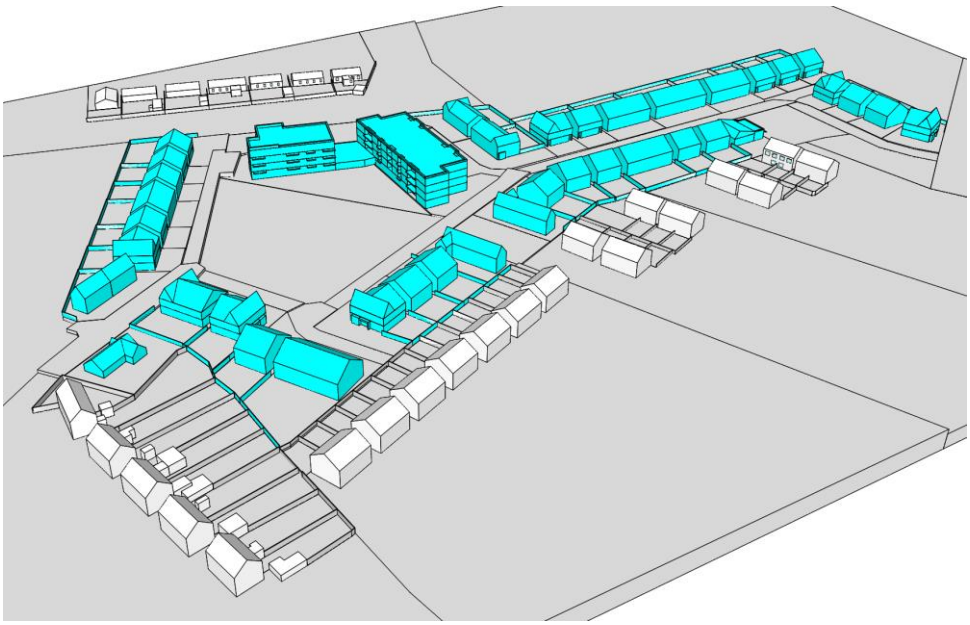
Puttaghan Lands, Tullamore

Daylight, Sunlight and Overshadowing Study



Report For: John Flanagan Developments

Project No: 16744

Version History

Document created by:
Integrated Environmental Solutions Limited
International Sustainability Consulting Developers of the IES **<Virtual Environment>**

Issued For:	**Prepared by:**		**Checked by:**
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Version:	**Date:**	**Revision Details:**	**Approved by:**
1	31/01/2023	Draft for comment	Douglas Bell
1	08/02/2023	Final Report	Douglas Bell
1	25/04/2023	Final Report	Douglas Bell

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1 Executive Summary

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Puttaghan Lands development located in Tullamore, Co. Offaly, Ireland. The report focuses on measuring the daylight and sunlight impact to the existing surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

1.1 Planning Authority Guidelines

The Sustainable Urban Housing: Design Standards for New Apartments December 2022 states the following in Section 6.6:

"Planning authorities should avail of appropriate expert advice where necessary and have regard to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2018 and the associated BRE guide 209 2022 Edition (June 2022) or any relevant future standards or guidance specific to the Irish context, when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."

With regards to daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all methodologies have been employed for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards. For clarity these are listed below and the following Section 1.2 denotes which standard is applicable for each assessment type:

- BRE Guide –3rd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- IS EN 17037-2018+A1-2021 – Daylight in Buildings
    - This is the Irish implementation of the European EN 17037-2018+A1-2021 standard
- BS EN 17037-2018+A1-2021 – Daylight in Buildings
    - This is the UK implementation of the European EN 17037-2018+A1-2021 standard. It supersedes BS 8206-2:2008 which is withdrawn in the UK. The BS EN standard includes a National Annex which addresses daylight requirements specific to dwellings which is notable as Ireland's climate matches closely with the UK.

1.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Shadow Analysis**
    - Assessed using shadow images cast at key times throughout the year, i.e. March 21st, June 21st and December 21st to determine if any overshadowing impact occurs and to what extent to any existing neighbouring dwellings in accordance with the BRE Guide (3rd Edition).
- **Sunlight to Amenity Spaces**
    - Assessed using annual Solar Exposure calculations to determine any impact to existing amenities and the sunlight received and also to assess the proposed developments amenity spaces to derive how much sunlight they can expect to receive in accordance with the BRE Guide (3rd Edition).
- **Sunlight to Existing Buildings**
    - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BRE Guide (3rd Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
    - Assessed using Solar Exposure calculations in accordance with IS/BS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)
    - In both assessments above the aim is to derive how much sunlight proposed development can expect to receive.
- **Daylight to Existing Buildings**
    - Assessed using the Vertical Sky Component (VSC) method in accordance with the BRE Guide (3rd Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
    - Assessed in accordance with IS EN 17037-2018+A1-2021 Method 2 (BRE Guide 3rd Edition)
    - Assessed in accordance with BS EN 17037-2018+A1-2021 National Annex Method 2 (BRE Guide 3rd Edition)
    - In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.
- **View Out**
    - Assessed in accordance with IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)
- **Glare**
    - Assessed in accordance with IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)

The following can be concluded based on the assessments undertaken:

1.3 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Permitted Situation and the Proposed Scheme. The results from the study are summarised as follows:

113-119 Arden Vale

Minimal additional shading is observed from the proposed development on these residential properties on December 1000, no additional overshadowing observed throughout the rest of the year.

82-89 Thornsberry Estate

No additional shading is observed from the proposed development on these residential properties throughout the year.

42-55 Harbour Walk

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 1800-2000, no additional overshadowing observed throughout the rest of the year.

24-27 Harbour Walk and 9-12 Harbour Drive

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 2000, no additional overshadowing observed throughout the rest of the year.

13-16 and 25-28 Harbour Drive

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 2000, no additional overshadowing observed throughout the rest of the year. It should be noted that the overshadowing noted is limited to the front façade of these properties and does not affect the main private amenity to the rear of the properties. As noted below this is verified in the "Sunlight to Amenity Spaces" section 6.1.2.

The results highlight there is minimal change to the shadows cast to the existing buildings when comparing the proposed scheme to the existing situation. The potential shading impact is quantified via the "Sunlight to Amenity Spaces" and "Daylight to Existing Buildings" sections of this report.

1.4 Sunlight to Amenity Spaces

The BRE Guide (3rd Edition) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st. In the case of existing amenity spaces, if they are already below the 50% threshold

then the BRE recommends the results are kept to within 80% of the existing situation with the proposed development in place.

Existing Amenity Spaces

On March 21st the existing amenity spaces will receive the same level of sunlight with the proposed development in place when compared to the permitted design. In all cases the results comply with the recommendations in the BRE Guide outlined above.

Proposed Amenity Spaces

On March 21st, 100% of the communal open space areas and 99.5% of the public open space areas situated within the development site will receive at least 2 hours of sunlight over its total area, thus complying with the BRE recommendations.

In regards of the proposed private amenity areas, all the tested spaces are complying with the BRE Guidelines.

1.5 Sunlight to Existing Buildings

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place.

Based on the criteria outlined in Section 3.2.9 of the BRE Guide 3rd Edition, none of the existing buildings fit the requirements to be assessed and as such the APSH assessment was not conducted for these properties. The BRE guide (3rd Edition) notes that there should be no impact to sunlight for the rest of the properties "It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted."

Given the statement above the surrounding dwellings adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, the existing adjacent properties were excluded on the basis, as noted in Section 3.2.9 of the BRE Guide 3rd Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the existing occupants.

1.6 Sunlight to Proposed Development

For the sunlight to proposed development assessment, this is covered in the following standards.

- IS/BS EN 17037-2018+A1-2021 & the BRE Guide 3rd Edition.

The methodologies discussed in each is the same.

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 considers the orientation of the rooms the following should be noted from section 3.1.11 of the guide.

"The BS EN 17037 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 68 no. points tested, 68 no. points (100%) meet the BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Overall, the sunlight provision results to the proposed development in accordance with IS/BS EN 17037-2018+A1-2021 are considered excellent.

Note, the sunlight exposure results are visually represented in Appendix B.

1.7 Daylight to Existing Buildings

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (3rd Edition), none of the neighbouring dwellings need to be included within the VSC assessment they did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the existing surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, none of the adjacent dwellings have been included within the VSC assessment as the daylight impact will be unnoticeable to the occupants.

1.8 Daylight to Proposed Development

For the daylight to proposed development assessment, two standards have been analysed: IS EN 17037-2018+A1-2021 and BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition). The results under each standard are summarised below.

BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021

It is important to note that IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition) does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 of IS EN 17037-2018+A1-2021 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1 (refer to Section 10.1.2 of this report). The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4 of the standard, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037-2018+A1-2021.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation

linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

Across the proposed development, 100% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037-2018+A1-2021 using Method 2.

BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 National Annex

In the UK, EN 17037-2018+A1-2021 was adopted to form "BS EN 17037-2018+A1-2021". However, a National Annex was included which states:

"The UK committee supports the recommendations for daylight in buildings given in BS EN 17037:2018; however, it is the opinion of the UK committee that the recommendations for daylight provision in a space (see Clause A.2) may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings. This National Annex therefore provides the UK committee's guidance on minimum daylight provision in all UK dwellings."

Whereas IS EN 17037-2018+A1-2021 does not provide different illuminance targets for different space types, the BS EN 17037-2018+A1-2021 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 10.1.3 of this report). It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

The BS National Annex also states:

"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx."

Therefore, combined LKDs were assessed using a 200 lux target illuminance (E_T).

Across the proposed development, 100% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037-2018+A1-2021 using Method 2.

1.9 View Out

The View Out assessment is related to buildings such as offices or schools where seating layouts are typically fixed compared to domestic settings where an occupant can move around the space freely. In their own home occupants can choose to sit near to or even at a window which will inevitably provide the varying layers of a 'View Out' such as the ground, landscape or sky. This ability to choose their position within a domestic setting means they would always have access to a position in the apartment with the minimum requirements of 'View Out'. Therefore, all the properties would meet the minimum requirement as outlined in IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition).

1.10 Glare

As outlined in IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition), a Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

1.11 Observations

It is important to note that the recommendations within the BRE Guide (3rd Edition) 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"*, Although this is true appropriate and reasonable regard has still been taken to the BRE guide.

Whilst the results shown relate to the criteria as laid out in the BRE Guide (3rd Edition), it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites.

In addition, BRE Guide 3rd Edition also notes

"This report is a comprehensive revision of the 2011 edition of Site layout planning for daylight and sunlight: a guide to good practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide 3rd Edition and IS EN 17037-2018+A1-2021 /BS EN 17037-2018+A1-2021 National Annex. With regards to the existing properties there is a negligible impact when considering sunlight and daylight as a result of the proposed development and the proposed development itself performs very well with the same regard.

2 Introduction

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Puttaghan Lands development located in Tullamore, Co. Offaly, Ireland. The report focuses on measuring the daylight and sunlight impact to the existing surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

2.1 Development Description

The development will consist of the Demolition of existing buildings and proposed residential development compromising the construction of 148 dwellings on a site area of c. 4 hectares on lands adjacent to the Midland Regional Hospital, Puttaghan, Tullamore. The proposed accommodation will consist of:

- 90no. houses comprising 08no. 2 bedroom houses, 58no. 3 bedroom houses and 24no. 4 bedroom houses. 89no. of the houses are 2 storey with 1no. 3 bed bungalow being proposed.
- 20 dwelling apartments comprising 4no. 1 bed units and 16no. 2 bed units over 4 storeys
- 38 no. age friendly assisted living units comprising of 28no. 1 bed units and 10no. 2 bed units with associated communal and administrative facilities.
- Crèche
- All ancillary site development works including footpaths, landscaping boundary treatments, public and private open space areas, car parking, bicycle parking, ESB substations, bin and bicycle stores and all ancillary site development works.

3 BRE – Site Layout Planning for Daylight and Sunlight (3rd Edition)

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

The 3rd Edition of the BR 209 BRE Site Layout Planning for Daylight and Sunlight, advise on planning developments for good access to daylight and sunlight and is widely used by local authorities to help determine the performance of new developments.

3.1 Impact Classification Discussion

BRE guidance in Appendix H (BRE Guide 3rd Edition) – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria summarised in the table below.

Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide (3rd Edition), the impact is assessed as negligible or minor adverse. Where the loss of skylight or sunlight does not meet the BRE guidelines, the impact is assessed as minor, moderate or major adverse.

Impact	Description
Negligible adverse impact	• *Loss of light well within guidelines, **or*** • *only a small number of windows losing light (within the guidelines) **or** limited area of open space losing light (within the guidelines)*

Minor adverse impact (a)	• *Loss of light only just within guidelines **and***
	  ○ *a larger number of windows are affected **or***
	  ○ *larger area of open space is 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 space only has a low-level requirement for skylight or sunlight* • *there are particular reasons 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 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 Methodology

4.1 Planning Authority Guidelines

The Sustainable Urban Housing: Design Standards for New Apartments December 2022 states the following in Section 6.6:

"Planning authorities should avail of appropriate expert advice where necessary and have regard to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2018 and the associated BRE guide 209 2022 Edition (June 2022) or any relevant future standards or guidance specific to the Irish context, when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."

With regards to daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all methodologies have been employed for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards. For clarity these are listed below and the following Section 1.2 denotes which standard is applicable for each assessment type:

- BRE Guide –3rd Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- IS EN 17037-2018+A1-2021 – Daylight in Buildings
    - This is the Irish implementation of the European EN 17037-2018+A1-2021 standard
- BS EN 17037-2018+A1-2021 – Daylight in Buildings
    - This is the UK implementation of the European EN 17037-2018+A1-2021 standard. It supersedes BS 8206-2:2008 which is withdrawn in the UK. The BS EN standard includes a National Annex which addresses daylight requirements specific to dwellings which is notable as Ireland's climate matches closely with the UK.

Furthermore, the EN 17037-2018+A1-2021 standard has already been adopted in the UK to inform the BS EN 17037-2018+A1-2021 standard which supersedes BS 8206-2:2008 which is now withdrawn. It is important to note that BS EN 17037-2018+A1-2021 includes a National Annex which specifically addresses daylight provision in residential dwellings in the UK. A similar annex is not included in the IS EN 17037-2018+A1-2021 standard.

Finally, the latest BRE guide 'Site Layout Planning for Daylight and Sunlight' (3rd Edition) has just been published (June 2022). This now directly links to the new daylighting standards EN 17037-2018+A1-2021. Aside refinements to the BRE guide, the assessments are the same to what is found within the BRE guide 2nd Edition.

Therefore, with regards to interior daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all have been carried out for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards.

4.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Shadow Analysis**
  - Assessed using shadow images cast at key times throughout the year, i.e. March 21st, June 21st and December 21st to determine if any overshadowing impact occurs and to what extent to any existing neighbouring dwellings in accordance with the BRE Guide (3rd Edition).
- **Sunlight to Amenity Spaces**
  - Assessed using annual Solar Exposure calculations to determine any impact to existing amenities and the sunlight received and also to assess the proposed developments amenity spaces to derive how much sunlight they can expect to receive in accordance with the BRE Guide (3rd Edition).
- **Sunlight to Existing Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BRE Guide (3rd Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
  - Assessed using Solar Exposure calculations in accordance with IS/BS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)
  - In both assessments above the aim is to derive how much sunlight proposed development can expect to receive.
- **Daylight to Existing Buildings**
  - Assessed using the Vertical Sky Component (VSC) method in accordance with the BRE Guide (3rd Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
  - Assessed in accordance with IS EN 17037-2018+A1-2021 Method 2 (BRE Guide 3rd Edition)
  - Assessed in accordance with BS EN 17037-2018+A1-2021 National Annex Method 2 (BRE Guide 3rd Edition)
  - In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.

- **View Out**
  - Assessed in accordance with IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)
- **Glare**
  - Assessed in accordance with IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition)

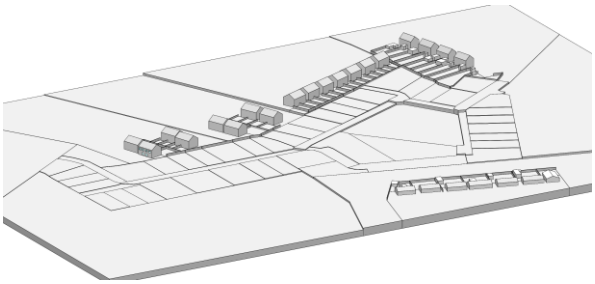
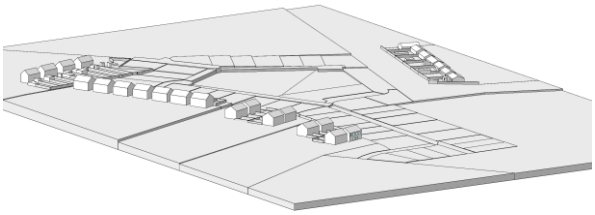
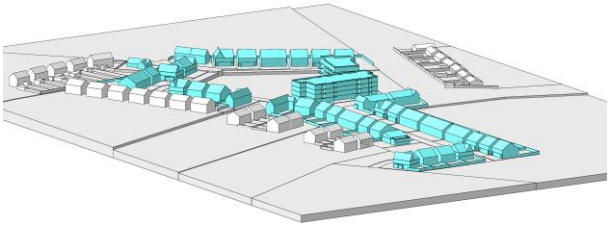
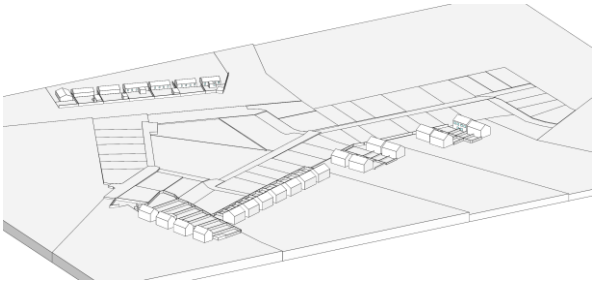
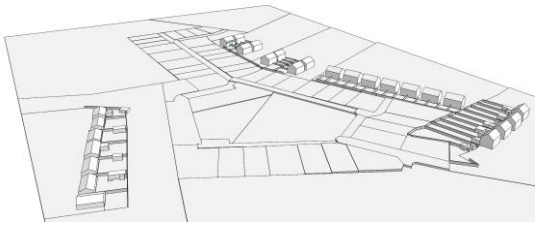
4.3 Orientation

The model orientation has been taken from drawings provided by the Architect with the resulting angle shown below used in the analysis.

Orientation	
	
	

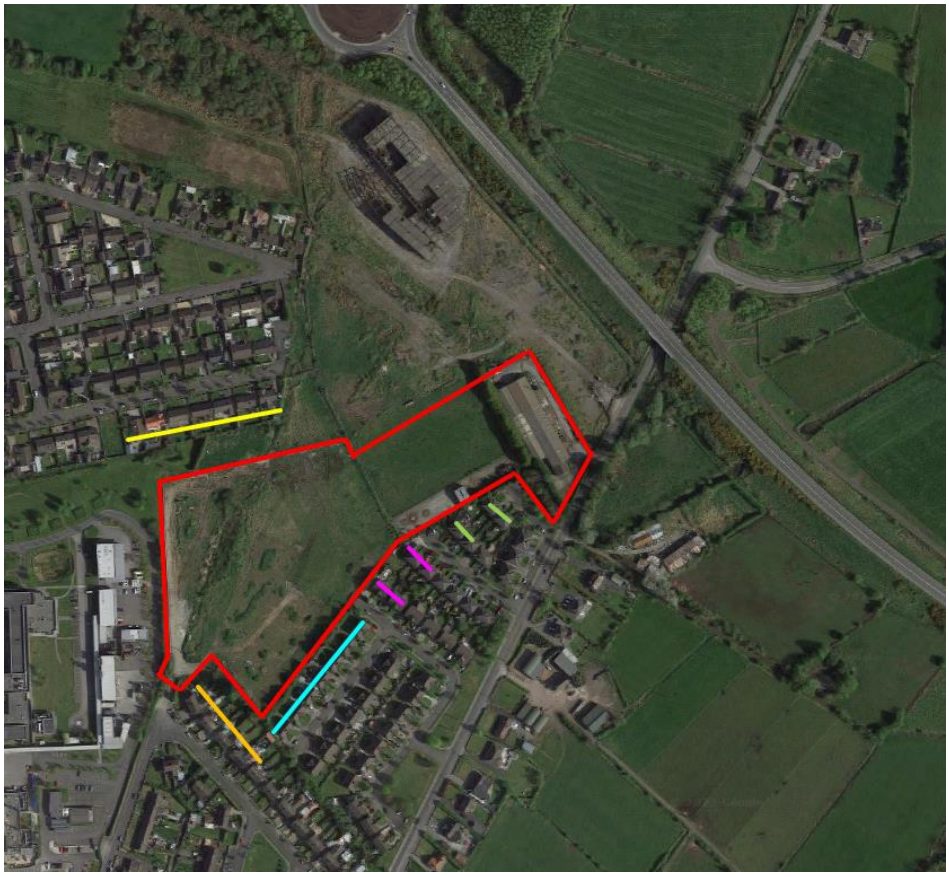
4.4 Proposed Model

The following images illustrate the models created from the architectural information provided and the use of Google/Bing maps where information was absent.

	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		

4.5 Potential Sensitive Receptors

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



	Proposed Site (approximate site boundary)
	113-119 Arden Vale
	82-89 Thornsberry Estate
	42-55 Harbour Walk
	24-27 Harbour Walk and 9-12 Harbour Drive
	13-16 and 25-28 Harbour Drive

5 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that the sunniest months in Ireland are May and June, based on 1981-2010 averages or latest: https://www.met.ie/climate/30-year-averages.

The following can also be shown:

- During December a mean daily duration of 1.7 hours of sunlight out of a potential 7.3 hours sunlight each day is received (i.e. only 23% of potential sunlight hours).
- During June a mean daily duration of 5.8 hours of sunlight out of a potential 15.9 hours sunlight each day is received (i.e. only 36% of potential sunlight hours).

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

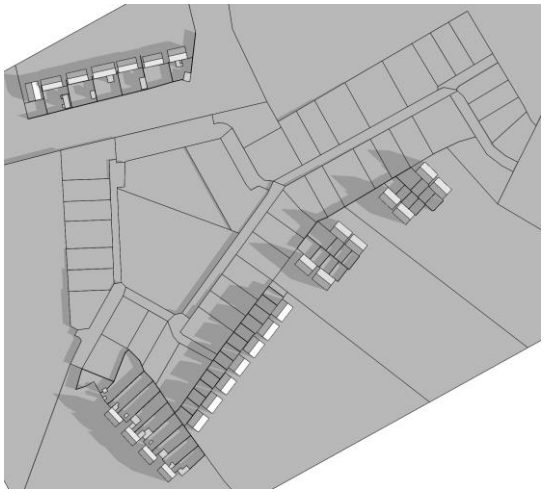
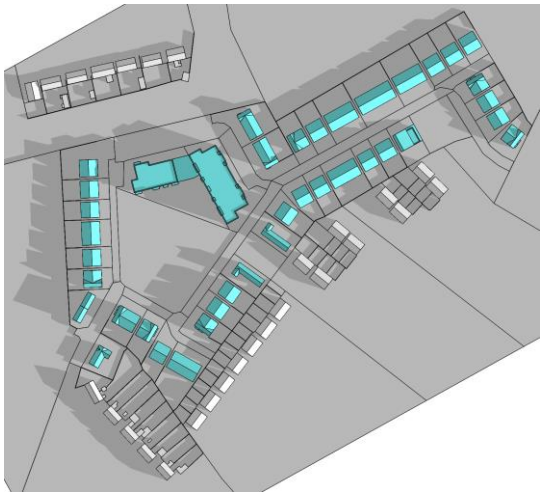
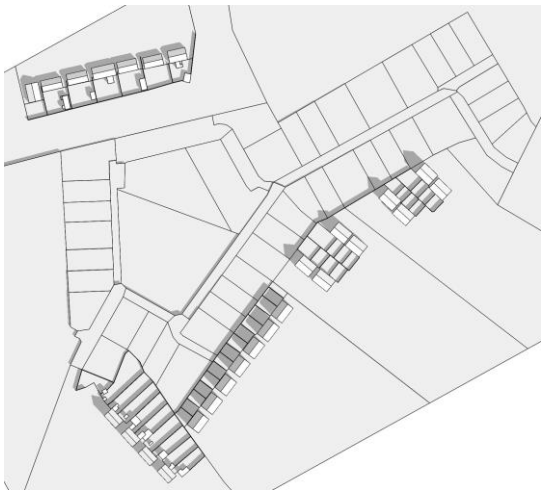
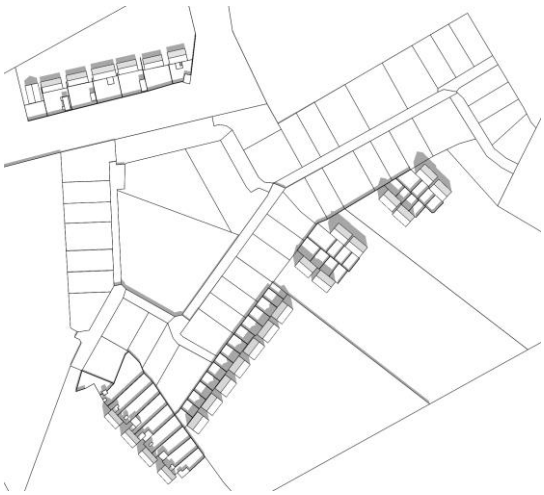
This section will consider the shadows cast by the proposed development on the following dates:

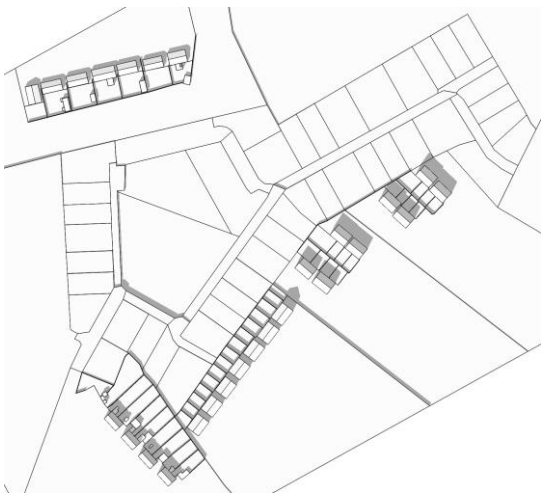
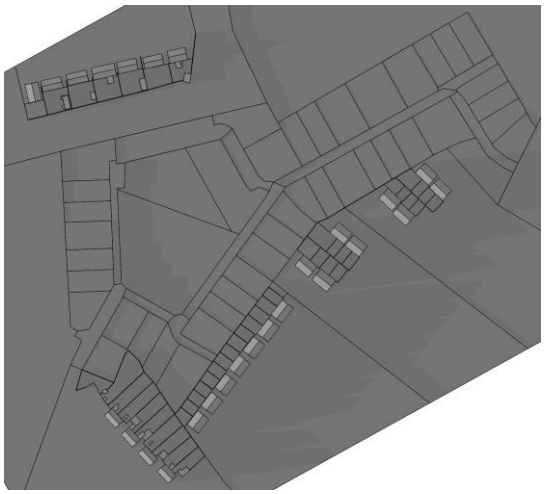
- March 21st / September 21st (Equinox)
- June 21st (Summer Solstice)
- December 21st (Winter Solstice)

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

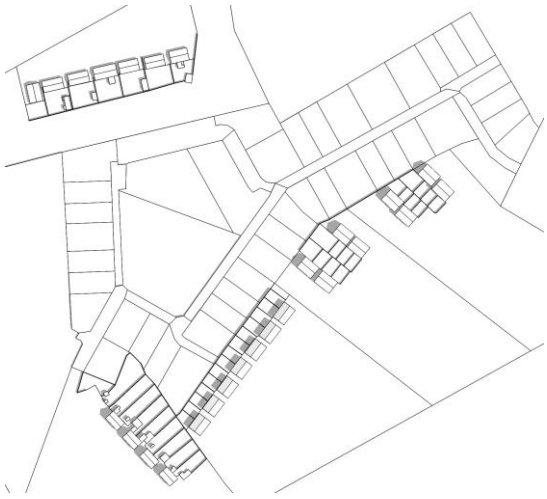
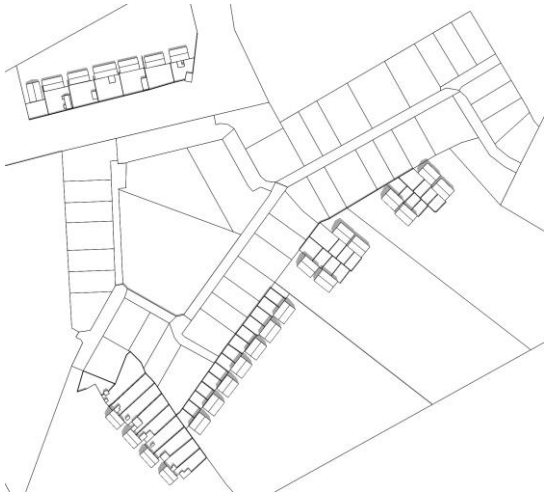
5.1 Plan View

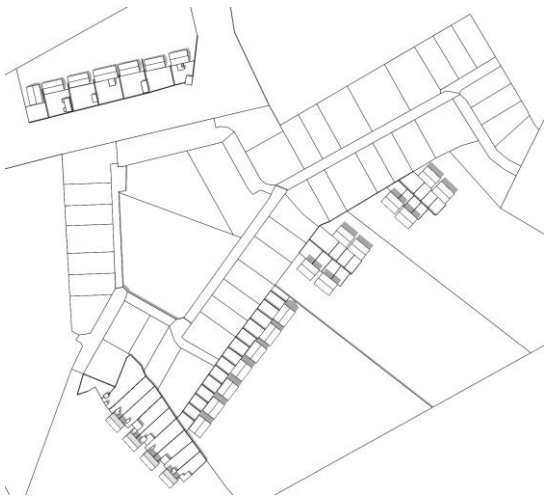
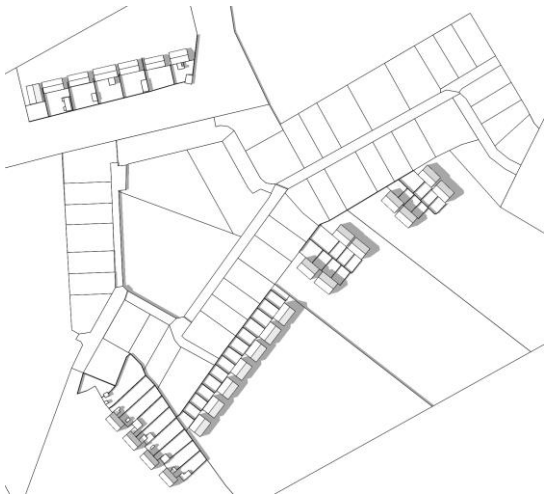
5.1.1 March 21st

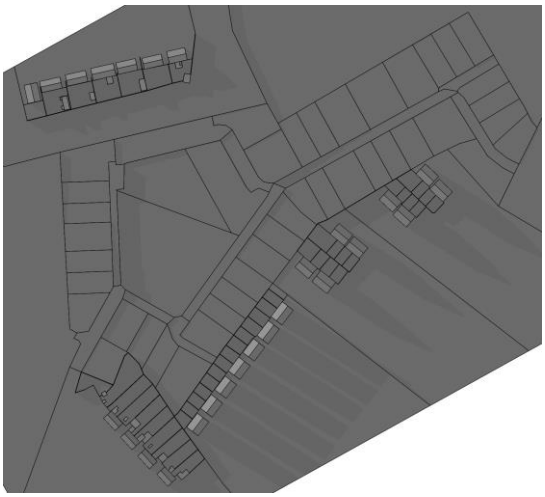
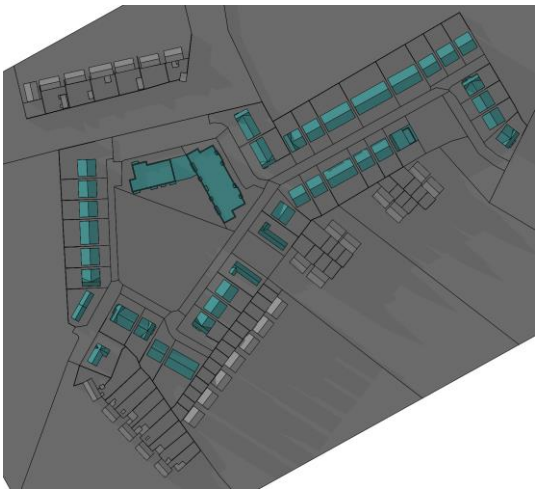
	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		
March 21st - 12:00		

	Existing	Proposed
March 21st - 14:00		
March 21st - 16:00		
March 21st - 18:00		

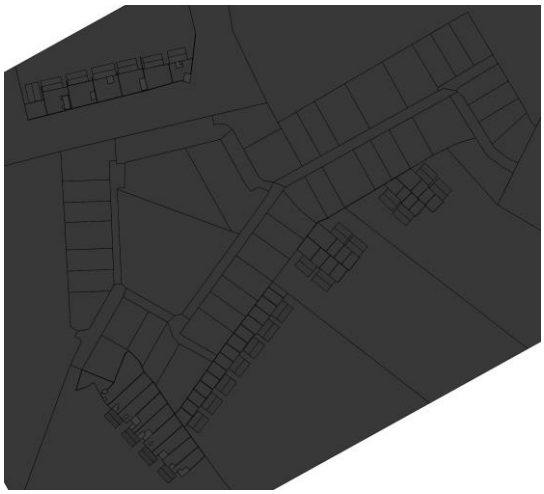
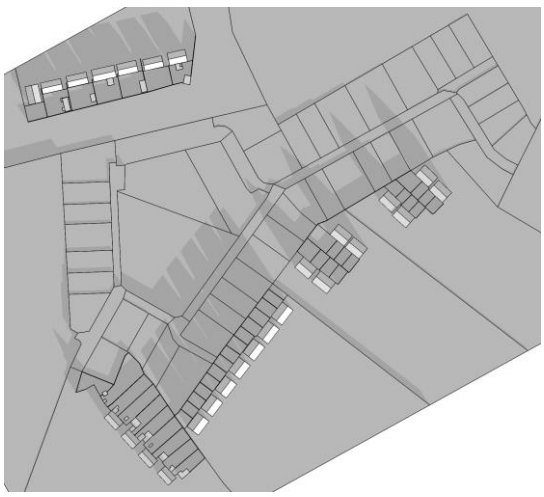
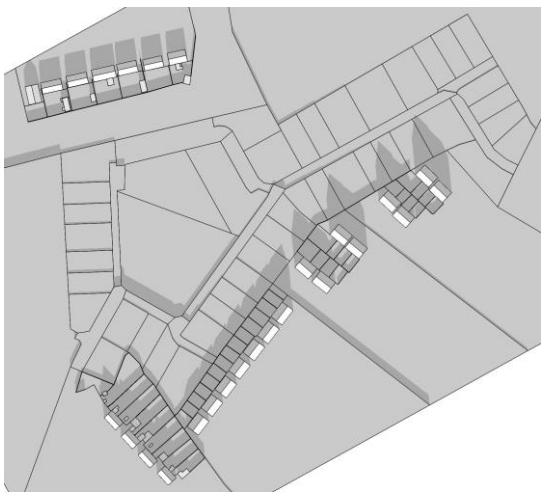
5.1.2 June 21st

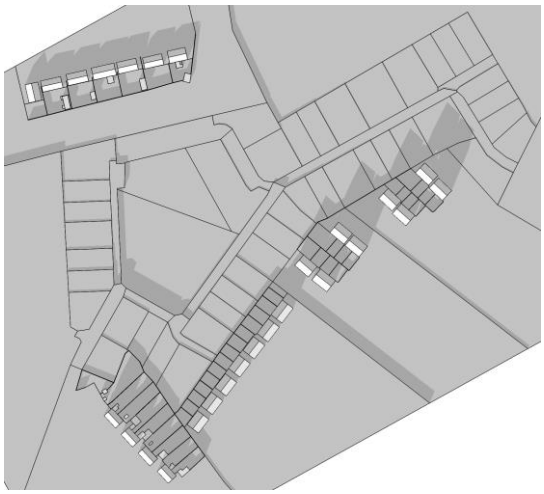
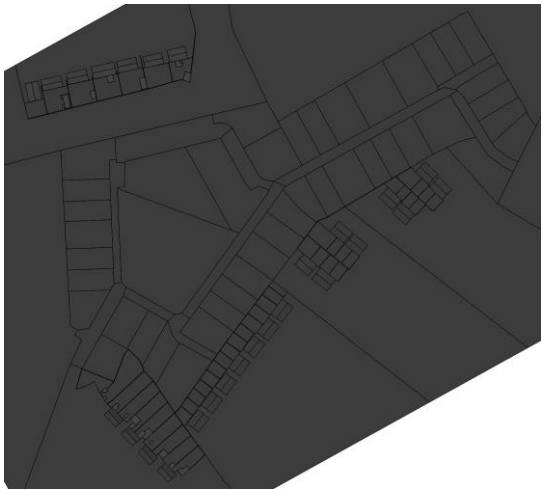
	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		
June 21st - 12:00		

	Existing	Proposed
June 21st - 14:00		
June 21st - 16:00		
June 21st - 18:00		

	Existing	Proposed
June 21st - 20:00		

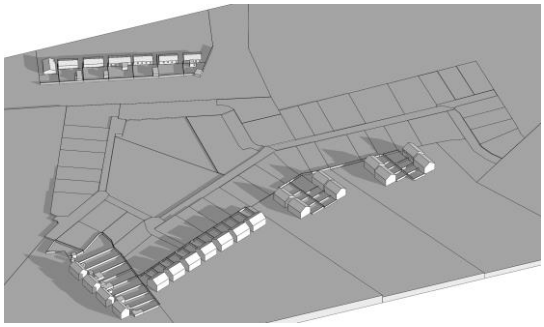
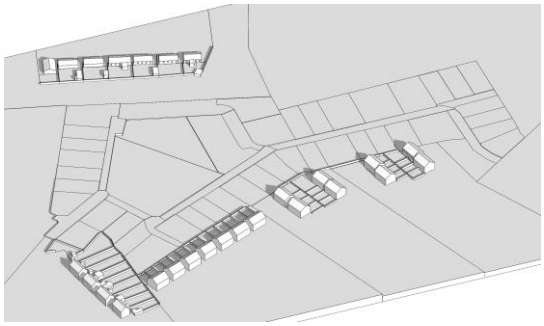
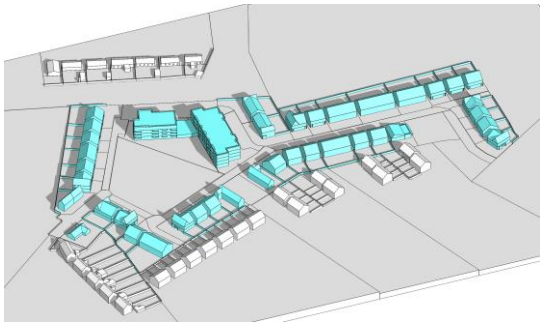
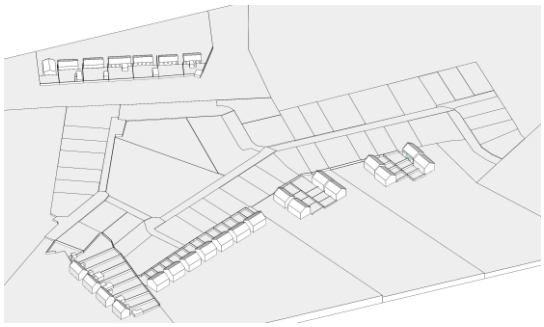
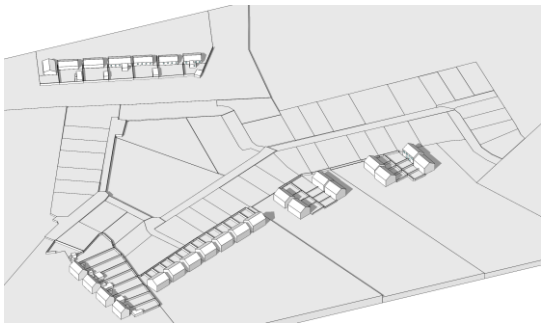
5.1.3 December 21st

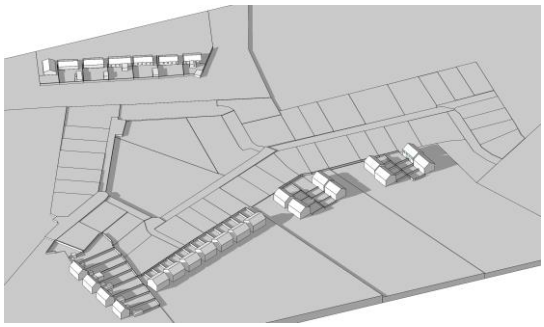
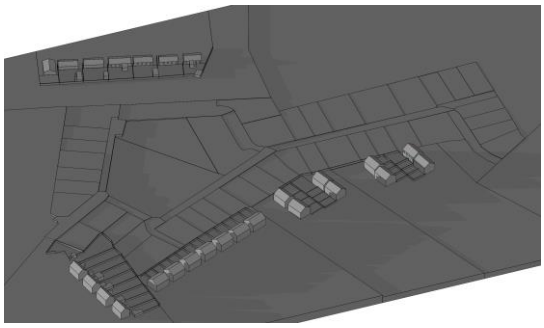
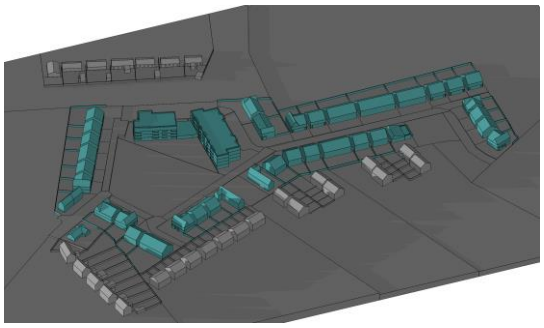
	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		

	Existing	Proposed
December 21st - 14:00		
December 21st - 16:00		

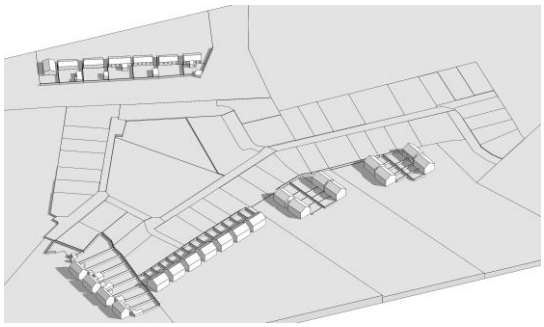
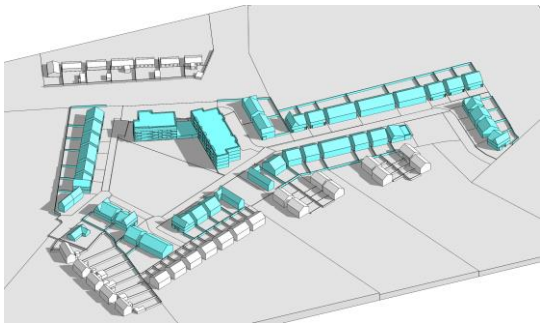
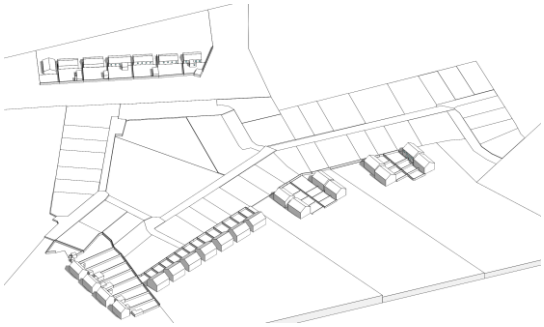
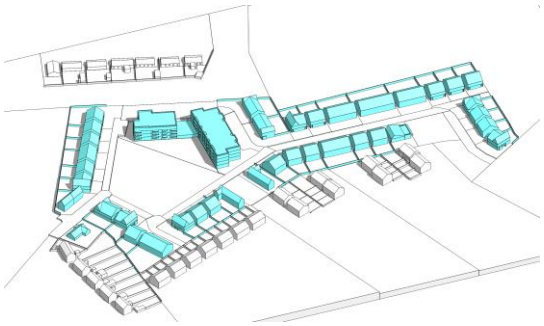
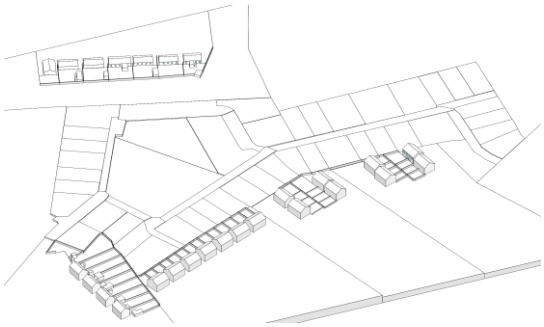
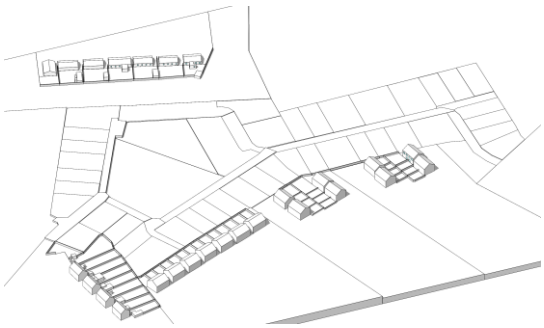
5.2 3D View

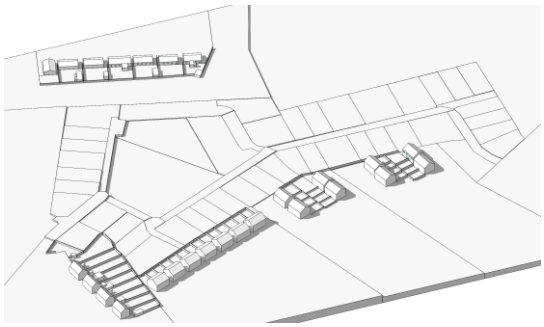
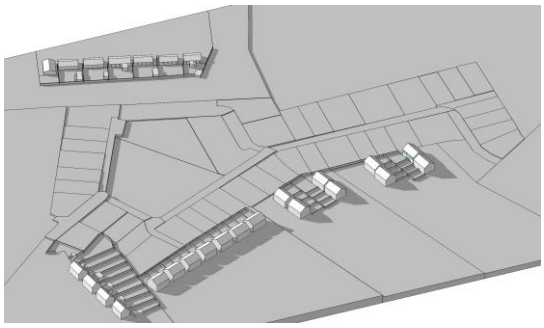
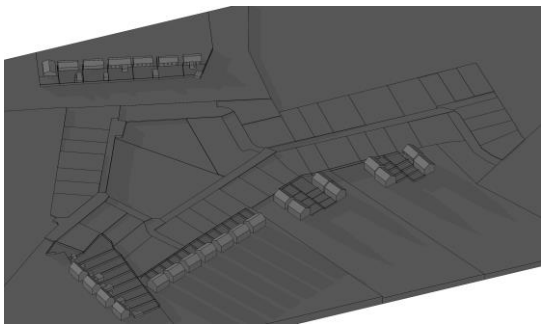
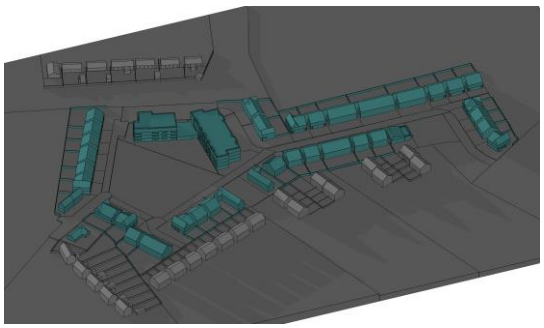
5.2.1 March 21st

	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		
March 21st - 12:00		
March 21st - 14:00		

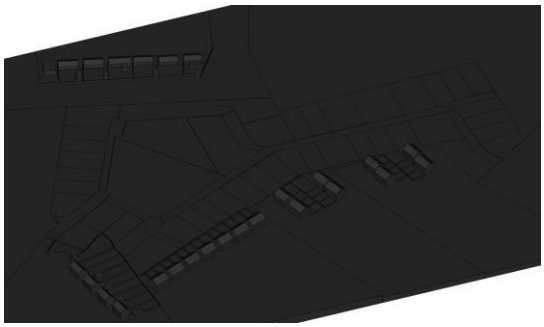
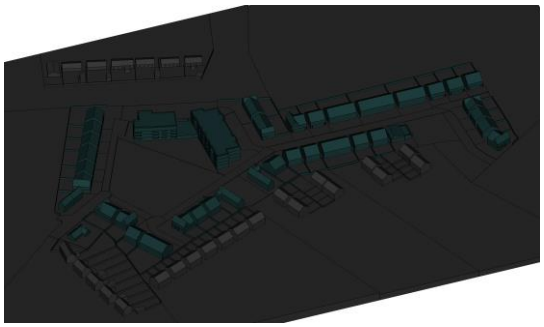
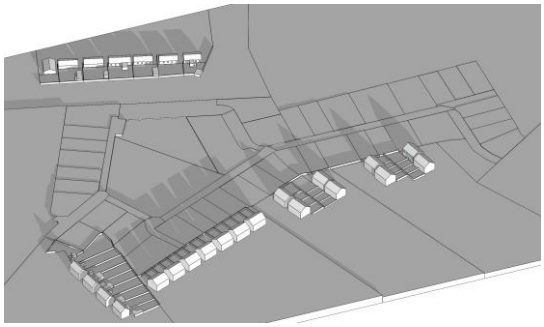
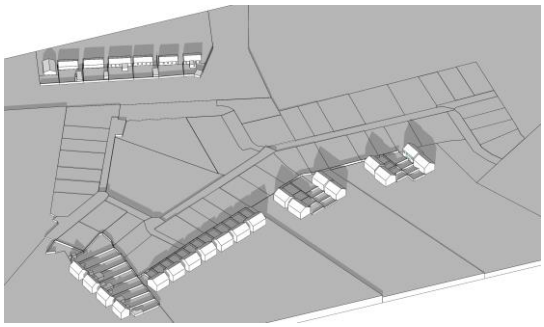
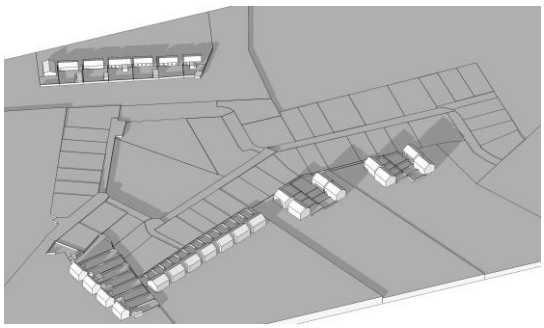
	Existing	Proposed
March 21st - 16:00		
March 21st - 18:00		

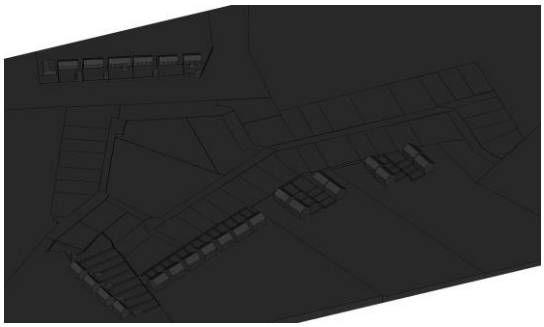
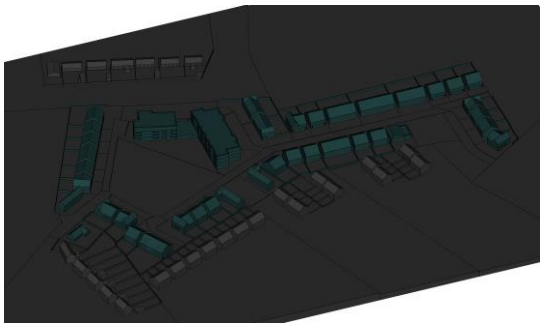
5.2.2 June 21st

	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		
June 21st - 12:00		
June 21st - 14:00		

	Existing	Proposed
June 21st - 16:00		
June 21st - 18:00		
June 21st - 20:00		

5.2.3 December 21st

	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		
December 21st - 14:00		

	Existing	Proposed
December 21st - 16:00		

5.3 Discussion

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Permitted Situation and the Proposed Scheme. The results from the study are summarised as follows:

113-119 Arden Vale

Minimal additional shading is observed from the proposed development on these residential properties on December 1000, no additional overshadowing observed throughout the rest of the year.

82-89 Thornsberry Estate

No additional shading is observed from the proposed development on these residential properties throughout the year.

42-55 Harbour Walk

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 1800-2000, no additional overshadowing observed throughout the rest of the year.

24-27 Harbour Walk and 9-12 Harbour Drive

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 2000, no additional overshadowing observed throughout the rest of the year.

13-16 and 25-28 Harbour Drive

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 2000, no additional overshadowing observed throughout the rest of the year. It should be noted that the overshadowing noted is limited to the front façade of these properties and does not affect the main private amenity to the rear of the properties. As noted below this is verified in the "Sunlight to Amenity Spaces" section 6.1.2.

The results highlight there is minimal change to the shadows cast to the existing buildings when comparing the proposed scheme to the existing situation. The potential shading impact is quantified via the "Sunlight to Amenity Spaces" and "Daylight to Existing Buildings" sections of this report.

6 Sunlight to Amenity Spaces

6.1 Guidance Requirements

The impact of the proposed development on the sunlight availability to the amenity spaces will be considered to determine how the amenity spaces perform when assessed against the BRE Guide (3rd Edition) 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 that can receive two hours of sun on 21 March is less than 0.80 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.

The BRE Guide (3rd Edition) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st.

6.1.1 Existing and Proposed Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide (3rd Edition), for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity space should receive at least 2 hours of sunlight on March 21st. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the permitted situation with the proposed development in place.

6.1.2 Existing Amenity Spaces

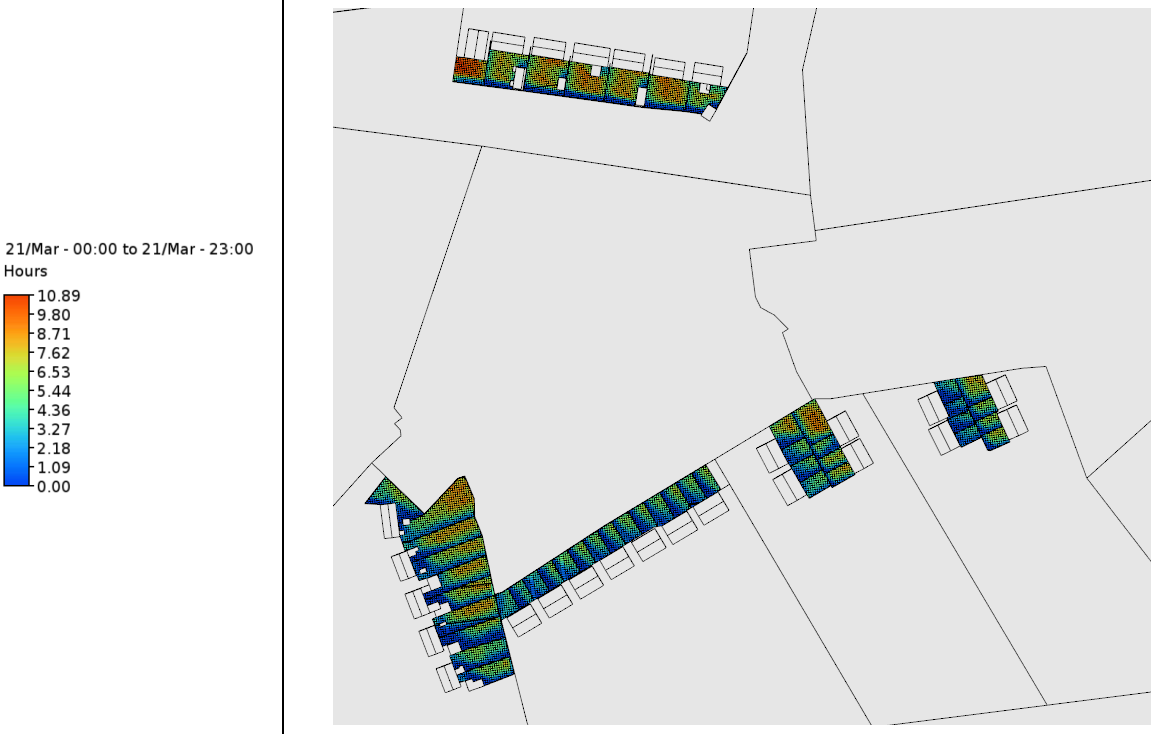
This analysis will be performed on the amenity spaces illustrated in the image below.

Existing Amenity Spaces	
Existing Amenities	

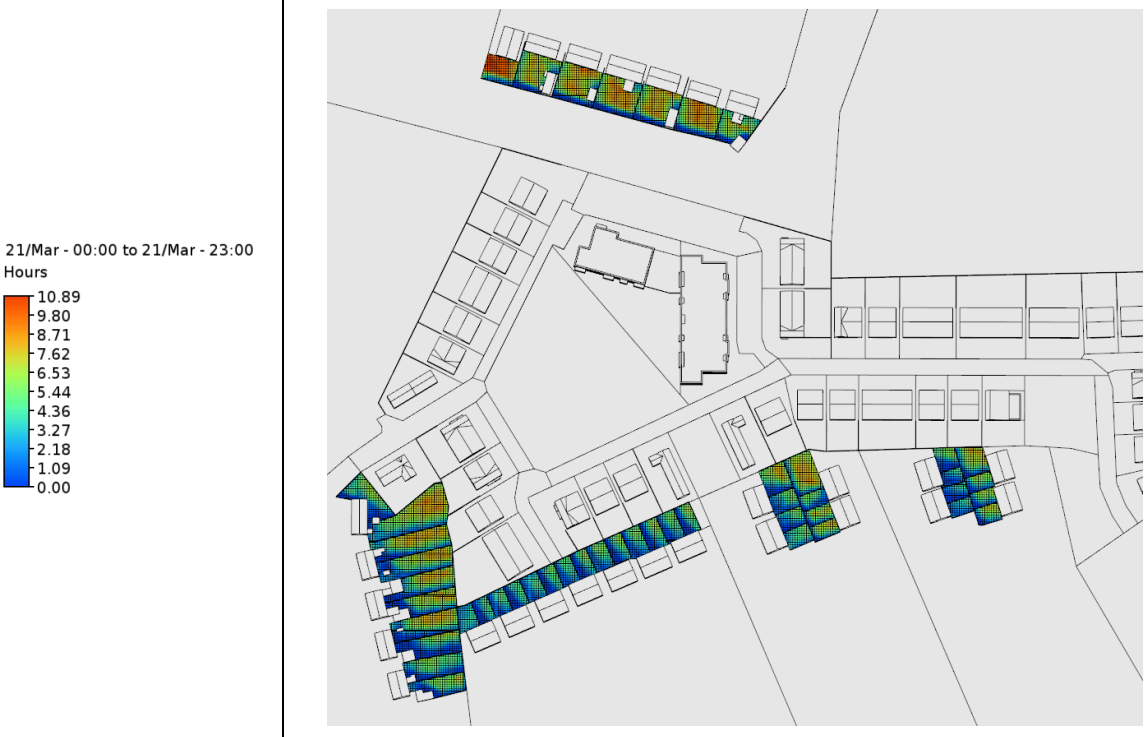
The following images illustrate the predicted results with respect to this space receiving at least 2 hours of sunlight on March 21st. Any areas that receive less than 2 hours of sunlight are colour-coded in grey.

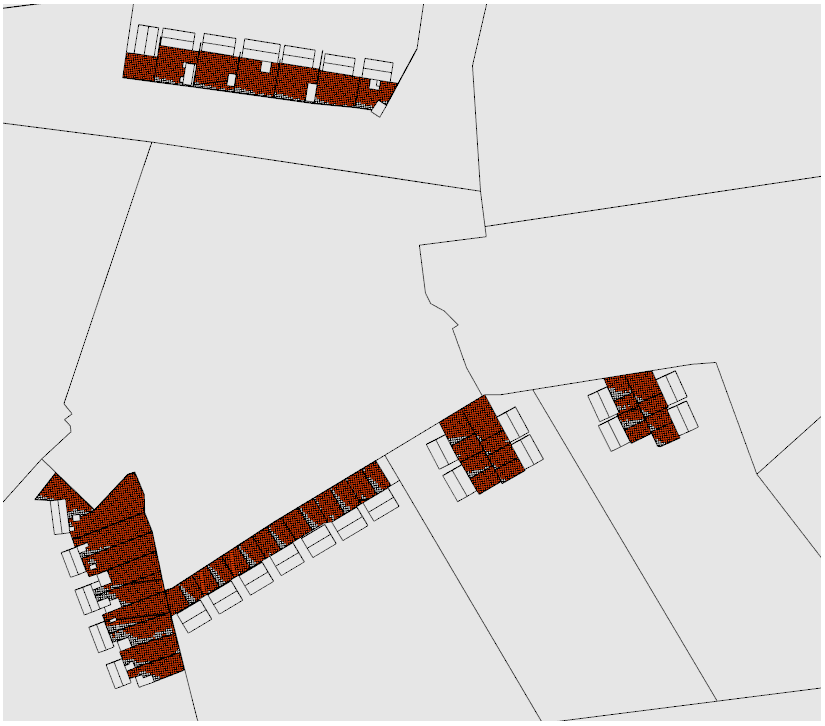
6.1.2.1 Existing Amenity Spaces Results

Permitted Development in place: Absolute Scale Showing all Hours of Sunlight Received



Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received



Permitted Development in place: Hours of Sunlight > 2 Illustrated in Red	
Receives more than 2 hours of sunlight Receives less than 2 hours of sunlight	
Proposed Development in place: Hours of Sunlight > 2 Illustrated in Red	
Receives more than 2 hours of sunlight Receives less than 2 hours of sunlight	

6.1.2.2 Existing Amenity Results

Existing Amenity Results

Ref	Area (m^2)	Existing Area >2 hrs		Existing Area with Proposed Development in Place >2 hrs		Proposed vs Existing (%)	Comment
		(m^2)	(%)	(m^2)	(%)		
1	160	160	100%	160	100%	100%	✓
2	235	220	93%	220	93%	100%	✓
3	300	280	93%	280	93%	100%	✓
4	266	246	93%	246	93%	100%	✓
5	254	225	89%	225	89%	100%	✓
6	267	247	92%	247	92%	100%	✓
7	168	145	86%	145	86%	100%	✓
8	213	185	87%	185	87%	100%	✓
9	445	445	100%	445	100%	100%	✓
10	304	285	94%	285	94%	100%	✓
11	303	299	99%	299	99%	100%	✓

Ref	Area (m^2)	Existing Area >2 hrs		Existing Area with Proposed Development in Place >2 hrs		Proposed vs Existing (%)	Comment
		(m^2)	(%)	(m^2)	(%)		
12	239	225	94%	225	94%	100%	✓
13	223	223	100%	223	100%	100%	✓
14	284	255	90%	255	90%	100%	✓
15	229	175	77%	175	77%	100%	✓
16	228	205	90%	205	90%	100%	✓
17	173	152	88%	152	88%	100%	✓
18	87	87	100%	87	100%	100%	✓
19	82	60	73%	60	73%	100%	✓
20	88	88	100%	88	100%	100%	✓
21	88	50	57%	50	57%	100%	✓
22	97	97	100%	97	100%	100%	✓
23	94	80	85%	80	85%	100%	✓
24	94	94	100%	94	100%	100%	✓
25	95	80	84%	80	84%	100%	✓
26	107	107	100%	107	100%	100%	✓
27	97	82	84%	82	84%	100%	✓
28	113	105	93%	105	93%	100%	✓
29	112	101	90%	101	90%	100%	✓
30	110	105	95%	105	95%	100%	✓
31	98	85	86%	85	86%	100%	✓
32	144	135	94%	135	94%	100%	✓
33	103	100	97%	100	97%	100%	✓
34	98	90	92%	90	92%	100%	✓
35	94	94	100%	94	100%	100%	✓
36	216	213	99%	213	99%	100%	✓
37	85	81	95%	81	95%	100%	✓
38	87	85	98%	85	98%	100%	✓
39	83	79	95%	79	95%	100%	✓
40	93	63	68%	63	68%	100%	✓
41	63	58	92%	58	92%	100%	✓
42	75	60	80%	60	80%	100%	✓
43	69	69	100%	69	100%	100%	✓
44	150	143	96%	143	96%	100%	✓
45	82	77	94%	77	94%	100%	✓
46	75	70	93%	70	93%	100%	✓
47	85	72	85%	72	85%	100%	✓

6.1.3 Proposed Amenity Spaces

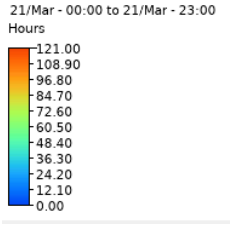
This analysis will be performed on the amenity spaces illustrated in the image below.

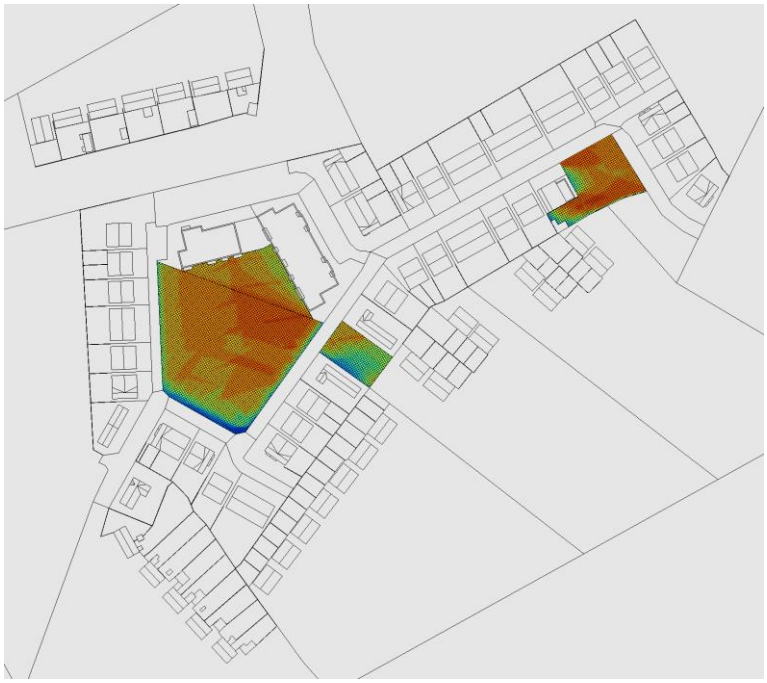
Proposed Amenity Spaces	
Communal Open Space Private Amenities Public Open Space	

The following images illustrate the predicted results with respect to this space receiving at least 2 hours of sunlight on March 21st. Any areas that receive less than 2 hours of sunlight are colour-coded in grey.

6.1.3.1 Proposed Public and Communal Amenity Spaces Results

Permitted Development in place: Absolute Scale Showing all Hours of Sunlight Received





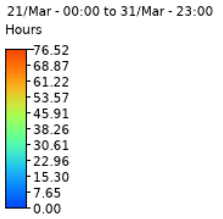
Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received

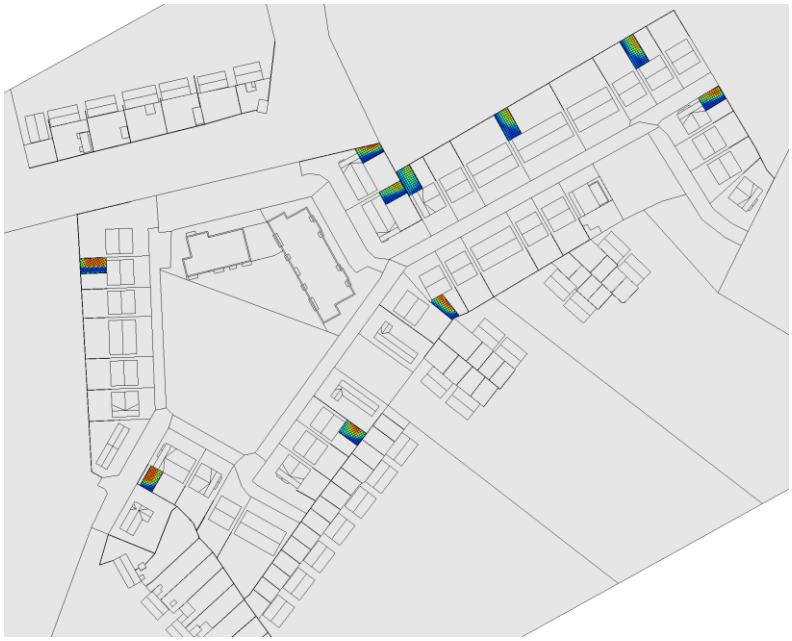
Receives more than 2 hours of sunlight

Receives less than 2 hours of sunlight

6.1.3.2 Proposed Private Amenity Spaces Results

Permitted Development in place: Absolute Scale Showing all Hours of Sunlight Received





Proposed Development in place: Absolute Scale Showing all Hours of Sunlight Received

Receives more than 2 hours of sunlight

Receives less than 2 hours of sunlight

6.1.3.3 Proposed Amenity Results

Proposed Public Amenity Results

Public Open Space Results:

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
1 (Public Open Space)	4,518	4,491	99%	✓
2 (Public Open Space)	640	640	100%	✓
3 (Public Open Space)	979	979	100%	✓
Total	**6,197**	**6,170**	**99.5%**	✓

Proposed Communal Amenity Results

Communal Open Space Results:

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
1 (Communal Open Space)	1,075	1,075	100%	✓
2 (Creche Play Area)	178	178	100%	✓
Total	**1,253**	**1,253**	**100%**	✓

Proposed Private Amenity Results

Ref	Total Area (m^2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
1	97	97	100%	✓
2	75	66	88%	✓
3	82	71	87%	✓
4	77	56	73%	✓
5	82	56	68%	✓
6	71	59	83%	✓
7	97	92	95%	✓
8	102	82	80%	✓
9	116	105	91%	✓
10	83	61	73%	✓

6.2 Discussion

As outlined in Section 3.3.17 of the BRE Guide (3rd Edition), 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 March 21st. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the permitted situation with the proposed development in place.

Existing Amenity Spaces

On March 21st the existing amenity spaces will receive the same level of sunlight with the proposed development in place when compared to the permitted design. In all cases the results comply with the recommendations in the BRE Guide outlined above.

Proposed Amenity Spaces

On March 21st, 100% of the communal open space areas and 99.5% of the public open space areas situated within the development site will receive at least 2 hours of sunlight over its total area, thus complying with the BRE recommendations.

In regards of the proposed private amenity areas, all the tested spaces are complying with the BRE Guidelines.

7 Sunlight to Existing Buildings

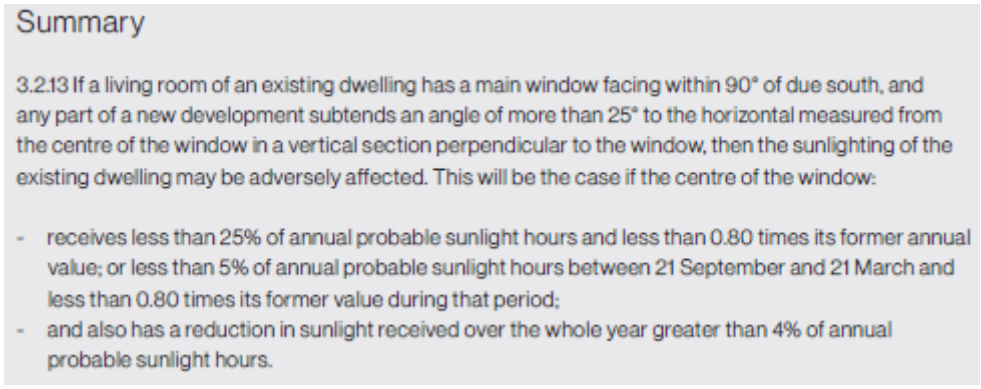
7.1 Guidance – BRE Guide (3rd Edition)

The BRE Guide (3rd Edition) states that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months, between 21st September and 21st March.

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

If a window reference point can receive more than 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months between 21st September and 21st March, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

If the available sunlight hours are both less than the amount given and less than 0.8 times their former value, either over the whole year or just during the winter months (21st September to 21st March) and reduction in sunlight across the year has a greater reduction than 4%, then the occupants of the existing building will notice the loss of sunlight.



Summary

3.2.13 If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:

- receives less than 25% of annual probable sunlight hours and less than 0.80 times its former annual value; or less than 5% of annual probable sunlight hours between 21 September and 21 March and less than 0.80 times its former value during that period;
- and also has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

BRE 3rd Edition guidance document Site Layout Planning for Daylight and Sunlight

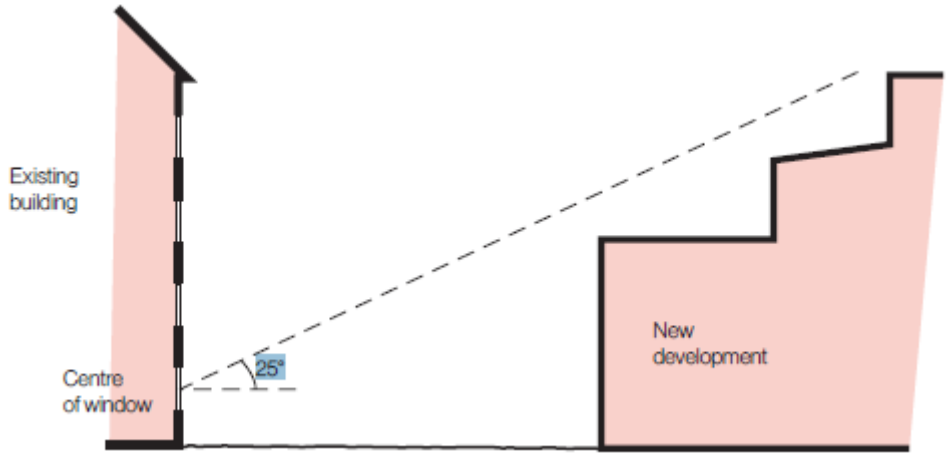
As such this study will compare the Existing Scheme and Proposed Schemes and consider if the values on the existing buildings meet the requirements outlined above when compared to their former value (that of the Existing scheme).

7.2 APSH Exclusions

The BRE recommendations note that if a new development sits within 90° of due south of any main living room window of an existing dwelling, then these should be assessed for APSH. However, there are several exceptional cases in which APSH is not required to be calculated, as indicated below:

3.2.9 It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either of the following is true:

- If the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window (note: obstructions within 90° of due north of the existing window need not count here).
- The window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal (Figure 14 in section 2.2). Again, obstructions within 90° of due north of the existing window need not be counted.
- The window wall faces within 20° of due south and the reference point has a VSC (section 2.1) of 27% or more.



BRE 3rd Edition guidance document Site Layout Planning for Daylight and Sunlight

Consequently, APSH will only be calculated for adjacent windows which meet the following conditions:

1. The height distance rule it not met and the existing building has living room with a main window which faces within 90 degrees of due south with the 25° rule not being met either.
2. Existing building is located to the North, East, or West of the Proposed Development.
3. The existing main living room window lies within 20 degrees of due south and has a VSC of less than 27%.

7.3 Discussion

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place.

Based on the criteria outlined in Section 3.2.9 of the BRE Guide 3rd Edition, none of the existing buildings fit the requirements to be assessed and as such the APSH assessment was not conducted for these properties. The BRE guide (3rd Edition) notes that there should be no impact to sunlight for the rest of the properties "It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted."

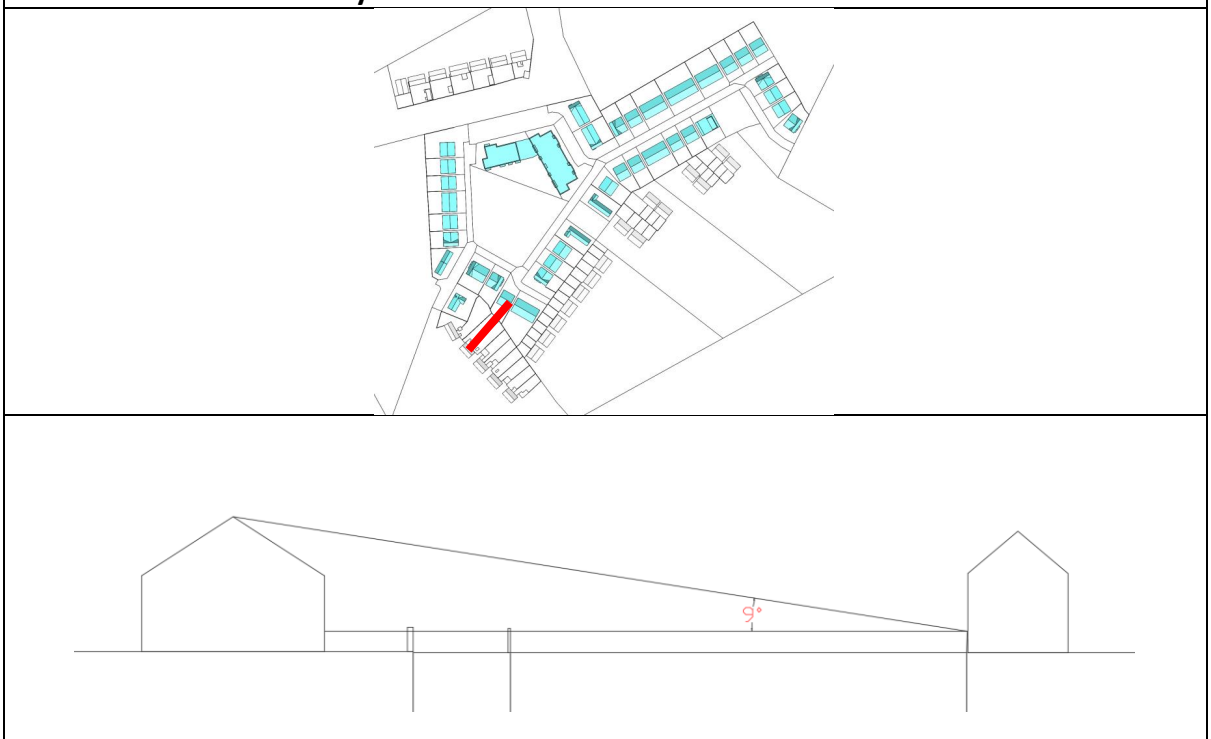
Given the statement above the surrounding dwellings adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, the existing adjacent properties were excluded on the basis, as noted in Section 3.2.9 of the BRE Guide 3rd Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the existing occupants.

Screenshots showing the 25-degree rule sections are shown in the following page.

View 1: 113-119 Arden Vale

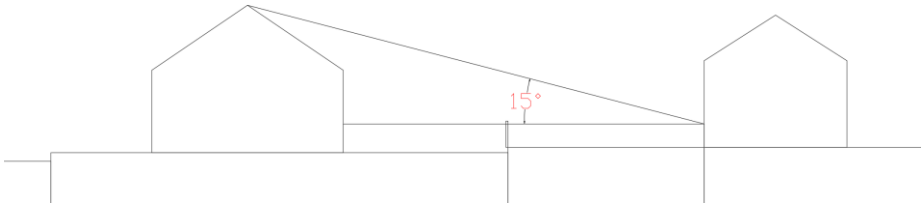
Site Section – Qualification of 25° Rule

View 2: 82-89 Thornsberry Estate



Site Section – Qualification of 25° Rule

View 3: 42-55 Harbour Walk


Site Section – Qualification of 25° Rule

8 Sunlight to Proposed Development

8.1 Guidance – BRE Guide 3rd Edition / IS/BS EN 17037-2018+A1-2021

Section 5.3.1 of IS/BS EN 17037-2018+A1-2021 states that *"exposure to sunlight is an important quality criterion of an interior space and can contribute to human well-being."* Table A.6 from IS/BS EN 17037-2018+A1-2021 summarises the recommendation for daily sunlight exposure.

Table A.6 — Recommendation for daily sunlight exposure

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1,5 h
Medium	3,0 h
High	4,0 h

Within the context of a domestic property, BRE Guide 3rd Edition/IS EN 17037:2018 states that at least one habitable space within a dwelling should receive the recommended minimum value of 1.5 hours of sunlight on the 21st of March. The test is carried out on a clear, cloud free day.

8.2 Sunlight Exposure Assessment

Based on the above criteria for BRE Guide 3rd Edition/IS/BS EN 17037-2018+A1-2021, all main living room windows within the proposed development have been assessed with the results included in the following sections.

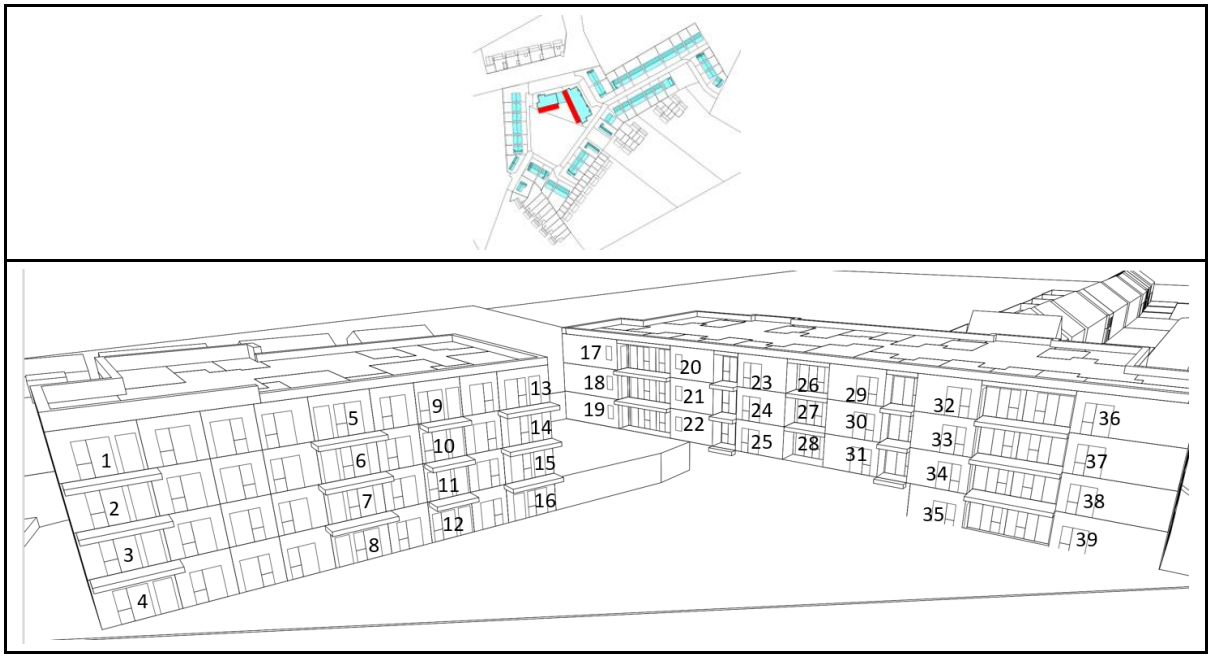
Please note, the "Comment" symbol in each of the tables represents the following:

BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021

✓ These rooms achieve the minimum 1.5 hours of recommended sunlight exposure on March 21st.

x These rooms do not achieve the minimum 1.5 hours of recommended sunlight exposure on March 21st.

8.2.1 View 01 – Apartment Block

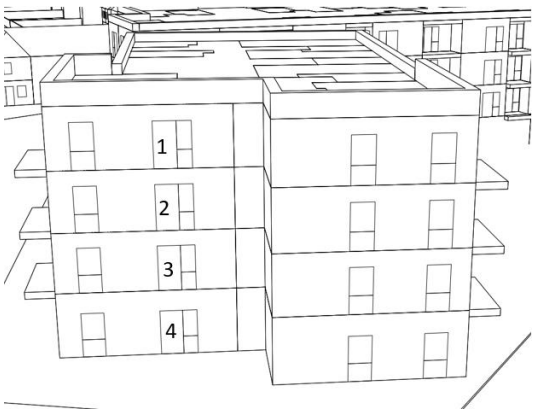


Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs	Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment		Comment
1	✓	21	✓
2	✓	22	✓
3	✓	23	✓
4	✓	24	✓
5	✓	25	✓
6	✓	26	✓
7	✓	27	✓
8	✓	28	✓
9	✓	29	✓
10	✓	30	✓
11	✓	31	✓
12	✓	32	✓
13	✓	33	✓
14	✓	34	✓
15	✓	35	✓
16	✓	36	✓
17	✓	37	✓
18	✓	38	✓
19	✓	39	✓
20	✓		

8.2.2 View 02 – Apartment Block

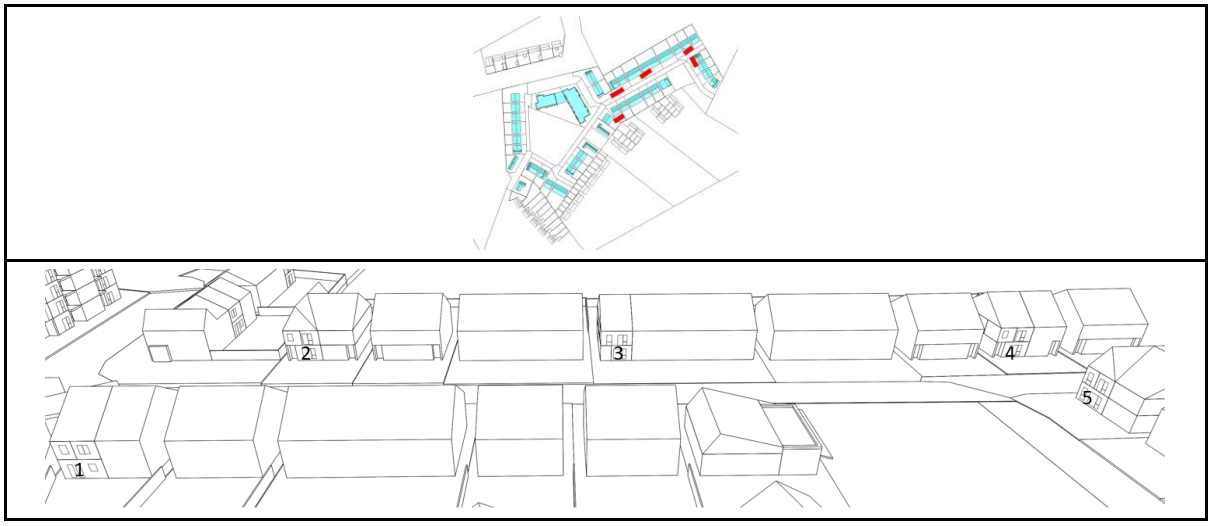
Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment
1	✓
2	✓
3	✓
4	✓
5	✓
6	✓
7	✓
8	✓
9	✓
10	✓
11	✓
12	✓
13	✓
14	✓
15	✓

8.2.3 View 03 – Apartment Block



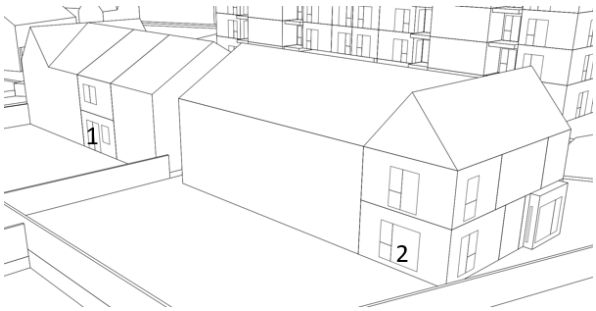
Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment
1	✓
2	✓
3	✓
4	✓

8.2.4 View 04 – Houses



Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment
1	✓
2	✓
3	✓
4	✓
5	✓

8.2.5 View 05 – Houses



Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment
1	✓
2	✓

8.2.6 View 06 – Houses

Ref.	BRE Guide 3rd Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	Comment
1	✓
2	✓
3	✓

8.3 Discussion

BRE Guide 3rd Edition / IS/BS EN 17037-2018+A1-2021

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / IS/BS EN 17037-2018+A1-2021 considers the orientation of the rooms the following should be noted from section 3.1.11 of the guide.

"The BS EN 17037 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 68 no. points tested, 68 no. points (100%) meet the BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Overall, the sunlight provision results to the proposed development in accordance with IS/BS EN 17037-2018+A1-2021 are considered excellent.

Finally, the sunlight exposure results are visually represented in Appendix B.

9 Daylight to Existing Buildings

9.1 Guidance – BRE Guide (3rd Edition) / IS/BS EN 17037-2018+A1-2021

When designing a new development, it is important to safeguard the daylight to nearby buildings. The BRE Guide provides 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 existing 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 determining the vertical sky component at the centre of key reference points. The vertical sky component definition from the BRE Guide (3rd Edition) is described below:

Vertical sky component (VSC)	This is a measure of the amount of light reaching a window. It is the 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 RadianceIES, a module of IES VE.

For typical residential schemes the BRE Guide (3nd Edition) 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 scheme and Proposed scheme and consider if the values on the existing buildings are above 27% or not less than 0.8 times their former value (that of the Existing scheme).

9.2 Discussion

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (3rd Edition), none of the neighbouring dwellings need to be included within the VSC assessment they did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the existing surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, none of the adjacent dwellings have been included within the VSC assessment as the daylight impact will be unnoticeable to the occupants.

Screenshots showing the 25-degree rule sections can be found in Section 7.3.

10 Daylight to Proposed Development

This section addresses daylight provision to the proposed apartments and housing. The purpose of the calculations is to quantify an overall percentage of units which exceeds the daylight provision recommendations. Our proposed methodology is to complete the calculations for all of the apartments and a sample of the housing within the development. The objective of the design team is to maximise the number of units which exceed the minimum recommendations.

10.1 Reference Standards

The daylight provision to the proposed development was assessed against the following standards for completeness:

- BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021
- BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021

The following sections summarise the various requirements of each standard.

10.1.1 BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021

As outlined in Section 5.1.2 of the IS EN 17037-2018+A1-2021 standard:

"A space is considered to provide adequate daylight if a target illuminance level is achieved across a fraction of the reference plane within a space for at least half of the daylight hours. In addition, for spaces with vertical or inclined daylight openings, a minimum target illuminance level is also to be achieved across the reference plane".

Annex A of IS EN 17037-2018+A1-2021 gives three levels of recommendation for the assessment of daylight provision in interior spaces which are summarised as follows:

"The three levels are: minimum, medium and high, and the minimum recommendation should be provided."

It is important to note that IS EN 17037-2018+A1-2021 does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

Table A.1 of IS EN 17037-2018+A1-2021 (included below) provides recommendations for daylight provision by daylight openings in vertical and inclined surfaces. Note, Table A.2 provides similar recommendations for daylight openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.2 are not followed.

To achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.1, the following must be achieved:

- A target illuminance (E_T) of 300 lux must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target illuminance (E_{TM}) of 100 lux must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

Table A.1 — Recommendations of daylight provision by daylight openings in vertical and inclined surface

Level of recommendation for vertical and inclined daylight opening	Target illuminance E_T lx	Fraction of space for target level $F_{plane,\%}$	Minimum target illuminance E_{TM} lx	Fraction of space for minimum target level $F_{plane,\%}$	Fraction of daylight hours $F_{time,\%}$
Minimum	300	50 %	100	95 %	50 %
Medium	500	50 %	300	95 %	50 %
High	750	50 %	500	95 %	50 %
NOTE Table A.3 gives target daylight factor (D_T) and minimum target daylight factor (D_{TM}) corresponding to target illuminance level and minimum target illuminance, respectively, for the CEN capital cities.					

The recommendations in Table A.1 can also be expressed in terms of a daylight factor "D". Table A.3 provides the corresponding daylight factor (D) relative to a recommended target illuminance E_T (lx) and target minimum illuminance E_{TM} (lx) depending on the location for daylight openings in vertical and inclined surfaces. Note, Table A.4 provides similar target values for openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.4 are not followed.

The extract from Table A.3 below is for Dublin with the daylight factor targets highlighted, i.e. to achieve the target illuminance (E_T) of 300 lux outlined in Table A.1, an equivalent target daylight factor is 2.0%. Furthermore, to achieve the minimum target illuminance (E_{TM}) of 100 lux outlined in Table A.1, an equivalent target daylight factor is 0.7%.

Table A.3 — Values of *D* for daylight openings to exceed an illuminance level of 100, 300, 500 or 750 lx for a fraction of daylight hours $F_{time,\%}$ = 50 % for 33 capitals of CEN national members

Nation	Capital [a]	Geographical latitude φ [°]	Median External Diffuse Illuminance $E_{v,d,med}$	*D* to exceed 100 lx	*D* to exceed 300 lx	*D* to exceed 500 lx	*D* to exceed 750 lx
Ireland	Dublin	53,43	14 900	0,7 %	2,0 %	3,4 %	5,0 %

Therefore, to achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.3, the following must be achieved:

- A target daylight factor (D_T) of 2.0% must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target daylight factor (D_{TM}) of 0.7% must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3. The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1. The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037-2018+A1-2021.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

10.1.2 BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 National Annex

In the UK, EN17037-2018+A1-2021 was adopted to form "BS EN 17037-2018+A1-2021". However, a "National Annex NA" was included which states:

"The UK committee supports the recommendations for daylight in buildings given in BS EN 17037:2018; however, it is the opinion of the UK committee that the recommendations for daylight provision in a space (see Clause A.2) may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings. This National Annex therefore provides the UK committee's guidance on minimum daylight provision in all UK dwellings."

Whereas IS EN 17037-2018+A1-2021 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 below. It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

Table NA.1 — Values of target illuminance for room types in UK dwellings

Room type	Target illuminance E_T (lx)
Bedroom	100
Living room	150
Kitchen	200

The BS National Annex also states:

"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx."

Therefore, combined LKDs are to be assessed using a 200 lux target illuminance (E_T).

Finally, the BS National Annex also states that:

"It is the opinion of the UK committee that the recommendation in Clause A.2 – that a target illuminance level should be achieved across the entire (i.e. 95 %) fraction of the reference plane within a space – need not be applied to rooms in dwellings."

Therefore, when assessing the daylight provisions in residential dwellings in accordance with BS EN 17037-2018+A1-2021, only the target illuminance (E_T) or target daylight factor (D_T) will be assessed for Bedrooms, Living Rooms, Kitchens (or combined LKDs) on over 50% of the floor area over 50% of the available daylight hours. The minimum target illuminance (E_{TM}) or minimum target daylight factor (D_{TM}) will not be assessed.

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table NA.1 of BS EN 17037-2018+A1-2021.

10.2 Daylight Model Inputs

The following inputs were used in the study:

BRE Guide (3rd Edition) / IS EN / BS EN 17037-2018+A1-2021

- Weather File: Dublin.epw (15 year average)

Common Inputs to all Standards

- Working Plane Height: 0.85m
- Glazing Light Transmittance: 70%
- Window Frame thickness: 50 mm

The following surface reflectance values are used in the study:

Material Surface	Reflectance
External Wall – Buff Brick	0.30
Internal Partition – White Paint	0.80
Roof - Default	0.20
Ground - Default	0.20
Floor/Ceiling (Floor) – Light Veneers	0.40
Floor/Ceiling (Ceiling) – White Paint	0.80

10.3 Daylight Results

The following tables summarise the daylight provision results for each property type assessed within the development. Individual room results can be viewed in Appendix A.

The purpose of the calculations is to quantify an overall percentage of rooms which exceed the recommendations. The objective of the design team is to maximise the number of units which exceed the recommendations.

The results are summarised in the following tables:

Apartment Block

The daylight provision results for the tested spaces in the Apartment Block of the development under the various standards are summarised below. Under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex Method 2 a compliance rate of 100% is achieved. Overall, the quality of daylight provision to the Apartment Block is very high.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	84
Total No. LKDs Tested	58
Total No. Spaces Tested	**142**

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	84	100%	0	0%
No. LKDs	58	100%	0	0%
Total No.	**142**	**100%**	**0**	**0%**

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	84	100%	0	0%
No. LKDs	58	100%	0	0%
Total No.	**142**	**100%**	**0**	**0%**

Houses

The daylight provision results for the tested houses in the development under the various standards are summarised below. Under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2 and BS EN 17037-2018+A1-2021 Method 2 National Annex, a compliance rate of 100% is achieved. Overall, the quality of daylight provision to the tested Houses is very high.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	31
Total No. KDs Tested	10
Total No. Living Rooms Tested	10
Total No. Spaces Tested	**51**

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	31	100%	0	0%
No. KDs	10	100%	0	0%
No. Living Rooms	10	100%	0	0%
Total No.	**51**	**100%**	**0**	**0%**

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	31	100%	0	0%
No. KDs	10	100%	0	0%
No. Living Rooms	10	100%	0	0%
Total No.	**51**	**100%**	**0**	**0%**

Total for the Development

The daylight provision results for the tested spaces in the development under the various standards are summarised below. Under BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 Method 2, a compliance rate of 99% is achieved which increases to 100% under BS EN 17037-2018+A1-2021 Method 2 National Annex. Overall, the quality of daylight provision to the tested spaces in the development is very high.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	115
Total No. LKDs Tested	58
Total No. KDs Tested	10
Total No. Living Rooms Tested	10
Total No. Spaces Tested	**193**

BRE Guide 3rd Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	115	100%	0	0%
No. LKDs	58	100%	0	0%
No. KDs	10	100%	0	0%
No. Living Rooms	10	100%	0	0%
Total No.	**193**	**100%**	**0**	**0%**

BRE Guide 3rd Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	**Pass (No.)**	**Pass (%)**	**Fail (No.)**	**Fail (%)**
No. Bedrooms	115	100%	0	0%
No. LKDs	58	100%	0	0%
No. KDs	10	100%	0	0%
No. Living Rooms	10	100%	0	0%
Total No.	**193**	**100%**	**0**	**0%**

11 Conclusion

The following can be concluded based on the assessments undertaken:

11.1 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21st, June 21st and December 21st) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

113-119 Arden Vale

Minimal additional shading is observed from the proposed development on these residential properties on December 1000, no additional overshadowing observed throughout the rest of the year.

82-89 Thornsberry Estate

No additional shading is observed from the proposed development on these residential properties throughout the year.

42-55 Harbour Walk

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 1800-2000, no additional overshadowing observed throughout the rest of the year.

24-27 Harbour Walk and 9-12 Harbour Drive

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 2000, no additional overshadowing observed throughout the rest of the year.

13-16 and 25-28 Harbour Drive

Minimal additional shading is observed from the proposed development on these residential properties on March 1800 and June 2000, no additional overshadowing observed throughout the rest of the year. It should be noted that the overshadowing noted is limited to the front façade of these properties and does not affect the main private amenity to the rear of the properties. As noted below this is verified in the "Sunlight to Amenity Spaces" section 6.1.2.

The results highlight there is minimal change to the shadows cast to the existing buildings when comparing the proposed scheme to the existing situation. The potential shading impact is quantified via the "Sunlight to Amenity Spaces" and "Daylight to Existing Buildings" sections of this report.

11.2 Sunlight to Amenity Spaces

The BRE Guide (3rd Edition) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21st. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results are kept to within 80% of the existing situation with the proposed development in place.

Existing Amenity Spaces

On March 21st the existing amenity spaces will receive the same level of sunlight with the proposed development in place when compared to the permitted design. In all cases the results comply with the recommendations in the BRE Guide outlined above.

Proposed Amenity Spaces

On March 21st, 100% of the communal open space areas and 99.5% of the public open space areas situated within the development site will receive at least 2 hours of sunlight over its total area, thus complying with the BRE recommendations.

In regards of the proposed private amenity areas, all the tested spaces are complying with the BRE Guidelines.

11.3 Sunlight to Existing Buildings

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place.

Based on the criteria outlined in Section 3.2.9 of the BRE Guide 3rd Edition, none of the existing buildings fit the requirements to be assessed and as such the APSH assessment was not conducted for these properties. The BRE guide (3rd Edition) notes that there should be no impact to sunlight for the rest of the properties "It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted."

Given the statement above the surrounding dwellings adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, the existing adjacent properties were excluded on the basis, as

noted in Section 3.2.9 of the BRE Guide 3rd Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the existing occupants.

11.4 Sunlight to Proposed Development

For the sunlight to proposed development assessment, this is covered in the following standards.

- IS/BS EN 17037-2018+A1-2021 & the BRE Guide 3rd Edition.

The methodologies discussed in each is the same.

As the sunlight exposure assessment in accordance with BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 considers the orientation of the rooms the following should be noted from section 3.1.11 of the guide.

"The BS EN 17037 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met."

Of the 68 no. points tested, 68 no. points (100%) meet the BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021 sunlight exposure recommendations of greater than 1.5 hours on March 21st.

Overall, the sunlight provision results to the proposed development in accordance with IS/BS EN 17037-2018+A1-2021 are considered excellent.

Note, the sunlight exposure results are visually represented in Appendix B.

11.5 Daylight to Existing Buildings

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (3rd Edition), none of the neighbouring dwellings need to be included within the VSC assessment they did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the existing surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, none of the adjacent dwellings have been included within the VSC assessment as the daylight impact will be unnoticeable to the occupants.

11.6 Daylight to Proposed Development

For the daylight to proposed development assessment, two standards have been analysed: IS EN 17037-2018+A1-2021 and BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition). The results under each standard are summarised below.

BRE Guide 3rd Edition / IS EN 17037-2018+A1-2021

It is important to note that IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition) does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 of IS EN 17037-2018+A1-2021 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). The assessment is carried out on a representative day and time during the year, i.e. 21st September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1 (refer to Section 10.1.2 of this report). The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4 of the standard, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *"a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2."*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037-2018+A1-2021.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount

of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

Across the proposed development, 100% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037-2018+A1-2021 using Method 2.

BRE Guide 3rd Edition / BS EN 17037-2018+A1-2021 National Annex

In the UK, EN 17037-2018+A1-2021 was adopted to form "BS EN 17037-2018+A1-2021". However, a National Annex was included which states:

"The UK committee supports the recommendations for daylight in buildings given in BS EN 17037:2018; however, it is the opinion of the UK committee that the recommendations for daylight provision in a space (see Clause A.2) may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings. This National Annex therefore provides the UK committee's guidance on minimum daylight provision in all UK dwellings."

Whereas IS EN 17037-2018+A1-2021 does not provide different illuminance targets for different space types, the BS EN 17037-2018+A1-2021 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 10.1.3 of this report). It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

The BS National Annex also states:

"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx."

Therefore, combined LKDs were assessed using a 200 lux target illuminance (E_T).

Across the proposed development, 100% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037-2018+A1-2021 using Method 2.

11.7 View Out

The View Out assessment is related to buildings such as offices or schools where seating layouts are typically fixed compared to domestic settings where an occupant can move around the space freely. In their own home occupants can choose to sit near to or even at a window which will inevitably provide the varying layers of a 'View Out' such as the ground, landscape or sky. This ability to choose their position within a domestic setting means they would always have access to a position in the apartment with the minimum requirements of 'View Out'. Therefore, all the properties would meet the minimum requirement as outlined in IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition).

11.8 Glare

As outlined in IS EN 17037-2018+A1-2021 / BS EN 17037-2018+A1-2021 National Annex (BRE Guide 3rd Edition), a Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction".* Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

11.9 Observations

It is important to note that the recommendations within the BRE Guide (3rd Edition) 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"*, Although this is true appropriate and reasonable regard has still been taken to the BRE guide.

Whilst the results shown relate to the criteria as laid out in the BRE Guide (3rd Edition), it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites.

In addition, BRE Guide 3rd Edition also notes

"This report is a comprehensive revision of the 2011 edition of Site layout planning for daylight and sunlight: a guide to good practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location."

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide 3rd Edition and IS EN 17037-2018+A1-2021 /BS EN 17037-2018+A1-2021 National Annex. With regards to the existing properties there is a negligible impact when considering sunlight and daylight as a result of the proposed development and the proposed development itself performs very well with the same regard.

12 Appendix A – Daylight Provision Results

The tables in the following sections summarise the daylight provision results for the rooms that were assessed in the proposed development. Note, within the tables the code "LKD" equates to combined Living, Kitchen, Dining area.

The results for the following daylight standards are included in each table:

- BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021
- BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021 National Annex

Please note, the "Comment" symbol in each of the tables represents the following:

BRE Guide (3rd Edition) / IS EN 17037-2018+A1-2021

✓ These rooms achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements, i.e. 300 lux for over 50% of their floor area (E_T) and 100 lux for over 95% of their floor area (E_{TM}).

x These rooms do not achieve both the target illuminance (E_T) and minimum target illuminance (E_{TM}) over the minimum floor area requirements.

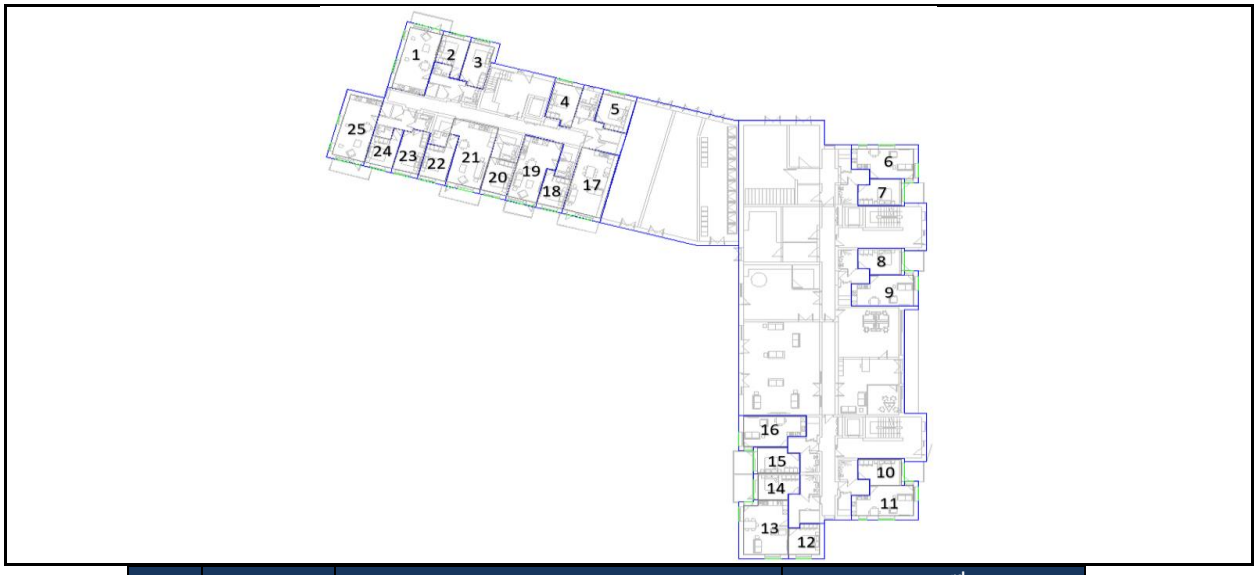
BRE Guide (3rd Edition) / BS EN 17037-2018+A1-2021 National Annex

✓ These rooms achieve the target illuminance (E_T) over the minimum floor area requirements, i.e. 100 lux for over 50% of bedroom floor areas, and 200 lux for over 50% of LKD floor areas.

x These rooms do not achieve the target illuminance (E_T) over the minimum floor area requirements.

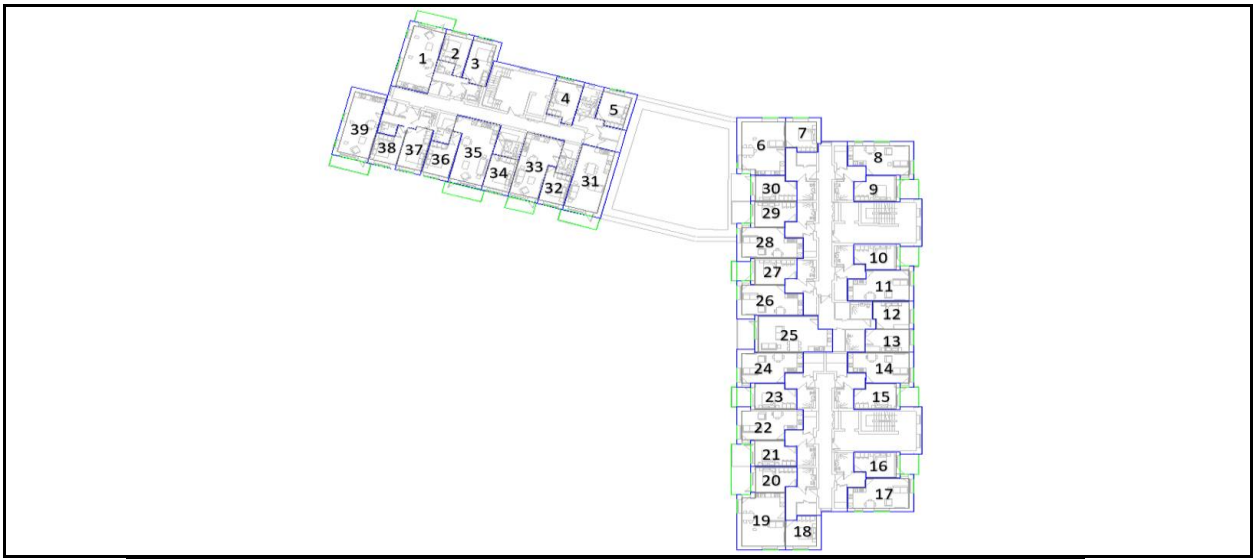
12.1 Daylight Provision Results

12.1.1 Apartment Block – Level 0



Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	100	100	✓	100	✓
2	Bedroom	96.67	100	✓	100	✓
3	Bedroom	60.23	100	✓	100	✓
4	Bedroom	74.16	100	✓	100	✓
5	Bedroom	100	100	✓	100	✓
6	LKD	100	100	✓	100	✓
7	Bedroom	74.16	100	✓	100	✓
8	Bedroom	50	100	✓	100	✓
9	LKD	69.19	100	✓	95.93	✓
10	Bedroom	81.25	100	✓	100	✓
11	LKD	100	100	✓	100	✓
12	Bedroom	100	100	✓	100	✓
13	LKD	100	100	✓	100	✓
14	Bedroom	71.28	100	✓	100	✓
15	Bedroom	85.39	100	✓	100	✓
16	LKD	80.81	100	✓	100	✓
17	LKD	76	100	✓	100	✓
18	Bedroom	100	100	✓	100	✓
19	LKD	50	100	✓	65.96	✓
20	Bedroom	100	100	✓	100	✓
21	LKD	60.09	100	✓	62.66	✓
22	Bedroom	97.4	100	✓	100	✓
23	Bedroom	90.11	100	✓	100	✓
24	Bedroom	98.41	100	✓	100	✓
25	LKD	100	100	✓	100	✓

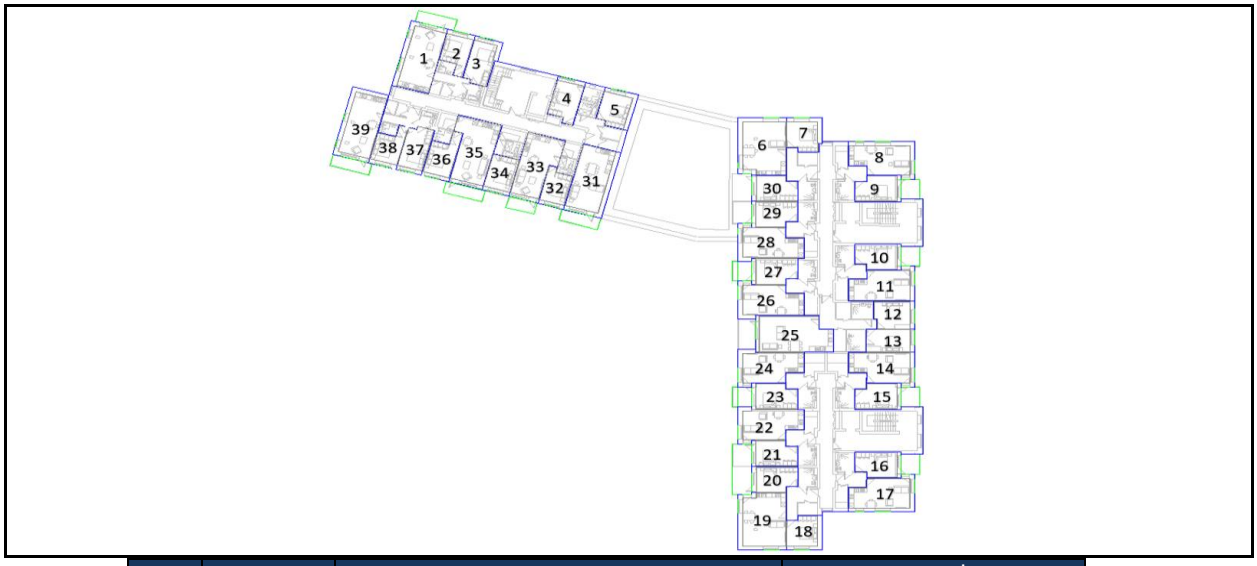
12.1.2 Apartment Block – Level 1



Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	100	100	✓	100	✓
2	Bedroom	98.33	100	✓	100	✓
3	Bedroom	61.36	100	✓	100	✓
4	Bedroom	94.38	100	✓	100	✓
5	Bedroom	100	100	✓	100	✓
6	LKD	72.24	100	✓	100	✓
7	Bedroom	100	100	✓	100	✓
8	LKD	100	100	✓	100	✓
9	Bedroom	70.79	100	✓	100	✓
10	Bedroom	76.4	100	✓	100	✓
11	LKD	68.02	100	✓	91.86	✓
12	Bedroom	100	100	✓	100	✓
13	Bedroom	100	100	✓	100	✓
14	LKD	68.02	100	✓	92.44	✓
15	Bedroom	57.81	100	✓	100	✓
16	Bedroom	76.5	100	✓	100	✓
17	LKD	100	100	✓	100	✓
18	Bedroom	100	100	✓	100	✓
19	LKD	100	100	✓	100	✓
20	Bedroom	81.91	100	✓	100	✓
21	Bedroom	95.51	100	✓	100	✓
22	LKD	84.02	100	✓	100	✓
23	Bedroom	55.06	100	✓	100	✓
24	LKD	51.97	100	✓	81.58	✓
25	LKD	50.01	100	✓	70.93	✓
26	LKD	100	100	✓	100	✓
27	Bedroom	100	100	✓	100	✓
28	LKD	50	100	✓	73.37	✓
29	Bedroom	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
30	Bedroom	95.51	100	✓	100	✓
31	LKD	50	100	✓	70.35	✓
32	Bedroom	100	100	✓	100	✓
33	LKD	51.58	100	✓	67.89	✓
34	Bedroom	100	100	✓	100	✓
35	LKD	52.16	100	✓	70.69	✓
36	Bedroom	98.7	100	✓	100	✓
37	Bedroom	97.8	100	✓	100	✓
38	Bedroom	98.41	100	✓	100	✓
39	LKD	100	100	✓	100	✓

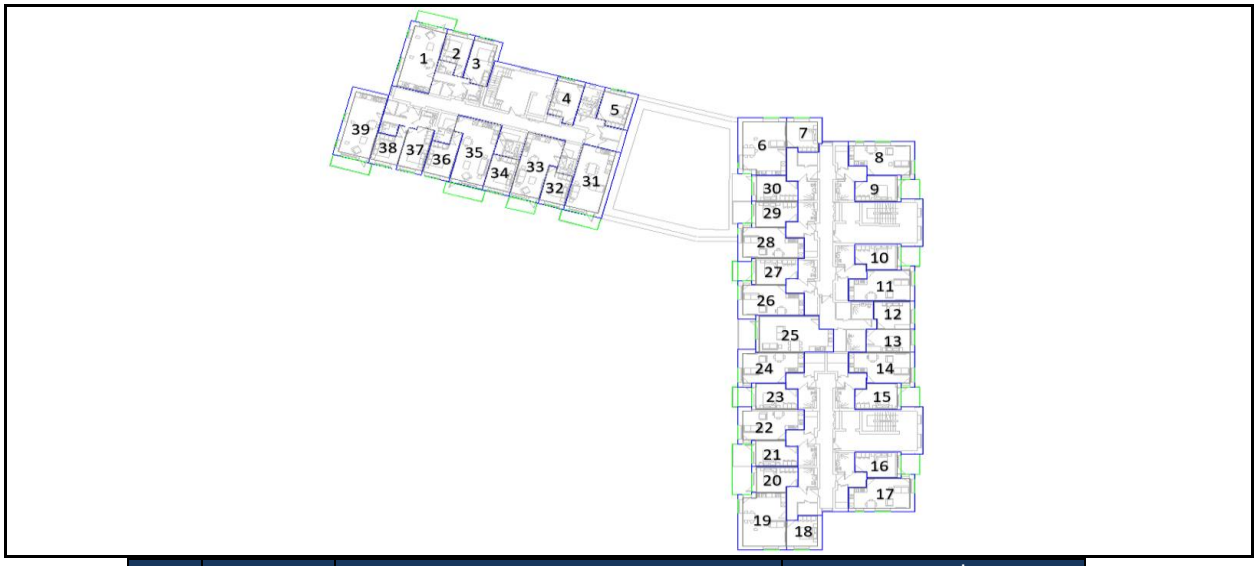
12.1.3 Apartment Block – Level 2



Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	100	100	✓	100	✓
2	Bedroom	98.33	100	✓	100	✓
3	Bedroom	71.59	100	✓	100	✓
4	Bedroom	91.01	100	✓	100	✓
5	Bedroom	100	100	✓	100	✓
6	LKD	100	100	✓	100	✓
7	Bedroom	100	100	✓	100	✓
8	LKD	100	100	✓	100	✓
9	Bedroom	98.88	100	✓	100	✓
10	Bedroom	73.03	100	✓	100	✓
11	LKD	80.23	100	✓	100	✓
12	Bedroom	100	100	✓	100	✓
13	Bedroom	100	100	✓	100	✓
14	LKD	71.51	100	✓	92.44	✓
15	Bedroom	50	100	✓	100	✓
16	Bedroom	78.12	100	✓	100	✓
17	LKD	100	100	✓	100	✓
18	Bedroom	100	100	✓	100	✓
19	LKD	100	100	✓	100	✓
20	Bedroom	97.74	100	✓	100	✓
21	Bedroom	100	100	✓	100	✓
22	LKD	50.89	100	✓	76.92	✓
23	Bedroom	67.42	100	✓	100	✓
24	LKD	59.87	100	✓	81.58	✓
25	LKD	51.1	100	✓	78.89	✓
26	LKD	77.33	100	✓	100	✓
27	Bedroom	100	100	✓	100	✓
28	LKD	59.57	100	✓	89.89	✓
29	Bedroom	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
30	Bedroom	100	100	✓	100	✓
31	LKD	57.45	100	✓	92.34	✓
32	Bedroom	100	100	✓	100	✓
33	LKD	56.15	100	✓	73.26	✓
34	Bedroom	100	100	✓	100	✓
35	LKD	50	99.19	✓	69.64	✓
36	Bedroom	98.7	100	✓	100	✓
37	Bedroom	100	100	✓	100	✓
38	Bedroom	98.41	100	✓	100	✓
39	LKD	100	100	✓	100	✓

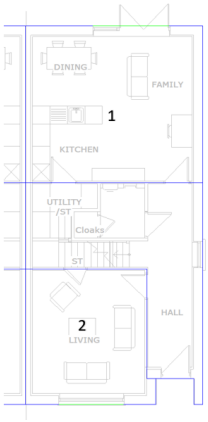
12.1.4 Apartment Block – Level 3



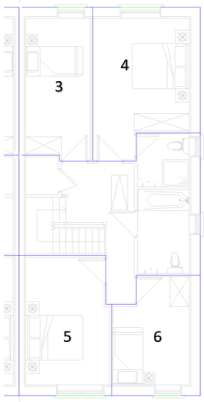
Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
1	LKD	100	100	✓	100	✓
2	Bedroom	98.33	100	✓	100	✓
3	Bedroom	65.91	100	✓	100	✓
4	Bedroom	96.63	100	✓	100	✓
5	Bedroom	100	100	✓	100	✓
6	LKD	83.67	100	✓	100	✓
7	Bedroom	100	100	✓	100	✓
8	LKD	100	100	✓	100	✓
9	Bedroom	68.54	100	✓	100	✓
10	Bedroom	75.28	100	✓	100	✓
11	LKD	68.02	100	✓	100	✓
12	Bedroom	100	100	✓	100	✓
13	Bedroom	100	100	✓	100	✓
14	LKD	67.55	100	✓	86.17	✓
15	Bedroom	52.81	100	✓	100	✓
16	Bedroom	56.18	100	✓	100	✓
17	LKD	100	100	✓	100	✓
18	Bedroom	100	100	✓	100	✓
19	LKD	100	100	✓	100	✓
20	Bedroom	100	100	✓	100	✓
21	Bedroom	100	100	✓	100	✓
22	LKD	62.72	100	✓	83.43	✓
23	Bedroom	94.38	100	✓	100	✓
24	LKD	63.82	100	✓	83.55	✓
25	LKD	52.24	100	✓	86.16	✓
26	LKD	75.58	100	✓	100	✓
27	Bedroom	100	100	✓	100	✓
28	LKD	60.1	100	✓	63.31	✓
29	Bedroom	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
		Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
30	Bedroom	100	100	✓	100	✓
31	LKD	64.26	100	✓	100	✓
32	Bedroom	100	100	✓	100	✓
33	LKD	55.05	100	✓	92.2	✓
34	Bedroom	100	100	✓	100	✓
35	LKD	60.32	100	✓	90.69	✓
36	Bedroom	98.7	100	✓	100	✓
37	Bedroom	100	100	✓	100	✓
38	Bedroom	100	100	✓	100	✓
39	LKD	100	100	✓	100	✓

12.1.5 House Type A



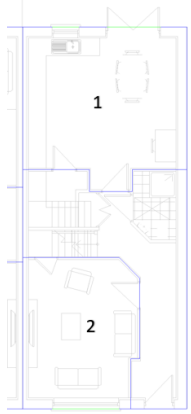
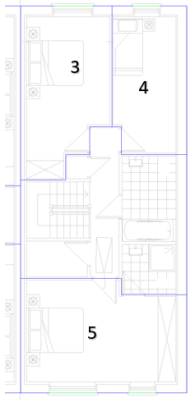
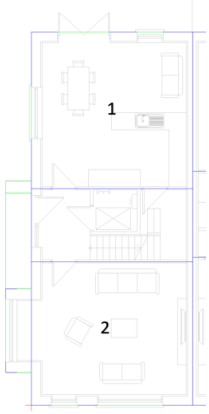
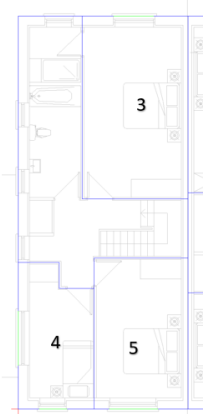
L00



L01

House Ref.	Level	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
				Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
HA-01	L00	1	KD	100	100	✓	100	✓
		2	Living	94.83	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	69.86	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓
		6	Bedroom	100	100	✓	100	✓
HA-02	L00	1	KD	100	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓
		6	Bedroom	100	100	✓	100	✓
HA-03	L00	1	14.29	100	100	✓	100	✓
		2	100	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓
		6	Bedroom	100	100	✓	100	✓

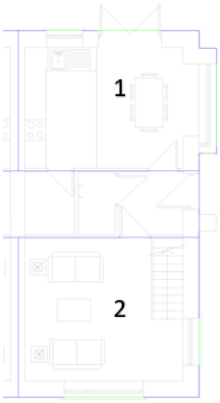
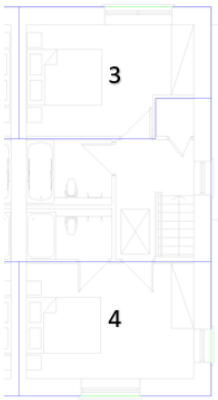
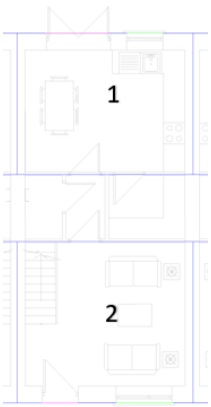
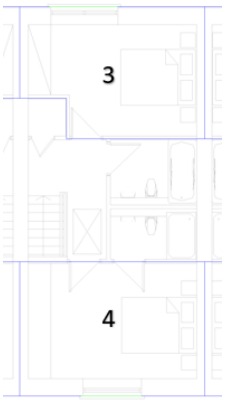
12.1.6 House Type B

Type B1		Type B2	
			
L00	L01	L00	L01

House Ref.	Level	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
				Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
B1-01	L00	1	KD	99.4	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓
B1-02	L00	1	KD	99.43	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓
B1-03	L00	1	KD	100	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓
B2-01	L00	1	KD	100	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	50	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓

House Ref.	Level	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
				Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
B2-02	L00	1	KD	100	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
		5	Bedroom	100	100	✓	100	✓

12.1.7 House Type E

Type E2		Type E	
			
L00	**L01**	**L00**	**L01**

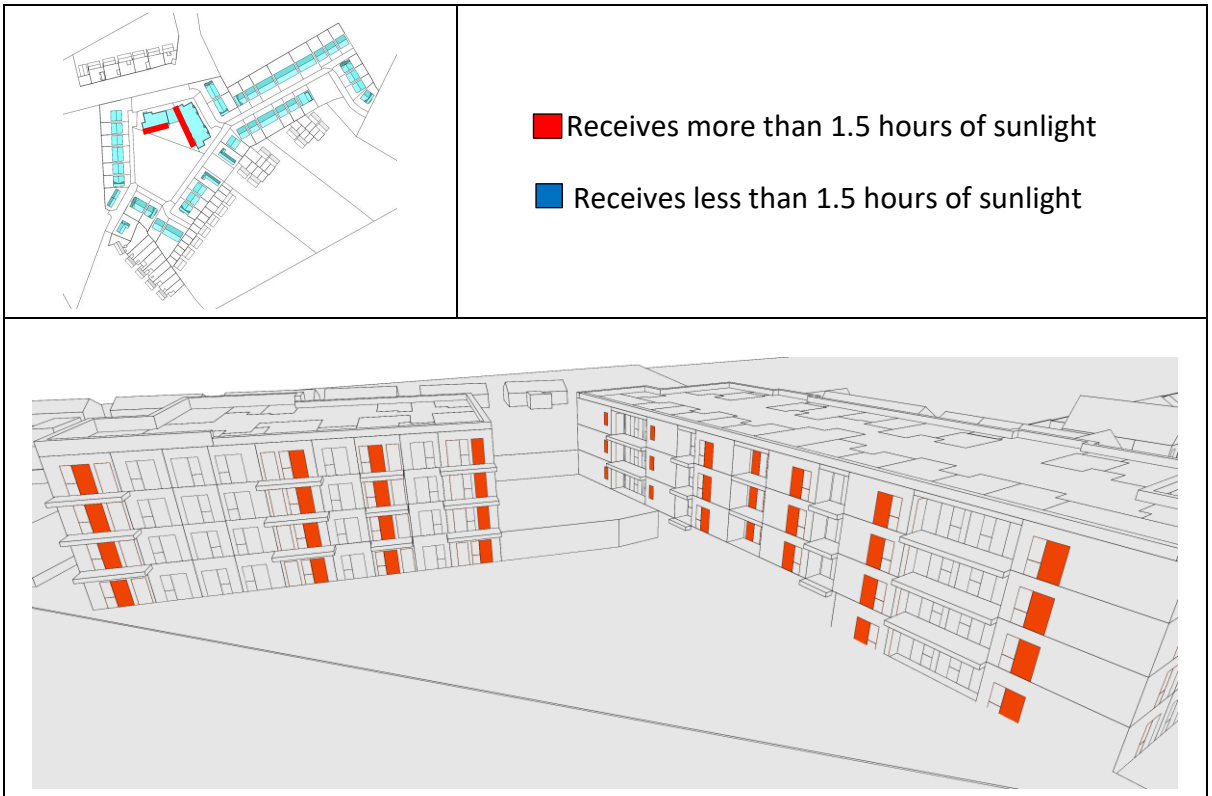
House Ref.	Level	Ref.	Room Activity	BRE Guide 3rd Edition IS EN 17037:2018 Method 2			BRE Guide 3rd Edition BS EN 17037:2018 Method 2 National Annex	
				Floor Area > E_T (%)	Floor Area > E_{TM} (%)	Comment	Floor Area > E_T (%)	Comment
E-01	L00	1	KD	100	100	✓	100	✓
		2	Living	50	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓
E2-01	L00	1	KD	100	100	✓	100	✓
		2	Living	100	100	✓	100	✓
	L01	3	Bedroom	100	100	✓	100	✓
		4	Bedroom	100	100	✓	100	✓

13 Appendix B – Sunlight Exposure Results

13.1 Sunlight Exposure Results

The IS EN 17037-2018+A1-2021 (BRE Guide 3rd Edition) sunlight exposure results tabulated in Section 8.2 for the proposed development are visually represented in the following images. The windows highlighted in “red” achieve the minimum 1.5 hours of recommended sunlight on March 21st, while the windows highlighted in “blue” do not achieve the recommended value.

13.1.1 View 01 – Apartment Block

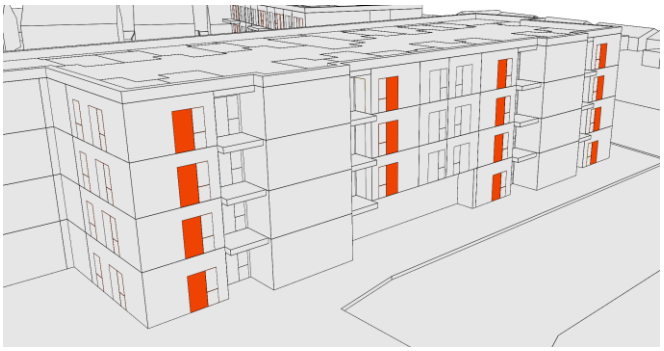


39 out of 39 windows passing

13.1.2 View 02 – Apartment Block

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

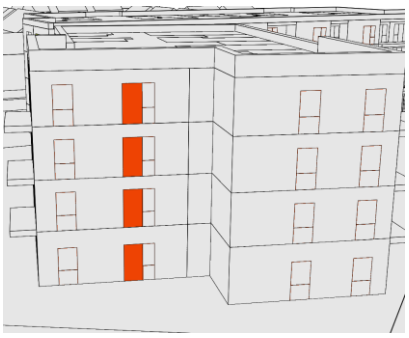


15 out of 15 windows passing

13.1.3 View 03 – Apartment Block

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

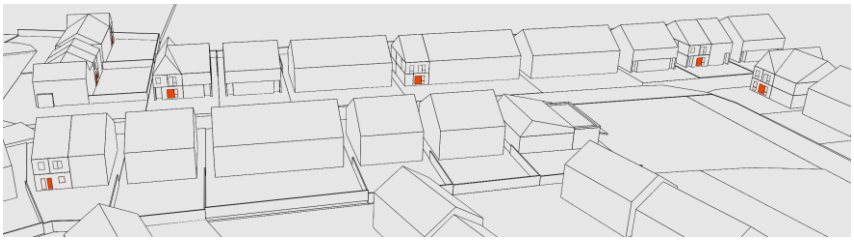


4 out of 4 windows passing

13.1.4 View 04 – Houses

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

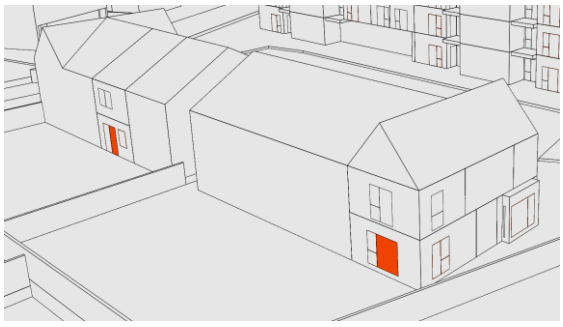


5 out of 5 windows passing

13.1.5 View 05 – Houses

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight

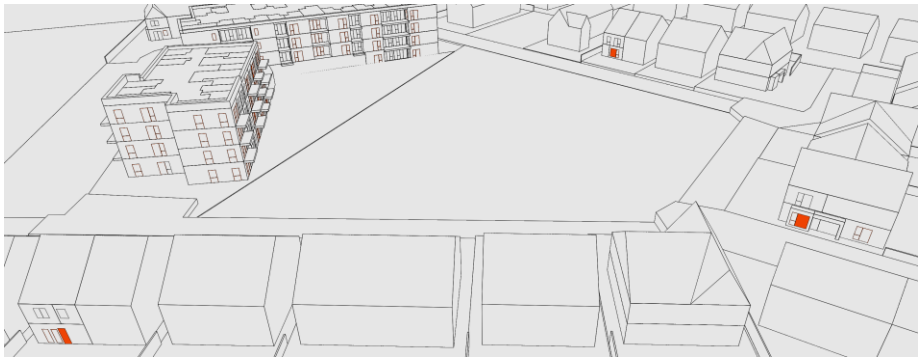


2 out of 2 windows passing

13.1.6 View 06 – Houses

Receives more than 1.5 hours of sunlight

Receives less than 1.5 hours of sunlight



3 out of 3 windows passing