

Kenmare LRD

Proposed Residential Development

Daylight and Sunlight Analysis Report

Pat Scarteen Road
(Kenmare by-pass)
Kenmare
Co. Kerry

Client
KPH Construction

DKP document no
50100

Document issue / status
3 / P

Issue date
2026-08-04

Project file no

P0600-DKP-50100-WD-XX-XX | 3P



Document control

DKP project no: P06
DKP document no: 50100
Project file no: DKP-P06-50100-WD-XX-XX

Circular		Issue >	1#	2P	3P
Client	KPH Construction		☒	☒	☒
Architect	Meitheal Architects		☒	☒	☒
Planning consultant	HW Planning		☒	☒	☒

Issue	1#	2026-04-16	Draft issue for review
Issue	2P	2026-04-29	Final issue
Issue	3P	2026-08-04	Updated issue

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
2P	208	201	201
3P	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..... 25
	Appendix A - Sunlight analysis illustrations 33
	Appendix B - Sunlight calculation results - proposed amenity areas 38
	Appendix C - Daylight calculation results - VSC impact..... 39
	Appendix D - Sunlight calculation results - existing amenity spaces..... 41



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 KPH Construction, Kenmare, Co. Kerry to carry out the analysis and report for the proposed development at Pat Scarteen Road (Kenmare by-pass), Kenmare, Co. Kerry.

1.3 Development detail

KPH Construction intend to apply for planning permission for a Large-scale Residential Development (LRD) at a site located off Pat Scarteen Road, Killowen, (townland), Kenmare, Co. Kerry.

The proposed development includes the demolition of 2 no. existing single-storey sheds and the construction of 100 no. residential units comprising 30 no. 1-bed units; 30 no. 2-bed units; and 40 no. 3-bed houses, with ancillary landscaping and associated site development works. The development makes provision for 40 no. two-storey houses, comprising 36 no. semi-detached 3 bed units and 4 no. 3 bed mid-terraced units and 60 no. own-door maisonette/apartment units over 2 no. storeys (30 no. 1 bed units, 30 no. 2 bed units).

Vehicular access to the development will be via an upgraded and relocated entrance off the Pat Scarteen Road, with proposed upgrades including amendments to the existing shared pedestrian/cycle path and modifications to the signing and lining on the public road. The proposed development also provides for separate pedestrian/cycle entrances off Pat Scarteen Road and includes dedicated pedestrian and cycling paths traversing the site.

Ancillary infrastructure development works will include wastewater infrastructure, a pumping station, surface water attenuation, water utility services, public lighting, bin stores, bicycle stores, ESB substations, landscaping and all associated site development works.

1.4 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



1.5 Geographical overview

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

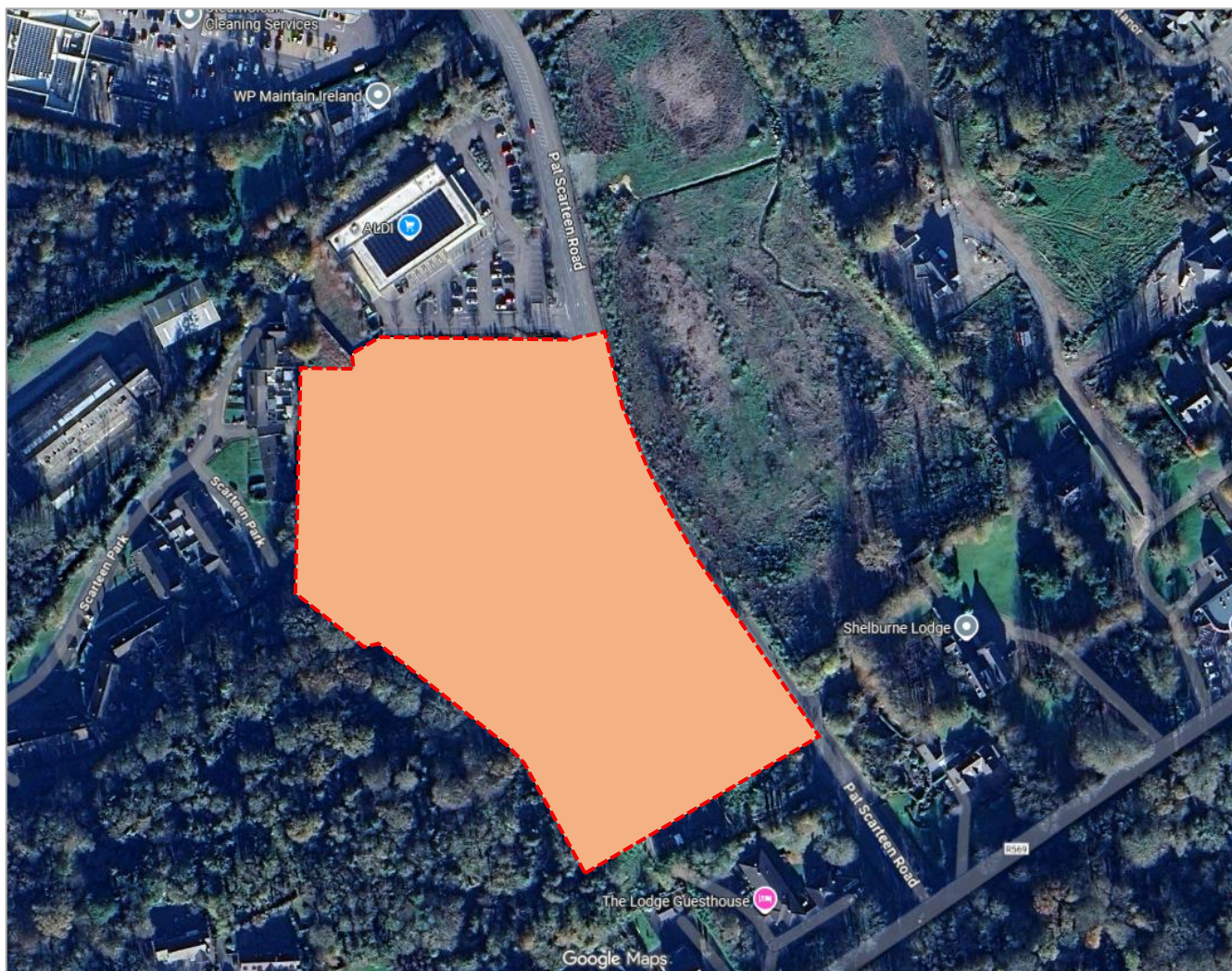


Image 1.1: Proposed development site boundary. Imagery © Google 2026.

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 5.6. 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: The daylight reception assessment has been targeted to a large selection of 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.
- House Block 1 and Block 2: all habitable rooms on the ground floor 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 well in excess.

- Houses: Overall, examined residential rooms, achieved on average a daylight factor (DF) of 2.8% and an illuminance of 431 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 0.99% and an illuminance of 142 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved. The proposed house units achieved well in excess of recommendations.
- House Block 1 and Block 2: Overall, examined residential rooms achieved on average a daylight factor (DF) of 2.8% and an illuminance of 427 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 0.99% and an illuminance of 141 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved. The proposed house units achieved well in excess of recommendations.
- Overall compliance for proposed development = 100%

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 full compliance under IS EN17037 / BS EN17307 and full compliance under BS EN 17037:2018 National Annex guidelines. This indicates an overall very 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 5.3 we note the selected amenity spaces all achieved sunlight above the recommended guidelines, see image 5.7 for receptor/amenity space location. Summary of results are as follows:

- The average public open space amenity area calculated sunlight on at least 50% of the area on March 21st is 10.30 hours.
- The average communal open space amenity area calculated sunlight on at least 50% of the area on March 21st is 5.0 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 0.84 to 0.99. 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 6.1-6.4 for receptor locations):

- West receptors: Receptor no. 1 to 24: Neighbouring dwellings located in Scarteen Park estate with ground floor windows were examined and resulted in a change factor range of 0.84 to 0.97. These receptors are all well within the guidelines and the effect is determined as negligible under BRE definitions.
- South receptors: Receptor no. 25 to 27: Neighbouring dwelling with ground floor windows were examined and resulted in a change factor range of 0.98 to 0.99. These receptors are all comfortably within the guidelines and the effect is determined as negligible under BRE definitions.
- Overall, the average change ratio for VSC is 0.93.

We conclude that the new proposed development's effect on daylight reception in the neighbouring rooms is all within the constraints and 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.

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 any loss of sunlight should not be greater than 0.8 (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 6.5-6.6 for receptor locations):

- West receptors: Receptor no. 1 to 10 are private amenity areas and receptor no. 11 is a communal green area all located in Scarteen Park, Kenmare. The receptors resulted in a change factor range of 0.80-0.99. The change happens in the early morning hours of 07.00-09.00. The calculation findings are all within the guidelines, and the effect is determined as 'negligible' under BRE definitions.
- Overall, the average change ratio is 0.85.

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	Geographic al 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 ($E_{v,d,med}$) 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/ $E_{v,d,med}$ x 100 [%].

Where, $E_{v,d,med}$ 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 $D = E_i/E_o \times 100\%$, where,
 E_i =illuminance due to daylight at a point on the indoors working plane.
 E_o = 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 m² or the minimum requirement = 120 (min) * 0.5a (m²) = [] min·m².

Analysis	BRE recommendation, criteria on March 21 st	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 be 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.

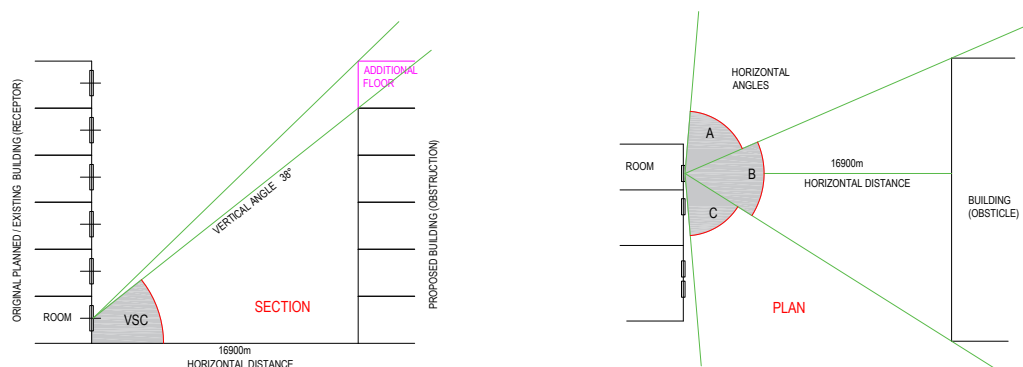


Image 4.1:

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 21 st	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.



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 housing development which are perceived to be in the most challenging locations 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 5.6 below.

- Houses – a large selection of 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.
- House Block 1 and Block 2: all habitable rooms on the ground floor have been assessed.

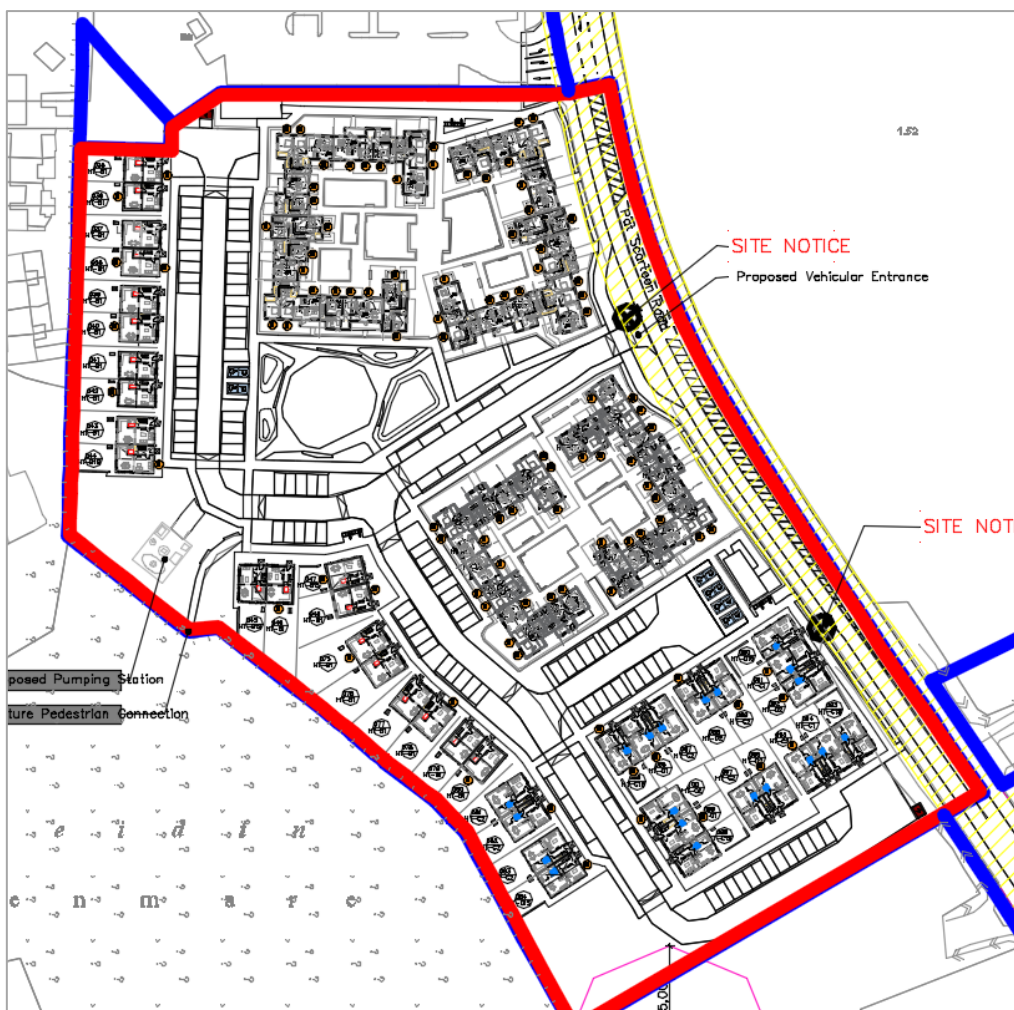


Image 5.1: Level 00 (ground floor). Overall view.



Image 5.2: Level 00 (ground floor). Receptor no. 01 to 07.



Image 5.3: Level 00 (ground floor). Receptor no. 08 to 15.



Image 5.4: Level 00 (ground floor). Receptor no. 16 to 26.



Image 5.5: Level 00 (ground floor). Receptor no. 27 to 69.



Image 5.6: Level 00 (ground floor). Receptor no. 70 to 101.

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 %	Depth/Width	Σ VSC L (total)	ISEN17037				ISEN17037				BSEN17037	
									DAYLIGHT FACTOR				ILLUMINANCE				ANNEX	
									50% area		95% area		50% area		95% area		illumina nce lx	day light factor
									50% sun hrs		50% sun hrs		50% sun hrs		50% sun hrs			
									%	min	%	min	%	min	%	min		
1	00	Unit no. 035	Living-Kitchen	2.48	16.0	15.5	1.98	34%	2.21	2.00	0.77	0.70	334	300	110	100	200	1.3
2	00	Unit no. 036	Living-Kitchen	3.70	19.0	19.5	2.42	32%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
3	00	Unit no. 038	Living-Kitchen	3.70	19.0	19.5	2.42	31%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
4	00	Unit no. 038	Living-Kitchen	2.48	16.0	15.5	1.98	34%	2.21	2.00	0.77	0.70	334	300	110	100	200	1.3
5	00	Unit no. 040	Living-Kitchen	3.70	19.0	19.5	2.42	31%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
6	00	Unit no. 042	Living-Kitchen	3.70	19.0	19.5	2.42	32%	2.75	2.00	0.96	0.70	415	300	137	100	200	1.3
7	00	Unit no. 044	Living-Kitchen	4.95	16.0	31.0	1.98	33%	4.29	2.00	1.50	0.70	648	300	214	100	200	1.3
8	00	Unit no. 046	Living-Kitchen	3.70	19.0	19.5	2.42	34%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
9	00	Unit no. 047	Living-Kitchen	7.06	19.0	37.2	2.42	31%	4.96	2.00	1.73	0.70	750	300	247	100	200	1.3
10	00	Unit no. 048	Living-Kitchen	2.48	16.0	15.5	1.98	33%	2.14	2.00	0.75	0.70	324	300	107	100	200	1.3
11	00	Unit no. 075	Living-Kitchen	3.70	19.0	19.5	2.42	34%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
12	00	Unit no. 078	Living-Kitchen	2.48	16.0	15.5	1.98	33%	2.14	2.00	0.75	0.70	324	300	107	100	200	1.3
13	00	Unit no. 080	Living-Kitchen	3.70	19.0	19.5	2.42	35%	2.95	2.00	1.03	0.70	446	300	147	100	200	1.3
14	00	Unit no. 082	Living-Kitchen	2.48	16.0	15.5	1.98	33%	2.14	2.00	0.75	0.70	324	300	107	100	200	1.3
15	00	Unit no. 084	Living-Kitchen	4.95	16.0	31.0	1.98	33%	4.22	2.00	1.48	0.70	638	300	211	100	200	1.3
16	00	Unit no. 091	Living-Kitchen	3.40	20.0	17.0	1.58	28%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
17	00	Unit no. 092	Living-Kitchen	4.40	20.0	22.1	1.58	28%	2.68	2.00	0.94	0.70	405	300	134	100	200	1.3
18	00	Unit no. 095	Living-Kitchen	4.40	20.0	22.1	1.58	29%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
19	00	Unit no. 096	Living-Kitchen	4.40	20.0	22.1	1.58	29%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
20	00	Unit no. 099	Living-Kitchen	3.40	20.0	17.0	1.58	28%	2.14	2.00	0.75	0.70	324	300	107	100	200	1.3
21	00	Unit no. 100	Living-Kitchen	2.48	14.4	17.1	2.19	33%	2.28	2.00	0.80	0.70	344	300	114	100	200	1.3
22	00	Unit no. 085	Living-Kitchen	4.95	14.4	34.3	2.19	33%	4.56	2.00	1.59	0.70	689	300	227	100	200	1.3
23	00	Unit no. 085	Living-Kitchen	6.64	20.0	33.3	1.58	27%	3.95	2.00	1.38	0.70	598	300	197	100	200	1.3
24	00	Unit no. 086	Living-Kitchen	3.40	20.0	17.0	1.58	28%	2.08	2.00	0.73	0.70	314	300	104	100	200	1.3
25	00	Unit no. 088	Living-Kitchen	2.48	14.4	17.1	2.19	33%	2.28	2.00	0.80	0.70	344	300	114	100	200	1.3
26	00	Unit no. 089	Living-Kitchen	4.40	20.0	22.1	1.58	29%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
27	00	Block 1	Living-Kitchen	5.54	22.5	24.6	1.77	28%	3.15	2.00	1.10	0.70	476	300	157	100	200	1.3
28	00	Block 1	Bed room	2.34	11.5	20.3	2.15	27%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
29	00	Block 1	Living-Kitchen	5.54	29.5	18.8	1.99	28%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
30	00	Block 1	Bed room	2.34	10.8	21.6	1.93	36%	2.88	2.00	1.01	0.70	436	300	144	100	100	0.7
31	00	Block 1	Bed room	4.68	12.5	37.3	2.07	36%	5.16	2.00	1.80	0.70	780	300	257	100	100	0.7
32	00	Block 1	Bed room	2.34	11.4	20.6	2.14	26%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
33	00	Block 1	Living-Kitchen	5.54	22.5	24.6	1.77	25%	2.75	2.00	0.96	0.70	415	300	137	100	200	1.3
34	00	Block 1	Living-Kitchen	4.72	21.6	21.9	1.36	32%	3.08	2.00	1.08	0.70	466	300	154	100	200	1.3
35	00	Block 1	Bed room	2.34	11.6	20.2	2.34	36%	2.81	2.00	0.98	0.70	426	300	140	100	100	0.7
36	00	Block 1	Living-Kitchen	5.54	22.5	24.6	1.77	28%	3.08	2.00	1.08	0.70	466	300	154	100	200	1.3
37	00	Block 1	Bed room	2.34	10.9	21.5	2.28	25%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
38	00	Block 1	Bed room	2.34	12.5	18.7	2.07	29%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
39	00	Block 1	Bed room	2.34	11.0	21.2	1.95	36%	2.88	2.00	1.01	0.70	436	300	144	100	100	0.7
40	00	Block 1	Living-Kitchen	7.88	29.5	26.7	1.99	33%	4.42	2.00	1.55	0.70	669	300	221	100	200	1.3
41	00	Block 1	Bed room	2.34	12.6	18.6	2.23	27%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
42	00	Block 1	Bed room	2.34	10.8	21.7	2.09	27%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
43	00	Block 1	Living-Kitchen	7.12	29.5	24.1	1.99	27%	3.15	2.00	1.10	0.70	476	300	157	100	200	1.3



44	00	Block 1	Bed room	2.34	12.6	18.6	2.23	31%	2.28	2.00	0.80	0.70	344	300	114	100	100	0.7
45	00	Block 1	Bed room	2.34	10.8	21.7	2.09	30%	2.48	2.00	0.87	0.70	375	300	124	100	100	0.7
46	00	Block 1	Living-Kitchen	7.06	29.5	23.9	1.60	29%	3.48	2.00	1.22	0.70	527	300	174	100	200	1.3
47	00	Block 1	Bed room	3.04	11.2	27.1	2.21	28%	2.81	2.00	0.98	0.70	426	300	140	100	100	0.7
48	00	Block 1	Living-Kitchen	4.72	21.2	22.2	1.38	29%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
49	00	Block 1	Living-Kitchen	7.12	29.5	24.1	1.99	25%	3.02	2.00	1.05	0.70	456	300	150	100	200	1.3
50	00	Block 1	Bed room	2.34	11.1	21.1	2.03	28%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
51	00	Block 1	Bed room	2.34	13.0	18.1	2.17	28%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
52	00	Block 1	Living-Kitchen	6.40	29.5	21.7	1.99	25%	2.75	2.00	0.96	0.70	415	300	137	100	200	1.3
53	00	Block 1	Bed room	2.34	11.0	21.2	1.95	36%	2.81	2.00	0.98	0.70	426	300	140	100	100	0.7
54	00	Block 1	Bed room	4.68	12.5	37.3	2.07	33%	4.82	2.00	1.69	0.70	730	300	241	100	100	0.7
55	00	Block 1	Living-Kitchen	5.54	22.5	24.6	1.77	29%	3.22	2.00	1.13	0.70	486	300	160	100	200	1.3
56	00	Block 1	Bed room	2.34	10.9	21.5	2.28	25%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
57	00	Block 1	Bed room	2.34	11.6	20.2	2.34	34%	2.61	2.00	0.91	0.70	395	300	130	100	100	0.7
58	00	Block 1	Living-Kitchen	4.72	21.6	21.9	1.36	32%	3.08	2.00	1.08	0.70	466	300	154	100	200	1.3
59	00	Block 1	Bed room	2.34	10.9	21.5	2.28	25%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
60	00	Block 1	Living-Kitchen	5.54	22.5	24.6	1.77	25%	2.75	2.00	0.96	0.70	415	300	137	100	200	1.3
61	00	Block 1	Bed room	4.68	12.5	37.3	2.07	34%	4.89	2.00	1.71	0.70	740	300	244	100	100	0.7
62	00	Block 1	Bed room	2.34	11.0	21.2	1.95	36%	2.88	2.00	1.01	0.70	436	300	144	100	100	0.7
63	00	Block 1	Living-Kitchen	6.40	29.5	21.7	1.99	28%	2.95	2.00	1.03	0.70	446	300	147	100	200	1.3
64	00	Block 1	Living-Kitchen	7.12	29.5	24.1	1.99	29%	3.42	2.00	1.20	0.70	517	300	171	100	200	1.3
65	00	Block 1	Bed room	2.34	11.1	21.1	2.03	28%	2.21	2.00	0.77	0.70	334	300	110	100	100	0.7
66	00	Block 1	Bed room	2.34	13.0	18.1	2.17	28%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
67	00	Block 1	Living-Kitchen	7.06	29.5	23.9	1.60	29%	3.48	2.00	1.22	0.70	527	300	174	100	200	1.3
68	00	Block 1	Bed room	2.34	13.3	17.6	2.12	30%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
69	00	Block 1	Bed room	2.34	11.4	20.5	1.98	30%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
70	00	Block 2	Living-Kitchen	5.54	22.5	24.6	1.77	26%	2.95	2.00	1.03	0.70	446	300	147	100	200	1.3
71	00	Block 2	Bed room	2.34	11.5	20.3	2.15	27%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
72	00	Block 2	Living-Kitchen	7.88	29.5	26.7	1.99	30%	4.02	2.00	1.41	0.70	608	300	201	100	200	1.3
73	00	Block 2	Bed room	1.52	9.9	15.4	1.91	37%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
74	00	Block 2	Bed room	2.34	12.5	18.7	2.07	37%	2.68	2.00	0.94	0.70	405	300	134	100	100	0.7
75	00	Block 2	Living-Kitchen	5.54	22.5	24.6	1.77	26%	2.88	2.00	1.01	0.70	436	300	144	100	200	1.3
76	00	Block 2	Bed room	2.34	11.5	20.3	2.15	27%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
77	00	Block 2	Bed room	2.34	11.5	20.3	2.15	27%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
78	00	Block 2	Living-Kitchen	5.54	22.5	24.6	1.77	23%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
79	00	Block 2	Bed room	4.68	12.5	37.3	2.07	34%	4.96	2.00	1.73	0.70	750	300	247	100	100	0.7
80	00	Block 2	Bed room	2.34	11.0	21.2	1.95	35%	2.75	2.00	0.96	0.70	415	300	137	100	100	0.7
81	00	Block 2	Living-Kitchen	6.40	29.5	21.7	1.99	23%	2.41	2.00	0.84	0.70	365	300	120	100	200	1.3
82	00	Block 2	Bed room	2.34	11.8	19.8	2.09	26%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
83	00	Block 2	Living-Kitchen	5.54	22.5	24.6	1.77	19%	2.14	2.00	0.75	0.70	324	300	107	100	200	1.3
84	00	Block 2	Living-Kitchen	4.72	21.2	22.2	1.38	28%	2.81	2.00	0.98	0.70	426	300	140	100	200	1.3
85	00	Block 2	Bed room	3.04	11.2	27.1	2.51	26%	2.61	2.00	0.91	0.70	395	300	130	100	100	0.7
86	00	Block 2	Living-Kitchen	5.54	22.5	24.6	1.77	23%	2.55	2.00	0.89	0.70	385	300	127	100	200	1.3
87	00	Block 2	Bed room	2.34	10.2	22.9	2.31	24%	2.01	2.00	0.70	0.70	304	300	100	100	100	0.7
88	00	Block 2	Bed room	4.68	12.5	37.3	2.07	32%	4.69	2.00	1.64	0.70	709	300	234	100	100	0.7
89	00	Block 2	Bed room	2.34	11.4	20.5	1.98	34%	2.68	2.00	0.94	0.70	405	300	134	100	100	0.7
90	00	Block 2	Living-Kitchen	6.40	29.5	21.7	1.99	25%	2.75	2.00	0.96	0.70	415	300	137	100	200	1.3
91	00	Block 2	Bed room	2.34	13.3	17.6	2.20	33%	2.35	2.00	0.82	0.70	355	300	117	100	100	0.7
92	00	Block 2	Bed room	2.34	11.1	21.1	2.03	34%	2.68	2.00	0.94	0.70	405	300	134	100	100	0.7
93	00	Block 2	Living-Kitchen	7.32	32.0	22.9	2.04	28%	3.15	2.00	1.10	0.70	476	300	157	100	200	1.3
94	00	Block 2	Living-Kitchen	6.40	29.5	21.7	1.99	28%	2.95	2.00	1.03	0.70	446	300	147	100	200	1.3
95	00	Block 2	Bed room	2.34	11.0	21.2	1.95	34%	2.68	2.00	0.94	0.70	405	300	134	100	100	0.7
96	00	Block 2	Bed room	4.68	12.5	37.3	2.07	33%	4.82	2.00	1.69	0.70	730	300	241	100	100	0.7
97	00	Block 2	Bed room	2.34	11.5	20.3	2.15	27%	2.08	2.00	0.73	0.70	314	300	104	100	100	0.7
98	00	Block 2	Living-Kitchen	5.54	22.5	24.6	1.77	23%	2.61	2.00	0.91	0.70	395	300	130	100	200	1.3
99	00	Block 2	Living-Kitchen	7.88	29.5	26.7	1.99	25%	3.28	2.00	1.15	0.70	496	300	164	100	200	1.3
100	00	Block 2	Bed room	2.34	11.0	21.2	1.95	27%	2.14	2.00	0.75	0.70	324	300	107	100	100	0.7
101	00	Block 2	Bed room	4.68	12.5	37.3	2.07	26%	3.75	2.00	1.31	0.70	567	300	187	100	100	0.7

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 5.6. 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: The daylight reception assessment has been targeted to a large selection of 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.
- House Block 1 and Block 2: all habitable rooms on the ground floor 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 well in excess.

- Houses: Overall, examined residential rooms, achieved on average a daylight factor (DF) of 2.8% and an illuminance of 431 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 0.99% and an illuminance of 142 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved. The proposed house units achieved well in excess of recommendations.
- House Block 1 and Block 2: Overall, examined residential rooms achieved on average a daylight factor (DF) of 2.8% and an illuminance of 427 lux on over 50% of the floor area for over 50% of the available daylight hours. An average DF of 0.99% and an illuminance of 141 lux on over 95% of the floor area for over 50% of the available daylight hours was achieved. The proposed house units achieved well in excess of recommendations.
- Overall compliance for proposed development = 100%

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 full compliance under IS EN17037 / BS EN17307 and full compliance under BS EN 17037:2018 National Annex guidelines. This indicates an overall very 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 5.7 below indicates the open space and public 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 5.7: New proposed amenity spaces within the development.

Receptor	Amenity Description	Amenity area (m ²)
A	Public open space 001	1,179.9
B	Public open space 002	908.9
C	Public open space 003	835.5
	total	2,924.3
D	Communal open space 001	1,104.9
E	Communal open space 002	597.8
	total	1,702.7

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 (m ²)	Achieved daily sun time * area	Achieved total sun time (hrs)	Required sun hours @ 50% area	Achieved sun hours on @ 50% area
A	1179.9	632190.4	8.93	2.0	10.0
B	908.9	492442.0	9.03	2.0	10.0
C	835.5	516840.3	10.31	2.0	11.0
D	1104.9	332132.9	5.01	2.0	6.0
E	597.8	127690.1	3.56	2.0	4.0

Table 5.4: Calculation results: Summary table of sunlight analysis of proposed public and communal amenity spaces.

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 5.3 we note the selected amenity spaces all achieved sunlight above the recommended guidelines, see image 5.7 for receptor/amenity space location. Summary of results are as follows:

- The average public open space amenity area calculated sunlight on at least 50% of the area on March 21st is 10.30 hours.
- The average communal open space amenity area calculated sunlight on at least 50% of the area on March 21st is 5.0 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 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 6.1-6.4 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).

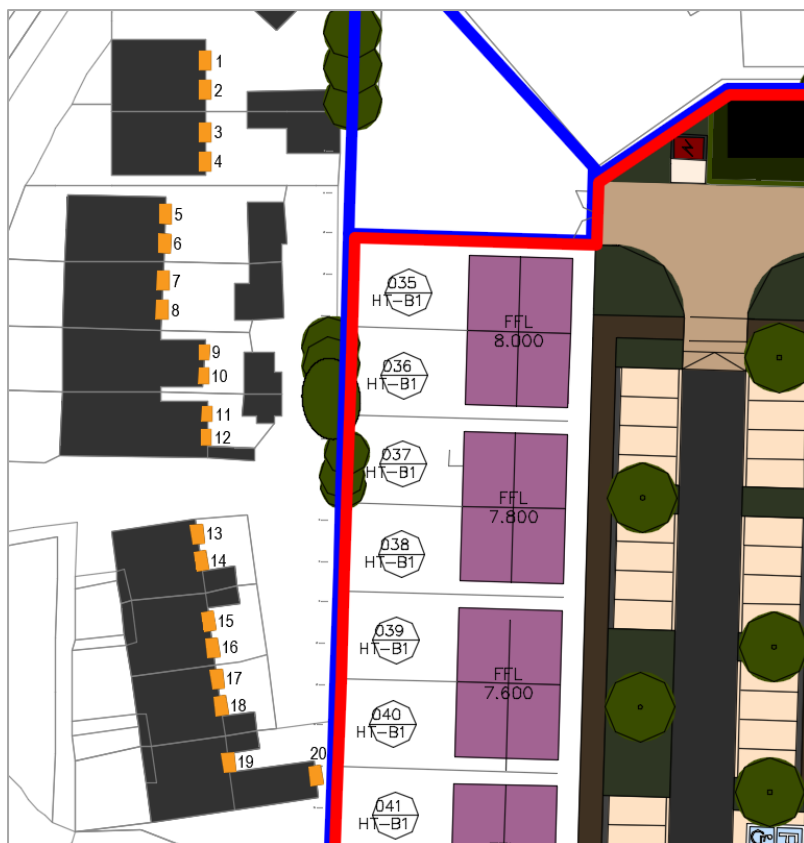


Image 6.2: Daylight impact: Neighbouring receptors – Receptor no. 1 - 20.



Image 6.3: Daylight impact: Neighbouring receptors – Receptor no. 21 - 24.

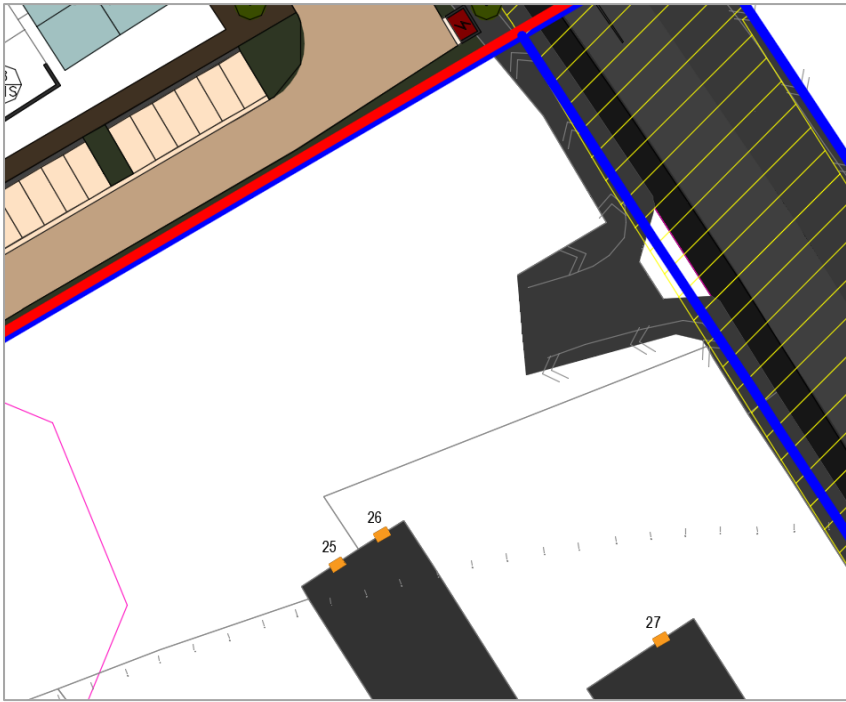


Image 6.4: Daylight impact: Neighbouring receptors – Receptor no. 25 - 27.

Receptor / window *	Level	Location / address	Dwelling description
1, 2	00	33 Scarteen Park, Kenmare, Co. Kerry	Residential
3, 4	00	34 Scarteen Park, Kenmare, Co. Kerry	Residential
5, 6	00	35 Scarteen Park, Kenmare, Co. Kerry	Residential
7, 8	00	36 Scarteen Park, Kenmare, Co. Kerry	Residential
9, 10	00	37 Scarteen Park, Kenmare, Co. Kerry	Residential
11, 12	00	38 Scarteen Park, Kenmare, Co. Kerry	Residential
13, 14	00	39 Scarteen Park, Kenmare, Co. Kerry	Residential
15, 16	00	40 Scarteen Park, Kenmare, Co. Kerry	Residential
17, 18	00	41 Scarteen Park, Kenmare, Co. Kerry	Residential
19, 20	00	42 Scarteen Park, Kenmare, Co. Kerry	Residential
21, 22	00	1 Factory Houses, Scarteen Park, Kenmare, Co. Kerry	Residential
23, 24	00	2 Factory Houses, Scarteen Park, Kenmare, Co. Kerry	Residential
25, 26, 27	00	The Lodge, Killowen Road, Kenmare, 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.

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 guide

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

Receptor ID	Existing baseline VSC value [%]	Proposed VSC value [%]	Change factor	Comment / Effect of proposed development
Receptor 1	35%	34%	0.96	Negligible
Receptor 2	35%	34%	0.96	Negligible
Receptor 3	35%	34%	0.96	Negligible
Receptor 4	35%	34%	0.96	Negligible
Receptor 5	35%	33%	0.95	Negligible
Receptor 6	35%	33%	0.95	Negligible
Receptor 7	36%	33%	0.94	Negligible
Receptor 8	36%	33%	0.94	Negligible
Receptor 9	36%	32%	0.91	Negligible
Receptor 10	36%	33%	0.91	Negligible
Receptor 11	36%	32%	0.91	Negligible
Receptor 12	36%	32%	0.91	Negligible
Receptor 13	36%	31%	0.88	Negligible
Receptor 14	36%	31%	0.88	Negligible
Receptor 15	36%	31%	0.88	Negligible
Receptor 16	36%	31%	0.88	Negligible
Receptor 17	35%	30%	0.87	Negligible
Receptor 18	35%	30%	0.87	Negligible
Receptor 19	34%	30%	0.90	Negligible
Receptor 20	36%	30%	0.84	Negligible
Receptor 21	36%	34%	0.96	Negligible
Receptor 22	36%	34%	0.96	Negligible
Receptor 23	36%	34%	0.96	Negligible
Receptor 24	36%	34%	0.97	Negligible
Receptor 25	37%	36%	0.98	Negligible
Receptor 26	37%	36%	0.98	Negligible
Receptor 27	34%	34%	0.99	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 0.84 to 0.99. 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 6.1-6.4 for receptor locations):

- West receptors: Receptor no. 1 to 24: Neighbouring dwellings located in Scarteen Park estate with ground floor windows were examined and resulted in a change factor range of 0.84 to 0.97. These receptors are all well within the guidelines and the effect is determined as negligible under BRE definitions.
- South receptors: Receptor no. 25 to 27: Neighbouring dwelling with ground floor windows were examined and resulted in a change factor range of 0.98 to 0.99. These receptors are all comfortably within the guidelines and the effect is determined as negligible under BRE definitions.
- Overall, the average change ratio for VSC is 0.93.

We conclude that the new proposed development's effect on daylight reception in the neighbouring rooms is all within the constraints and 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.



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 6.5-6.6 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.

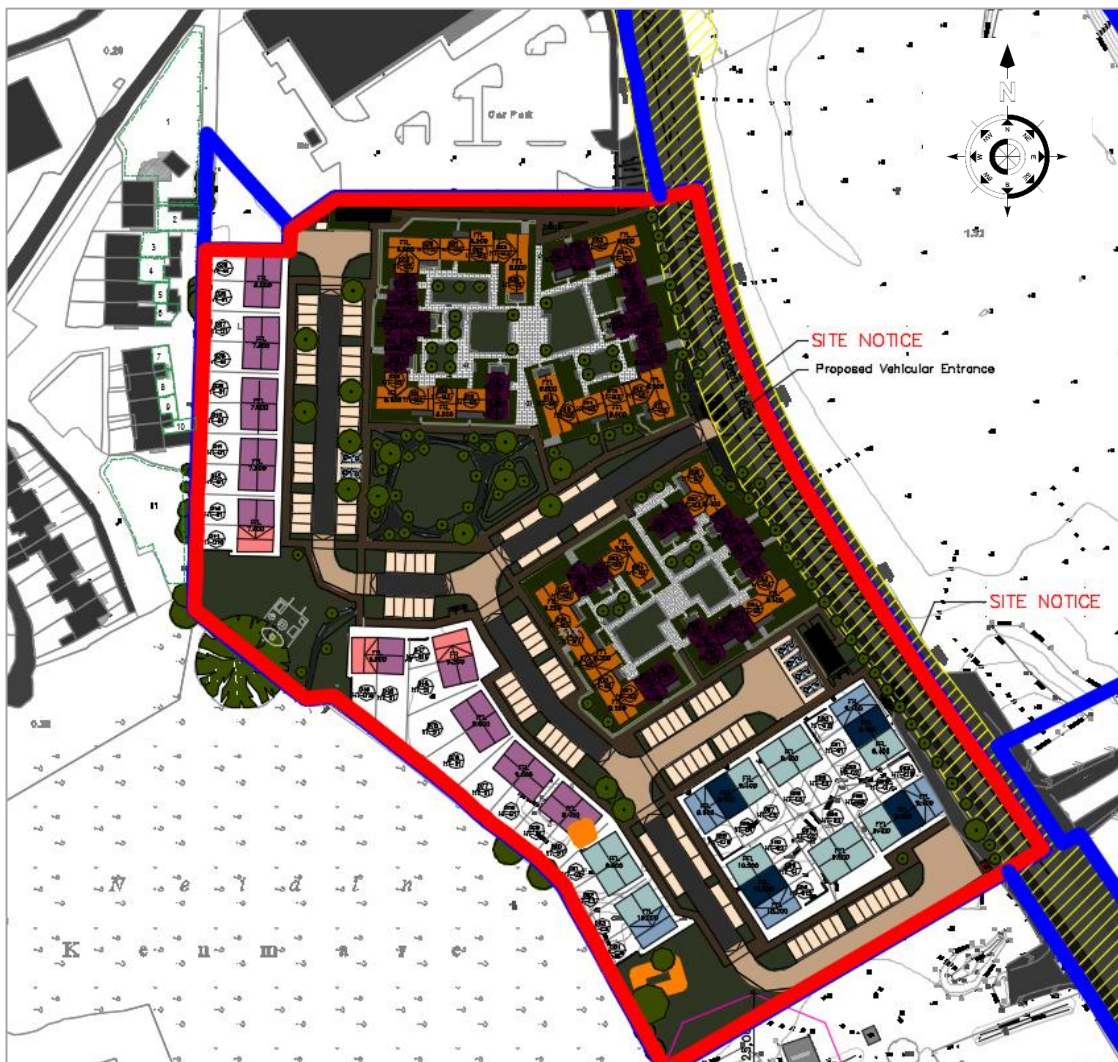


Image 6.5: Sunlight impact: Existing neighbouring amenity spaces. Overall view.



Image 6.6: Sunlight impact: Existing neighbouring amenity spaces. Receptors labelled 1-11.

Receptor	Location / address	Amenity description	Approx. area (m ²)
1	33 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	520
2	34 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	60
3	35 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	40
4	36 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	35
5	37 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	18
6	38 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	23
7	39 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	19
8	40 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	20
9	41 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	20
10	42 Scarteen Park, Kenmare, Co. Kerry	Private amenity area	21
11	Scarteen Park, Kenmare, Co. Kerry	Communal amenity area	380

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

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 (m ²)	EXISTING STATUS			NEW STATUS			Change factor	Comment / effect of proposed development
		sun hours * amenity space area (Sun Hr*m ²)	total sun hours (Sun Hr)	sun hours on 50% of the area	sun hours * amenity space area (Sun Hr*m ²)	total sun hours (Sun Hr)	sun hours on 50% of the area		
1	520	272376	8.73	12.0	269568	8.64	11.0	0.99	Negligible
2	60	25452	7.07	8.0	23040	6.40	8.0	0.91	Negligible
3	40	15000	6.25	7.0	12120	5.05	6.0	0.81	Negligible
4	35	12957	6.17	7.0	10437	4.97	6.0	0.81	Negligible
5	18	6652.8	6.16	7.0	5367.6	4.97	6.0	0.81	Negligible
6	23	10432.8	7.56	8.0	8804.4	6.38	7.0	0.85	Negligible
7	19	6258.6	5.49	6.0	5027.4	4.41	5.0	0.81	Negligible
8	20	6588	5.49	6.0	5292	4.41	5.0	0.81	Negligible
9	20	6588	5.49	6.0	5292	4.41	5.0	0.81	Negligible
10	21	8895.6	7.06	8.0	7030.8	5.58	6.0	0.80	Negligible
11	380	202464	8.88	10.0	187188	8.21	9.0	0.93	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 any loss of sunlight should not be greater than 0.8 (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 6.5-6.6 for receptor locations):

- West receptors: Receptor no. 1 to 10 are private amenity areas and receptor no. 11 is a communal green area all located in Scarteen Park, Kenmare. The receptors resulted in a change factor range of 0.80-0.99. The change happens in the early morning hours of 07.00-09.00. The calculation findings are all within the guidelines, and the effect is determined as 'negligible' under BRE definitions.
- Overall, the average change ratio is 0.85.

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.

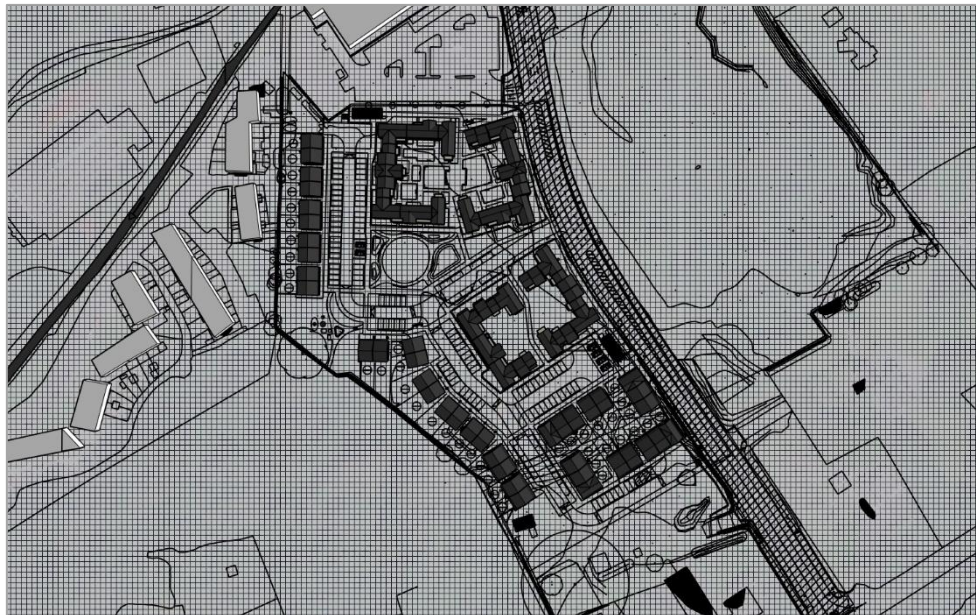


Appendix A

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

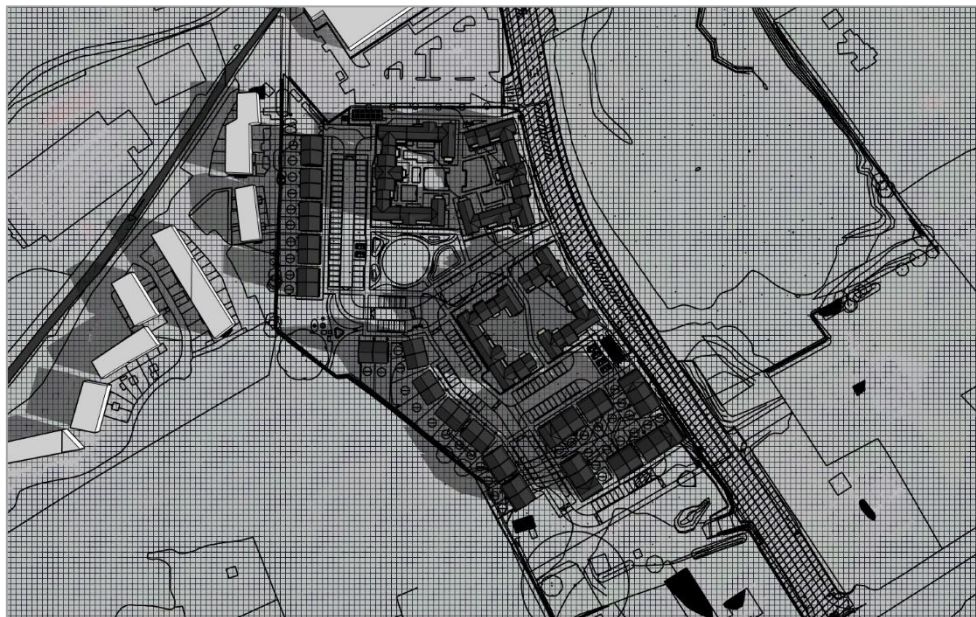
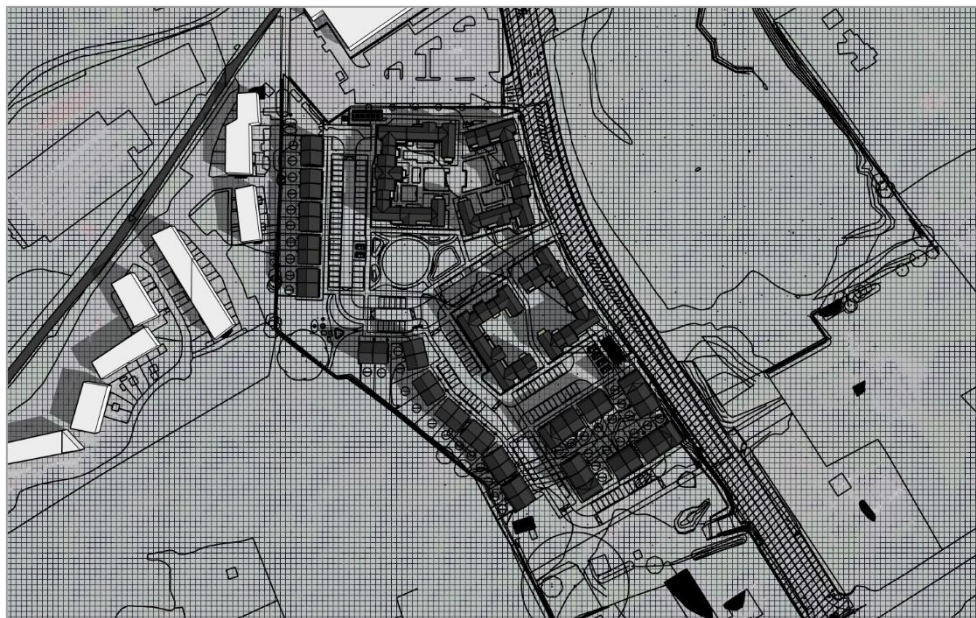
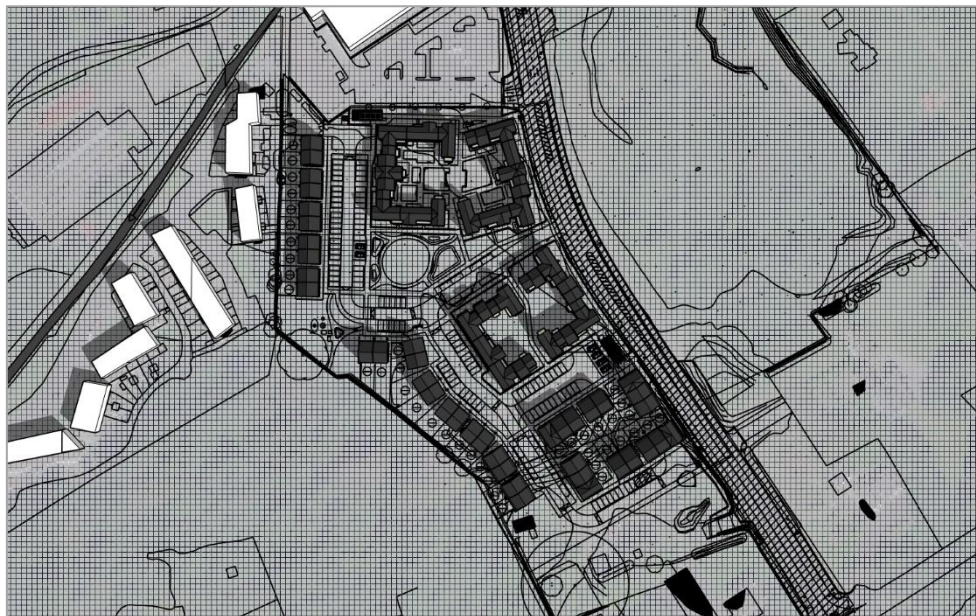
Proposed status: 06:00 to 19:00 hours.

06.00 March 21st

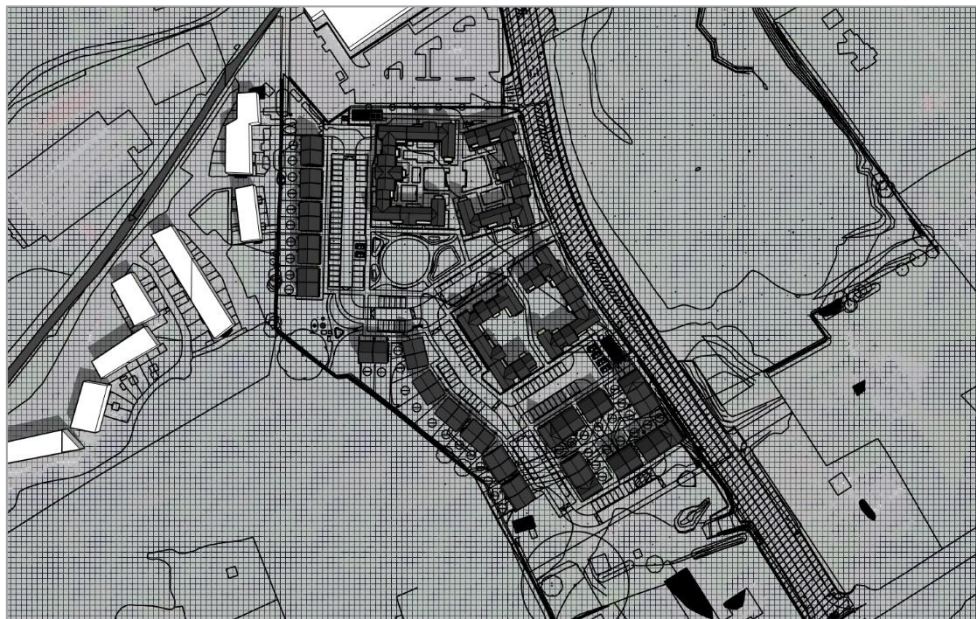


07.00 March 21st

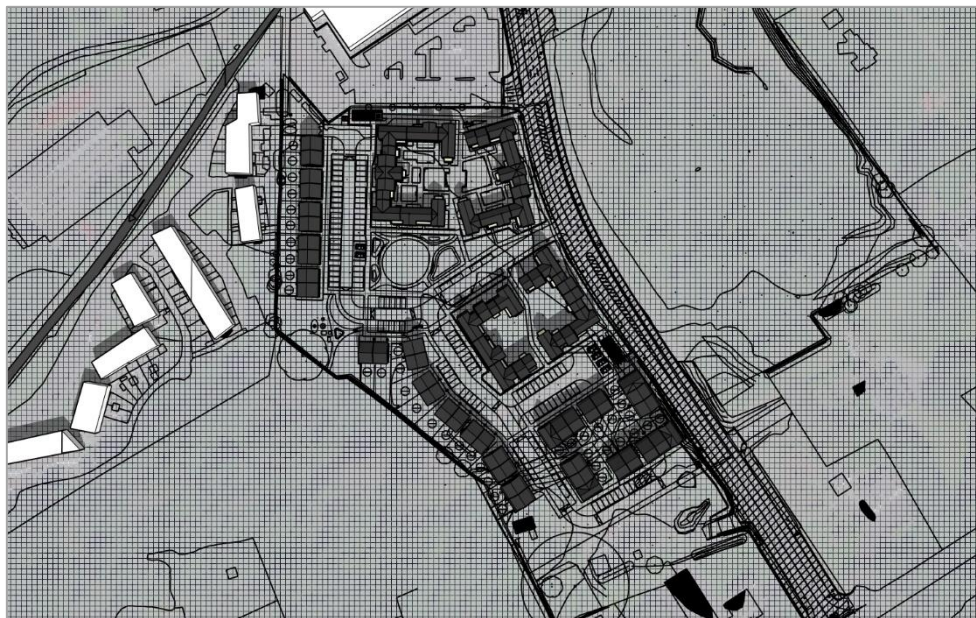


08.00 March 21st09.00 March 21st10.00 March 21st

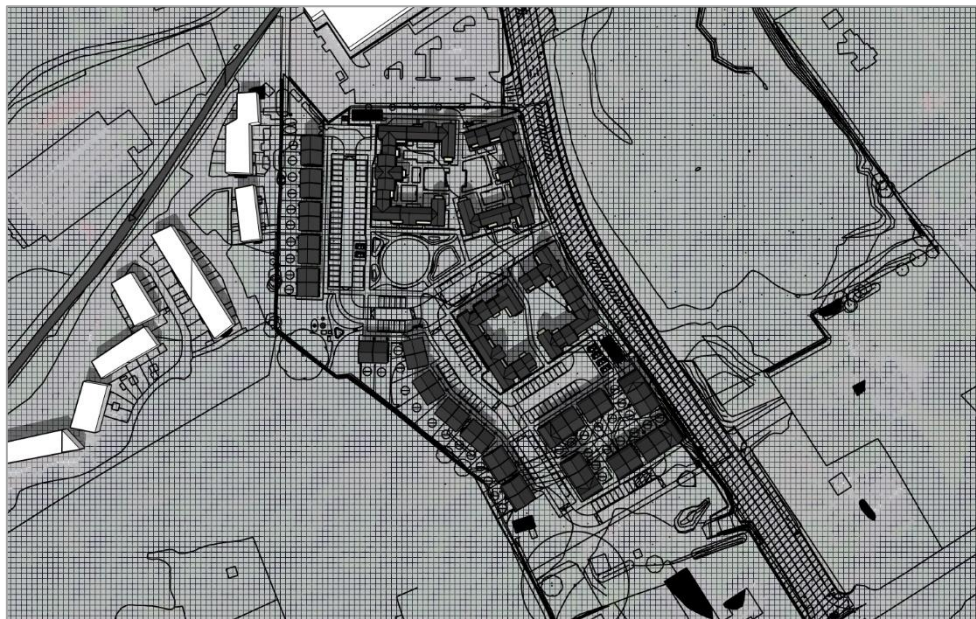
11.00 March 21st



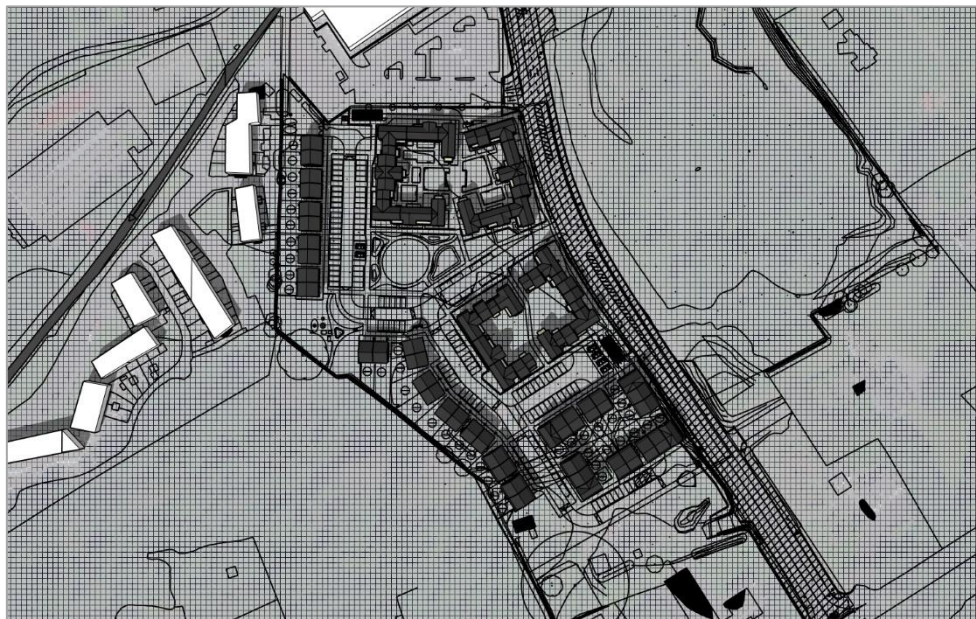
12.00 March 21st



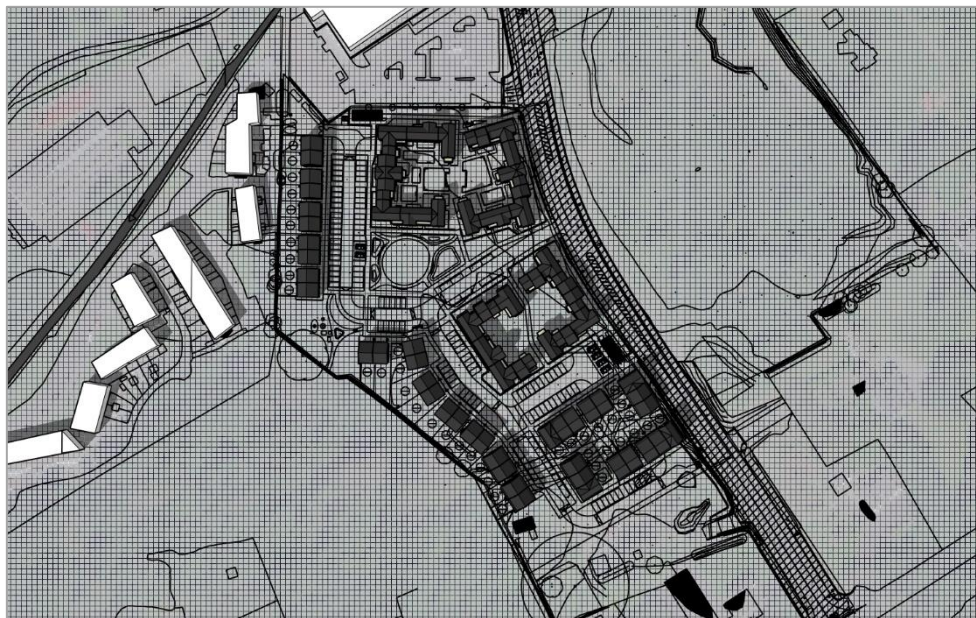
13.00 March 21st



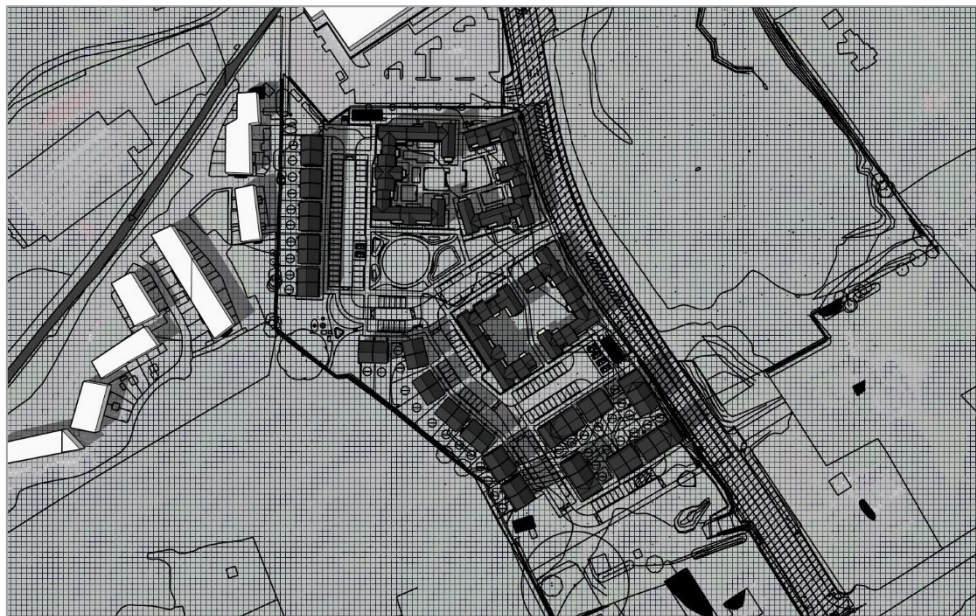
14.00 March 21st



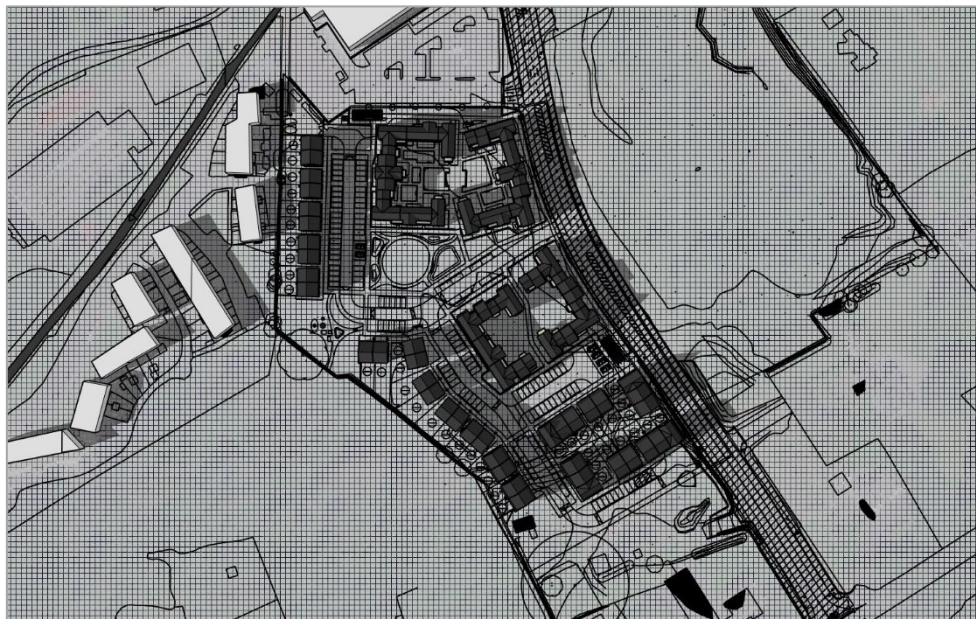
15.00 March 21st



16.00 March 21st



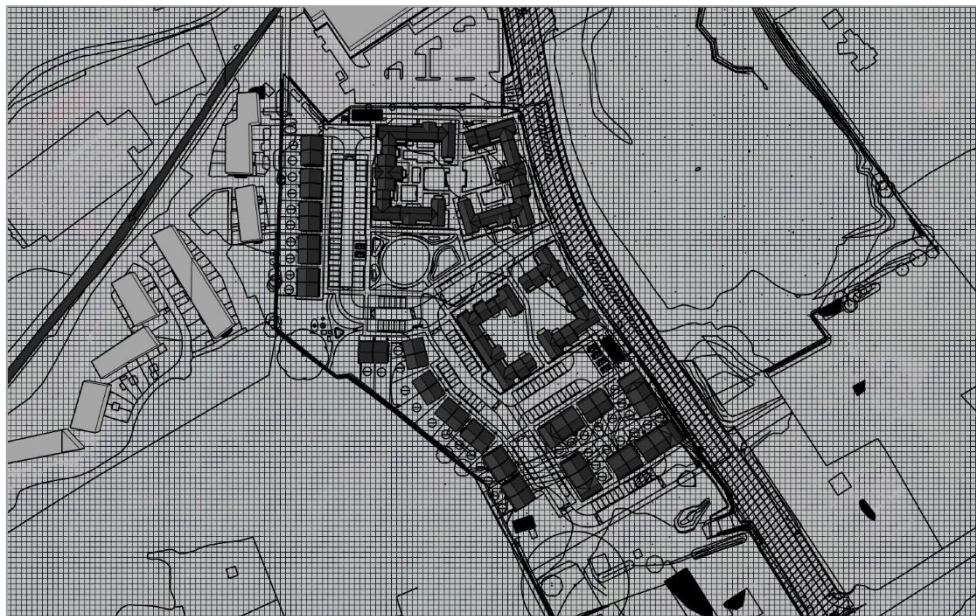
17.00 March 21st



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						1179.90 m ²
NEW STATUS						
March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% / %		min	m ²	min*m ²	
6.00	100%	0%	60	0	0	
7.00	95%	5%	60	59	3,540	
8.00	39%	61%	60	720	43,184	
9.00	21%	79%	60	932	55,927	
10.00	8%	92%	60	1086	65,130	
11.00	8%	92%	60	1086	65,130	
12.00	8%	92%	60	1086	65,130	
13.00	8%	92%	60	1086	65,130	
14.00	8%	92%	60	1086	65,130	
15.00	8%	92%	60	1086	65,130	
16.00	8%	92%	60	1086	65,130	
17.00	8%	92%	60	1086	65,130	
18.00	88%	12%	60	142	8,495	
19.00	100%	0%	60	0	0	
Required sun hours @ 50% area						
Achieved sun hours on @ 50% area						
Achieved total sun time (hrs)						
Achieved daily sun time * area						

B						908.90 m ²
NEW STATUS						
March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% / %		min	m ²	min*m ²	
6.00	100%	0%	60	0	0	
7.00	100%	0%	60	0	0	
8.00	63%	37%	60	336	20,178	
9.00	28%	72%	60	654	39,264	
10.00	18%	82%	60	745	44,718	
11.00	13%	87%	60	791	47,445	
12.00	8%	92%	60	836	50,171	
13.00	8%	92%	60	836	50,171	
14.00	8%	92%	60	836	50,171	
15.00	8%	92%	60	836	50,171	
16.00	8%	92%	60	836	50,171	
17.00	8%	92%	60	836	50,171	
18.00	27%	73%	60	663	39,810	
19.00	100%	0%	60	0	0	
Required sun hours @ 50% area						
Achieved sun hours on @ 50% area						
Achieved total sun time (hrs)						
Achieved daily sun time * area						

C						835.50 m ²
NEW STATUS						
March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% / %		min	m ²	min*m ²	
6.00	100%	0%	60	0	0	
7.00	64%	36%	60	301	18,047	
8.00	16%	84%	60	702	42,109	
9.00	8%	92%	60	769	46,120	
10.00	8%	92%	60	769	46,120	
11.00	8%	92%	60	769	46,120	
12.00	8%	92%	60	769	46,120	
13.00	8%	92%	60	769	46,120	
14.00	8%	92%	60	769	46,120	
15.00	8%	92%	60	769	46,120	
16.00	8%	92%	60	769	46,120	
17.00	8%	92%	60	769	46,120	
18.00	17%	83%	60	693	41,608	
19.00	100%	0%	60	0	0	
Required sun hours @ 50% area						
Achieved sun hours on @ 50% area						
Achieved total sun time (hrs)						
Achieved daily sun time * area						

D						1104.90 m ²
NEW STATUS						
March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% / %		min	m ²	min*m ²	
6.00	100%	0%	60	0	0	
7.00	100%	0%	60	0	0	
8.00	76%	24%	60	265	15,911	
9.00	59%	41%	60	453	27,181	
10.00	46%	54%	60	597	35,799	
11.00	41%	59%	60	652	39,113	
12.00	37%	63%	60	696	41,765	
13.00	37%	63%	60	696	41,765	
14.00	37%	63%	60	696	41,765	
15.00	42%	58%	60	641	38,451	
16.00	54%	46%	60	508	30,495	
17.00	70%	30%	60	331	19,888	
18.00	100%	0%	60	0	0	
19.00	100%	0%	60	0	0	
Required sun hours @ 50% area						
Achieved sun hours on @ 50% area						
Achieved total sun time (hrs)						
Achieved daily sun time * area						

E						597.80 m ²
NEW STATUS						
March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	Sun time.area	
24 Hr	% / %		min	m ²	min*m ²	
6.00	100%	0%	60	0	0	
7.00	100%	0%	60	0	0	
8.00	100%	0%	60	0	0	
9.00	78%	22%	60	132	7,891	
10.00	68%	32%	60	191	11,478	
11.00	56%	44%	60	263	15,782	
12.00	48%	52%	60	311	18,651	
13.00	46%	54%	60	323	19,369	
14.00	45%	55%	60	329	19,727	
15.00	48%	52%	60	311	18,651	
16.00	68%	32%	60	191	11,478	
17.00	87%	13%	60	78	4,663	
18.00	100%	0%	60	0	0	
19.00	100%	0%	60	0	0	
Required sun hours @ 50% area						
Achieved sun hours on @ 50% area						
Achieved total sun time (hrs)						
Achieved daily sun time * area						



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	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	28m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		64	12	107	2	9	8	180	35%	64	12	30	2	24	8	62	12	180	34%	0.96
Receptor 2		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	28m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		62	12	109	2	9	8	180	35%	62	12	28	2	23	8	67	12	180	34%	0.96
Receptor 3		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	25m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		56	11	113	2	11	8	180	35%	56	11	36	2	58	12	30	8	180	34%	0.96
Receptor 4		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	25m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		55	11	110	2	15	8	180	35%	55	11	35	2	59	12	31	8	180	34%	0.96
Receptor 5		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	26m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		54	10	110	2	16	9	180	35%	54	10	32	2	78	15	16	9	180	33%	0.95
Receptor 6		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	26m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		53	10	109	2	18	9	180	35%	53	10	31	2	88	15	8	9	180	33%	0.95
Receptor 7		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	26m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		52	8	111	2	17	9	180	36%	52	8	29	2	82	15	17	9	180	33%	0.94
Receptor 8		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	26m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		51	8	111	2	18	9	180	36%	51	8	28	2	83	15	18	9	180	33%	0.94
Receptor 9		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	22m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		49	7	116	2	15	10	180	36%	49	8	19	2	97	17	15	10	180	32%	0.91
Receptor 10		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	22m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		48	7	117	2	15	10	180	36%	48	8	19	2	98	17	15	10	180	33%	0.91
Receptor 11		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	22m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		47	7	116	2	17	10	180	36%	47	7	10	2	106	17	17	10	180	32%	0.91
Receptor 12		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	22m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		46	7	115	2	19	10	180	36%	46	7	9	2	106	17	19	10	180	32%	0.91
Receptor 13		EXISTING								NEW										
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor°	Ver°	Σ	VSC	change		
Target distance	22m	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC	Hor°	Ver°	Hor°	Ver°	Hor°	Ver°	Σ	VSC			
		52	6	110	2	18	11	180	36%	52	6	110	21	18	11	180	31%	0.88		

Receptor 14		EXISTING								NEW								change 0.88
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	22m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		51	6	111	2	18	11			180	36%	51	6	111	21	18	11	
Receptor 15		EXISTING								NEW								change 0.88
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	21m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		49	5	102	2	29	11			180	36%	43	5	121	21	16	11	
Receptor 16		EXISTING								NEW								change 0.88
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	21m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		48	5	101	2	31	11			180	36%	43	5	121	21	16	11	
Receptor 17		EXISTING								NEW								change 0.87
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	20m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		47	5	89	2	44	13			180	35%	38	5	123	22	19	13	
Receptor 18		EXISTING								NEW								change 0.87
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	20m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		46	5	88	2	46	13			180	35%	38	5	122	22	20	13	
Receptor 19		EXISTING								NEW								change 0.90
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	19m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		46	4	53	2	81	17			180	34%	33	4	123	22	24	17	
Receptor 20		EXISTING								NEW								change 0.84
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	12m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		43	4	137	2					180	36%	24	4	144	22	12	2	
Receptor 21		EXISTING								NEW								change 0.96
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	35m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		29	4	29	11	122	2			180	36%	29	4	29	11	122	8	
Receptor 22		EXISTING								NEW								change 0.96
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	35m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		30	4	31	11	119	2			180	36%	30	4	31	11	119	8	
Receptor 23		EXISTING								NEW								change 0.96
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	36m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		31	4	32	11	117	2			180	36%	31	4	32	11	117	8	
Receptor 24		EXISTING								NEW								change 0.97
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	36m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		32	4	33	11	115	2			180	36%	32	4	33	11	115	8	
Receptor 25		EXISTING								NEW								change 0.98
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	52m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		114	1	66	2					180	37%	71	7	109	1			
Receptor 26		EXISTING								NEW								change 0.98
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	52m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		115	1	65	2					180	37%	72	7	108	1			
Receptor 27		EXISTING								NEW								change 0.99
VSC test distance	21 m	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	Section 1	Section 2	Section 3	Section 4	Hor ^o	Ver ^o	Σ	VSC	
Target distance	76m	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	Hor ^o	Ver ^o	
		56	24	124	1					180	34%	56	24	79	1	45	5	



Appendix D

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

1						520 m ²						
EXISTING STATUS						March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	
7.00	49%	51%	60	265	15,912	7.00	58%	42%	60	218	13,104	
8.00	25%	75%	60	390	23,400	8.00	25%	75%	60	390	23,400	
9.00	17%	83%	60	432	25,896	9.00	17%	83%	60	432	25,896	
10.00	18%	82%	60	426	25,584	10.00	18%	82%	60	426	25,584	
11.00	19%	81%	60	421	25,272	11.00	19%	81%	60	421	25,272	
12.00	19%	81%	60	421	25,272	12.00	19%	81%	60	421	25,272	
13.00	19%	81%	60	421	25,272	13.00	19%	81%	60	421	25,272	
14.00	23%	77%	60	400	24,024	14.00	23%	77%	60	400	24,024	
15.00	28%	72%	60	374	22,464	15.00	28%	72%	60	374	22,464	
16.00	32%	68%	60	354	21,216	16.00	32%	68%	60	354	21,216	
17.00	38%	62%	60	322	19,344	17.00	38%	62%	60	322	19,344	
18.00	40%	60%	60	312	18,720	18.00	40%	60%	60	312	18,720	
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)					
Achieved sun hours on (hrs) @ 50% area						12.00	Achieved sun hours on (hrs) @ 50% area					
Achieved total sun time (hrs)						8.73	Achieved total sun time (hrs)					
Achieved daily sun time * area						272376	Achieved daily sun time * area					

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	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	58%	42%	60	218	13,104	7.00	58%	42%	60	218	13,104	-2,808
8.00	25%	75%	60	390	23,400	8.00	25%	75%	60	390	23,400	0
9.00	17%	83%	60	432	25,896	9.00	17%	83%	60	432	25,896	0
10.00	18%	82%	60	426	25,584	10.00	18%	82%	60	426	25,584	0
11.00	19%	81%	60	421	25,272	11.00	19%	81%	60	421	25,272	0
12.00	19%	81%	60	421	25,272	12.00	19%	81%	60	421	25,272	0
13.00	19%	81%	60	421	25,272	13.00	19%	81%	60	421	25,272	0
14.00	23%	77%	60	400	24,024	14.00	23%	77%	60	400	24,024	0
15.00	28%	72%	60	374	22,464	15.00	28%	72%	60	374	22,464	0
16.00	32%	68%	60	354	21,216	16.00	32%	68%	60	354	21,216	0
17.00	38%	62%	60	322	19,344	17.00	38%	62%	60	322	19,344	0
18.00	40%	60%	60	312	18,720	18.00	40%	60%	60	312	18,720	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)					
Achieved sun hours on (hrs) @ 50% area						11.00	Achieved sun hours on (hrs) @ 50% area					
Achieved total sun time (hrs)						8.64	Achieved total sun time (hrs)					
Achieved daily sun time * area						269568	Achieved daily sun time * area					

2						60 m ²						
EXISTING STATUS						March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	
7.00	52%	48%	60	29	1,728	7.00	100%	0%	60	0	-1,728	
8.00	29%	71%	60	43	2,556	8.00	36%	64%	60	38	2,304	
9.00	13%	87%	60	52	3,132	9.00	25%	75%	60	45	2,700	
10.00	13%	87%	60	52	3,132	10.00	13%	87%	60	52	3,132	
11.00	13%	87%	60	52	3,132	11.00	13%	87%	60	52	3,132	
12.00	13%	87%	60	52	3,132	12.00	13%	87%	60	52	3,132	
13.00	13%	87%	60	52	3,132	13.00	13%	87%	60	52	3,132	
14.00	20%	80%	60	48	2,880	14.00	20%	80%	60	48	2,880	
15.00	47%	53%	60	32	1,908	15.00	47%	53%	60	32	1,908	
16.00	80%	20%	60	12	720	16.00	80%	20%	60	12	720	
17.00	100%	0%	60	0	0	17.00	100%	0%	60	0	0	
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0	
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)					
Achieved sun hours on (hrs) @ 50% area						8.00	Achieved sun hours on (hrs) @ 50% area					
Achieved total sun time (hrs)						7.07	Achieved total sun time (hrs)					
Achieved daily sun time * area						25452	Achieved daily sun time * area					

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	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	min*m ²
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	0
7.00	100%	0%	60	0	0	7.00	100%	0%	60	0	0	-1,728
8.00	36%	64%	60	38	2,304	8.00	36%	64%	60	38	2,304	-252
9.00	25%	75%	60	45	2,700	9.00	25%	75%	60	45	2,700	-432
10.00	13%	87%	60	52	3,132	10.00	13%	87%	60	52	3,132	0
11.00	13%	87%	60	52	3,132	11.00	13%	87%	60	52	3,132	0
12.00	13%	87%	60	52	3,132	12.00	13%	87%	60	52	3,132	0
13.00	13%	87%	60	52	3,132	13.00	13%	87%	60	52	3,132	0
14.00	20%	80%	60	48	2,880	14.00	20%	80%	60	48	2,880	0
15.00	47%	53%	60	32	1,908	15.00	47%	53%	60	32	1,908	0
16.00	80%	20%	60	12	720	16.00	80%	20%	60	12	720	0
17.00	100%	0%	60	0	0	17.00	100%	0%	60	0	0	0
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0	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)					
Achieved sun hours on (hrs) @ 50% area						8.00	Achieved sun hours on (hrs) @ 50% area					
Achieved total sun time (hrs)						6.4	Achieved total sun time (hrs)					
Achieved daily sun time * area						23040	Achieved daily sun time * area					

3						40 m ²						
EXISTING STATUS						March 21st						
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area	
24 Hr	% / %	% / %	min	m ²	min*m ²	24 Hr	% / %	% / %	min	m ²	min*m ²	
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0	
7.00	54%	46%	60	18	1,104	7.00	100%	0%	60	0	-1,104	
8.00	29%	71%	60	28	1,704	8.00	100%	0%	60	0	-1,704	
9.00	13%	87%	60	35	2,088	9.00	16%	84%	60	34	2,016	
10.00	13%	87%	60	35	2,088	10.00	13%	87%	60	35	2,088	
11.00	13%	87%	60	35	2,088	11.00	13%	87%	60	35	2,088	
12.00	13%	87%	60	35	2,088	12.00	13%	87%	60	35	2,088	
13.00	13%	87%	60	35	2,088	13.00	13%	87%	60	35	2,088	
14.00	46%	54%	60	22	1,296	14.00	46%	54%	60	22	1,296	
15.00	81%	19%	60	8	456	15.00	81%	19%	60	8	456	
16.00	100%	0%	60	0	0	16.00	100%	0%	60	0	0	
17.00	100%	0%	60	0	0	17.00	100%	0%	60	0	0	
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0	
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0	
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)					
Achieved sun hours on (hrs) @ 50% area						7.00	Achieved sun hours on (hrs) @ 50% area					
Achieved total sun time (hrs)						6.25	Achieved total sun time (hrs)					
Achieved daily sun time * area						15000	Achieved daily sun time * area					



4						35 m2					
EXISTING STATUS						NEW STATUS					
March 21st						March 21st					
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0
7.00	54%	46%	60	16	966	7.00	100%	0%	60	0	-966
8.00	29%	71%	60	25	1,491	8.00	100%	0%	60	0	-1,491
9.00	13%	87%	60	30	1,827	9.00	16%	84%	60	29	1,764
10.00	13%	87%	60	30	1,827	10.00	13%	87%	60	30	1,827
11.00	13%	87%	60	30	1,827	11.00	13%	87%	60	30	1,827
12.00	13%	87%	60	30	1,827	12.00	13%	87%	60	30	1,827
13.00	13%	87%	60	30	1,827	13.00	13%	87%	60	30	1,827
14.00	46%	54%	60	19	1,134	14.00	46%	54%	60	19	1,134
15.00	89%	11%	60	4	231	15.00	89%	11%	60	4	231
16.00	100%	0%	60	0	0	16.00	100%	0%	60	0	0
17.00	100%	0%	60	0	0	17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)				
Achieved sun hours on (hrs) @ 50% area						7.00	Achieved sun hours on (hrs) @ 50% area				
Achieved total sun time (hrs)						6.17	Achieved total sun time (hrs)				
Achieved daily sun time * area						12957	Achieved daily sun time * area				

5						18 m2					
EXISTING STATUS						NEW STATUS					
March 21st						March 21st					
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0
7.00	54%	46%	60	8	497	7.00	100%	0%	60	0	-497
8.00	29%	71%	60	13	767	8.00	100%	0%	60	0	-767
9.00	13%	87%	60	16	940	9.00	15%	85%	60	15	918
10.00	13%	87%	60	16	940	10.00	13%	87%	60	16	940
11.00	13%	87%	60	16	940	11.00	13%	87%	60	16	940
12.00	13%	87%	60	16	940	12.00	13%	87%	60	16	940
13.00	13%	87%	60	16	940	13.00	13%	87%	60	16	940
14.00	46%	54%	60	10	583	14.00	46%	54%	60	10	583
15.00	90%	10%	60	2	108	15.00	90%	10%	60	2	108
16.00	100%	0%	60	0	0	16.00	100%	0%	60	0	0
17.00	100%	0%	60	0	0	17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)				
Achieved sun hours on (hrs) @ 50% area						7.00	Achieved sun hours on (hrs) @ 50% area				
Achieved total sun time (hrs)						6.16	Achieved total sun time (hrs)				
Achieved daily sun time * area						6652.8	Achieved daily sun time * area				

6						23 m2					
EXISTING STATUS						NEW STATUS					
March 21st						March 21st					
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0
7.00	55%	45%	60	10	621	7.00	100%	0%	60	0	-621
8.00	29%	71%	60	16	980	8.00	100%	0%	60	0	-980
9.00	13%	87%	60	20	1,201	9.00	15%	85%	60	20	1,173
10.00	13%	87%	60	20	1,201	10.00	13%	87%	60	20	1,201
11.00	13%	87%	60	20	1,201	11.00	13%	87%	60	20	1,201
12.00	13%	87%	60	20	1,201	12.00	13%	87%	60	20	1,201
13.00	15%	85%	60	20	1,173	13.00	15%	85%	60	20	1,173
14.00	17%	83%	60	19	1,145	14.00	17%	83%	60	19	1,145
15.00	28%	72%	60	17	994	15.00	28%	72%	60	17	994
16.00	59%	41%	60	9	566	16.00	59%	41%	60	9	566
17.00	89%	11%	60	3	152	17.00	89%	11%	60	3	152
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)				
Achieved sun hours on (hrs) @ 50% area						8.00	Achieved sun hours on (hrs) @ 50% area				
Achieved total sun time (hrs)						7.56	Achieved total sun time (hrs)				
Achieved daily sun time * area						10432.8	Achieved daily sun time * area				

7						19 m2					
EXISTING STATUS						NEW STATUS					
March 21st						March 21st					
Time	Shadow	Sunlight	Sun time	Sun area	time * area	Time	Shadow	Sunlight	Sun time	Sun area	time * area
24 Hr	% / %		min	m2	min*m2	24 Hr	% / %		min	m2	min*m2
6.00	100%	0%	60	0	0	6.00	100%	0%	60	0	0
7.00	56%	44%	60	8	502	7.00	100%	0%	60	0	-502
8.00	36%	64%	60	12	730	8.00	100%	0%	60	0	-730
9.00	13%	87%	60	17	992	9.00	13%	87%	60	17	992
10.00	13%	87%	60	17	992	10.00	13%	87%	60	17	992
11.00	13%	87%	60	17	992	11.00	13%	87%	60	17	992
12.00	13%	87%	60	17	992	12.00	13%	87%	60	17	992
13.00	16%	84%	60	16	958	13.00	16%	84%	60	16	958
14.00	91%	9%	60	2	103	14.00	91%	9%	60	2	103
15.00	100%	0%	60	0	0	15.00	100%	0%	60	0	0
16.00	100%	0%	60	0	0	16.00	100%	0%	60	0	0
17.00	100%	0%	60	0	0	17.00	100%	0%	60	0	0
18.00	100%	0%	60	0	0	18.00	100%	0%	60	0	0
19.00	100%	0%	60	0	0	19.00	100%	0%	60	0	0
Required sun hours @ 50% area (hr)						2	Required sun hours @ 50% area (hr)				
Achieved sun hours on (hrs) @ 50% area						6.00	Achieved sun hours on (hrs) @ 50% area				
Achieved total sun time (hrs)						5.49	Achieved total sun time (hrs)				
Achieved daily sun time * area						6258.6	Achieved daily sun time * area				



8						20 m2
EXISTING STATUS						March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	56%	44%	60	9	528	
8.00	36%	64%	60	13	768	
9.00	13%	87%	60	17	1,044	
10.00	13%	87%	60	17	1,044	
11.00	13%	87%	60	17	1,044	
12.00	13%	87%	60	17	1,044	
13.00	16%	84%	60	17	1,008	
14.00	91%	9%	60	2	108	
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)						5.49
Achieved daily sun time * area						6588

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	0
7.00	100%	0%	60	0	0	0	-528
8.00	100%	0%	60	0	0	0	-768
9.00	13%	87%	60	17	1,044	1,044	0
10.00	13%	87%	60	17	1,044	1,044	0
11.00	13%	87%	60	17	1,044	1,044	0
12.00	13%	87%	60	17	1,044	1,044	0
13.00	16%	84%	60	17	1,008	1,008	0
14.00	91%	9%	60	2	108	108	0
15.00	100%	0%	60	0	0	0	0
16.00	100%	0%	60	0	0	0	0
17.00	100%	0%	60	0	0	0	0
18.00	100%	0%	60	0	0	0	0
19.00	100%	0%	60	0	0	0	0
Required sun hours @ 50% area (hr)						2	
Achieved sun hours on (hrs) @ 50% area						5.00	
Achieved total sun time (hrs)						4.41	0.81
Achieved daily sun time * area						5292	0.81

9						20 m2
EXISTING STATUS						March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	56%	44%	60	9	528	
8.00	36%	64%	60	13	768	
9.00	13%	87%	60	17	1,044	
10.00	13%	87%	60	17	1,044	
11.00	13%	87%	60	17	1,044	
12.00	13%	87%	60	17	1,044	
13.00	16%	84%	60	17	1,008	
14.00	91%	9%	60	2	108	
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)						5.49
Achieved daily sun time * area						6588

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	0
7.00	100%	0%	60	0	0	0	-528
8.00	100%	0%	60	0	0	0	-768
9.00	13%	87%	60	17	1,044	1,044	0
10.00	13%	87%	60	17	1,044	1,044	0
11.00	13%	87%	60	17	1,044	1,044	0
12.00	13%	87%	60	17	1,044	1,044	0
13.00	16%	84%	60	17	1,008	1,008	0
14.00	91%	9%	60	2	108	108	0
15.00	100%	0%	60	0	0	0	0
16.00	100%	0%	60	0	0	0	0
17.00	100%	0%	60	0	0	0	0
18.00	100%	0%	60	0	0	0	0
19.00	100%	0%	60	0	0	0	0
Required sun hours @ 50% area (hr)						2	
Achieved sun hours on (hrs) @ 50% area						5.00	
Achieved total sun time (hrs)						4.41	0.81
Achieved daily sun time * area						5292	0.81

10						21 m2
EXISTING STATUS						March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	58%	42%	60	9	529	
8.00	39%	61%	60	13	769	
9.00	27%	73%	60	15	920	
10.00	13%	87%	60	18	1,096	
11.00	13%	87%	60	18	1,096	
12.00	13%	87%	60	18	1,096	
13.00	13%	87%	60	18	1,096	
14.00	13%	87%	60	18	1,096	
15.00	43%	57%	60	12	718	
16.00	73%	27%	60	6	340	
17.00	89%	11%	60	2	139	
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)						7.06
Achieved daily sun time * area						8895.6

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	0
7.00	100%	0%	60	0	0	0	-529
8.00	100%	0%	60	0	0	0	-769
9.00	72%	28%	60	6	353	353	-567
10.00	13%	87%	60	18	1,096	1,096	0
11.00	13%	87%	60	18	1,096	1,096	0
12.00	13%	87%	60	18	1,096	1,096	0
13.00	13%	87%	60	18	1,096	1,096	0
14.00	13%	87%	60	18	1,096	1,096	0
15.00	43%	57%	60	12	718	718	0
16.00	73%	27%	60	6	340	340	0
17.00	89%	11%	60	2	139	139	0
18.00	100%	0%	60	0	0	0	0
19.00	100%	0%	60	0	0	0	0
Required sun hours @ 50% area (hr)						2	
Achieved sun hours on (hrs) @ 50% area						6.00	
Achieved total sun time (hrs)						5.58	0.80
Achieved daily sun time * area						7031	0.80

11						380 m2
EXISTING STATUS						March 21st
Time	Shadow	Sunlight	Sun time	Sun area	time * area	change
24 Hr	% / %		min	m2	min*m2	
6.00	100%	0%	60	0	0	
7.00	59%	41%	60	156	9,348	
8.00	37%	63%	60	239	14,364	
9.00	11%	89%	60	338	20,292	
10.00	11%	89%	60	338	20,292	
11.00	11%	89%	60	338	20,292	
12.00	11%	89%	60	338	20,292	
13.00	11%	89%	60	338	20,292	
14.00	11%	89%	60	338	20,292	
15.00	11%	89%	60	338	20,292	
16.00	11%	89%	60	338	20,292	
17.00	28%	72%	60	274	16,416	
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)						8.88
Achieved daily sun time * area						202464

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	0
7.00	100%	0%	60	0	0	0	-9,348
8.00	59%	41%	60	156	9,348	9,348	-5,016
9.00	15%	85%	60	323	19,380	19,380	-912
10.00	11%	89%	60	338	20,292	20,292	0
11.00	11%	89%	60	338	20,292	20,292	0
12.00	11%	89%	60	338	20,292	20,292	0
13.00	11%	89%	60	338	20,292	20,292	0
14.00	11%	89%	60	338	20,292	20,292	0
15.00	11%	89%	60	338	20,292	20,292	0
16.00	11%	89%	60	338	20,292	20,292	0
17.00	28%	72%	60	274	16,416	16,416	0
18.00	100%	0%	60	0	0	0	0
19.00	100%	0%	60	0	0	0	0
Required sun hours @ 50% area (hr)						2	
Achieved sun hours on (hrs) @ 50% area						9.00	
Achieved total sun time (hrs)						8.21	0.93
Achieved daily sun time * area						187188	0.93



End of Report

