Deer Park, Killarney

Proposed Mixed Use Development

Daylight and Sunlight Analysis Report

Ardshanavooly,
Deer Park,
Killarney,
Co. Kerry

Project document no
DKP-Q01-5100 ¦ 2P
2026-09-17

5100

DKP EV ENVIRONMENTAL Dublin Cork London
T : 01-813-1930 T : 064-664-1686
E : post@dkpartnership.com

Document control

DKP project no: Q01
DKP document no: 5100
Project file no: DKP-Q01-5100

Circular		Issue >	1#	1P	2P
Client	Ross-Park Residential HS Limited		☑	☑	☑
Architect	Reddy Architecture		☑	☑	☑
Planning consultant	HW Planning		☑	☑	☑

Issue	1#	2026-02-26	Draft issue for review
Issue	1#	2026-03-12	Draft issue for review
Issue	1P	2026-03-12	Issue for planning
Issue	2P	2026-09-17	Revised Issue for planning

Document issue status ID
Sketch/draft
P Planning
C Concept
D Design
G General information
T Tender
W Works/construction
Z As-build/constructed

Issue	Prepared	Checked	Approved
1#	208	201	201
1P	208	201	201
2P	208	201	201

ING Gerard (Craig) van Deventer CEng., BE(mech)., HDip CIOB, MCIBSE
Jasmin van Deventer BSc (hons)

M : [00] 353 (0)87 260 8080
E : gerard@dkpartnership.com

DKPartnership
70 Main Street, Applewood , Swords, Co. Dublin, Ireland
Reen Kenmare Co. Kerry

post@dkpartnership.com
www.dkpartnership.com

T : [00] 353 (0) 1813 1930
T : [00] 353 (0)64664 1686

Contents

Section		Page
1	Introduction	4
2	Executive summary	6
3	Standards and guidelines	8
4	Approach and methodology	9
5	Performance of proposed development – Calculation results and conclusion	16
6	Impact of proposed development – Calculation results and conclusion	29
	Appendix A - Sunlight analysis illustrations	38
	Appendix B - Sunlight calculation results - proposed amenity areas	43
	Appendix C - Daylight calculation results - VSC impact	44
	Appendix D - Sunlight calculation results - existing amenity spaces	46

1 Introduction

1.1 Report purpose

This report gives information on daylight and sunlight studies within the proposed new development and assesses the impact on daylight and sunlight to surrounding areas / existing environment. The daylight and sunlight studies are assessed under two categories, these are.

Performance of proposed development:

- Daylight reception analysis of the proposed development
- Sunlight reception analysis of the proposed development

Impact of proposed development on the existing surrounding environment:

- Impact on daylight reception analysis on existing environment
- Impact on sunlight reception analysis on existing environment

1.2 Instruction

DKPartnership (DKP) have been commissioned by Ross-Park Residential HS Limited to carry out the analysis and report for the proposed development at Ardshanavooly (townland), Killarney, Co. Kerry.

1.3 Standards and guidelines overview

For this report we applied the recommendations and guidelines of the following documents.

- The Building Research Establishment report, BR 209 (2022) Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice. (referred to as the BRE Report).
- British European Standard BS EN 17037:2018 +A1:2021 also referred to as the UK Annex
- Irish European Standard IS EN 17037:2018

1.4 Brief development description

Ross-Park Residential HS Limited intend to apply for planning permission for a Large-Scale Residential Development (LRD) off Park Road, Ardshanavooly (townland), Killarney, Co. Kerry. The development will consist of the construction of a residential development of 188 no. residential units with ancillary creche, landscaping and all associated site development works.

The proposed development includes the construction of 120 no. two and three storey houses comprising of 53 no. townhouse units (37 no. 3-bed units, 16 no. 4-bed units), 48 no. semi-detached units (30 no. 3-bed units, 18 no. 4-bed units), 19 no. mews houses (19 no. 2-bed units), and 68 no. apartments in 2 no. four storey blocks (36 no. 1-bed units, 32 no. 2-bed units).

Vehicular access to the proposed development will be via the proposed Killarney Strategic Links Project - Links Road A-C, part of which will be delivered by the proposed development. The design includes short and longer term future accesses reflecting the phased delivery of Links Road A-C, as well as pedestrian/cycle infrastructure to/from Friary Downs / the R876 to the south and internally within the development site and to adjoining areas.

Ancillary site works include car parking, provision of bicycle parking and bin storage facilities serving the proposed apartment/courtyard apartment buildings and creche, 1 no. ESB substation, landscaping, water services and drainage infrastructure and all associated site development works.

A Natura Impact Statement (NIS) has been prepared and will be submitted to the Planning Authority with the application. The NIS will be available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy during office hours at the offices of the Planning Authority. The planning application may be inspected, or purchased at a fee not exceeding the reasonable cost of making a copy at the offices of the Planning Authority during its public opening hours. The LRD application may also be inspected online at the following website set up by the applicant: www.DeerparkLRD.ie. A submission or observation in relation to the application may be made in writing to the Planning Authority on payment of the prescribed fee of €20 within the period of 5 weeks beginning on the date of receipt by the Authority of the application.

1.5 Geographical overview

Image 1.1 the (google maps) site is an overview of the site area with the proposed development approximately outlined in red.



Image 1.1: Proposed development site boundary. Imagery © Google 2026.

2 Executive summary

2.1 Analysis conducted

This report details the achieved calculated daylight and sunlight reception within the new development and the impact on neighbouring receptors. The results are compared for compliance with the recommendations of the relevant guidelines and standards. Daylight and sunlight studies are assessed under two categories, these are.
Performance of proposed development:

- Daylight reception analysis of the proposed development,
- Sunlight reception analysis of the proposed development.

Impact of proposed development on the existing surrounding environment:

- Impact on daylight reception analysis on existing environment,
- Impact on sunlight reception analysis on existing environment,

2.2 Performance of proposed development - Summary of results

Daylight reception analysis of the proposed development

For the daylight assessment, results have been analysed within these standards:

- Assessed in accordance with IS EN17037 / BS EN17307, carried out in accordance with Method 1 and Method 2 described in the methodology section.
- Assessed in accordance with BS EN 17037:2018 National Annex.

The results from table 5.1 are reviewed under each standard. The daylight reception assessment has been targeted to habitable rooms within the proposed development. Receptors / rooms within the proposed development are indicated in image 5.1 to 5.11.

- Apartments: Blocks A and B, all habitable rooms within the proposed blocks on the ground floor and first floor have been assessed. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.
- Houses: habitable rooms on the ground floor which are observed to be in the most daylight challenging positions or rooms positioned with close by obstacles have been assessed.

IS EN17037 / BS EN17307: To achieve recommendations outlined in IS EN 17037:2018 / BS EN 17307:2018, a given room must achieve: a target daylight factor of 2.0% or in terms of illuminance 300 lux on over 50% of the floor area for over 50% of the available daylight hours. And a minimum target daylight factor of 0.7% or in terms of illuminance 100 lux on over 95% of the floor area for over 50% of the available daylight hours. From the calculation result table 5.1 we note all of the proposed rooms calculated daylight results achieved the minimum guidelines or achieved well in excess of the guidelines.

- Apartments: Overall, examined residential rooms for Apartment blocks A and B achieved on average a daylight factor (DF) of 2.9% and an illuminance of 438 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 1.0% and an illuminance of 144 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved.
- Houses: Overall, examined residential rooms for Houses achieved on average a daylight factor (DF) of 2.5% and an illuminance of 383 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 0.88% and an illuminance of 126 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved.

In an urban environment it can more often be the case that complete fulfilment with the guidelines is not attainable. Within the BS EN 17037 it acknowledges that a rigid application of the European Standard could prove to be a difficult task as it offers only a single target for new buildings and IS EN17037 currently has no specific National Annex. The British Annex of BS EN 17037, daylight recommendations differ depending on the function of a room and offers minimum daylight provision targets for kitchens, living rooms and bedrooms.
Therefore, Given the similarity of weather, light and design patterns between Ireland and the UK and the lack of specific localisation Annex details in the Irish version, the alternate minimum daylight provision targets set out in the national annex of BS EN 17037 are reviewed next.

BS EN 17037:2018 National Annex: To achieve the alternate minimum daylight recommendations for Dublin, the room in question must achieve: Kitchen 1.3% target daylight factor or in terms of illuminance 200 lux. Living room 1.0% target daylight factor or in terms of illuminance 150 lux, and bedrooms 0.7% target daylight factor or in terms of

illuminance 100 lux all over 50% of the floor area for over half the daylight hours. From the calculation result table 5.1 we note that all of the rooms calculated daylight are well in excess of these minimum guidelines.

- Overall compliance for proposed development = 100%

In summary, the calculation results have achieved a high level of compliance under IS EN17037 / BS EN17307 and BS EN 17037:2018 National Annex guidelines. This indicates an overall good level of daylight for the proposed development under the guidelines. We conclude, the proposed development can provide a good level of residential daylight amenity to future occupants.

Sunlight in amenity areas / Sun on ground reception analysis of the proposed development

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21st of March. From the calculation results in table 5.4 we note that all selected amenity spaces received well in excess of the minimum 2 hours of sunlight on at least 50% of the area on March 21st, see image 5.12 for receptor/amenity space locations. Summary of results are as follows:

- Overall, the calculated average sunlight on at least 50% of the area on March 21st for public open space amenity areas is 9.00 hours.

This confirms the amenity areas proposed will be adequately sunlit throughout the year. We conclude that the new amenity spaces receive sunlight on 50% of the area is in line with the recommendations of the BRE Report - Site Layout and Planning for Daylight and Sunlight - and therefore deem these to be compliant to this element.

2.3 Impact of proposed development on the existing surrounding environment - Summary of results

Impact on daylight reception analysis on existing environment

The BRE recommends that the effects of a new development on daylight reception should not impact any existing VSC by more than 20% or have a maximum change factor in excess of 0.80. From the calculation results we note all selected neighbouring habitable receptors are affected to some degree with regards to daylight reception due to the introduction of the proposed development in their respective habitable rooms facing the proposed development. The calculated change in daylight reception in all of the neighbouring receptors/windows achieved a change factor ranging from 0.77 to 0.95. The BRE report outlines VSC guidelines are intended for use for rooms where daylight is required, including living rooms, kitchens and bedrooms. Properties used for habitable purposes have been assessed therefore properties occupied by commercial units have not been applied to the VSC assessment. Summarized result findings are as follows (see image 6.1-6.5 for receptor locations):

- West receptors: Receptor no. 1 to 29 & 24 to 27: Neighbouring dwellings located in Park Road, Sáil Árdán, Ceide Spris and the Ardshanavooly estate with ground floor windows were examined and resulted in a change factor range of 0.82 to 0.95. These receptors are all within the guidelines and the effect is determined as negligible under BRE definitions.
- South receptors: Receptor no. 20 to 23: Neighbouring units located in Park Ridge, estate with ground floor windows were examined and resulted in a change factor range of 0.77 to 0.91. 2 no. of receptors are marginally outside recommendations however are calculated within 5% of BRE recommendations and would not cause a major adverse impact.
- Overall, the average change ratio for VSC is 0.88.

Impact on sunlight in existing amenity areas / Sun on ground reception analysis on existing environment

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21st of March and that and any loss of sunlight should not be greater than 0.80 (20% reduction) times its former size. From the calculation results we note that all the existing amenity spaces received 2 hours of sunlight or more on at least 50% of the area before and after the introduction of the new development. Summary of results are as follows (see image 6.7-6.10 for receptor locations):

- West receptors: Receptor no. 1 to 14 & 16 to 18 are amenity spaces to neighbouring units. The receptors resulted in a change factor range of 0.81-0.96. The change happens in the early morning hours of 07.00-10.00. The calculation findings are within guidelines, and the effect is determined as 'negligible' under BRE definitions. Receptor no. 14 resulted in a change factor of 1.00, meaning the new proposed development will have no sunlight impact on the area.
- North receptor: Receptor no. 15 is the open space pitch and putt field. The receptor resulted in a change factor of 0.99. The calculation finding is well within guidelines, and the effect is determined as 'negligible' under BRE definitions.
- Overall, the average change ratio is 0.88.

We conclude that the new proposed development's effect on sunlight reception in the neighbouring amenity areas is all within the constraints and minimum recommendations of the BRE Report – Site Layout and Planning for Daylight and Sunlight BR209 2022, and we therefore deem the proposed development to be compliant with this element.

3 Standards and guidelines

3.1 Standards and guidelines overview

For this report we applied the recommendations and guidelines of the following documents.

- The Building Research Establishment report, BR 209 (2011) Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice. On June 8th, 2022, BR 209 (2011) was replaced with BR 209 (2022) Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice. This report is commonly referenced as the main guide in Ireland/UK in determining the minimum standards of daylight and sunlight and for determining the impact of a development.
- European Standard EN 17037:2018 and British European Standard BS EN 17037:2018 Daylight in buildings, which replaces BS 8206-2:2008. The document contains guidance on interior day lighting and introduces some of the calculation procedures used in the BRE Report.
- IS EN 17037:2018 Daylight in buildings. Irish guidelines.

3.2 BR 209 (2022): Site Layout and Planning for Daylight and Sunlight, A Guide to Good Practice

This document is an updated version of BR 209 (2011) and referred to as the BRE Guidelines. The report contains guidance on how to design developments, whilst minimising the impacts on existing buildings from overshadowing and reduced levels of daylight and sunlight. The BRE guidelines recommend the use of BS EN 17037:2018 for assessing the quality of interior spaces in proposed developments. BS EN 17037 sets out assessment methods for daylight provision and access to sunlight The advice provided within the guide is not mandatory and should not be seen as an instrument of planning policy. Its aim is to help rather than constrain the designer and should be interpreted flexibly since natural lighting is one of many factors in site layout design.

3.3 EN 17037:2018: Daylight in Buildings

EN 17037 is a daylighting standard published by the European Committee for Standardization (CEN) in 2018. It is applicable across all countries within the EU including Ireland with the Irish edition IS EN17037:2018EN 17037. It provides recommendations for daylight within spaces. Recommendations made in EN 17037 regarding daylight and sunlight exposure have been incorporated into the BRE Guidelines.

3.4 IS EN 17037:2018: Daylight in Buildings

Prior to 2018, Ireland had no standard for daylight. In 2018, the National Standards Authority of Ireland adopted EN 17037 to directly become IS EN 17037.

3.5 BS EN 17037:2018: Daylight in buildings

BS EN 17037:2018: Daylight in Buildings is the British version to the European Standard and also contains a national annex. The national annex (NA) attempts to align the guidance and expectations of the European standard with the now superseded BS 8206-2. Within the British Annex it acknowledges that a rigid application of the European Standard could prove to be a difficult task. Within BS EN 17037 NA, daylight recommendations differ depending on the function of a room and offers minimum daylight provision targets for kitchens, living rooms and bedrooms.

The assessment methodology in this report is built around the above-mentioned documents. The methods proposed are outlined in section 4.

4 Approach and methodology

4.1 General approach

This report assesses the daylight and sunlight reception to the proposed development and the impact on daylight and sunlight to surrounding areas. The results are then compared with the relevant guidelines and recommendations. The calculation assessment is split across two distinct parts:

Performance of proposed development

- Daylight reception analysis of the proposed development
- Sunlight reception analysis of the proposed development

Impact of proposed development on the existing surrounding environment:

- Impact on daylight reception analysis on existing environment
- Impact on sunlight reception analysis on existing environment

4.2 Note on the nature and effects of daylight and sunlight

When assessing the effects of proposed building projects on the potential to cause issues relating to light, it is important to recognise the distinction between daylight and sunlight. Daylight is the combination of all direct and indirect sunlight during the daytime, whereas sunlight (for the purposes of this report) comprises only the direct elements of sunlight. For example, on a cloudy or overcast day diffused daylight still comes in through windows, even when sunlight is absent. Any development within a built-up area has the potential to alter the amount of daylight received by nearby residential properties.

Care should be taken when designing new buildings in built-up areas, especially when the proposed development is relatively tall or situated to the south of existing buildings, because in the northern hemisphere the majority of the sunlight comes from the south. In Ireland (and other northern hemisphere countries) south-facing facades will in general, receive the most sunlight, while the north facing facades will receive sunlight on only a handful of occasions, specifically early mornings and late evenings during the summer months. It is therefore important to ensure that new buildings to the south of any development do not cause over shadowing to existing dwellings and therefore reduce their capacity to receive sunlight.

4.3 Assessment methodology

The analyses and assessments in this report are based on the guidelines recommended in the BRE guide (2022), the guide is intended to be used in conjunction with lighting recommendations in BS EN 17037 Daylight in buildings. It should also be noted that although the BRE guide gives numerical guidelines, these should be interpreted flexibly.

The BRE document sets out in its introduction that "*It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location." " The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design* ". Throughout this report an effort will be made to differentiate between metrics used to assess daylight (skylight) versus sunlight. The following sub-sections namely 'New buildings' and 'Existing buildings / existing amenity areas' outline the methodology and assessment criteria carried out.

4.4 New buildings

Daylight provision:

Daylight provision within IS EN 17037 guidelines

The IS EN 17037 explains that "*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*". These guidelines do not provide different illuminance targets for different room types. Therefore, all rooms have the same daylight provision targets. To achieve the minimum level of daylight provision as per table 4.2, the following must be achieved, taken from IS EN 17037:2018 (table ref A.1).

- A minimum target illuminance of 300 lux must be achieved on over 50% of the floor area for over 50% of the available daylight hours.
- A minimum target illuminance 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.

Level of recommendation for vertical and inclined daylight opening	Target illuminance ET lx	Fraction of space for target level Fplane,%	Minimum target illuminance ETM lx	Fraction of space for Minimum target level Fplane,%	Fraction of daylight hours Ftime,%
Minimum	300	50%	100	95%	50%
Medium	500	50%	300	95%	50%
High	750	50%	500	95%	50%

Table 4.2: IS EN 17037:2018 target illuminance levels.

These recommendations can also be expressed in terms of a daylight factor. IS EN 17037:2018 (table ref A.3) provides the corresponding daylight factor relative to a recommended target illuminance and target minimum illuminance depending on the location (capital city for individual countries) for daylight. The Dublin daylight factor target recommendations are replicated in table 4.3.

Nation	Capital	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%

Table 4.3: IS EN 17037:2018 target daylight factor levels for Dublin.

Therefore, within IS EN 17037:2018, to achieve the minimum level of daylight provision for vertical openings the following must be achieved:

- A minimum target daylight factor of 2.0% must be achieved on over 50% of the floor area for over 50% of the available daylight hours.
- A minimum target daylight factor 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.

Daylight provision within BS EN 17037 National Annex

In the UK, EN 17037 was adopted to form BS EN 17037 and a national annex was also included. The national annex offers additional targets and guidance for daylight provision in residential developments and states " *it is the opinion of the UK committee that the recommendations for daylight provision in a space may not be achievable for some buildings*." The national annex gives specific minimum recommendations for habitable rooms in dwellings in the UK. These are intended for 'hard to light' dwellings. The national annex therefore provides the UK guidance on minimum daylight provision in all UK dwellings, these are 100 lux in bedrooms, 150 lux in living rooms and 200 lux in kitchens, to be exceeded over at least 50% of the assessment points in the room for at least half of the daylight hours.

Habitable room types	BS EN17037 National Annex Minimum target Illuminance	BS EN17037 Corresponding minimum target daylight factor (Dublin)
Kitchen	200 lux	1.3%
Living rooms	150 lux	1.0%
Bedrooms	100 lux	0.7%
Living, Kitchen, Dining	200 lux	1.3%

Table 4.4: BS EN 17037 minimum target Illuminances and daylight factor for dwellings.

Daylight provision within BR 209 (2022) guidelines

The BRE guide is intended to be used in conjunction with recommendations in BS EN 17037. The guide states that "*Daylight provision in new rooms may be checked using either of the methods in BS EN 17037 Daylight in Buildings: direct prediction of illuminance levels using hourly climate data, or the use of the daylight factor*". The two methods to assess daylight provision to the interior which are based on target values.

- Method 1-Daylight factor method: This calculation method uses the daylight factor targets on the reference plane. The Daylight factor is the illuminance at a point on a reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The assessment is carried out on a representative day and time during the year, i.e., under standard CIE overcast sky conditions. BS EN 17037 gives the Median External Diffuse Illuminance (Ev,d,med) for the capital cities throughout Europe to account for external local illuminance levels.
- Method 2-Illuminance method: This calculation method uses the illuminance targets on the reference plane. The assessment requires the use of a suitable weather file which accounts for varying sky conditions and sun positions throughout the year and takes into account the orientation of the space

Equivalent daylight factor targets to achieve a target illuminance over at least half of the daylight hours in a year are based on the formula: Target daylight factor (DT)= target illuminance/Ev,d,med x 100 [%].
Where, Ev,d,med is the median diffuse horizontal illuminance from the sky (as recommended for Dublin, Ireland).

The daylight factor (D) addresses daylight provision as a ratio of unobstructed external illuminance under overcast sky conditions. The daylight factor is defined as D =Ei/Eo x 100[%], where,
Ei=illuminance due to daylight at a point on the indoors working plane.
Eo= simultaneous outdoor illuminance on a horizontal plane from an unobstructed hemisphere of overcast sky.

Table 4.5 provides the target illuminances from daylight over at least half of the daylight hours and thus the corresponding calculated daylight factor targets for side lit rooms for Dublin.

Level of recommendation for vertical and inclined daylight opening	Target illuminance (lx) for half of assessment grid	Target illuminance ETM (lx) for 95% of assessment grid	Target daylight factor D for half of assessment grid (Dublin)	Target daylight factor D for 95% of assessment grid (Dublin)
Minimum	300	100	2.0%	0.7%
Medium	500	300	3.4%	2.0%
High	750	500	5.0%	3.4%

Table 4.5: Target illuminances and thus the corresponding calculated daylight factor targets for side lit rooms for Dublin.

The recommendations for rooms are met if both target daylight factors are achieved; the median daylight factor over 50% of the reference plane, and the minimum daylight factor over 95% of the reference plane.

Project calculation parameters

The following values were used in the daylighting calculations.

Element	DKP metrics	Comments
Internal and external factors:		
Ceilings	0.8	Light
Walls	0.5	Medium dark
Floor	0.2	Dark
Exterior walls and obstructions	0.2	
Exterior ground	0.2	
Maintenance factors:		
Glass light diffuse transmittance	0.68	
Glazing maintenance factor	0.92	

Table 4.6: Project calculation parameters.

Sunlight provision:

Sunlight to proposed amenity spaces / Sun on ground

Acceptable criterion within the BRE guidelines for sunlight reception recommends that at least half of the amenity area should receive at least two hours of sunlight on the 21st of March. The minimum sunlight requirement in this report measured in sunlight time 2 hours (120 minutes) multiplied by 50% area m^2 or the minimum requirement = 120 (min) * 0.5a (m^2) = [ ] min·m^2.

Analysis	BRE recommendation, criteria on March 21st	Acceptable sunlight reception parameters
Sunlight reception	Minimum sunlight reception in amenity spaces	At least 50% of the total area to receive at least 2 hours sunshine

Table 4.7: Sunlight to proposed amenity spaces / Sun on ground assessment

The sunlight assessment is executed using a 3D model of the project with the results illustrated in tabular format showing the hourly status of the shadow / sunlight fraction in the relevant amenity spaces. Appendix A provides the 3D images. The impacts of vegetation: It is important to note that according to the BRE Report, calculations do not normally take into account vegetation. The exception is when evergreen vegetation exists that forms a continuous barrier and would be permanent throughout the seasons.

4.5 Existing buildings

Impact on daylight provision:

Daylight provision to surrounding existing buildings

The impact of the proposed development on the existing buildings with respect to daylight can assessed using the following methodologies advised in the BRE guide.

- The distance test: loss of light to windows need not be analysed if the distance from the existing window to the development is three or more times its height above the centre of the existing window.
- The 25° rule: loss of light to windows need not be analysed if the angle to the horizontal subtended by the new development from the centre of the existing window is less than 25° (an angle of 25° equates to a VSC of 27%).
- Vertical Sky Component (VSC) assessment: diffuse daylight of an existing building may be adversely affected by a proposed development if either: the vertical sky component measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value; or the area of the working plane which can receive direct skylight is reduced to less than 0.8 times its former value.

The impact assessment of daylight is required for windows serving rooms in adjoining dwellings where daylight is required including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be assessed. The guidelines also apply to any room that may have a reasonable expectation of daylight, including schools, hospitals, hotels and some offices. To ensure a neighbouring property is not adversely affected, VSC is calculated and assessed in this report. This report assesses the percentage of direct sky illuminance that falls on the assessment point of neighbouring windows that could be affected by the proposed development, image 4.1 represents this.

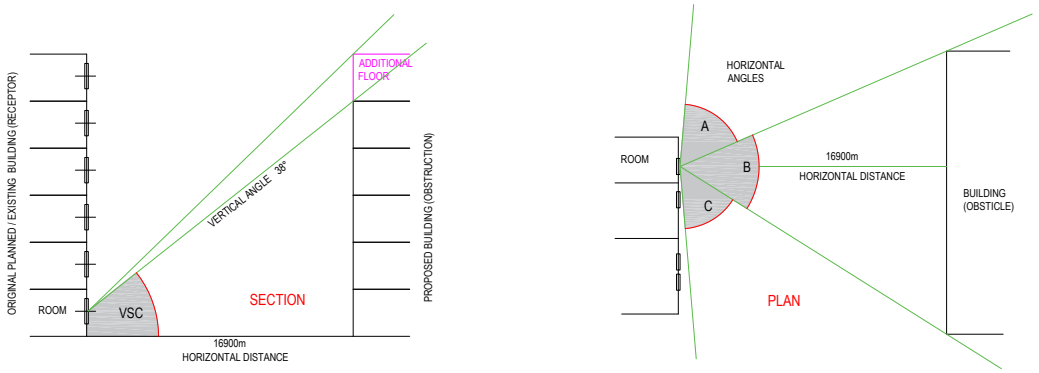


Image 4.1:

VSC gives a measure of daylight received on the outside of a window. Stated within BR 209 (2022) “if the 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 0.80 times its former value, occupants of the existing building will notice the reduction in the amount of skylight". Table 4.8 details the BRE assessment criteria for daylight reception for existing windows.

Analysis	Description	Acceptable parameters
Daylight reception	Existing daylight incoming angle	Existing angles should not be affected more than 0.8 time its former value or a maximum loss of 20%.

Table 4.8: VSC assessment.

In this report, the VSC of the assessment point on each of the assessed windows will be calculated, both in the baseline state and in the proposed state. The baseline state reflects the current VSC of the window, the proposed state will determine what the VSC of the window would be if the proposed development is built as planned.

Impact on sunlight provision:

Neighbouring Properties – Sunlight on the Ground (Shadow) Gardens and Open spaces

Sunlight provision in existing amenity areas: BRE (2022), recommendations are given as to the quantity of sunlight in amenity areas that is required to produce a well sunlit space throughout the year. " It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21st of March. If as a result of new development, an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21st of March is less than 0.80 times its former value, then the loss of sunlight is likely to be noticeable". Calculations were conducted in accordance with the BRE guidelines to determine the extent to which the proposed development could affect the shadow / sunlight reception in the selected existing neighbouring amenity spaces. For existing amenity spaces any loss of sunlight should not be greater than 0.8 times its former size on March 21st.

Analysis	Criteria on March 21st	Acceptable sunlight reception parameters
Sunlight reception	Minimum sunlight reception in amenity spaces	At least 80% or 0.8 x its former sunlight reception.

Table 4.9: Sunlight in existing amenity areas.

Sunlight provision in existing amenity areas is recommended to be checked for all open spaces where it is required. BRE recommends spaces such as, gardens, such as the main back garden of a house or communal gardens including courtyards and roof terraces, parks and playing fields, children's playgrounds, outdoor swimming pools and paddling pools, and other areas of recreational water such as marinas and boating lakes, sitting out areas such as those between non-domestic buildings and in public squares, nature reserves (which may have special requirements for sunlight if rare plants are growing there).

Design Model: A 3D model of the proposed development and the surrounding neighbouring properties was provided by the Architect. SketchUp Pro 2023 design model was used to examine potential impacts. The model was geo-referenced to its correct location and an accurate solar daylight system was introduced. The 3D model of the project with the results illustrated in tabular format showing the hourly status of the shadow/sunlight fraction in the relevant amenity spaces is used to undertake the sun light assessment. Appendix A provides the illustrations in hourly sections for the BRE recommended spring equinox (March 21st).

4.6 Summary of analysis

The table below summarises the assessments carried out in this report.

Element	Guidelines	
Performance of proposed development		
Daylight	Daylight – IS EN 17037 / BS EN 17307	To achieve the daylight provision outlined in IS / BS EN 17037:2018 a given room is recommended to achieve: Using method 1: • A target daylight factor of 2.0% must be achieved on over 50% of the floor area for over 50% of the available daylight hours. • A target daylight factor of 0.7% must be achieved on over 95% of the floor area for over 50% of the available daylight hours. Or using method 2: • A target illuminance of 300 lux must be achieved on over 50% of the floor area for over 50% of the available daylight hours. • A target illuminance of 100 lux must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
	Daylight - National annex BS EN 17037	To achieve the alternate minimum daylight provision outlined in the national annex of BS EN 17037:2018, the room is recommended to achieve: • Kitchens, 1.3% target daylight factor or 200 lux over 50% of the floor area for over half the daylight hours. • Living rooms, 1.0% target daylight factor or 150 lux over 50% of the floor area for over half the daylight hours. • Bedrooms, 0.7% target daylight factor or 100 lux over 50% of the floor area for over half the daylight hours.
Sunlight	Sunlight in amenity areas / Sun on ground	To meet the minimum recommendations given in BR 209 (2022), a new amenity space should experience two hours sunlight on March 21st for at least 50% of its area.
Impact of the proposed development on the existing surrounding environment		
Daylight	Vertical Sky Component (VSC)	To meet the recommendations in BR 209 (2022), the VSC with the new development in place, should be greater than 27% or greater than 0.80 times its former value.
Sunlight	Sunlight in existing amenity areas / Sun on ground	To meet the recommendations in BR 209 (2022), an existing amenity space, with the new development in place should experience in excess of two hours sunlight on March 21st for at least 50% of its area and should be greater than 0.80 times the previous value.

Table 4.10: Summary of assessments.

4.7 Note on receptors

The BRE guide states that when assessing the potential effects of a proposed development on existing buildings, only those windows and rooms that have a reasonable expectation of daylight and sunlight need to be considered. Windows and rooms which meet this criterion are considered to be sensitive receptors. the BRE guide clarifies what are considered sensitive receptors with respect to sunlight and daylight as follows: “The guidelines given here are intended for use for rooms in adjoining dwellings where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed.”
The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices. Outdoor amenity spaces which have a reasonable expectation of sunlight, whether they are private gardens, communal open spaces or outdoor public amenity areas, are also considered sensitive receptors. Receptors that may be affected by the proposed development are highlighted in the calculation section of each appropriate analysis.

4.8 Note on the definition of effects

Guidelines from Appendix H in the BRE guidelines is used to categorise the varying degrees of compliance when assessing the impact, a proposed development might have on the daylight and sunlight of an existing environment. The table of definitions given below is used in the results section of this report, for the purposes of categorising the impact on sunlight and daylight.

Effect	Definition of effect
Negligible	Where any loss of daylight / sunlight is well within the guidelines, or only a small number of windows or area of space lose daylight / sunlight but still within the guidelines, then the impact is assessed as negligible.
Minor Adverse	If the level of effect is marginally outside of the criteria as stated in the relevant guidelines, a minor adverse level of effect will be applied if the level of daylight / sunlight is within 5% of the target guideline.
Moderate Adverse	If the level of effect is outside of the criteria as stated in the relevant guidelines, a moderate adverse level of effect will be applied if the level of daylight / sunlight is within 5-10% of the target guideline.
Major Adverse	If the level of effect is outside of the criteria as stated in the relevant guidelines, a moderate adverse level of effect will be applied if the level of daylight / sunlight is in excess of 10% of the target value.
Beneficial Impact	If the ratio of change is > 1.10 (an improvement of 10%), then the impact is assessed as a beneficial impact. Should less significant improvements occur a negligible level of effect will be stated.

Table 4.11: Definition of effects used in the impact assessments.

5 Performance of proposed development – Calculation results and conclusion

The performance of the proposed development calculations is broken into two sections, daylight reception and sunlight reception.

Daylight Reception:

5.1 Receptor selection – Rooms within the proposed development

The daylight reception assessment has been targeted to habitable rooms within the proposed development on the ground floor which are observed to be in the most daylight challenging positions or rooms positioned with close by obstacles. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms. Receptors / rooms within the proposed development are indicated in image 5.1 to 5.11 below.

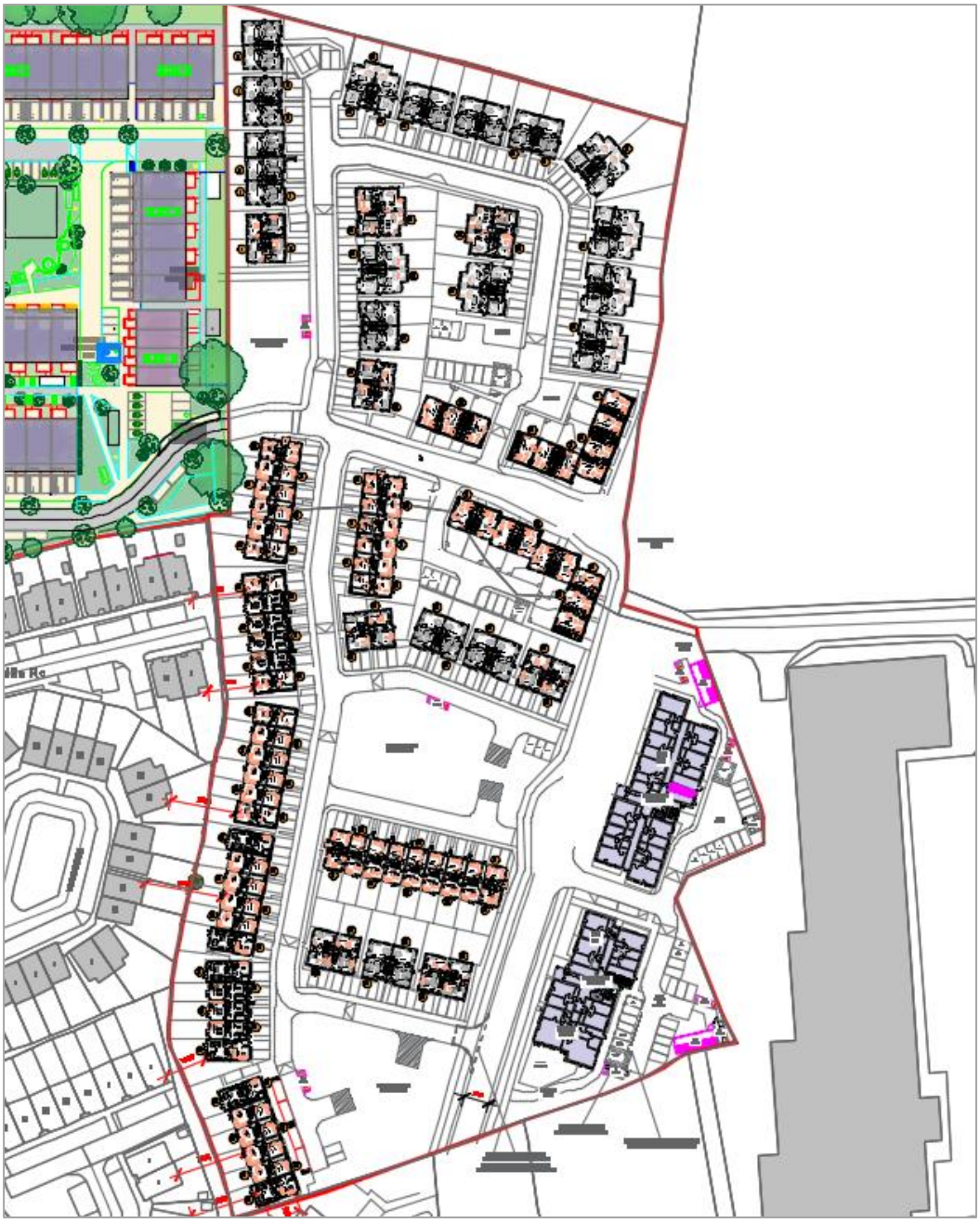


Image 5.1: Level 00 (ground floor). Overall view.



Image 5.2: Level 00 (ground floor). Receptor no. 1 to 17.



Image 5.3: Level 00 (ground floor). Receptor no. 18 to 33.

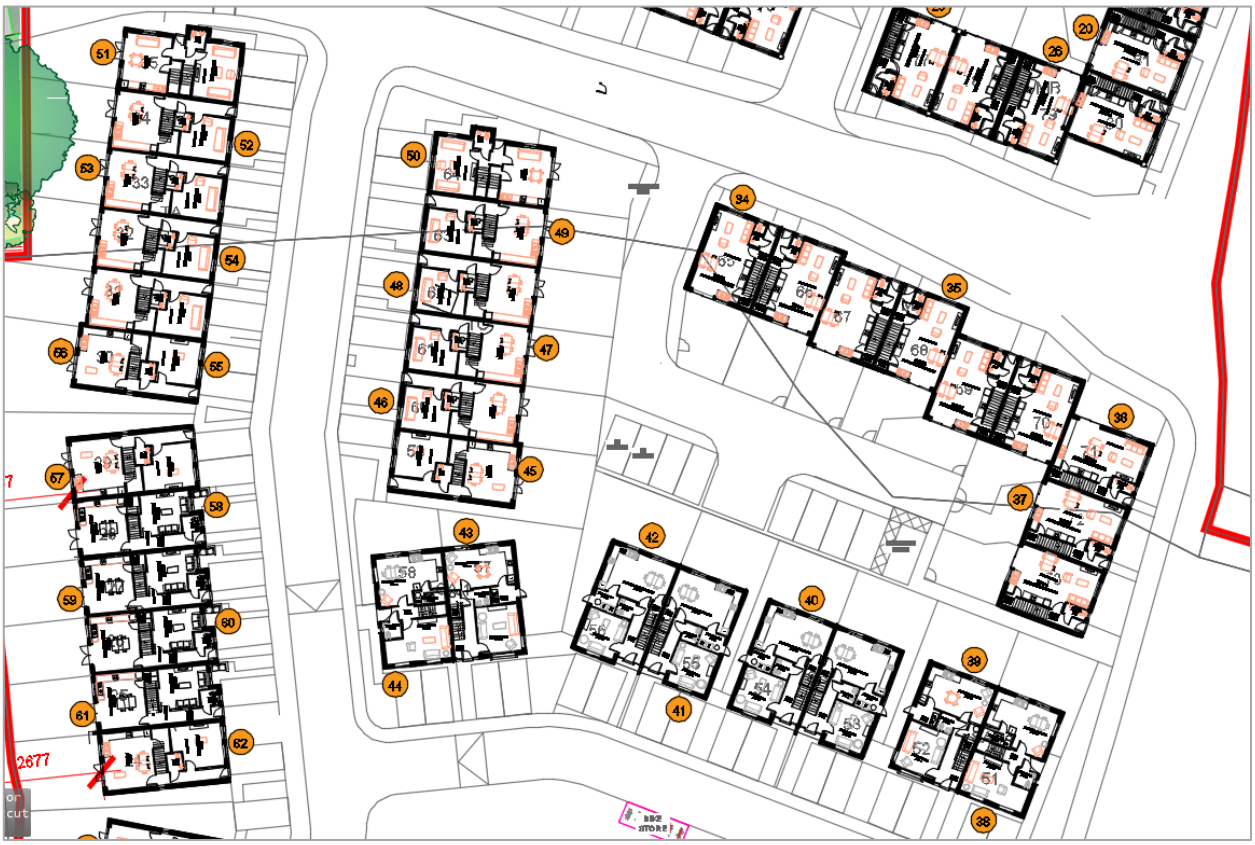


Image 5.4: Level 00 (ground floor). Receptor no. 34 to 62.

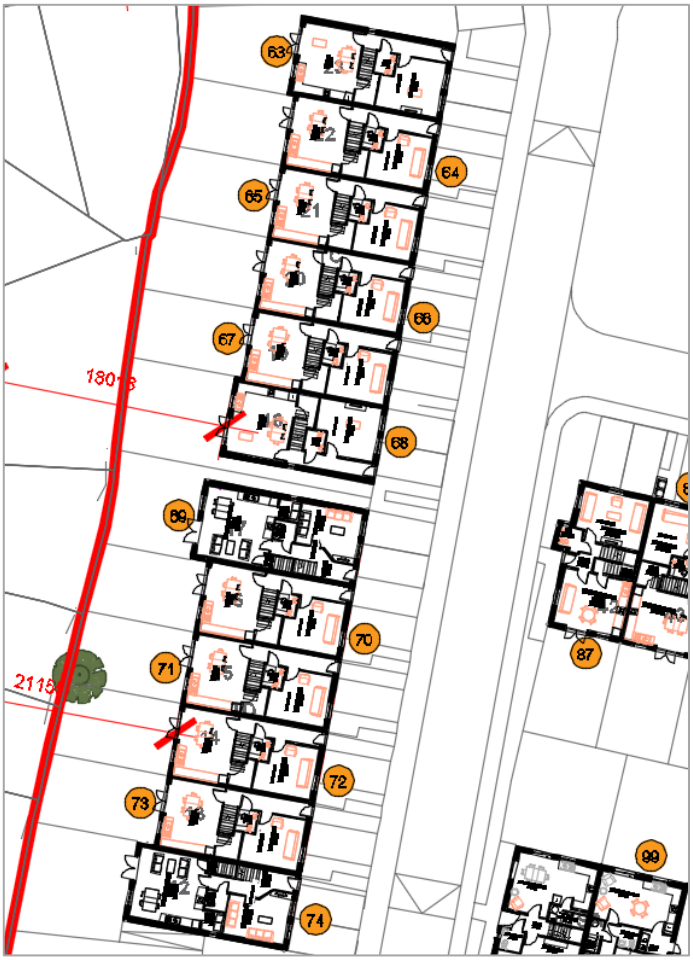


Image 5.5: Level 00 (ground floor). Receptor no. 63 to 74.

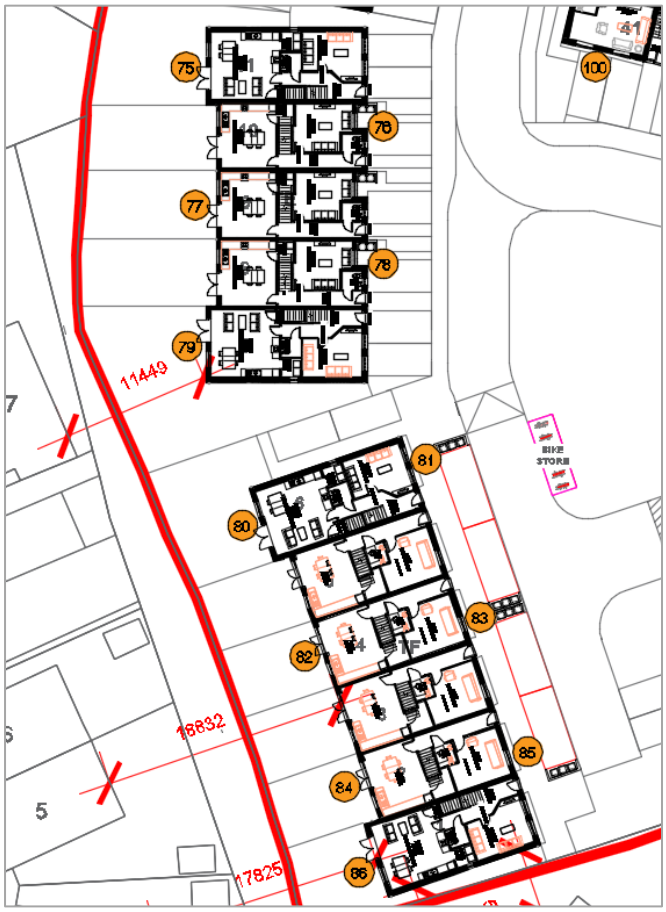


Image 5.6: Level 00 (ground floor). Receptor no. 75 to 86.



Image 5.7: Level 00 (ground floor). Receptor no. 87 to 100.

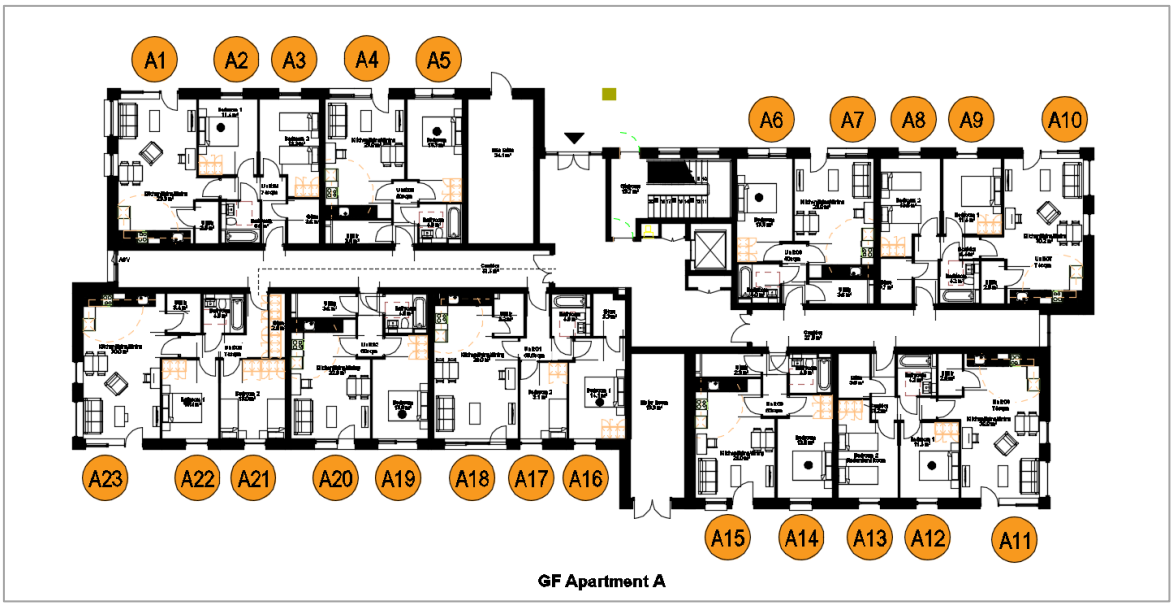


Image 5.8: Apartment Block A. Level 00 (ground floor). Receptor no. A1 to A23.

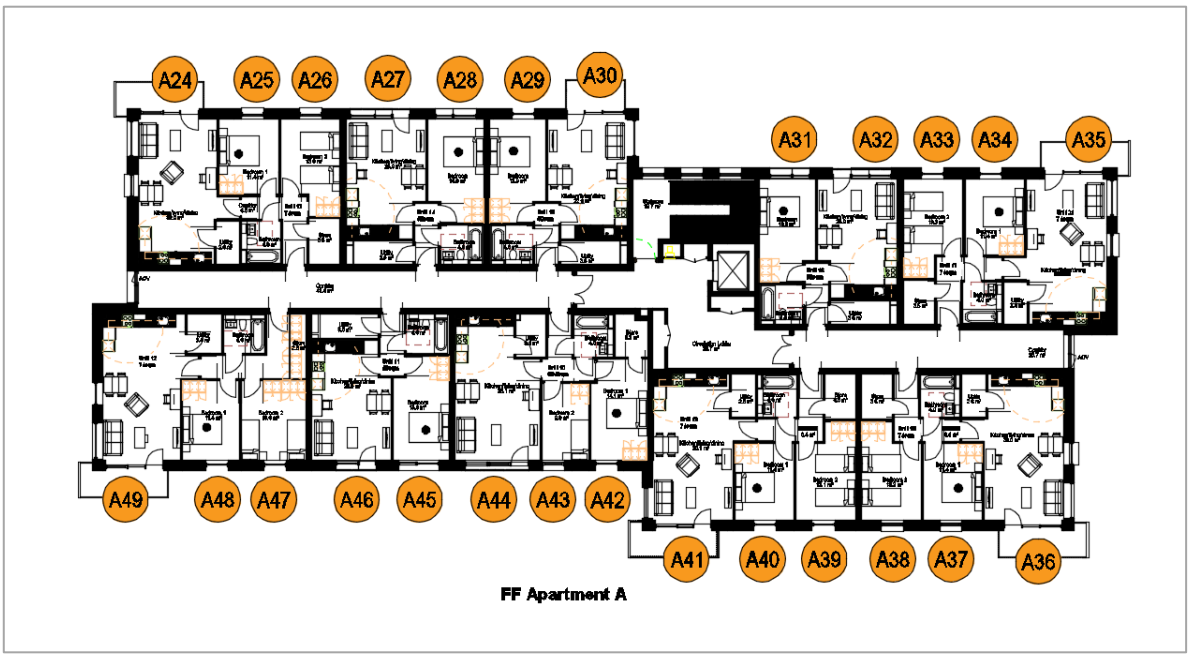


Image 5.9: Apartment Block A. Level 01 (first floor). Receptor no. A24 to A49.

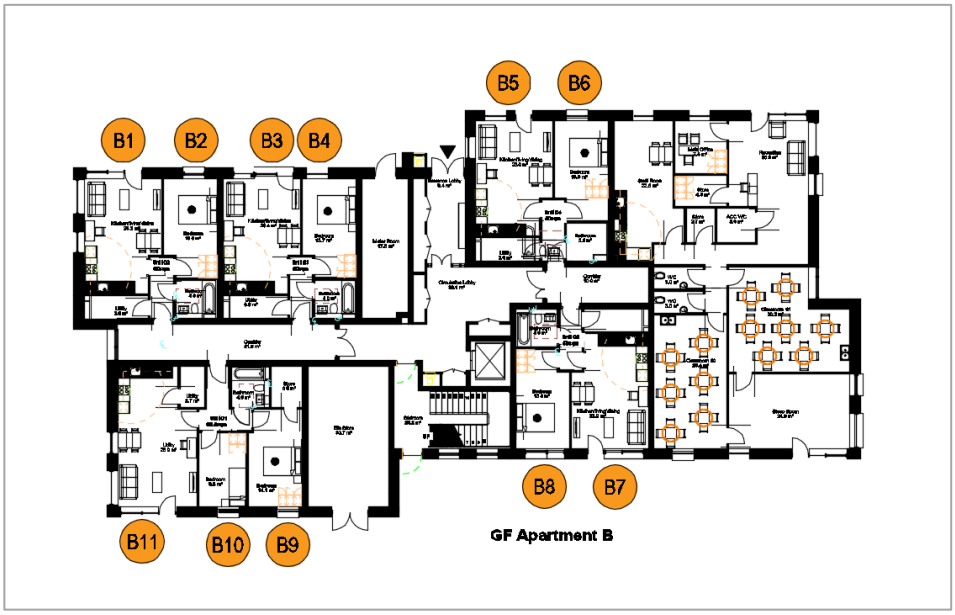


Image 5.10: Apartment Block B. Level 00 (ground floor). Receptor no. B1 to B11.

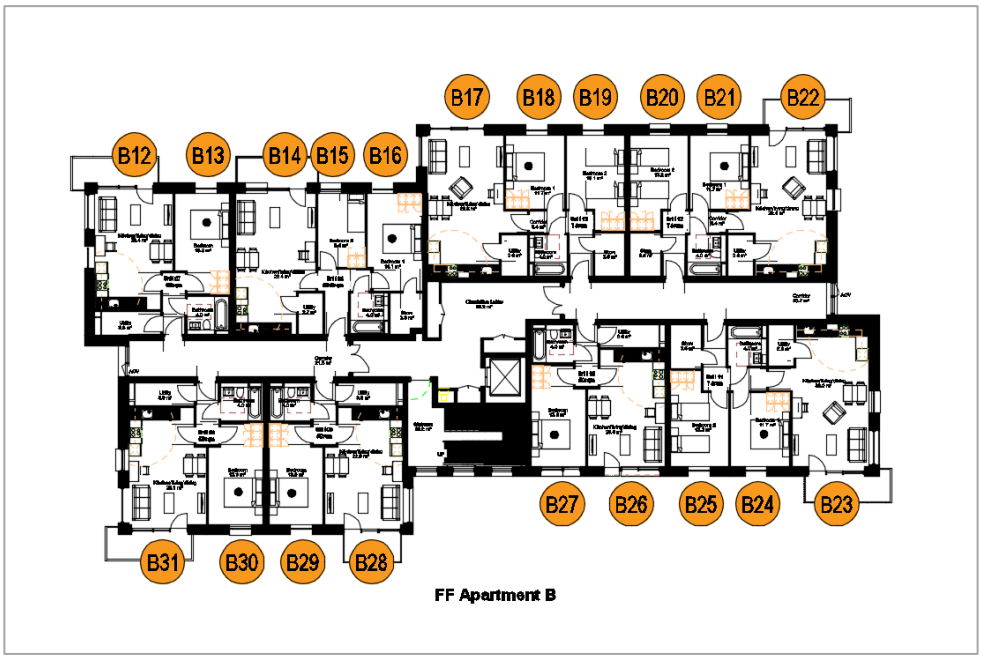


Image 5.11: Apartment Block B. Level 01 (first floor). Receptor no. B12 to B31.

5.2 Calculation result table

The results table below provide the full calculation results of the selected receptors / rooms. IS EN17037 / BS EN17037 daylight factor and illuminance levels are provided and the National Annex (NA) target values in BS EN17037. The calculation results have been given the following colour code guide depending on its level of resulting compliance within each guideline.

Compliance hierarchy

☑☑	>=100%
☑	<100% , >95%
☑	<95% , >90%
!!	<90% , >80%
x	<80%

Receptor	Level/Floor	Block /Unit ID	Room / type	glass area m2	room area m2	glass ratio %	Dept/Width	∑ VSC ∟ (total)	ISEN17037 DAY LIGHT FACTOR				ISEN17037 ILLUMINANCE				BSEN17037 ANNEX	
									50% area 50% sun hrs		95% area 50% sun hrs		50% area 50% sun hrs		95% area 50% sun hrs		illuminance	day light factor
									%	min %	%	min %	lx	min lx	lx	min lx	min lx	min %
1	00	unit no. 112	Living-Kitchen	5.56	22.6	24.6	2.49	30%	3.08	2.00	1.08	0.70	466	300	154	100	200	1.3
2	00	unit no. 112	Living	4.56	19.0	24.0	2.43	29%	2.75	2.00	0.96	0.70	415	300	137	100	150	1.0
3	00	unit no. 114	Living	2.60	14.1	18.5	2.16	31%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
4	00	unit no. 114	Living-Kitchen	3.60	24.0	15.0	2.39	32%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
5	00	unit no. 115	Living-Kitchen	3.60	24.0	15.0	2.39	32%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
6	00	unit no. 117	Living	2.60	14.1	18.5	2.16	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
7	00	unit no. 118	Living	2.60	14.1	18.5	2.16	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
8	00	unit no. 118	Living-Kitchen	3.60	24.0	15.0	2.45	31%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
9	00	unit no. 119	Living-Kitchen	3.60	24.0	15.0	2.45	31%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
10	00	unit no. 99	Living-Kitchen	4.86	32.2	15.1	1.51	37%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
11	00	unit no. 99	Living	2.60	16.2	16.0	1.80	33%	2.01	2.00	0.70	0.70	304	300	100	100	150	1.0
12	00	unit no. 98	Living	3.00	17.3	17.4	1.69	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
13	00	unit no. 97	Living	2.60	14.1	18.5	2.16	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
14	00	unit no. 93	Living	2.60	14.1	18.5	2.16	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
15	00	unit no. 92	Living	2.60	14.1	18.5	2.16	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
16	00	unit no. 90	Living-Kitchen	4.86	32.2	15.1	1.51	37%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
17	00	unit no. 88	Living	3.00	17.3	17.4	1.69	33%	2.21	2.00	0.77	0.70	334	300	110	100	150	1.0
18	00	unit no. 85	Living	2.60	16.2	16.0	1.77	33%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
19	00	unit no. 83	Living-Kitchen	5.88	31.5	18.7	2.42	29%	2.41	2.00	0.84	0.70	365	300	120	100	200	1.3
20	00	unit no. 81	Living	5.88	31.5	18.7	2.42	28%	2.35	2.00	0.82	0.70	355	300	117	100	150	1.0
21	00	unit no. 102	Living-Kitchen	4.86	32.2	15.1	1.51	30%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
22	00	unit no. 102	Living	5.20	23.4	22.2	2.51	27%	2.55	2.00	0.89	0.70	385	300	127	100	150	1.0
23	00	unit no. 100	Living-Kitchen	4.86	32.2	15.1	1.51	30%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
24	00	unit no. 75	Living-Kitchen	5.88	31.5	18.7	2.42	33%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
25	00	unit no. 77	Living	5.88	31.5	18.7	2.42	29%	2.41	2.00	0.84	0.70	365	300	120	100	150	1.0
26	00	unit no. 79	Living-Kitchen	5.88	31.5	18.7	2.42	28%	2.35	2.00	0.82	0.70	355	300	117	100	200	1.3
27	00	unit no. 111	Living-Kitchen	5.56	22.6	24.6	2.49	30%	3.08	2.00	1.08	0.70	466	300	154	100	200	1.3
28	00	unit no. 110	Living	5.13	16.3	31.4	1.93	33%	3.95	2.00	1.38	0.70	598	300	197	100	150	1.0
29	00	unit no. 109	Living-Kitchen	3.60	24.0	15.0	2.39	31%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
30	00	unit no. 107	Living-Kitchen	4.86	32.2	15.1	1.51	30%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
31	00	unit no. 106	Living	2.60	16.2	16.0	1.77	32%	2.01	2.00	0.70	0.70	304	300	100	100	150	1.0
32	00	unit no. 105	Living	4.20	17.1	24.6	1.85	31%	2.95	2.00	1.03	0.70	446	300	147	100	150	1.0
33	00	unit no. 105	Living-Kitchen	4.86	32.2	15.1	1.51	30%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3

34	00	unit no. 65	Living-Kitchen	8.00	32.7	24.5	1.15	30%	3.28	2.00	1.15	0.70	496	300	164	100	200	1.3
35	00	unit no. 68	Living-Kitchen	8.00	32.7	24.5	1.15	27%	3.02	2.00	1.05	0.70	456	300	150	100	200	1.3
36	00	unit no. 71	Living-Kitchen	8.00	32.7	24.5	1.15	34%	3.75	2.00	1.31	0.70	567	300	187	100	200	1.3
37	00	unit no. 72	Living-Kitchen	8.00	32.7	24.5	1.15	28%	3.02	2.00	1.05	0.70	456	300	150	100	200	1.3
38	00	unit no. 51	Living	4.56	19.0	24.0	2.43	33%	3.15	2.00	1.10	0.70	476	300	157	100	150	1.0
39	00	unit no. 52	Living-Kitchen	3.60	20.9	17.2	2.69	29%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
40	00	unit no. 54	Living-Kitchen	3.60	24.0	15.0	2.45	32%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
41	00	unit no. 55	Living	2.60	14.1	18.5	2.16	33%	2.28	2.00	0.80	0.70	344	300	114	100	150	1.0
42	00	unit no. 56	Living-Kitchen	3.60	24.0	15.0	2.45	32%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
43	00	unit no. 57	Living-Kitchen	3.60	20.9	17.2	2.69	28%	1.94	2.00	0.68	0.70	294	300	97	100	200	1.3
44	00	unit no. 58	Living	4.56	19.0	24.0	2.43	33%	3.15	2.00	1.10	0.70	476	300	157	100	150	1.0
45	00	unit no. 59	Living-Kitchen	4.65	22.9	20.3	2.13	29%	2.48	2.00	0.87	0.70	375	300	124	100	200	1.3
46	00	unit no. 60	Living	2.52	15.2	16.6	2.08	33%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
47	00	unit no. 61	Living-Kitchen	4.65	20.4	22.8	2.32	31%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
48	00	unit no. 62	Living	2.52	15.2	16.6	2.08	33%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
49	00	unit no. 63	Living-Kitchen	4.65	20.4	22.8	2.32	28%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
50	00	unit no. 64	Living	4.00	18.6	21.5	2.41	33%	2.81	2.00	0.98	0.70	426	300	140	100	150	1.0
51	00	unit no. 35	Living-Kitchen	6.65	20.5	32.4	2.25	31%	4.15	2.00	1.45	0.70	628	300	207	100	200	1.3
52	00	unit no. 34	Living	2.52	15.2	16.6	2.08	33%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
53	00	unit no. 33	Living-Kitchen	4.65	20.4	22.8	2.32	31%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
54	00	unit no. 32	Living	2.52	15.2	16.6	2.08	33%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
55	00	unit no. 30	Living	4.20	16.8	25.0	2.02	33%	3.15	2.00	1.10	0.70	476	300	157	100	150	1.0
56	00	unit no. 30	Living-Kitchen	4.65	22.9	20.3	2.13	31%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
57	00	unit no. 29	Living-Kitchen	4.65	22.9	20.3	2.13	29%	2.48	2.00	0.87	0.70	375	300	124	100	200	1.3
58	00	unit no. 28	Living	2.73	15.1	18.1	1.87	29%	2.01	2.00	0.70	0.70	304	300	100	100	150	1.0
59	00	unit no. 27	Living-Kitchen	4.56	21.0	21.7	2.20	30%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
60	00	unit no. 26	Living	2.73	15.1	18.1	1.87	29%	2.01	2.00	0.70	0.70	304	300	100	100	150	1.0
61	00	unit no. 25	Living-Kitchen	4.56	21.0	21.7	2.20	30%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
62	00	unit no. 24	Living	4.20	16.8	25.0	2.02	33%	3.22	2.00	1.13	0.70	486	300	160	100	150	1.0
63	00	unit no. 23	Living-Kitchen	4.65	22.9	20.3	2.13	30%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
64	00	unit no. 22	Living	2.52	15.2	16.6	2.08	34%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
65	00	unit no. 21	Living-Kitchen	4.65	20.4	22.8	2.32	31%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
66	00	unit no. 20	Living	2.52	15.2	16.6	2.08	34%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
67	00	unit no. 19	Living-Kitchen	4.65	20.4	22.8	2.32	31%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
68	00	unit no. 18	Living	4.20	16.8	25.0	2.02	34%	3.22	2.00	1.13	0.70	486	300	160	100	150	1.0
69	00	unit no. 17	Living-Kitchen	4.56	26.5	17.2	1.83	29%	2.21	2.00	0.77	0.70	334	300	110	100	200	1.3
70	00	unit no. 16	Living	2.52	15.2	16.6	2.08	34%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
71	00	unit no. 15	Living-Kitchen	4.65	20.4	22.8	2.32	29%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
72	00	unit no. 14	Living	2.52	15.2	16.6	2.08	34%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
73	00	unit no. 13	Living-Kitchen	4.65	20.4	22.8	2.32	29%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
74	00	unit no. 12	Living	5.04	14.8	34.1	1.98	31%	3.89	2.00	1.36	0.70	588	300	194	100	150	1.0
75	00	unit no. 11	Living-Kitchen	4.56	26.5	17.2	1.83	32%	2.41	2.00	0.84	0.70	365	300	120	100	200	1.3
76	00	unit no. 10	Living	2.73	15.1	18.1	1.87	30%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
77	00	unit no. 9	Living-Kitchen	4.56	21.0	21.7	2.20	32%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
78	00	unit no. 8	Living	2.73	15.1	18.1	1.87	30%	2.08	2.00	0.73	0.70	314	300	104	100	150	1.0
79	00	unit no. 7	Living-Kitchen	4.56	26.5	17.2	1.83	30%	2.21	2.00	0.77	0.70	334	300	110	100	200	1.3
80	00	unit no. 6	Living-Kitchen	4.56	26.5	17.2	1.83	29%	2.21	2.00	0.77	0.70	334	300	110	100	200	1.3
81	00	unit no. 5	Living	5.04	14.8	34.1	1.98	34%	4.36	2.00	1.52	0.70	659	300	217	100	150	1.0
82	00	unit no. 4	Living-Kitchen	4.65	20.4	22.8	2.32	29%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
83	00	unit no. 3	Living	2.52	15.2	16.6	2.08	34%	2.14	2.00	0.75	0.70	324	300	107	100	150	1.0

84	00	unit no. 2	Living-Kitchen	4.65	20.4	22.8	2.32	29%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
85	00	unit no. 2	Living	2.52	15.2	16.6	2.08	34%	2.14	2.00	0.75	0.70	324	300	107	100	150	1.0
86	00	unit no. 1	Living-Kitchen	4.56	26.5	17.2	1.83	29%	2.14	2.00	0.75	0.70	324	300	107	100	200	1.3
87	00	unit no. 42	Living-Kitchen	6.65	20.5	32.4	2.25	28%	3.75	2.00	1.31	0.70	567	300	187	100	200	1.3
88	00	unit no. 43	Living	2.52	15.2	16.6	2.08	34%	2.14	2.00	0.75	0.70	324	300	107	100	150	1.0
89	00	unit no. 44	Living-Kitchen	4.65	20.4	22.8	2.32	28%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
90	00	unit no. 46	Living	2.52	15.2	16.6	2.08	34%	2.14	2.00	0.75	0.70	324	300	107	100	150	1.0
91	00	unit no. 46	Living-Kitchen	4.65	20.4	22.8	2.32	28%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
92	00	unit no. 48	Living-Kitchen	4.65	20.4	22.8	2.32	28%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
93	00	unit no. 50	Living-Kitchen	6.65	20.5	32.4	2.25	28%	3.75	2.00	1.31	0.70	567	300	187	100	200	1.3
94	00	unit no. 50	Living	4.00	18.6	21.5	2.41	31%	2.68	2.00	0.94	0.70	405	300	134	100	150	1.0
95	00	unit no. 36	Living-Kitchen	5.56	22.6	24.6	2.49	29%	2.95	2.00	1.03	0.70	446	300	147	100	200	1.3
96	00	unit no. 37	Living	5.13	16.3	31.4	1.93	31%	3.75	2.00	1.31	0.70	567	300	187	100	150	1.0
97	00	unit no. 38	Living-Kitchen	3.60	24.0	15.0	2.39	32%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
98	00	unit no. 39	Living	2.60	14.1	18.5	2.16	35%	2.41	2.00	0.84	0.70	365	300	120	100	150	1.0
99	00	unit no. 40	Living-Kitchen	3.60	20.9	17.2	2.62	31%	2.21	2.00	0.77	0.70	334	300	110	100	200	1.3
100	00	unit no. 41	Living	4.56	19.0	24.0	2.43	34%	3.22	2.00	1.13	0.70	486	300	160	100	150	1.0
A1	00	Apt.block A	Living-Kitchen	10.29	29.2	35.2	1.16	31%	4.76	2.00	1.66	0.70	719	300	237	100	200	1.3
A2	00	Apt.block A	Bed room	2.10	9.3	22.6	2.30	32%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
A3	00	Apt.block A	Bed room	2.10	11.4	18.4	1.97	32%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
A4	00	Apt.block A	Living-Kitchen	4.83	23.1	20.9	1.47	32%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
A5	00	Apt.block A	Bed room	3.78	2.8	4.0	1.81	34%	3.95	2.00	1.38	0.70	598	300	197	100	100	0.7
A6	00	Apt.block A	Bed room	3.78	11.2	33.8	1.81	31%	3.62	2.00	1.27	0.70	547	300	181	100	100	0.7
A7	00	Apt.block A	Living-Kitchen	4.83	23.1	20.9	1.47	33%	2.95	2.00	1.03	0.70	446	300	147	100	200	1.3
A8	00	Apt.block A	Bed room	2.10	11.4	18.4	1.97	31%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
A9	00	Apt.block A	Bed room	2.10	9.3	22.6	2.30	31%	2.28	2.00	0.80	0.70	344	300	114	100	100	0.7
A10	00	Apt.block A	Living-Kitchen	10.29	29.2	35.2	1.16	25%	3.75	2.00	1.31	0.70	567	300	187	100	200	1.3
A11	00	Apt.block A	Living-Kitchen	10.29	29.2	35.2	1.16	23%	3.48	2.00	1.22	0.70	527	300	174	100	200	1.3
A12	00	Apt.block A	Bed room	2.10	9.3	22.6	2.30	33%	2.41	2.00	0.84	0.70	365	300	120	100	100	0.7
A13	00	Apt.block A	Bed room	2.10	11.4	18.4	1.97	33%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
A14	00	Apt.block A	Bed room	2.10	11.2	18.8	1.81	33%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
A15	00	Apt.block A	Living-Kitchen	3.15	23.1	13.6	1.47	35%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
A16	00	Apt.block A	Bed room	2.10	10.6	19.7	1.87	28%	1.94	2.00	0.68	0.70	294	300	97	100	100	0.7
A17	00	Apt.block A	Bed room	2.10	8.7	24.0	1.72	28%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
A18	00	Apt.block A	Living-Kitchen	5.25	28.1	18.7	1.29	32%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
A19	00	Apt.block A	Bed room	3.78	11.2	33.8	1.81	32%	3.69	2.00	1.29	0.70	557	300	184	100	100	0.7
A20	00	Apt.block A	Living-Kitchen	3.15	23.1	13.6	1.47	34%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
A21	00	Apt.block A	Bed room	2.10	10.9	19.3	2.27	32%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
A22	00	Apt.block A	Bed room	2.10	9.5	22.1	2.13	32%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
A23	00	Apt.block A	Living-Kitchen	10.29	28.5	36.1	1.15	32%	5.03	2.00	1.76	0.70	760	300	251	100	200	1.3
A24	01	Apt.block A	Living-Kitchen	10.29	29.2	35.2	1.16	33%	5.09	2.00	1.78	0.70	770	300	254	100	200	1.3
A25	01	Apt.block A	Bed room	2.10	9.3	22.6	2.30	33%	2.41	2.00	0.84	0.70	365	300	120	100	100	0.7
A26	01	Apt.block A	Bed room	2.10	11.4	18.4	1.97	33%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
A27	01	Apt.block A	Living-Kitchen	4.83	23.1	20.9	1.47	33%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
A28	01	Apt.block A	Bed room	3.78	11.2	33.8	1.81	33%	3.75	2.00	1.31	0.70	567	300	187	100	100	0.7
A29	01	Apt.block A	Bed room	2.10	11.2	18.8	1.81	33%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
A30	01	Apt.block A	Living-Kitchen	4.83	22.0	22.0	1.54	29%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
A31	01	Apt.block A	Bed room	3.78	11.2	33.8	1.81	33%	3.75	2.00	1.31	0.70	567	300	187	100	100	0.7
A32	01	Apt.block A	Living-Kitchen	4.83	23.1	20.9	1.47	33%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3

A33	01	Apt.block A	Bed room	2.10	11.4	18.4	1.97	33%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
A34	01	Apt.block A	Bed room	2.10	9.3	22.6	2.30	33%	2.41	2.00	0.84	0.70	365	300	120	100	100	0.7
A35	01	Apt.block A	Living-Kitchen	10.29	29.2	35.2	1.16	25%	3.82	2.00	1.34	0.70	578	300	191	100	200	1.3
A36	01	Apt.block A	Living-Kitchen	10.29	29.2	35.2	1.16	22%	3.35	2.00	1.17	0.70	507	300	167	100	200	1.3
A37	01	Apt.block A	Bed room	2.10	9.3	22.6	2.30	34%	2.48	2.00	0.87	0.70	375	300	124	100	100	0.7
A38	01	Apt.block A	Bed room	2.10	11.4	18.4	1.97	34%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
A39	01	Apt.block A	Bed room	2.10	11.4	18.4	1.97	34%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
A40	01	Apt.block A	Bed room	2.10	9.3	22.6	2.30	34%	2.48	2.00	0.87	0.70	375	300	124	100	100	0.7
A41	01	Apt.block A	Living-Kitchen	7.56	29.2	25.9	1.16	28%	3.22	2.00	1.13	0.70	486	300	160	100	200	1.3
A42	01	Apt.block A	Bed room	2.10	10.6	19.7	1.90	30%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
A43	01	Apt.block A	Bed room	2.10	8.7	24.0	1.72	29%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
A44	01	Apt.block A	Living-Kitchen	5.25	28.1	18.7	1.29	34%	2.75	2.00	0.96	0.70	415	300	137	100	200	1.3
A45	01	Apt.block A	Bed room	3.78	11.2	33.8	1.81	34%	3.89	2.00	1.36	0.70	588	300	194	100	100	0.7
A46	01	Apt.block A	Living-Kitchen	3.15	23.1	13.6	1.47	35%	2.01	2.00	0.70	0.70	304	300	100	100	200	1.3
A47	01	Apt.block A	Bed room	2.10	11.2	18.8	2.20	34%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
A48	01	Apt.block A	Bed room	2.10	9.8	21.4	2.07	34%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
A49	01	Apt.block A	Living-Kitchen	10.29	28.5	36.1	1.15	34%	5.29	2.00	1.85	0.70	800	300	264	100	200	1.3
B1	00	Apt.block B	Living-Kitchen	10.29	22.8	45.1	1.49	25%	4.62	2.00	1.62	0.70	699	300	231	100	200	1.3
B2	00	Apt.block B	Bed room	2.10	11.2	18.8	1.81	32%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
B3	00	Apt.block B	Living-Kitchen	4.83	22.8	21.2	1.49	32%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
B4	00	Apt.block B	Bed room	2.10	11.2	18.8	1.81	32%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
B5	00	Apt.block B	Living-Kitchen	5.25	22.8	23.0	1.49	26%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
B6	00	Apt.block B	Bed room	2.10	11.2	18.8	1.81	32%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
B7	00	Apt.block B	Living-Kitchen	4.83	22.0	22.0	1.54	33%	3.02	2.00	1.05	0.70	456	300	150	100	200	1.3
B8	00	Apt.block B	Bed room	3.78	11.2	33.8	1.81	33%	3.82	2.00	1.34	0.70	578	300	191	100	100	0.7
B9	00	Apt.block B	Bed room	2.10	10.6	19.7	1.90	33%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
B10	00	Apt.block B	Bed room	2.10	9.1	23.0	1.76	33%	2.41	2.00	0.84	0.70	365	300	120	100	100	0.7
B11	00	Apt.block B	Living-Kitchen	10.29	28.1	36.6	1.17	26%	4.09	2.00	1.43	0.70	618	300	204	100	200	1.3
B12	01	Apt.block B	Living-Kitchen	10.29	22.8	45.1	1.49	26%	4.89	2.00	1.71	0.70	740	300	244	100	200	1.3
B13	01	Apt.block B	Bed room	2.10	11.2	18.8	1.81	33%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
B14	01	Apt.block B	Living-Kitchen	4.83	27.9	17.3	1.26	33%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
B15	01	Apt.block B	Bed room	2.10	7.7	27.3	2.09	30%	2.48	2.00	0.87	0.70	375	300	124	100	100	0.7
B16	01	Apt.block B	Bed room	2.10	10.6	19.7	1.90	30%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
B17	01	Apt.block B	Living-Kitchen	8.19	28.0	29.3	1.21	29%	3.75	2.00	1.31	0.70	567	300	187	100	200	1.3
B18	01	Apt.block B	Bed room	2.10	9.6	21.9	2.34	33%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
B19	01	Apt.block B	Bed room	2.10	11.0	19.1	1.94	33%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
B20	01	Apt.block B	Bed room	2.10	9.6	21.9	2.34	33%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
B21	01	Apt.block B	Bed room	2.10	11.0	19.1	1.94	33%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
B22	01	Apt.block B	Living-Kitchen	10.29	28.0	36.8	1.21	33%	5.23	2.00	1.83	0.70	790	300	261	100	200	1.3
B23	01	Apt.block B	Living-Kitchen	10.29	29.4	35.0	1.24	35%	5.36	2.00	1.88	0.70	811	300	267	100	200	1.3
B24	01	Apt.block B	Bed room	2.10	11.0	19.1	1.94	35%	2.28	2.00	0.80	0.70	344	300	114	100	100	0.7
B25	01	Apt.block B	Bed room	2.10	9.6	21.9	2.34	35%	2.48	2.00	0.87	0.70	375	300	124	100	100	0.7
B26	01	Apt.block B	Living-Kitchen	4.83	22.8	21.2	1.49	35%	3.08	2.00	1.08	0.70	466	300	154	100	200	1.3
B27	01	Apt.block B	Bed room	2.10	11.2	18.8	1.81	35%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
B28	01	Apt.block B	Living-Kitchen	8.19	22.8	35.9	1.49	29%	4.36	2.00	1.52	0.70	659	300	217	100	200	1.3
B29	01	Apt.block B	Bed room	2.10	11.2	18.8	1.81	35%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
B30	01	Apt.block B	Bed room	2.10	11.2	18.8	1.81	35%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
B31	01	Apt.block B	Living-Kitchen	10.29	22.8	45.1	1.49	28%	5.16	2.00	1.80	0.70	780	300	257	100	200	1.3

Table 5.1: Calculation results: Daylight performance of proposed development.

5.3 Daylight reception of proposed development conclusion

For the daylight assessment, results have been analysed within these standards:

- Assessed in accordance with IS EN17037 / BS EN17307, carried out in accordance with Method 1 and Method 2 described in the methodology section.
- Assessed in accordance with BS EN 17037:2018 National Annex.

The results from table 5.1 are reviewed under each standard. The daylight reception assessment has been targeted to habitable rooms within the proposed development. Receptors / rooms within the proposed development are indicated in image 5.1 to 5.11.

- Apartments: Blocks A and B, all habitable rooms within the proposed blocks on the ground floor and first floor have been assessed. Once a (lowest level) room is compliant, rooms at higher levels with similar configuration / parameters are deemed compliant on the basis that the room daylight factor would have improved due to the better vertical sky view angle of higher located rooms.
- Houses: habitable rooms on the ground floor which are observed to be in the most daylight challenging positions or rooms positioned with close by obstacles have been assessed.

IS EN17037 / BS EN17307: To achieve recommendations outlined in IS EN 17037:2018 / BS EN 17307:2018, a given room must achieve: a target daylight factor of 2.0% or in terms of illuminance 300 lux on over 50% of the floor area for over 50% of the available daylight hours. And a minimum target daylight factor of 0.7% or in terms of illuminance 100 lux on over 95% of the floor area for over 50% of the available daylight hours. From the calculation result table 5.1 we note all of the proposed rooms calculated daylight results achieved the minimum guidelines or achieved well in excess of the guidelines.

- Apartments: Overall, examined residential rooms for Apartment blocks A and B achieved on average a daylight factor (DF) of 2.9% and an illuminance of 438 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 1.0% and an illuminance of 144 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved.
- Houses: Overall, examined residential rooms for Houses achieved on average a daylight factor (DF) of 2.5% and an illuminance of 383 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 0.88% and an illuminance of 126 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved.

In an urban environment it can more often be the case that complete fulfilment with the guidelines is not attainable. Within the BS EN 17037 it acknowledges that a rigid application of the European Standard could prove to be a difficult task as it offers only a single target for new buildings and IS EN17037 currently has no specific National Annex. The British Annex of BS EN 17037, daylight recommendations differ depending on the function of a room and offers minimum daylight provision targets for kitchens, living rooms and bedrooms.
Therefore, Given the similarity of weather, light and design patterns between Ireland and the UK and the lack of specific localisation Annex details in the Irish version, the alternate minimum daylight provision targets set out in the national annex of BS EN 17037 are reviewed next.

BS EN 17037:2018 National Annex: To achieve the alternate minimum daylight recommendations for Dublin, the room in question must achieve: Kitchen 1.3% target daylight factor or in terms of illuminance 200 lux. Living room 1.0% target daylight factor or in terms of illuminance 150 lux, and bedrooms 0.7% target daylight factor or in terms of illuminance 100 lux all over 50% of the floor area for over half the daylight hours. From the calculation result table 5.1 we note that all of the rooms calculated daylight are well in excess of these minimum guidelines.

- Overall compliance for proposed development = 100%

In summary, the calculation results have achieved a high level of compliance under IS EN17037 / BS EN17307 and BS EN 17037:2018 National Annex guidelines. This indicates an overall good level of daylight for the proposed development under the guidelines. We conclude, the proposed development can provide a good level of residential daylight amenity to future occupants.

Sunlight Reception

Sunlight in the new proposed amenity areas:

5.4 **Receptor selection - Amenity spaces within the proposed development**
Image 5.12 below indicates the open space amenity areas that have been selected and analysed on the basis that the shadow casted from the proposed development may affect the amenity areas given its geographical location in relation to the development. These areas are identified below and labelled for reference in the results.

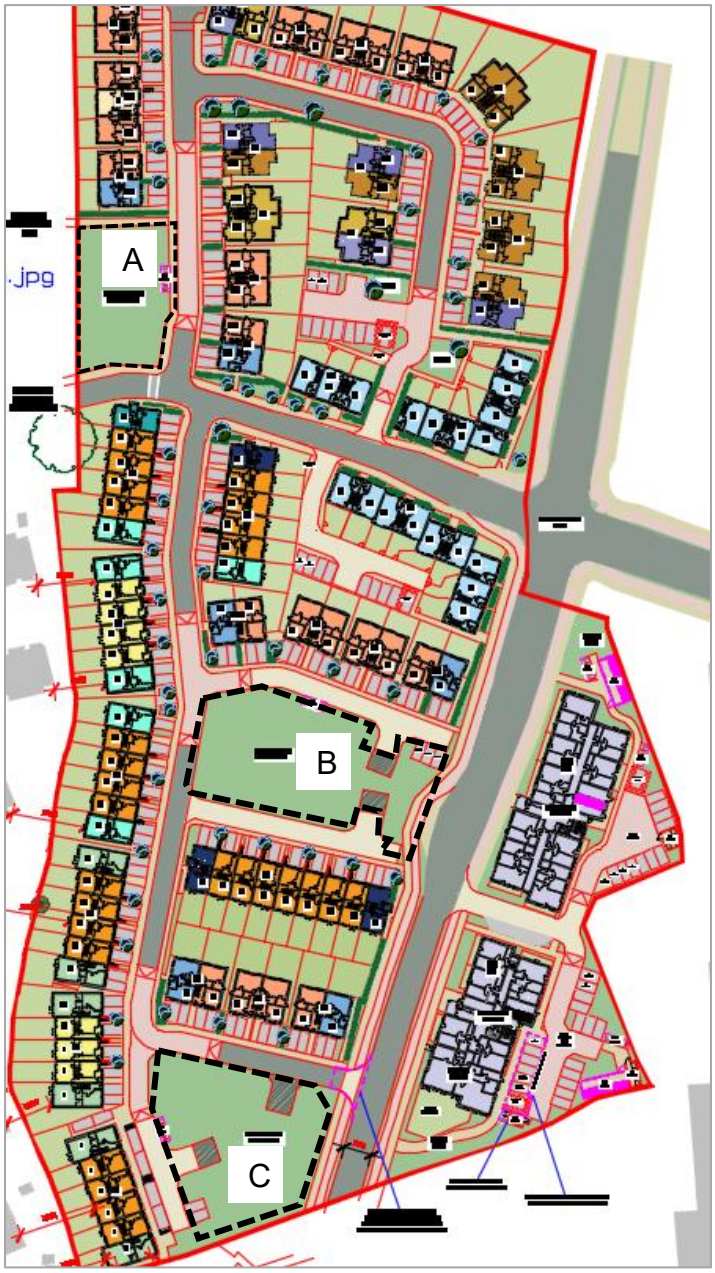


Image 5.12: New proposed amenity spaces within the development.

Receptor	Amenity Description	Amenity area (HA)
A	Public open space	0.082
B	Public open space	0.15
C	Public open space	0.15

Table 5.3: List of new proposed amenity spaces.

5.5 Calculation result table

The result table below provides a summary of the calculation results of the proposed amenity areas. It shows the overall hours of sunlight on March 21st together with the 'to-be-achieved' BRE minimum sunlight standards. Appendix B provides the full calculation results of the proposed amenity areas. The calculation results have been given the following colour code guide depending on its level of resulting compliance.

Compliance guide

☑	0%	Over /equal to
☑	5%	Within
!!	10%	Within
x	10%	In excess of

Amenity space ID ref	Amenity space area (m²)	Achieved daily sun time * area	Achieved total sun time (hrs)	Required sun hours @ 50% area	Achieved sun hours on @ 50% area
A	820.0	383760.0	7.80	2.0	8.0
B	1500.0	770400.0	8.56	2.0	9.0
C	1500.0	867600.0	9.64	2.0	10.0

Table 5.4: Calculation results: Summary table of sunlight analysis of proposed public amenity space.

5.6 Sunlight reception – amenity areas of the proposed development conclusion

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21st of March. From the calculation results in table 5.4 we note that all selected amenity spaces received well in excess of the minimum 2 hours of sunlight on at least 50% of the area on March 21st, see image 5.12 for receptor/amenity space locations. Summary of results are as follows:

- Overall, the calculated average sunlight on at least 50% of the area on March 21st for public open space amenity areas is 9.00 hours.

This confirms the amenity areas proposed will be adequately sunlit throughout the year. We conclude that the new amenity spaces receive sunlight on 50% of the area is in line with the recommendations of the BRE Report - Site Layout and Planning for Daylight and Sunlight - and therefore deem these to be compliant to this element.

6 Impact of proposed development – Calculation results and conclusion

The impact of the proposed development calculations and assessments is broken into two sections, impact on daylight reception and impact on sunlight reception.

Impact on Daylight Reception:

Vertical sky component (VSC):

6.1 **Receptor selection – Buildings / windows neighbouring the proposed development**
The VSC assessment has been targeted to the closest habitable neighbouring windows / rooms / dwellings that are perceived to be in challenging locations i.e., ground floor rooms and dwellings/rooms in the vicinity of the new proposed development on the basis that if these habitable rooms pass the minimum requirements all rooms at higher levels will definitely pass the minimum recommendations as a result of the improving vertical sky view angle. Image 6.1-6.5 below indicates the windows that have been selected and analysed. The windows are identified and labelled for reference in the results.



Image 6.1: Daylight impact: Neighbouring receptors – Overall view (receptor no. 1 - 27).



Image 6.2: Daylight impact: Neighbouring receptors – Receptor no. 1 - 7.

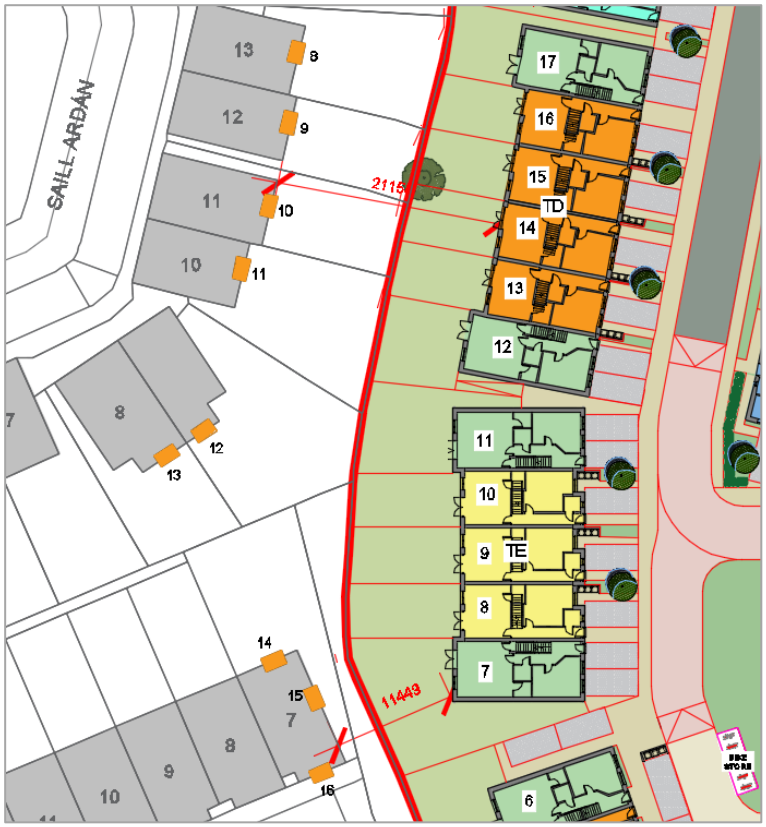


Image 6.3: Daylight impact: Neighbouring receptors – Receptor no. 8 - 16.

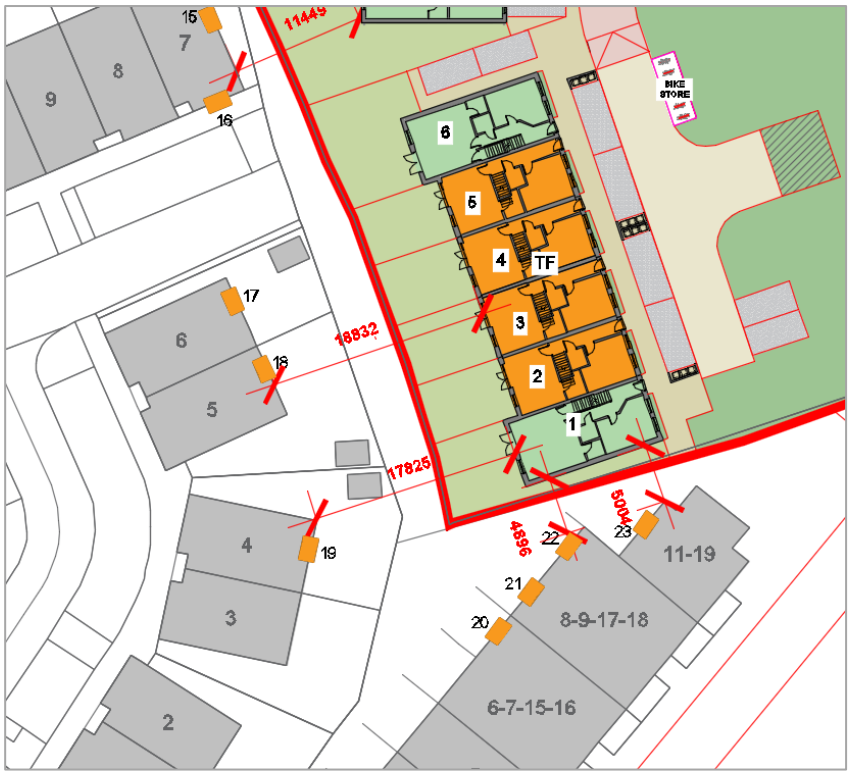


Image 6.4: Daylight impact: Neighbouring receptors – Receptor no. 17 - 23.



Image 6.5: Daylight impact: Neighbouring receptors – Receptor no. 24 - 27.

Receptor / window *	Level	Location / address	Dwelling description
1, 2	00	8 Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
3, 4, 5	00	9 Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
6	00	15 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
7	00	14 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
8	00	13 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
9	00	12 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
10	00	11 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
11	00	10 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
12	00	9 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
13	00	8 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
14, 15, 16	00	7 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
17	00	6 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
18	00	5 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
19	00	4 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
20, 21, 22, 23	00	Park Ridge, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Residential
24, 25, 26 **	00	Ardshanavooly, Killarney, Co. Kerry	Residential
27 **	00	Ardshanavooly, Killarney, Co. Kerry	Residential

Table 6.1: List of receptors selected for analysis.

* The BRE report outlines VSC guidelines are intended for use for rooms where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed or commercial premises.

* Some of the windows selected here could potentially be windows to a bathroom, WC, storeroom or circulation area and the room may not need to be examined. However, for the purpose of this report they have all been presumed as habitable.

* The windows have been calculated as ground floor receptors. On the basis that if these habitable rooms pass the minimum requirements all rooms at higher levels will definitely pass the minimum recommendations as a result of the improving vertical sky view angle.

** The receptors/windows at the neighbouring Ardshanavooly development are not existing, however, for the purpose of this report they have been presumed as existing.

6.2 Calculation result table

The VSC has been calculated for potentially affected windows within the neighbouring/adjacent properties. Locations of receptors are based on guideline recommendations for the closest facades which have windows with potential for impact. The change factor or effect on daylight reception in an existing habitable room should not be affected by more than 20% i.e., a maximum change factor of 0.8. The column named comment/effect describes the level of change an assessed window will experience, based on its compliance with the BRE target. A list of definitions can be found in section 4.8 of this report. To identify the status of the change factor in the tables below we use the following colour code guide depending on its level of resulting compliance status. The summary result table below provides the VSC calculation results. Appendix C provides the full calculation result table.

Compliance hierarchy	
☑☑	>=100%
☑	<100%, >95%
☑	<95%, >90%
!!	<90%, >80%
x	<80%

Receptor ID	Existing baseline VSC value [%]	Proposed VSC value [%]	Change factor	Comment / Effect of proposed development
Receptor 1	36%	30%	0.84	Negligible
Receptor 2	34%	29%	0.88	Negligible
Receptor 3	32%	30%	0.93	Negligible
Receptor 4	36%	30%	0.83	Negligible
Receptor 5	34%	31%	0.90	Negligible
Receptor 6	34%	29%	0.86	Negligible
Receptor 7	34%	29%	0.86	Negligible
Receptor 8	36%	31%	0.87	Negligible
Receptor 9	36%	31%	0.87	Negligible
Receptor 10	36%	31%	0.88	Negligible
Receptor 11	36%	31%	0.88	Negligible
Receptor 12	34%	31%	0.92	Negligible
Receptor 13	34%	31%	0.92	Negligible
Receptor 14	33%	31%	0.95	Negligible
Receptor 15	36%	30%	0.85	Negligible
Receptor 16	35%	30%	0.88	Negligible
Receptor 17	36%	31%	0.86	Negligible
Receptor 18	36%	31%	0.86	Negligible
Receptor 19	36%	34%	0.94	Negligible
Receptor 20	31%	28%	0.91	Negligible
Receptor 21	32%	28%	0.88	Negligible
Receptor 22	33%	25%	0.78	Negligible
Receptor 23	33%	25%	0.77	Negligible
Receptor 24	37%	35%	0.95	Negligible
Receptor 25	37%	30%	0.82	Negligible
Receptor 26	34%	30%	0.89	Negligible
Receptor 27	36%	30%	0.85	Negligible

Table 6.2: Calculation results: Summary table of VSC results.

6.3 Impact on daylight reception conclusion

The BRE recommends that the effects of a new development on daylight reception should not impact any existing VSC by more than 20% or have a maximum change factor in excess of 0.80. From the calculation results we note all selected neighbouring habitable receptors are affected to some degree with regards to daylight reception due to the introduction of the proposed development in their respective habitable rooms facing the proposed development. The calculated change in daylight reception in all of the neighbouring receptors/windows achieved a change factor ranging from 0.77 to 0.95. The BRE report outlines VSC guidelines are intended for use for rooms where daylight is required, including living rooms, kitchens and bedrooms. Properties used for habitable purposes have been assessed therefore properties occupied by commercial units have not been applied to the VSC assessment. Summarized result findings are as follows (see image 6.1-6.5 for receptor locations):

- West receptors: Receptor no. 1 to 29 & 24 to 27: Neighbouring dwellings located in Park Road, Sáil Árdán, Ceide Spris and the Ardshanavooly estate with ground floor windows were examined and resulted in a change factor range of 0.82 to 0.95. These receptors are all within the guidelines and the effect is determined as negligible under BRE definitions.
- South receptors: Receptor no. 20 to 23: Neighbouring units located in Park Ridge, estate with ground floor windows were examined and resulted in a change factor range of 0.77 to 0.91. 2 no. of receptors are marginally outside recommendations however are calculated within 5% of BRE recommendations and would not cause a major adverse impact.
- Overall, the average change ratio for VSC is 0.88.

Impact on Sunlight Reception:

Sunlight in existing amenity areas:

6.4 **Receptor selection – Existing amenity spaces**

The sunlight reception assessment is targeted to neighbouring amenity spaces that might be affected by the introduction of the new proposed development. BR 209 (2022) outlines sunlight checks should include gardens, parks, playing fields, playgrounds, swimming pools, areas of recreational water, moorings, sitting out areas and nature reserves. Image 6.7-6.10 below indicates the neighbouring amenity areas selected and analysed on the basis that the shadow casted from the new development may impact these amenity areas given its geographical location in relation to the proposed development. These areas are identified below and labelled for reference in the results.



Image 6.7: Sunlight impact: Existing neighbouring amenity spaces. Overall view (labelled 1-18).



Image 6.8: Sunlight impact: Existing neighbouring amenity spaces (labelled 1-7).



Image 6.9: Sunlight impact: Existing neighbouring amenity spaces (labelled 8-14).

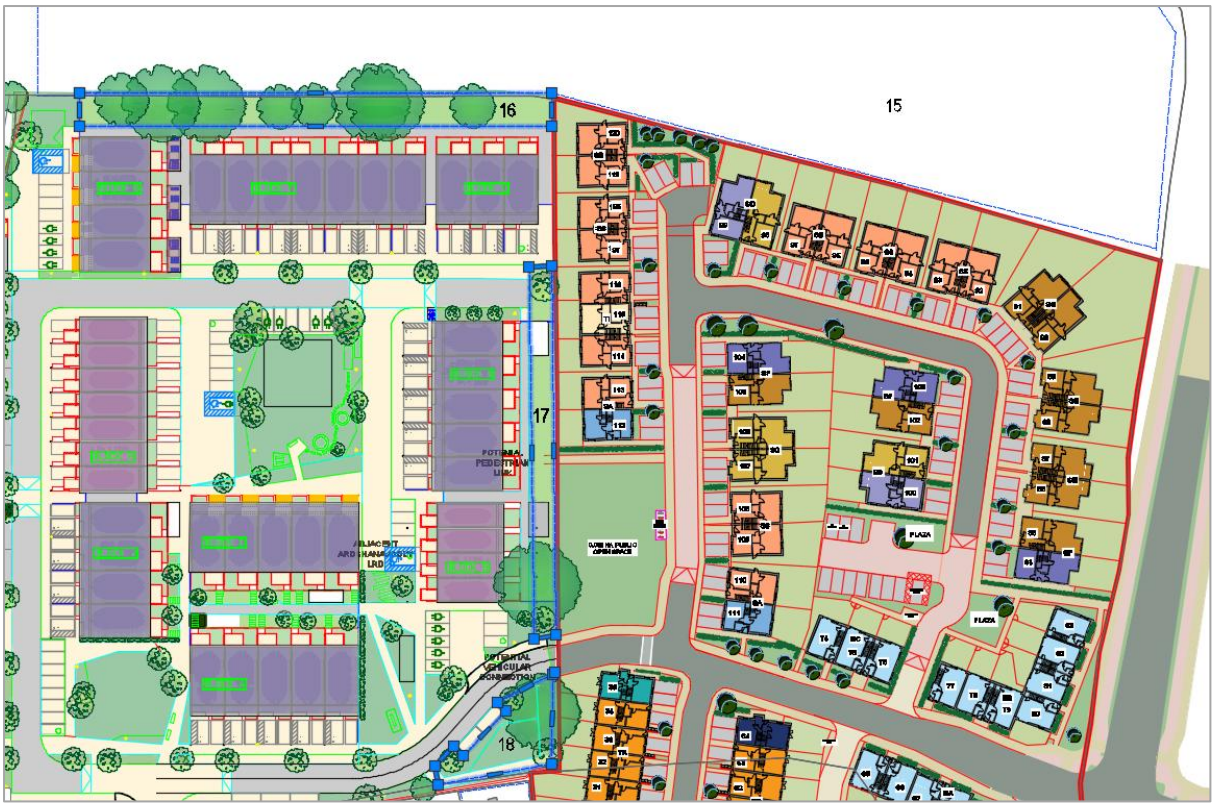


Image 6.10: Sunlight impact: Existing neighbouring amenity spaces (labelled 15-18).

Receptor	Location / address	Amenity description	Approx. area (m^2)
1	8 Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	165
2	9 Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	180
3	10 Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	90
4	15 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	160
5	14 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	160
6	13 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	105
7	12 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	75
8	11 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	75
9	10 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	130
10	9 Sáil Árdán, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	170
11	7 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	140
12	6 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	50
13	5 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	100
14	4 Ceide Spris, Park Rd, Ardshanavooly, Killarney, Co. Kerry	Private amenity area	95
15	Deerpark Pitch and Putt Club, Moyeightragh, Killarney, Co. Kerry	Pitch & Putt amenity area	~30,000
16*	Ardshanavooly, Killarney, Co. Kerry	Residential amenity areas	~650
17*			~350
18*			~270

Table 6.3: Sunlight impact: List of existing neighbouring amenity spaces.

* The areas at the neighbouring Ardshanavooly development are not existing, however, for the purpose of this report they have been presumed as existing.

6.5 Calculation result table

The table below provides a summary of the calculation results of the selected amenity space before and after the introduction of the new proposed development. Under the BRE guidelines any loss of sunlight in existing neighbouring amenity spaces as a result of the new development should not be greater than 0.80 times (maximum 20% reduction) its former size. The column named comment/effect describes the level of effect an assessed window will experience, based on its compliance with the BRE target. A list of definitions can be found in the section 4.8 of this report. Appendix D provides the full calculation results of the amenity areas. To identify the status of the change factor the following colour code guide is used depending on its level of resulting compliance status.

Compliance guide

☑	0% Over /equal to
☑	5% Within
!!	10% Within
x	10% In excess of

Amenity space ID	Amenity space area (m²)	EXISTING STATUS			NEW STATUS			Change factor	Comment / effect of proposed development
		sun hours * amenity space area (Sun Hr*m²)	total sun hours (Sun Hr)	sun hours on 50% of the area	sun hours * amenity space area (Sun Hr*m²)	total sun hours (Sun Hr)	sun hours on 50% of the area		
1	165	67716	6.84	8.0	57717	5.83	6.0	0.86	Negligible
2	180	76356	7.07	9.0	62748	5.81	7.0	0.83	Negligible
3	90	39258	7.27	9.0	35316	6.54	8.0	0.90	Negligible
4	160	48672	5.07	6.0	40992	4.27	5.0	0.85	Negligible
5	160	64992	6.77	9.0	54048	5.63	7.0	0.84	Negligible
6	105	42588	6.76	8.0	35406	5.62	6.0	0.84	Negligible
7	75	30465	6.77	9.0	25335	5.63	7.0	0.84	Negligible
8	75	30465	6.77	9.0	25335	5.63	7.0	0.84	Negligible
9	130	53274	6.83	9.0	44460	5.70	7.0	0.84	Negligible
10	170	78336	7.68	9.0	68136	6.68	8.0	0.87	Negligible
11	140	55020	6.55	10.0	48636	5.79	9.0	0.89	Negligible
12	50	13410	4.47	6.0	10860	3.62	5.0	0.81	Negligible
13	100	31020	5.17	6.0	27840	4.64	5.0	0.90	Negligible
14	95	31692	5.56	7.0	31692	5.56	7.0	1.00	Negligible
15	30,000	16578000	9.21	11.0	16272000	9.04	11.0	0.99	Negligible
16	650	183300	4.70	4.0	175110	4.49	4.0	0.96	Negligible
17	350	143640	6.84	6.0	130200	6.20	6.0	0.91	Negligible
18	270	149040	9.20	11.0	130248	8.04	10.0	0.88	Negligible

Table 6.4: Calculation results: summary table of sunlight impact of existing neighbouring amenity spaces.

6.6 Impact on sunlight reception conclusion

Based on the BRE guidelines at least 50% of the amenity space should receive at least two hours of sunlight on the 21st of March and that and any loss of sunlight should not be greater than 0.80 (20% reduction) times its former size. From the calculation results we note that all the existing amenity spaces received 2 hours of sunlight or more on at least 50% of the area before and after the introduction of the new development. Summary of results are as follows (see image 6.7-6.10 for receptor locations):

- West receptors: Receptor no. 1 to 14 & 16 to 18 are amenity spaces to neighbouring units. The receptors resulted in a change factor range of 0.81-0.96. The change happens in the early morning hours of 07.00-10.00. The calculation findings are within guidelines, and the effect is determined as 'negligible' under BRE definitions. Receptor no. 14 resulted in a change factor of 1.00, meaning the new proposed development will have no sunlight impact on the area.
- North receptor: Receptor no. 15 is the open space pitch and putt field. The receptor resulted in a change factor of 0.99. The calculation finding is well within guidelines, and the effect is determined as 'negligible' under BRE definitions.
- Overall, the average change ratio is 0.88.

We conclude that the new proposed development's effect on sunlight reception in the neighbouring amenity areas is all within the constraints and minimum recommendations of the BRE Report – Site Layout and Planning for Daylight and Sunlight BR209 2022, and we therefore deem the proposed development to be compliant with this element.

Appendix A

Sunlight analysis illustrations: plotted in one hourly illustration time frames for March 21st (Spring equinox).

Proposed status: 06:00 to 19:00 hours.

06.00 March 21st



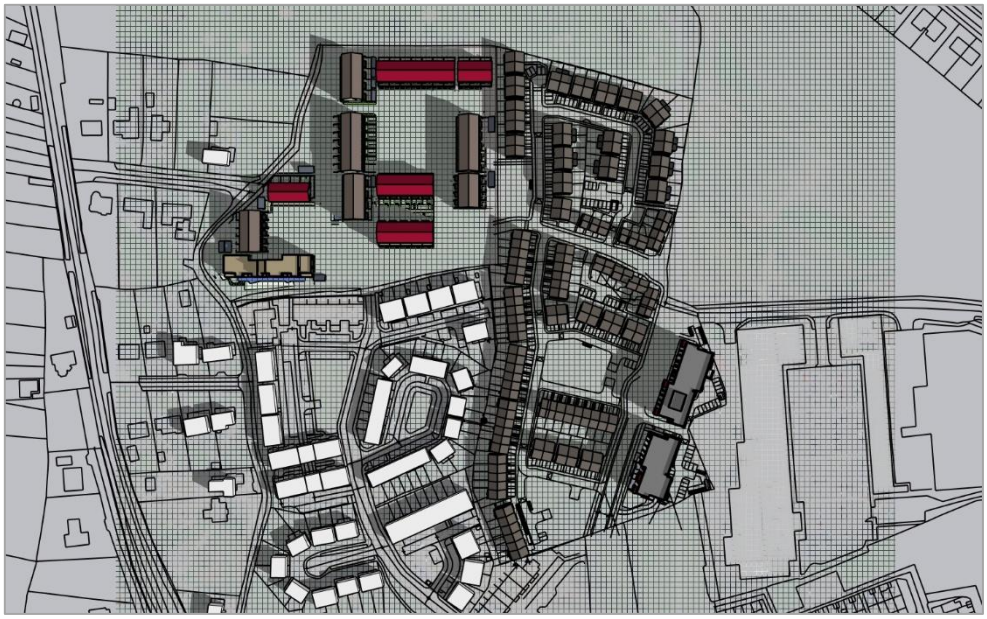
07.00 March 21st



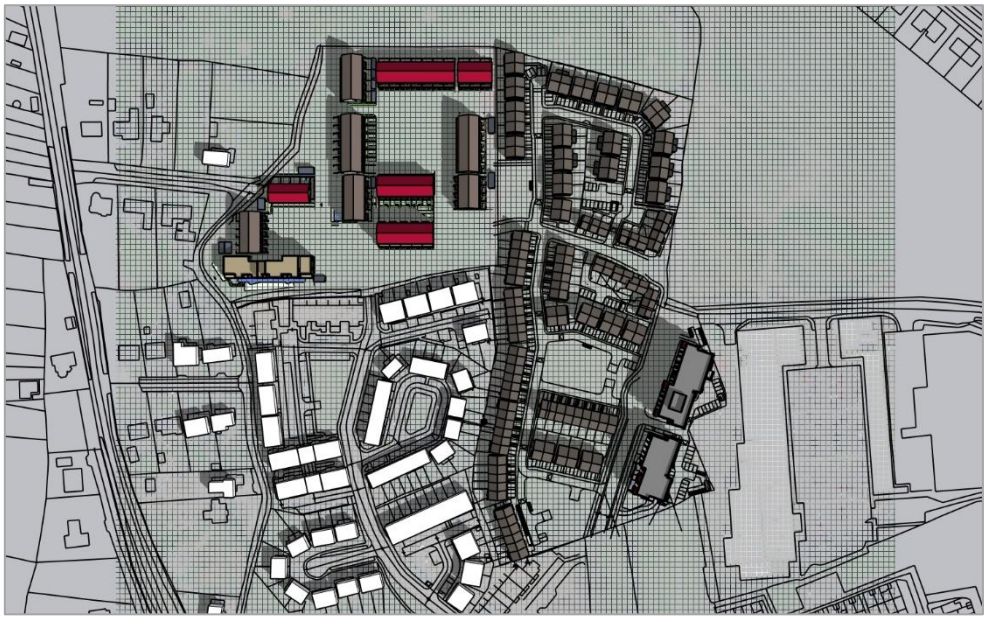
08.00 March 21st



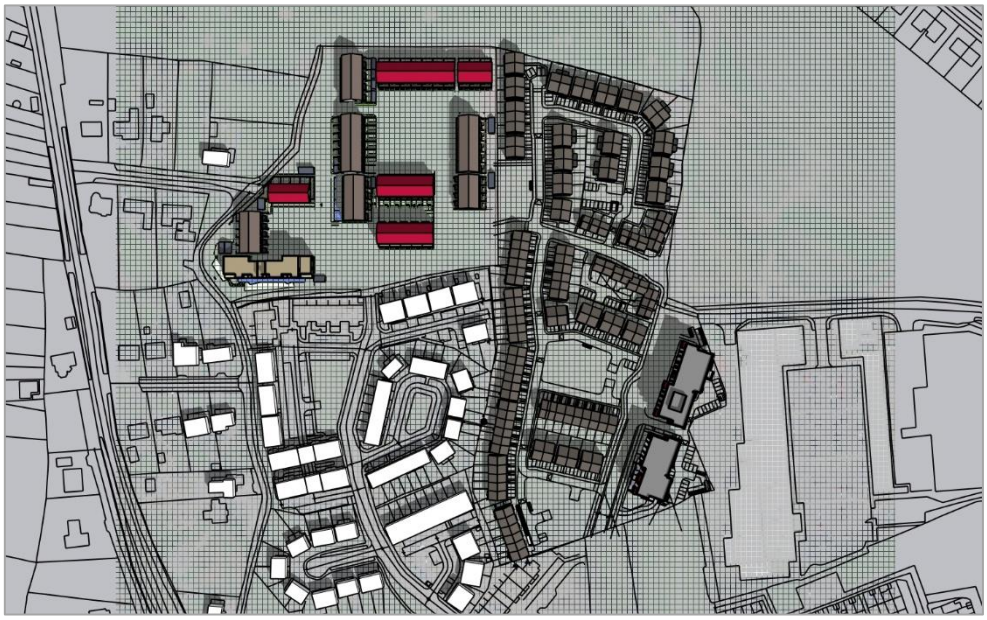
09.00 March 21st



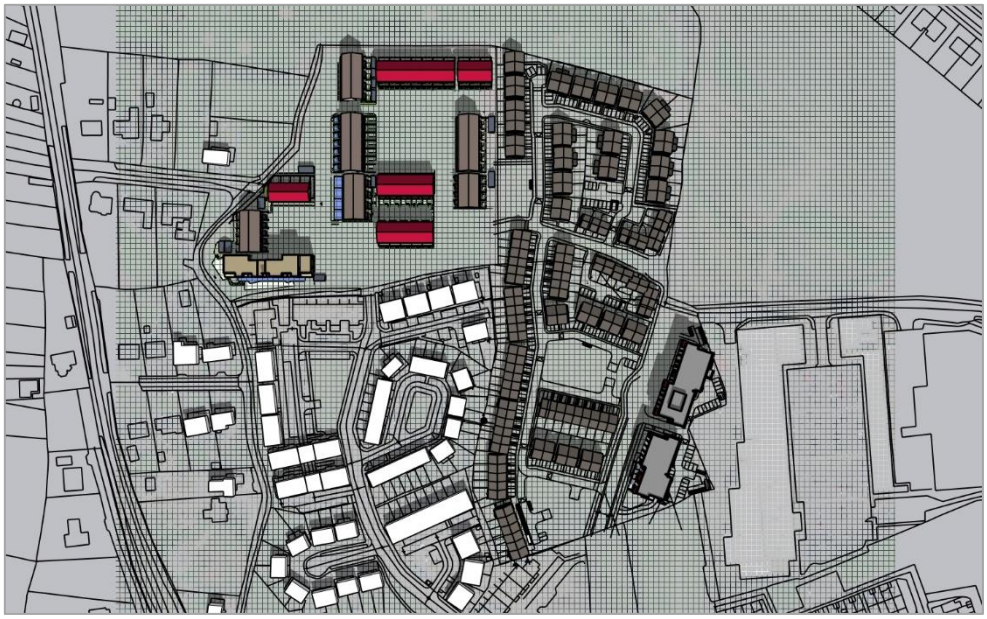
10.00 March 21st



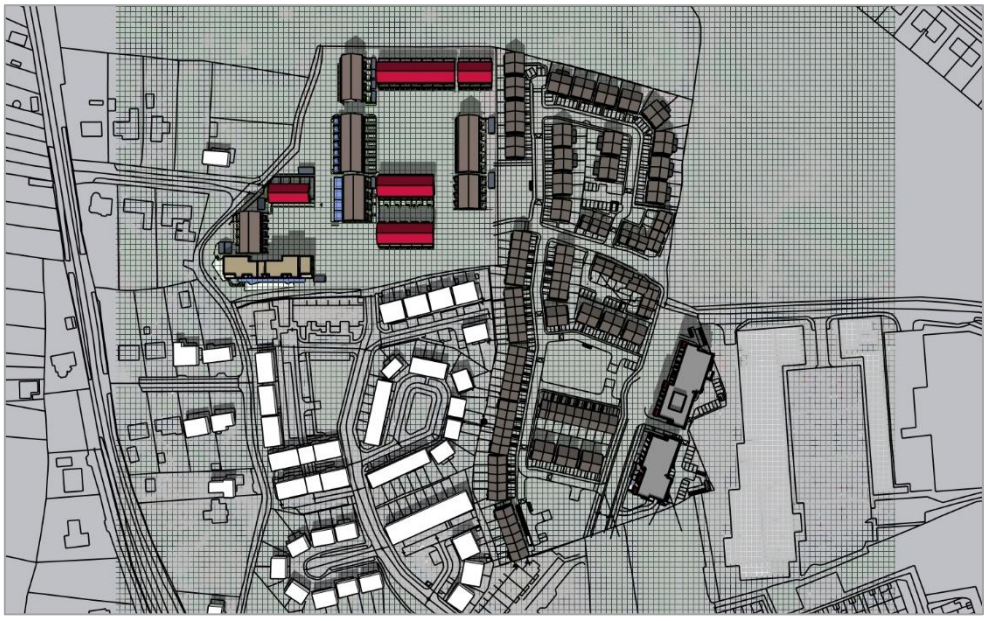
11.00 March 21st



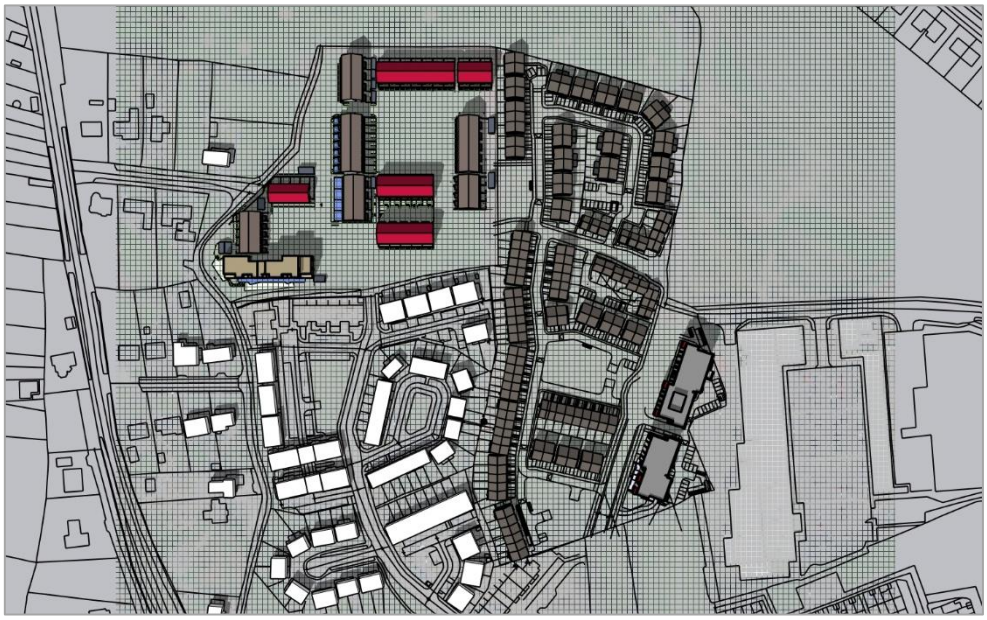
12.00 March 21st



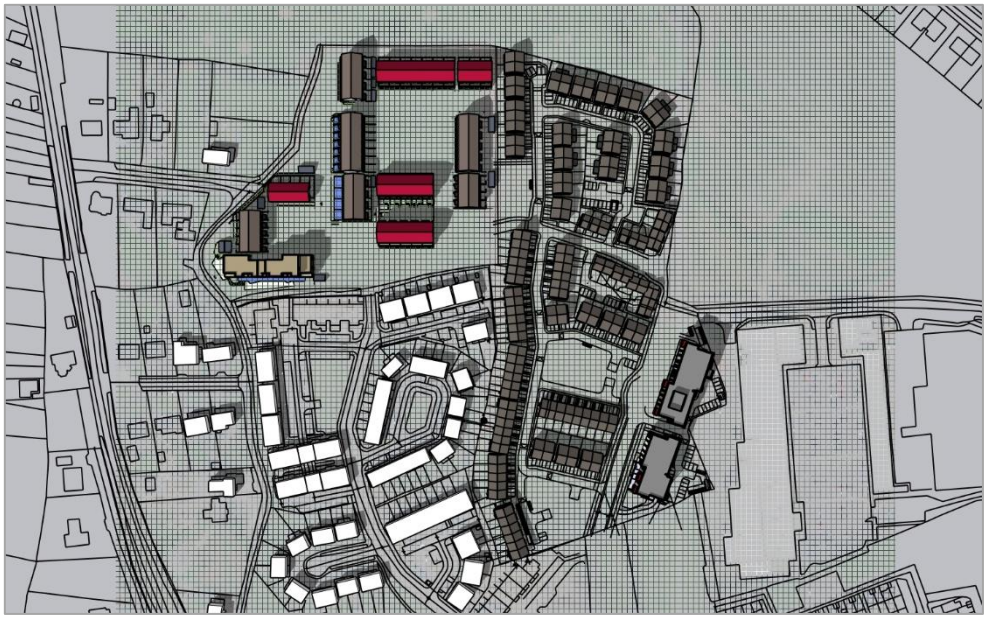
13.00 March 21st



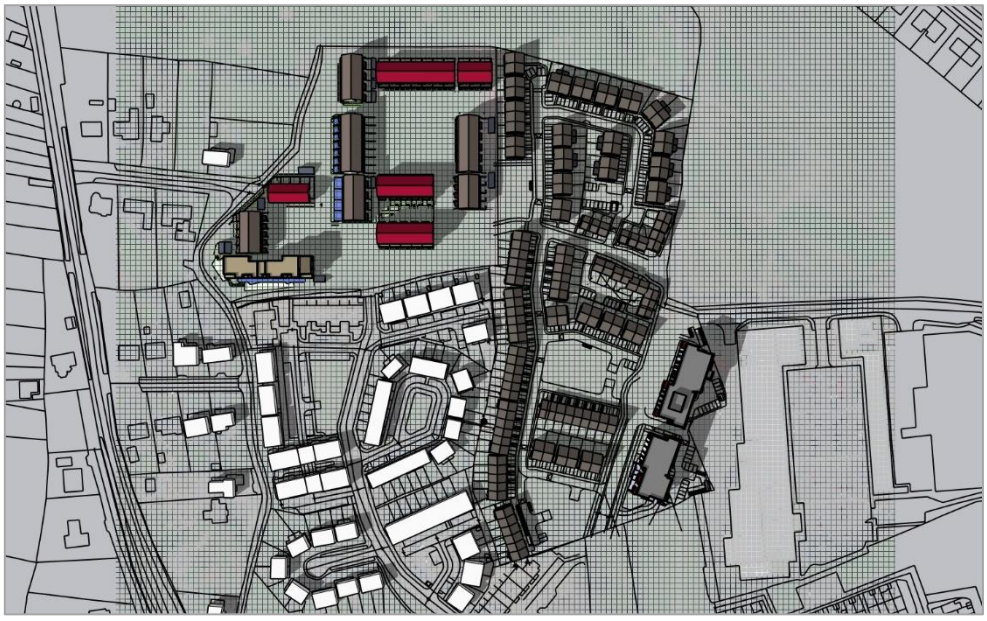
14.00 March 21st



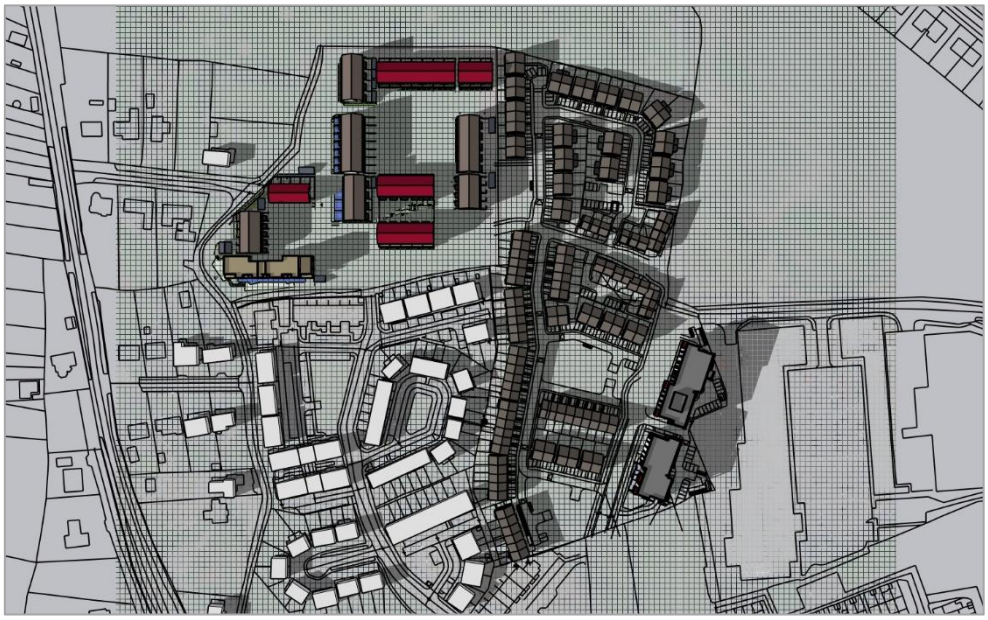
15.00 March 21st



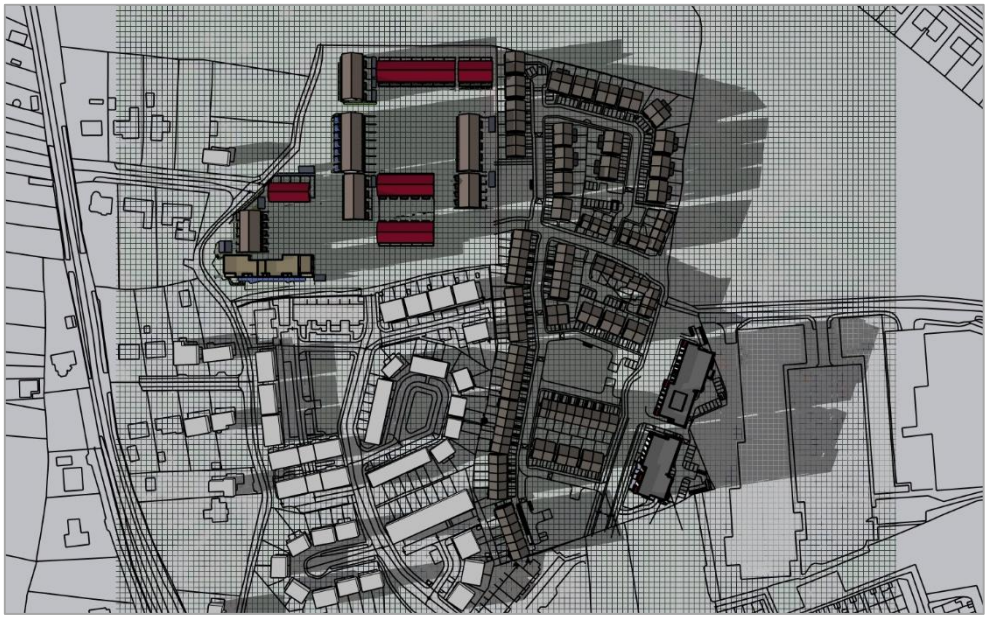
16.00 March 21st



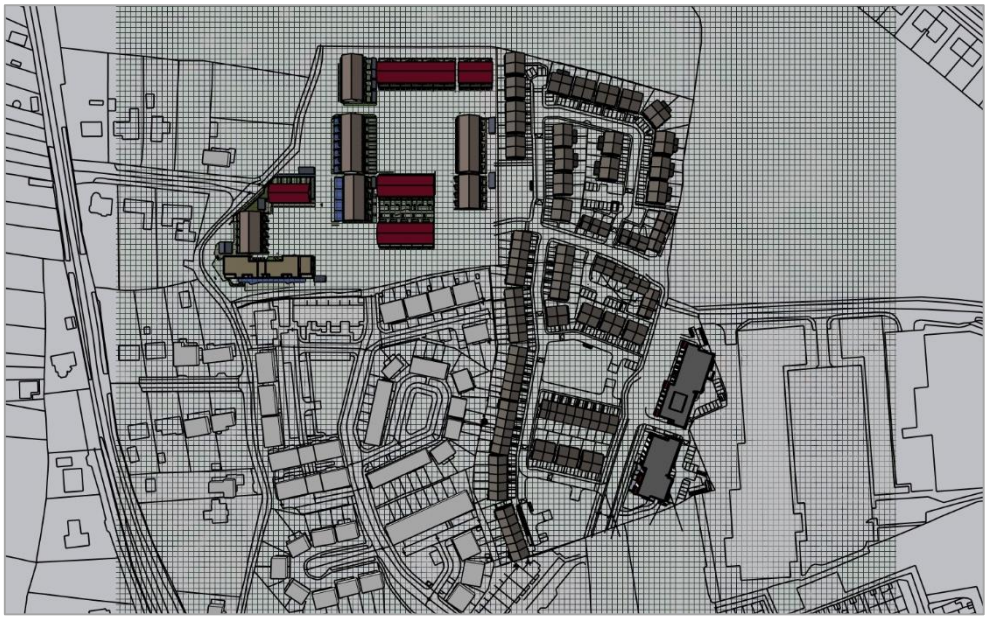
17.00 March 21st



18.00 March 21st



19.00 March 21st



Appendix B

Sunlight calculation results of the developments proposed amenity areas providing the overall hours of sunlight on March 21st together with the recommended BRE sunlight standards.

A				820.00	m2
NEW STATUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	100%	0%	60	0	0
8.00	89%	11%	60	90	5,412
9.00	19%	81%	60	664	39,852
10.00	8%	92%	60	754	45,264
11.00	8%	92%	60	754	45,264
12.00	8%	92%	60	754	45,264
13.00	8%	92%	60	754	45,264
14.00	8%	92%	60	754	45,264
15.00	8%	92%	60	754	45,264
16.00	12%	88%	60	722	43,296
17.00	58%	42%	60	344	20,664
18.00	94%	6%	60	49	2,952
19.00	100%	0%	60	0	0
Required sun hours @ 50% area					2
Achieved sun hours on @ 50% area					8.00
Achieved total sun time (hrs)					7.80
Achieved daily sun time * area					383760

B				1500.00	m2
NEW STATUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	100%	0%	60	0	0
8.00	92%	8%	60	120	7,200
9.00	28%	72%	60	1080	64,800
10.00	18%	82%	60	1230	73,800
11.00	0%	100%	60	1500	90,000
12.00	0%	100%	60	1500	90,000
13.00	0%	100%	60	1500	90,000
14.00	0%	100%	60	1500	90,000
15.00	0%	100%	60	1500	90,000
16.00	0%	100%	60	1500	90,000
17.00	18%	82%	60	1230	73,800
18.00	88%	12%	60	180	10,800
19.00	100%	0%	60	0	0
Required sun hours @ 50% area					2
Achieved sun hours on @ 50% area					9.00
Achieved total sun time (hrs)					8.56
Achieved daily sun time * area					770400

C				1500.00	m2
NEW STATUS				March 21st	
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	77%	23%	60	345	20,700
8.00	0%	100%	60	1500	90,000
9.00	0%	100%	60	1500	90,000
10.00	0%	100%	60	1500	90,000
11.00	0%	100%	60	1500	90,000
12.00	0%	100%	60	1500	90,000
13.00	0%	100%	60	1500	90,000
14.00	0%	100%	60	1500	90,000
15.00	0%	100%	60	1500	90,000
16.00	17%	83%	60	1245	74,700
17.00	42%	58%	60	870	52,200
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0
Required sun hours @ 50% area					2
Achieved sun hours on @ 50% area					10.00
Achieved total sun time (hrs)					9.64
Achieved daily sun time * area					867600

Appendix C

Daylight calculation results of existing VSC and the VSC after the introduction of the new proposed development.

Receptor 1	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 16m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	77	4	103	2					180	36%	122	22	58	8					180	30%	0.84

Receptor 2	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 15m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	88	17	92	2					180	34%	88	17	69	24	23	12			180	29%	0.88

Receptor 3	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 15m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	107	19	73	2					180	32%	107	19	17	2	56	21			180	30%	0.93

Receptor 4	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 13m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	120	4	60	2					180	36%	40	2	70	27	70	20			180	30%	0.83

Receptor 5	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 16m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	61	17	14	5	105	2			180	34%	61	17	17	5	102	18			180	31%	0.90

Receptor 6	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 21m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	42	21	138	3					180	34%	42	21	30	11	108	21			180	29%	0.86

Receptor 7	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 19m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	45	21	135	3					180	34%	45	21	31	11	104	21			180	29%	0.86

Receptor 8	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 21m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	48	4	19	11	113	2			180	36%	19	11	73	22	88	11			180	31%	0.87

Receptor 9	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 21m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	48	4	19	11	113	2			180	36%	19	11	73	22	88	11			180	31%	0.87

Receptor 10	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 21m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	48	4	22	11	110	2			180	36%	22	11	12	2	73	22	73	11	180	31%	0.88

Receptor 11	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 23m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	48	4	22	11	110	2			180	36%	22	11	12	2	73	22	73	11	180	31%	0.88

Receptor 12	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 23m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	79	16	101	3					180	34%	79	16	51	18	50	12			180	31%	0.92

Receptor 13	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 26m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	80	16	100	3					180	34%	80	16	50	18	50	12			180	31%	0.92

Receptor 14	EXISTING										NEW									
VSC test distance 19.5 m	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor (	∑ VSC	
Target distance 16m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	126	15	54	2					180	33%	126	15	54	18					180	31%	0.95

Receptor 15

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 12m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	37	9	143	2					180	36%	37	9	123	22	20	9			180	30%	0.85

Receptor 16

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 12m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	75	14	105	2					180	35%	75	14	25	2	80	25			180	30%	0.88

Receptor 17

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 18m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	30	10	50	4	100	2			180	36%	30	10	94	25	31	2	25	9	180	31%	0.86

Receptor 18

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 17m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	29	10	50	4	101	2			180	36%	29	10	94	25	30	2	27	9	180	31%	0.86

Receptor 19

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 17m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	88	3	92	2					180	36%	66	19	21	3	93	2			180	34%	0.94

Receptor 20

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 12m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	100	23	33	8	47	4			180	31%	100	23	25	8	55	27			180	28%	0.91

Receptor 21

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 9m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	92	21	40	8	48	4			180	32%	92	21	29	8	59	36			180	28%	0.88

Receptor 22

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 5m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	85	19	46	6	49	4			180	33%	85	19	18	6	77	47			180	25%	0.78

Receptor 23

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 7m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	78	19	51	6	51	4			180	33%	62	19	93	47	25	4			180	25%	0.77

Receptor 24

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 11m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	180	2							180	37%	152	2	28	29					180	35%	0.95

Receptor 25

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 8m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	180	2							180	37%	38	2	115	27	27	7			180	30%	0.82

Receptor 26

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 11m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	40	18	47	8	93	2			180	34%	40	18	47	8	23	8	70	27	180	30%	0.89

Receptor 27

VSC test distance 19.5 m	EXISTING										NEW									
	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	Section 1		Section 2		Section 3		Section 4		∑ Hor ↓	∑ VSC	
Target distance 16m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°			change
	16	18	164	2					180	36%	16	18	43	27	94	16	27	8	180	30%	0.85

Appendix D

Sunlight calculation results of existing amenity spaces before and after the introduction of the new proposed development.

1 — 165 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	100%	0%	60	0	0
8.00	43%	57%	60	94	5,643
9.00	31%	69%	60	114	6,831
10.00	19%	81%	60	134	8,019
11.00	18%	82%	60	135	8,118
12.00	15%	85%	60	140	8,415
13.00	15%	85%	60	140	8,415
14.00	26%	74%	60	122	7,326
15.00	38%	62%	60	102	6,138
16.00	59%	41%	60	68	4,059
17.00	67%	33%	60	54	3,267
18.00	85%	15%	60	25	1,485
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 8.00
Achieved total sun time (hrs) 6.84
Achieved daily sun time * area 67716

NEW STATUS — March 21st — change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	0
8.00	100%	0%	60	0	0	-5,643
9.00	75%	25%	60	41	2,475	-4,356
10.00	19%	81%	60	134	8,019	0
11.00	18%	82%	60	135	8,118	0
12.00	15%	85%	60	140	8,415	0
13.00	15%	85%	60	140	8,415	0
14.00	26%	74%	60	122	7,326	0
15.00	38%	62%	60	102	6,138	0
16.00	59%	41%	60	68	4,059	0
17.00	67%	33%	60	54	3,267	0
18.00	85%	15%	60	25	1,485	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 6.00
Achieved total sun time (hrs) 5.83 0.86
Achieved daily sun time * area 57717 0.86

2 — 180 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	100%	0%	60	0	0
8.00	37%	63%	60	113	6,804
9.00	27%	73%	60	131	7,884
10.00	19%	81%	60	146	8,748
11.00	18%	82%	60	148	8,856
12.00	15%	85%	60	153	9,180
13.00	15%	85%	60	153	9,180
14.00	24%	76%	60	137	8,208
15.00	36%	64%	60	115	6,912
16.00	48%	52%	60	94	5,616
17.00	64%	36%	60	65	3,888
18.00	90%	10%	60	18	1,080
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 7.07
Achieved daily sun time * area 76356

NEW STATUS — March 21st — change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	0
8.00	100%	0%	60	0	0	-6,804
9.00	90%	10%	60	18	1,080	-6,804
10.00	19%	81%	60	146	8,748	0
11.00	18%	82%	60	148	8,856	0
12.00	15%	85%	60	153	9,180	0
13.00	15%	85%	60	153	9,180	0
14.00	24%	76%	60	137	8,208	0
15.00	36%	64%	60	115	6,912	0
16.00	48%	52%	60	94	5,616	0
17.00	64%	36%	60	65	3,888	0
18.00	90%	10%	60	18	1,080	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.81 0.83
Achieved daily sun time * area 62748 0.83

3 — 90 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	100%	0%	60	0	0
8.00	37%	63%	60	57	3,402
9.00	27%	73%	60	66	3,942
10.00	19%	81%	60	73	4,374
11.00	18%	82%	60	74	4,428
12.00	15%	85%	60	77	4,590
13.00	15%	85%	60	77	4,590
14.00	15%	85%	60	77	4,590
15.00	15%	85%	60	77	4,590
16.00	48%	52%	60	47	2,808
17.00	64%	36%	60	32	1,944
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 7.27
Achieved daily sun time * area 39258

NEW STATUS — March 21st — change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	0
8.00	100%	0%	60	0	0	-3,402
9.00	37%	63%	60	57	3,402	-540
10.00	19%	81%	60	73	4,374	0
11.00	18%	82%	60	74	4,428	0
12.00	15%	85%	60	77	4,590	0
13.00	15%	85%	60	77	4,590	0
14.00	15%	85%	60	77	4,590	0
15.00	15%	85%	60	77	4,590	0
16.00	48%	52%	60	47	2,808	0
17.00	64%	36%	60	32	1,944	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 8.00
Achieved total sun time (hrs) 6.54 0.90
Achieved daily sun time * area 35316 0.90

4 — 160 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	88%	12%	60	19	1,152
8.00	37%	63%	60	101	6,048
9.00	37%	63%	60	101	6,048
10.00	38%	62%	60	99	5,952
11.00	38%	62%	60	99	5,952
12.00	38%	62%	60	99	5,952
13.00	49%	51%	60	82	4,896
14.00	55%	45%	60	72	4,320
15.00	55%	45%	60	72	4,320
16.00	68%	32%	60	51	3,072
17.00	90%	10%	60	16	960
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 6.00
Achieved total sun time (hrs) 5.07
Achieved daily sun time * area 48672

NEW STATUS — March 21st — change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-1,152
8.00	100%	0%	60	0	0	-6,048
9.00	42%	58%	60	93	5,568	-480
10.00	38%	62%	60	99	5,952	0
11.00	38%	62%	60	99	5,952	0
12.00	38%	62%	60	99	5,952	0
13.00	49%	51%	60	82	4,896	0
14.00	55%	45%	60	72	4,320	0
15.00	55%	45%	60	72	4,320	0
16.00	68%	32%	60	51	3,072	0
17.00	90%	10%	60	16	960	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 5.00
Achieved total sun time (hrs) 4.27 0.85
Achieved daily sun time * area 40992 0.85

5 — 160 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	87%	13%	60	21	1,248
8.00	47%	53%	60	85	5,088
9.00	27%	73%	60	117	7,008
10.00	19%	81%	60	130	7,776
11.00	17%	83%	60	133	7,968
12.00	17%	83%	60	133	7,968
13.00	17%	83%	60	133	7,968
14.00	17%	83%	60	133	7,968
15.00	26%	74%	60	118	7,104
16.00	49%	51%	60	82	4,896
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 6.77
Achieved daily sun time * area 64992

NEW STATUS — March 21st — change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-1,248
8.00	100%	0%	60	0	0	-5,088
9.00	75%	25%	60	40	2,400	-4,608
10.00	19%	81%	60	130	7,776	0
11.00	17%	83%	60	133	7,968	0
12.00	17%	83%	60	133	7,968	0
13.00	17%	83%	60	133	7,968	0
14.00	17%	83%	60	133	7,968	0
15.00	26%	74%	60	118	7,104	0
16.00	49%	51%	60	82	4,896	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.63 0.84
Achieved daily sun time * area 54048 0.84

6 — 105 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	87%	13%	60	14	819
8.00	47%	53%	60	56	3,339
9.00	27%	73%	60	77	4,599
10.00	19%	81%	60	85	5,103
11.00	17%	83%	60	87	5,229
12.00	17%	83%	60	87	5,229
13.00	17%	83%	60	87	5,229
14.00	17%	83%	60	87	5,229
15.00	26%	74%	60	78	4,662
16.00	50%	50%	60	53	3,150
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 8.00
Achieved total sun time (hrs) 6.76
Achieved daily sun time * area 42588

NEW STATUS — March 21st — change

Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-819
8.00	100%	0%	60	0	0	-3,339
9.00	75%	25%	60	26	1,575	-3,024
10.00	19%	81%	60	85	5,103	0
11.00	17%	83%	60	87	5,229	0
12.00	17%	83%	60	87	5,229	0
13.00	17%	83%	60	87	5,229	0
14.00	17%	83%	60	87	5,229	0
15.00	26%	74%	60	78	4,662	0
16.00	50%	50%	60	53	3,150	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 6.00
Achieved total sun time (hrs) 5.62 0.84
Achieved daily sun time * area 35406 0.84

7 — 75 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	87%	13%	60	10	585
8.00	47%	53%	60	40	2,385
9.00	27%	73%	60	55	3,285
10.00	19%	81%	60	61	3,645
11.00	17%	83%	60	62	3,735
12.00	17%	83%	60	62	3,735
13.00	17%	83%	60	62	3,735
14.00	17%	83%	60	62	3,735
15.00	26%	74%	60	56	3,330
16.00	49%	51%	60	38	2,295
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 6.77
Achieved daily sun time * area 30465

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-585
8.00	100%	0%	60	0	0	-2,385
9.00	75%	25%	60	19	1,125	-2,160
10.00	19%	81%	60	61	3,645	0
11.00	17%	83%	60	62	3,735	0
12.00	17%	83%	60	62	3,735	0
13.00	17%	83%	60	62	3,735	0
14.00	17%	83%	60	62	3,735	0
15.00	26%	74%	60	56	3,330	0
16.00	49%	51%	60	38	2,295	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.63 0.84
Achieved daily sun time * area 25335 0.84

8 — 75 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	87%	13%	60	10	585
8.00	47%	53%	60	40	2,385
9.00	27%	73%	60	55	3,285
10.00	19%	81%	60	61	3,645
11.00	17%	83%	60	62	3,735
12.00	17%	83%	60	62	3,735
13.00	17%	83%	60	62	3,735
14.00	17%	83%	60	62	3,735
15.00	26%	74%	60	56	3,330
16.00	49%	51%	60	38	2,295
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 6.77
Achieved daily sun time * area 30465

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-585
8.00	100%	0%	60	0	0	-2,385
9.00	75%	25%	60	19	1,125	-2,160
10.00	19%	81%	60	61	3,645	0
11.00	17%	83%	60	62	3,735	0
12.00	17%	83%	60	62	3,735	0
13.00	17%	83%	60	62	3,735	0
14.00	17%	83%	60	62	3,735	0
15.00	26%	74%	60	56	3,330	0
16.00	49%	51%	60	38	2,295	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.63 0.84
Achieved daily sun time * area 25335 0.84

9 — 130 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	87%	13%	60	17	1,014
8.00	47%	53%	60	69	4,134
9.00	27%	73%	60	95	5,694
10.00	19%	81%	60	105	6,318
11.00	17%	83%	60	108	6,474
12.00	17%	83%	60	108	6,474
13.00	17%	83%	60	108	6,474
14.00	17%	83%	60	108	6,474
15.00	26%	74%	60	96	5,772
16.00	49%	51%	60	66	3,978
17.00	94%	6%	60	8	468
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 6.83
Achieved daily sun time * area 53274

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-1,014
8.00	100%	0%	60	0	0	-4,134
9.00	74%	26%	60	34	2,028	-3,666
10.00	19%	81%	60	105	6,318	0
11.00	17%	83%	60	108	6,474	0
12.00	17%	83%	60	108	6,474	0
13.00	17%	83%	60	108	6,474	0
14.00	17%	83%	60	108	6,474	0
15.00	26%	74%	60	96	5,772	0
16.00	49%	51%	60	66	3,978	0
17.00	94%	6%	60	8	468	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.7 0.84
Achieved daily sun time * area 44460 0.84

10 — 170 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	86%	14%	60	24	1,428
8.00	37%	63%	60	107	6,426
9.00	19%	81%	60	138	8,262
10.00	18%	82%	60	139	8,364
11.00	18%	82%	60	139	8,364
12.00	18%	82%	60	139	8,364
13.00	18%	82%	60	139	8,364
14.00	20%	80%	60	136	8,160
15.00	21%	79%	60	134	8,058
16.00	31%	69%	60	117	7,038
17.00	56%	44%	60	75	4,488
18.00	90%	10%	60	17	1,020
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 7.68
Achieved daily sun time * area 78336

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-1,428
8.00	100%	0%	60	0	0	-6,426
9.00	42%	58%	60	99	5,916	-2,346
10.00	18%	82%	60	139	8,364	0
11.00	18%	82%	60	139	8,364	0
12.00	18%	82%	60	139	8,364	0
13.00	18%	82%	60	139	8,364	0
14.00	20%	80%	60	136	8,160	0
15.00	21%	79%	60	134	8,058	0
16.00	31%	69%	60	117	7,038	0
17.00	56%	44%	60	75	4,488	0
18.00	90%	10%	60	17	1,020	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 8.00
Achieved total sun time (hrs) 6.68 0.87
Achieved daily sun time * area 68136 0.87

11 — 140 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	90%	10%	60	14	840
8.00	37%	63%	60	88	5,292
9.00	37%	63%	60	88	5,292
10.00	37%	63%	60	88	5,292
11.00	36%	64%	60	90	5,376
12.00	41%	59%	60	83	4,956
13.00	45%	55%	60	77	4,620
14.00	40%	60%	60	84	5,040
15.00	20%	80%	60	112	6,720
16.00	20%	80%	60	112	6,720
17.00	42%	58%	60	81	4,872
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 10.00
Achieved total sun time (hrs) 6.55
Achieved daily sun time * area 55020

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-840
8.00	100%	0%	60	0	0	-5,292
9.00	40%	60%	60	84	5,040	-252
10.00	37%	63%	60	88	5,292	0
11.00	36%	64%	60	90	5,376	0
12.00	41%	59%	60	83	4,956	0
13.00	45%	55%	60	77	4,620	0
14.00	40%	60%	60	84	5,040	0
15.00	20%	80%	60	112	6,720	0
16.00	20%	80%	60	112	6,720	0
17.00	42%	58%	60	81	4,872	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 9.00
Achieved total sun time (hrs) 5.79 0.89
Achieved daily sun time * area 48636 0.89

12 — 50 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	78%	22%	60	11	660
8.00	37%	63%	60	32	1,890
9.00	37%	63%	60	32	1,890
10.00	28%	72%	60	36	2,160
11.00	18%	82%	60	41	2,460
12.00	18%	82%	60	41	2,460
13.00	47%	53%	60	27	1,590
14.00	90%	10%	60	5	300
15.00	100%	0%	60	0	0
16.00	100%	0%	60	0	0
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 6.00
Achieved total sun time (hrs) 4.47
Achieved daily sun time * area 13410

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-660
8.00	100%	0%	60	0	0	-1,890
9.00	37%	63%	60	32	1,890	0
10.00	28%	72%	60	36	2,160	0
11.00	18%	82%	60	41	2,460	0
12.00	18%	82%	60	41	2,460	0
13.00	47%	53%	60	27	1,590	0
14.00	90%	10%	60	5	300	0
15.00	100%	0%	60	0	0	0
16.00	100%	0%	60	0	0	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 5.00
Achieved total sun time (hrs) 3.62 0.81
Achieved daily sun time * area 10860 0.81

13 — 100 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	78%	22%	60	22	1,320
8.00	37%	63%	60	63	3,780
9.00	37%	63%	60	63	3,780
10.00	28%	72%	60	72	4,320
11.00	18%	82%	60	82	4,920
12.00	18%	82%	60	82	4,920
13.00	37%	63%	60	63	3,780
14.00	60%	40%	60	40	2,400
15.00	70%	30%	60	30	1,800
16.00	100%	0%	60	0	0
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 6.00
Achieved total sun time (hrs) 5.17
Achieved daily sun time * area 31020

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	-1,320
8.00	68%	32%	60	32	1,920	-1,860
9.00	37%	63%	60	63	3,780	0
10.00	28%	72%	60	72	4,320	0
11.00	18%	82%	60	82	4,920	0
12.00	18%	82%	60	82	4,920	0
13.00	37%	63%	60	63	3,780	0
14.00	60%	40%	60	40	2,400	0
15.00	70%	30%	60	30	1,800	0
16.00	100%	0%	60	0	0	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 5.00
Achieved total sun time (hrs) 4.64 0.90
Achieved daily sun time * area 27840 0.90

14 — 95 m2

EXISTING STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0
7.00	78%	22%	60	21	1,254
8.00	37%	63%	60	60	3,591
9.00	37%	63%	60	60	3,591
10.00	28%	72%	60	68	4,104
11.00	18%	82%	60	78	4,674
12.00	18%	82%	60	78	4,674
13.00	18%	82%	60	78	4,674
14.00	30%	70%	60	67	3,990
15.00	80%	20%	60	19	1,140
16.00	100%	0%	60	0	0
17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.56
Achieved daily sun time * area 31692

NEW STATUS — March 21st

Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	0
7.00	78%	22%	60	21	1,254	0
8.00	37%	63%	60	60	3,591	0
9.00	37%	63%	60	60	3,591	0
10.00	28%	72%	60	68	4,104	0
11.00	18%	82%	60	78	4,674	0
12.00	18%	82%	60	78	4,674	0
13.00	18%	82%	60	78	4,674	0
14.00	30%	70%	60	67	3,990	0
15.00	80%	20%	60	19	1,140	0
16.00	100%	0%	60	0	0	0
17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	0
19.00	100%	0%	60	0	0	0

Required sun hours @ 50% area (hr) 2
Achieved sun hours on (hrs) @ 50% area 7.00
Achieved total sun time (hrs) 5.56 1.00
Achieved daily sun time * area 31692 1.00

15 **30,000** m2

EXISTING STATUS					March 21st	NEW STATUS					March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	75%	25%	60	7500	450,000	7.00	75%	25%	60	7500	450,000	0
8.00	28%	72%	60	21600	1,296,000	8.00	30%	70%	60	21000	1,260,000	-36,000
9.00	17%	83%	60	24900	1,494,000	9.00	18%	82%	60	24600	1,476,000	-18,000
10.00	17%	83%	60	24900	1,494,000	10.00	18%	82%	60	24600	1,476,000	-18,000
11.00	17%	83%	60	24900	1,494,000	11.00	18%	82%	60	24600	1,476,000	-18,000
12.00	17%	83%	60	24900	1,494,000	12.00	18%	82%	60	24600	1,476,000	-18,000
13.00	17%	83%	60	24900	1,494,000	13.00	18%	82%	60	24600	1,476,000	-18,000
14.00	17%	83%	60	24900	1,494,000	14.00	18%	82%	60	24600	1,476,000	-18,000
15.00	17%	83%	60	24900	1,494,000	15.00	18%	82%	60	24600	1,476,000	-18,000
16.00	17%	83%	60	24900	1,494,000	16.00	18%	82%	60	24600	1,476,000	-18,000
17.00	17%	83%	60	24900	1,494,000	17.00	19%	81%	60	24300	1,458,000	-36,000
18.00	23%	77%	60	23100	1,386,000	18.00	28%	72%	60	21600	1,296,000	-90,000
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	0
Required sun hours @ 50% area (hr)					2	Required sun hours @ 50% area (hr)					2	
Achieved sun hours on (hrs) @ 50% area					11.00	Achieved sun hours on (hrs) @ 50% area					11.00	
Achieved total sun time (hrs)					9.21	Achieved total sun time (hrs)					9.04	0.99
Achieved daily sun time * area					16578000	Achieved daily sun time * area					16272000	0.99

16 **650** m2

EXISTING STATUS					March 21st	NEW STATUS					March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	89%	11%	60	72	4,290	7.00	95%	5%	60	33	1,950	-2,340
8.00	77%	23%	60	150	8,970	8.00	87%	13%	60	85	5,070	-3,900
9.00	77%	23%	60	150	8,970	9.00	82%	18%	60	117	7,020	-1,950
10.00	61%	39%	60	254	15,210	10.00	61%	39%	60	254	15,210	0
11.00	52%	48%	60	312	18,720	11.00	52%	48%	60	312	18,720	0
12.00	52%	48%	60	312	18,720	12.00	52%	48%	60	312	18,720	0
13.00	48%	52%	60	338	20,280	13.00	48%	52%	60	338	20,280	0
14.00	48%	52%	60	338	20,280	14.00	48%	52%	60	338	20,280	0
15.00	48%	52%	60	338	20,280	15.00	48%	52%	60	338	20,280	0
16.00	49%	51%	60	332	19,890	16.00	49%	51%	60	332	19,890	0
17.00	60%	40%	60	260	15,600	17.00	60%	40%	60	260	15,600	0
18.00	69%	31%	60	202	12,090	18.00	69%	31%	60	202	12,090	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	0
Required sun hours @ 50% area (hr)					2	Required sun hours @ 50% area (hr)					2	
Achieved sun hours on (hrs) @ 50% area					4.00	Achieved sun hours on (hrs) @ 50% area					4.00	
Achieved total sun time (hrs)					4.7	Achieved total sun time (hrs)					4.49	0.96
Achieved daily sun time * area					183300	Achieved daily sun time * area					175110	0.96

17 **350** m2

EXISTING STATUS					March 21st	NEW STATUS					March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	76%	24%	60	84	5,040	7.00	100%	0%	60	0	0	-5,040
8.00	53%	47%	60	165	9,870	8.00	73%	27%	60	95	5,670	-4,200
9.00	15%	85%	60	298	17,850	9.00	35%	65%	60	228	13,650	-4,200
10.00	15%	85%	60	298	17,850	10.00	15%	85%	60	298	17,850	0
11.00	15%	85%	60	298	17,850	11.00	15%	85%	60	298	17,850	0
12.00	17%	83%	60	291	17,430	12.00	17%	83%	60	291	17,430	0
13.00	17%	83%	60	291	17,430	13.00	17%	83%	60	291	17,430	0
14.00	17%	83%	60	291	17,430	14.00	17%	83%	60	291	17,430	0
15.00	55%	45%	60	158	9,450	15.00	55%	45%	60	158	9,450	0
16.00	68%	32%	60	112	6,720	16.00	68%	32%	60	112	6,720	0
17.00	78%	22%	60	77	4,620	17.00	78%	22%	60	77	4,620	0
18.00	90%	10%	60	35	2,100	18.00	90%	10%	60	35	2,100	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	0
Required sun hours @ 50% area (hr)					2	Required sun hours @ 50% area (hr)					2	
Achieved sun hours on (hrs) @ 50% area					6.00	Achieved sun hours on (hrs) @ 50% area					6.00	
Achieved total sun time (hrs)					6.84	Achieved total sun time (hrs)					6.2	0.91
Achieved daily sun time * area					143640	Achieved daily sun time * area					130200	0.91

18 **270** m2

EXISTING STATUS					March 21st	NEW STATUS					March 21st	change
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	56%	44%	60	119	7,128	7.00	100%	0%	60	0	0	-7,128
8.00	44%	56%	60	151	9,072	8.00	100%	0%	60	0	0	-9,072
9.00	14%	86%	60	232	13,932	9.00	30%	70%	60	189	11,340	-2,592
10.00	14%	86%	60	232	13,932	10.00	14%	86%	60	232	13,932	0
11.00	14%	86%	60	232	13,932	11.00	14%	86%	60	232	13,932	0
12.00	14%	86%	60	232	13,932	12.00	14%	86%	60	232	13,932	0
13.00	14%	86%	60	232	13,932	13.00	14%	86%	60	232	13,932	0
14.00	14%	86%	60	232	13,932	14.00	14%	86%	60	232	13,932	0
15.00	14%	86%	60	232	13,932	15.00	14%	86%	60	232	13,932	0
16.00	14%	86%	60	232	13,932	16.00	14%	86%	60	232	13,932	0
17.00	23%	77%	60	208	12,474	17.00	23%	77%	60	208	12,474	0
18.00	45%	55%	60	149	8,910	18.00	45%	55%	60	149	8,910	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	0
Required sun hours @ 50% area (hr)					2	Required sun hours @ 50% area (hr)					2	
Achieved sun hours on (hrs) @ 50% area					11.00	Achieved sun hours on (hrs) @ 50% area					10.00	
Achieved total sun time (hrs)					9.2	Achieved total sun time (hrs)					8.04	0.88
Achieved daily sun time * area					149040	Achieved daily sun time * area					130248	0.88

End of Report