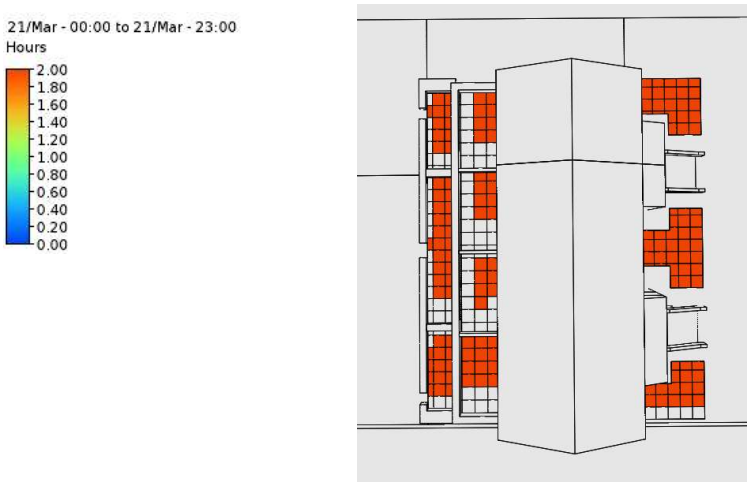
17.2 Proposed Amenity Areas

This analysis will be performed on the following proposed amenity & garden spaces shown in the images below:

Proposed Scheme Amenity Areas

The following images shows the predicted results with respect to ***Duplex Apt 1 - 4*** receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

Custom Scale - showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)

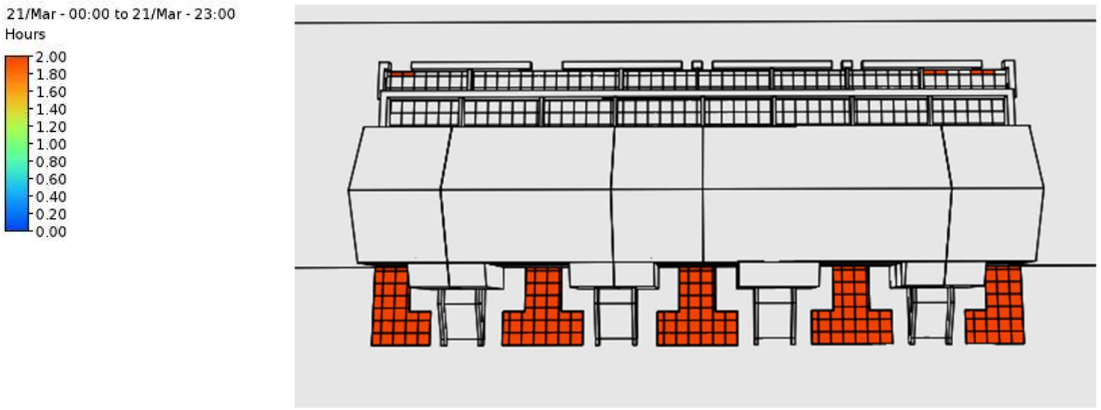


The following images shows the predicted results with respect to ***Duplex Apt 5 - 18*** receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

Custom Scale - showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)

The following images shows the predicted results with respect to ***Duplex Apt 19 - 26*** receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

Custom Scale - showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)



The following images shows the predicted results with respect to ***Duplex Apt 27-36*** receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

Custom Scale - showing hours > 2 in red
(Any gridded cells area below 2 hours are shown as grey)

17.2.1 Discussion

As mentioned above under Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

The images above shows the following on the 21st of March for the proposed scheme amenity areas:

Communal Amenity Area: Over half of the amenity space would receive at least 2 hours of sunlight in line with the BRE recommendations.

Private Patio: Over half of each of the amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

Private Garden: Over half of each of the amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

18 Average Daylight Factors (ADF)

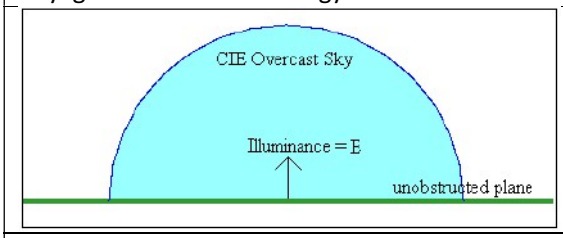
This section addresses daylight to the proposed Duplex apartments.

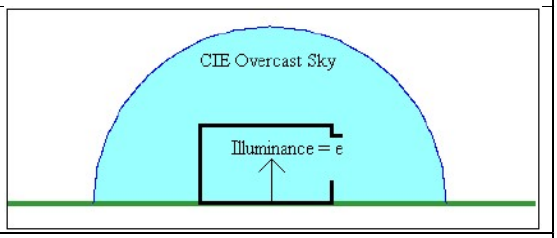
18.1 Introduction to ADF

Daylight is constantly changing, so its level at a point in a building is usually defined as an average daylight factor (ADF).

This is the ratio of the indoor illuminance at the point in question to the outdoor unobstructed horizontal illuminance.

Daylight Factor Methodology



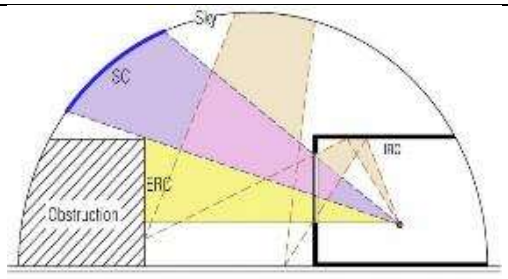


E = illuminance on unobstructed plane

e = illuminance at point in interior

Daylight Factor = e/E (often expressed as a percentage)

SC – Sky Component
ERC – Externally Reflected Component
IRC – Internally Reflected Component



Sources of Daylight at a Point Within a Room

Both illuminances are measured under the same standard sky, a CIE overcast sky. Since the sun is in a particular position for only a short period each day, direct sunlight is excluded. Instead diffuse sunlight is used for average daylight calculations. Diffuse sunlight describes the sunlight that has been scattered by molecules and particles in the atmosphere but has still made it down to surface of the earth.

For average daylight factor there are three possible paths along which diffuse light can get into a room through glazed windows.

Light from the patch of sky visible at the point considered, is expressed as the sky component.

Light reflected from opposing exterior surfaces and then reaches the point, is expressed as the externally reflected component.

Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

18.2 Reference and Metrics

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states the following in Appendix C with respect to Average Daylight Factors (ADF);

> C4 If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable.

From BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight

From this the recommended Average Daylight Factors (ADF) are therefore;

- Bedrooms – 1.0%
- Living Rooms – 1.5%

This study will consider the predicted average daylight factor to the proposed Houses and apartments. Analysis has been carried by using the Radiance module of IES VE software to quantify the metrics describe below.

18.3 Assumptions

The following assumptions are to be used in the study:

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September
- Working Plane: 0.85m
- Level 00: Floor to Ceiling Height: 2.90m
- Level 01: Floor to Ceiling Height: 2.90m

The following Surface Reflectance's are to be used in the study:

Material Surface	Reflectance
External Wall	0.50
Internal Partition	0.50
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.20
Floor/Ceiling (Ceiling)	0.70

Glazing Transmittance:

- Light Transmittance: 70%
- Window Frame thickness: 70 mm

18.4 Average Daylight Factor Results

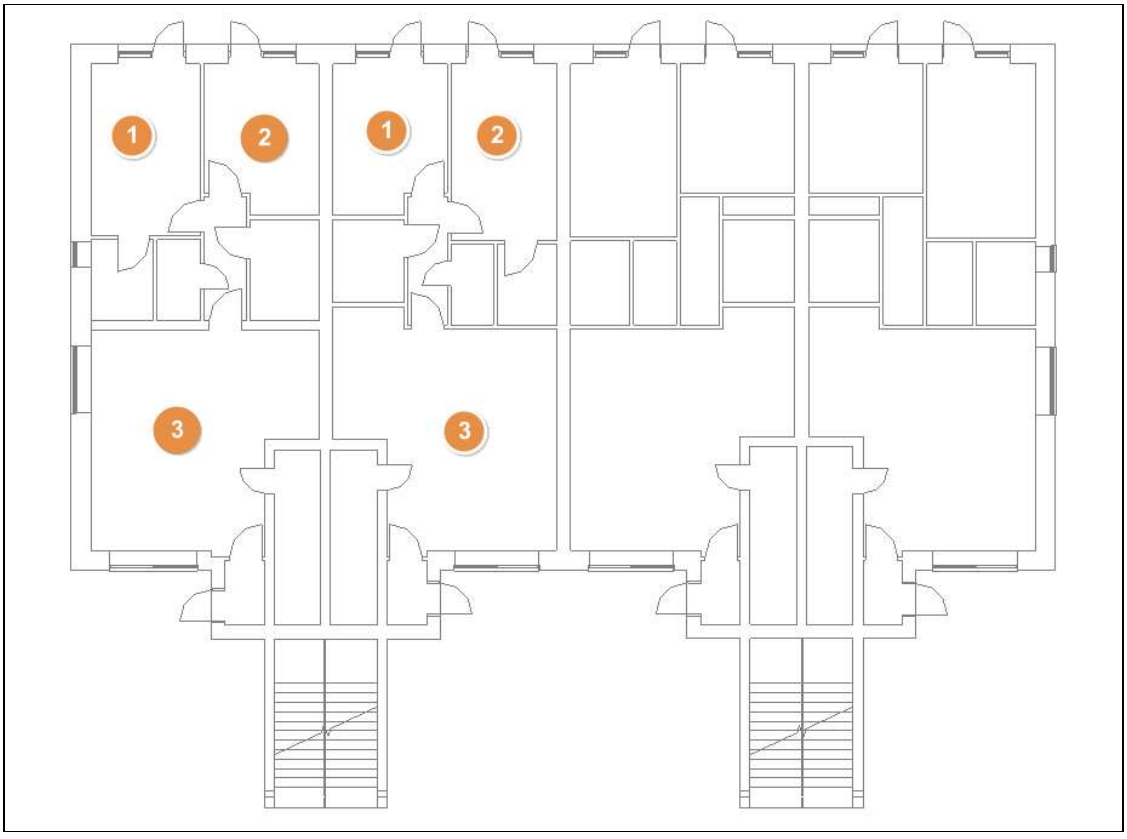
Based on the results below, the following conclusions can be made:

✓ All these rooms have an average daylight factor greater than the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight.

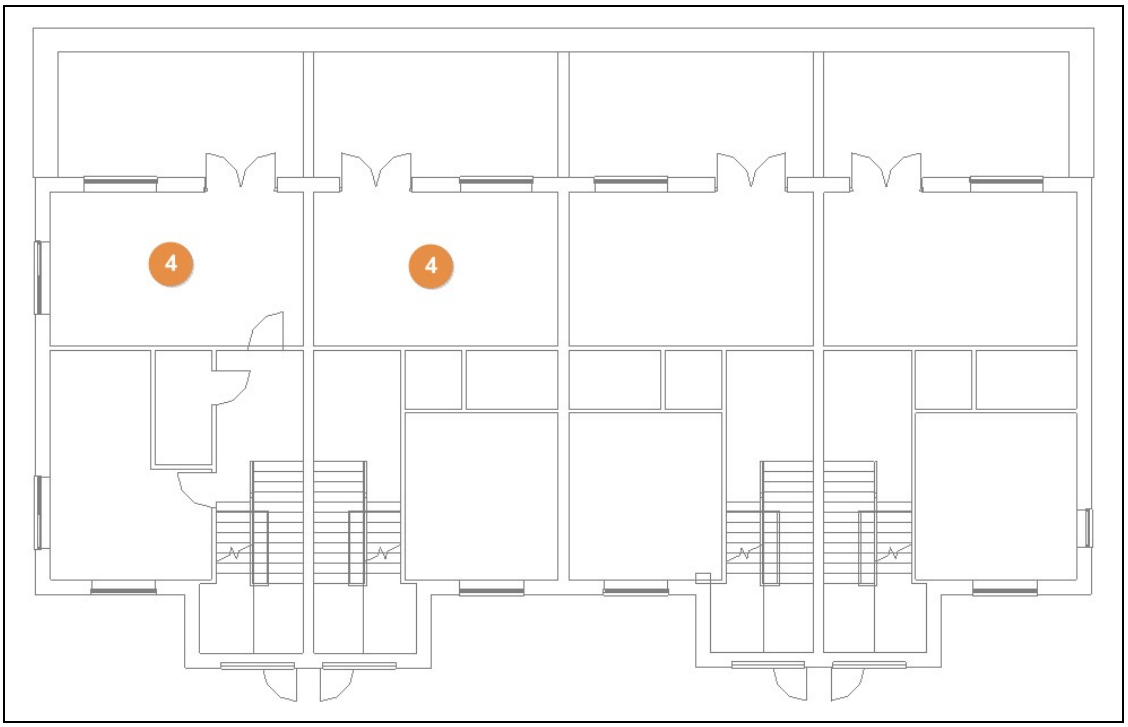
Therefore, these rooms are all in line with the BRE recommendations.

x These rooms have an average daylight factor below the recommended minimum values.

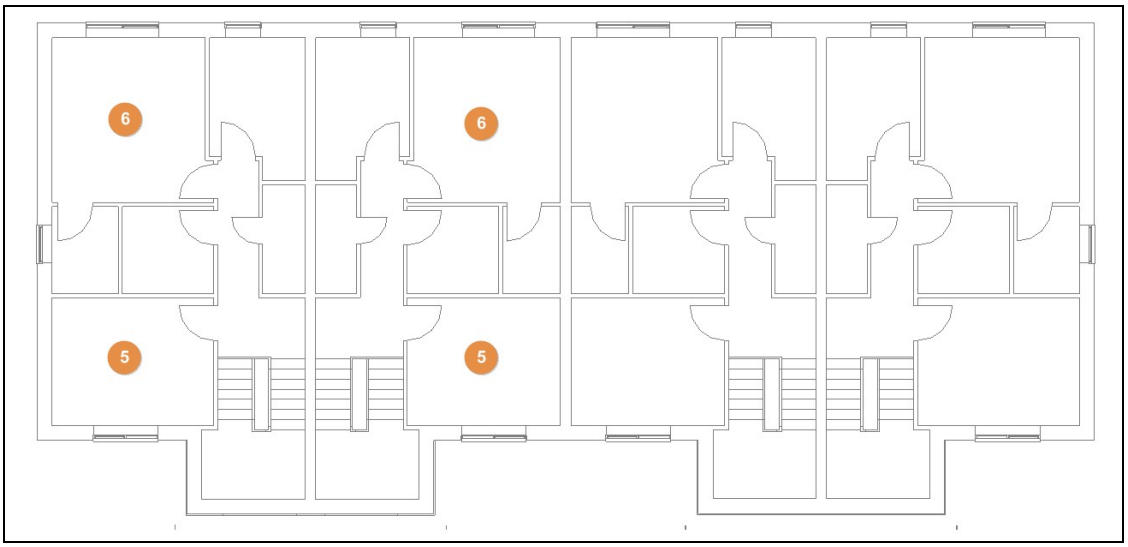
18.4.1 Typical Ground Floor – End & Mid-Terrace Duplex; Test Room References



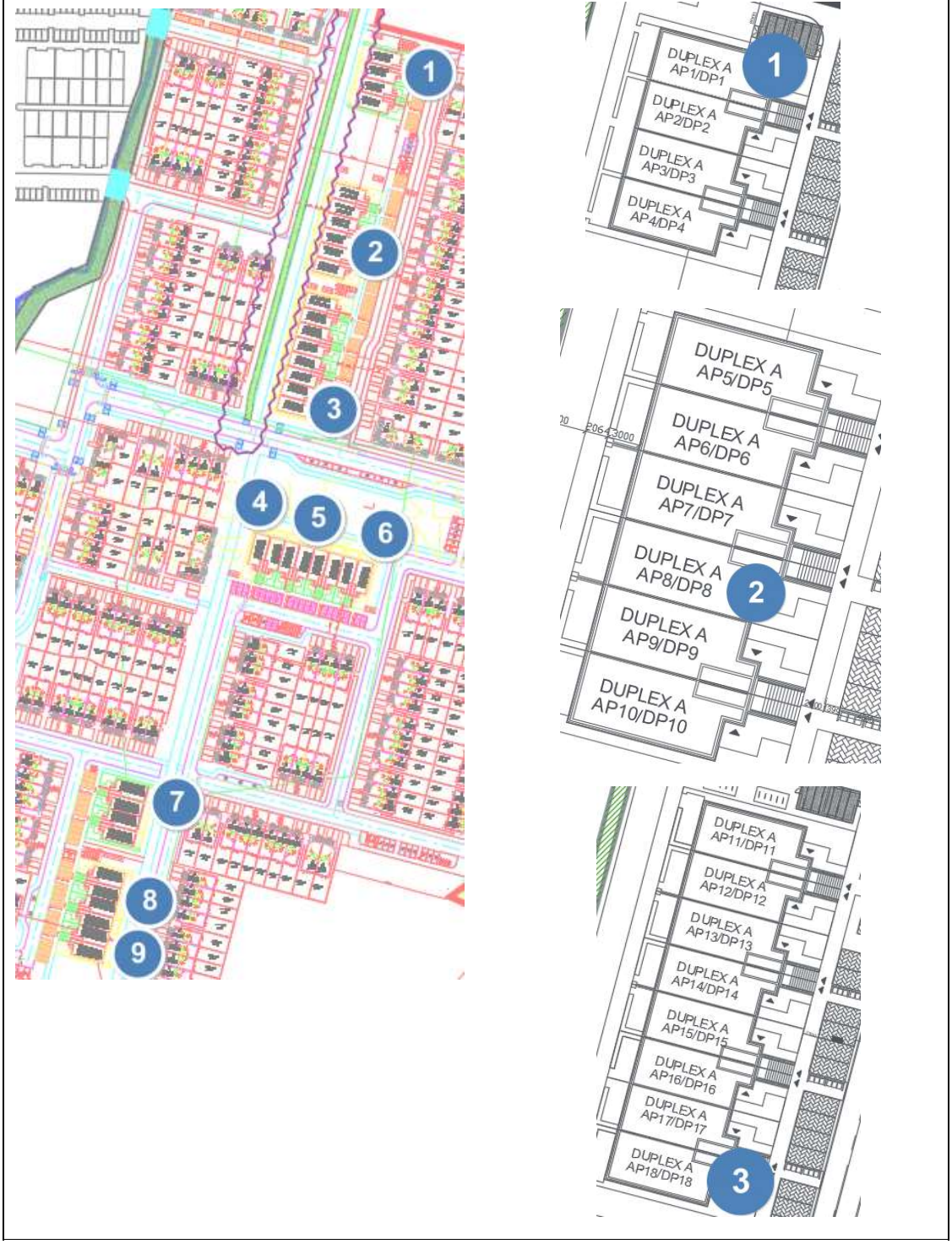
18.4.2 Typical First Floor – End & Mid-Terrace Duplex; Test Room References



18.4.3 Typical Second Floor – End & Mid-Terrace Duplex; Test Room References



18.4.4 Sample Duplex Apartments; Test Key Plan



A number of sample apartments were chosen to represent a mix of both terraced and end-terrace, which would also encompass sample results on apartments with differing orientations.

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
1 (Dup 1)	1	L00: AP1_Bedroom 01	Bedroom	2.19	✓
	2	L00: AP1_Bedroom 02	Bedroom	1.83	✓
	3	L00: AP1_Living	Living Room	2.88	✓
	4	L01: AP1_Living	Living Room	2.37	✓
	5	L02: AP1_Bedroom 01	Bedroom	3.82	✓
	6	L02: AP1_Bedroom 02	Bedroom	2.04	✓

Duplex Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
2 (Dup 8)	1	L00: AP8_Bedroom 01	Bedroom	1.48	✓
	2	L00: AP8_Bedroom 02	Bedroom	1.79	✓
	3	L00: AP8_Living	Living Room	2.36	✓
	4	L01: AP8_Living	Living Room	2.22	✓
	5	L02: AP8_Bedroom 01	Bedroom	1.85	✓
	6	L02: AP8_Bedroom 02	Bedroom	1.66	✓

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
3 (Dup 18)	1	L00: AP18_Bedroom 01	Bedroom	2.04	✓
	2	L00: AP18_Bedroom 02	Bedroom	1.64	✓
	3	L00: AP18_Living	Living Room	2.84	✓
	4	L01: AP18_Living	Living Room	2.32	✓
	5	L02: AP18_Bedroom 01	Bedroom	3.76	✓
	6	L02: AP18_Bedroom 02	Bedroom	2.01	✓

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
4 (Dup 19)	1	L00: AP19_Bedroom 01	Bedroom	2.17	✓
	2	L00: AP19_Bedroom 02	Bedroom	1.87	✓
	3	L00: AP19_Living	Living Room	2.79	✓
	4	L01: AP19_Living	Living Room	2.37	✓
	5	L02: AP19_Bedroom 01	Bedroom	3.76	✓
	6	L02: AP19_Bedroom 02	Bedroom	2.04	✓

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
5 (Dup 22)	1	L00: AP22_Bedroom 01	Bedroom	1.76	✓
	2	L00: AP22_Bedroom 02	Bedroom	1.84	✓
	3	L00: AP22_Living	Living Room	2.38	✓
	4	L01: AP22_Living	Living Room	2.25	✓
	5	L02: AP22_Bedroom 01	Bedroom	1.86	✓
	6	L02: AP22_Bedroom 02	Bedroom	1.68	✓

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
6 (Dup 26)	1	L00: AP26_Bedroom 01	Bedroom	1.63	✓
	2	L00: AP26_Bedroom 02	Bedroom	1.84	✓
	3	L00: AP26_Living	Living Room	2.59	✓
	4	L01: AP26_Living	Living Room	2.37	✓
	5	L02: AP26_Bedroom 01	Bedroom	1.99	✓
	6	L02: AP26_Bedroom 02	Bedroom	1.84	✓

Duplex Key Plan Ref..	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
7 (Dup 27)	1	L00: AP27_Bedroom 01	Bedroom	2.07	✓
	2	L00: AP27_Bedroom 02	Bedroom	1.83	✓
	3	L00: AP27_Living	Living Room	2.84	✓
	4	L01: AP27_Living	Living Room	2.42	✓
	5	L02: AP27_Bedroom 01	Bedroom	3.76	✓
	6	L02: AP27_Bedroom 02	Bedroom	2.02	✓

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
8 (Dup 33)	1	L00: AP33_Bedroom 01	Bedroom	1.38	✓
	2	L00: AP33_Bedroom 02	Bedroom	1.82	✓
	3	L00: AP33_Living	Living Room	2.46	✓
	4	L01: AP33_Living	Living Room	2.29	✓
	5	L02: AP33_Bedroom 01	Bedroom	1.87	✓
	6	L02: AP33_Bedroom 02	Bedroom	1.66	✓

Duplex Key Plan Ref.	Room Ref	Room Reference	Room Activity	ADF	BRE Recommendation
9 (Dup 36)	1	L00: AP36_Bedroom 01	Bedroom	2.15	✓
	2	L00: AP36_Bedroom 02	Bedroom	1.84	✓
	3	L00: AP36_Living	Living Room	2.95	✓
	4	L01: AP36_Living	Living Room	2.43	✓
	5	L02: AP36_Bedroom 01	Bedroom	3.82	✓
	6	L02: AP36_Bedroom 02	Bedroom	2.03	✓

18.5 Discussion

Full results for the rooms considered can be seen above. The results are summarised in the following table:

Ground Floor:

Living & Bedrooms Tested	27
Exceeds BRE recommendations	27
Below BRE recommendations (Living Rooms)	-
% of Rooms above BRE recommendations	**100%**

First Floor:

Living Rooms Tested	9
Exceeds BRE recommendations	9
Below BRE recommendations	-
% of Rooms above BRE recommendations	**100%**

Second Floor:

Bedrooms Tested	18
Exceeds BRE recommendations	18
Below BRE recommendations	-
% of Rooms above BRE recommendations	**100%**

Summary:

Total Rooms Tested	54
Exceeds BRE recommendations	54
Below BRE recommendations	-
% of Rooms above BRE recommendations	**100%**

Overall, this equates to a 100% success rate in the tested rooms.

As the results indicate, the quality of daylight in each apartment increases going upwards through each level. As such, it would be expected that 100% of the overall development would exceed the BRE recommendations.

19 Conclusion

The following can be concluded based on the studies undertaken

19.1 Shadow Analysis

The Shadow analysis shows different shadows being cast at three periods within a year by the proposed scheme. The images highlight that within these time frames the proposed development has no shading on surrounding properties and therefore can be described as having a 'negligible to minor adverse impact' for the majority of the year.

19.2 Sunlight to the Proposed Amenity Spaces

Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

Proposed Amenity Spaces:

The analysis images show that on the 21st of March for the proposed scheme amenity areas, over half of all amenity spaces would receive at least 2 hours of sunlight in line with the BRE recommendations.

19.3 Average Daylight Factors

100% of the rooms tested are achieving an Average Daylight Factor above the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight. The only room(s) achieving an Average Daylight Factor below the minimum recommended values are sample living / kitchen rooms located on the ground floor.

As the results indicate, the quality of daylight in each apartment increases going upwards through each level. As such, it would be expected that 100% of the overall development would exceed the BRE recommendations.

19.4 Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report itself states ‘although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite this, the site performs well in relation to the metrics considered in this report.

When comparing the proposed development against the existing situation the following can be concluded:

- Shading on surrounding properties can be described as having a ‘negligible to minor adverse impact’ for the majority of the year.

In terms of Sunlight to the Proposed Amenity Spaces, over half of all proposed amenity areas would receive over 2 hours of sunlight on the 21st March in line with the BRE recommendations.

In addition, 100% of the rooms tested in the proposed development have Average Daylight Factors (ADF) above the recommended values as outlined in the BRE guidelines.

Overall the results demonstrate that the proposed development performance is in line with BRE recommendations in the BRE ‘Site Layout Planning for Daylight and Sunlight’ guide, sometimes referred to as BRE Digest 209.

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