

Scholarstown House

Daylight and Sunlight Assessment Report
in response to RFI (reg. ref. SD22A/0401)

Applicant: Emmaville Ltd.

"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." - BRE 209

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The full set of results for each assessment and shadow study can be found in the appendix section of this report.

1.0 Executive Summary

1.1 Summary of Assessment

3D Design Bureau (3DDB) were commissioned to carry out a daylight and sunlight assessment for the protected structure, namely Scholarstown House, located within the proposed residential development at Scholarstown Road, Dublin 16. The full set of assessments, along with an accompanying shadow study, and this written report were produced to address the request for further information made by South Dublin County Council (SDCC). The applicant was asked to test Scholarstown House in terms of daylight/sunlight and the impact the revised proposed apartment building would have on Scholarstown House and its proposed gardens. As such, 'Impact Assessment' studies evaluated how the revised apartment building will impact the amount of daylight and sunlight that reaches the windows of Scholarstown House. 'Scheme Performance' studies measured the ability of the proposed internal configuration of Scholarstown House to provide adequate levels of daylight to future occupants. In addition, 'Scheme Performance' assessments to Scholarstown House in its current state were carried out to allow for a comparison with the performance of the proposed design layout.

The primary assessments carried out for this report are all in accordance with the BRE Guidelines. The "baseline model state" and the "proposed model state" have been built both to measure the levels of effect in the 'Impact Assessment' studies and to allow for a comparison of results in the 'Scheme Performance' studies. Model states are described below:

Baseline model state

The baseline model state reflects the do nothing scenario. It includes the surrounding context and the subject site in their current standing. Existing trees are also included and Scholarstown House is represented in its current standing.

Proposed model state

The proposed model state reflects the subject site if the development is built as per the proposed design. Proposed trees are also included and Scholarstown House is represented in its proposed configuration.

A more detailed definition of model states is provided in the 'Methodology' section on Page 11.

The two main categories of assessments, 'Impact Assessment' and 'Scheme Performance', have been broken down in subcategories as summarised below:

Impact Assessment

The impact assessment that was carried out for the purpose of this report has studied the potential levels of effect the protected structure would sustain should the proposed be built as per the revised design proposal. The effects were assessed in the baseline state versus the proposed state; A visual representation of the model states can be seen in the renderings of the shadow study in the appendix section on Page 27.

This impact assessment to Scholarstown House covers the following metrics:

- Effect on daylight (VSC) of the windows.
- The effect to the annual and winter probable sunlight hours (APSH/WPSH) of the windows.

Scheme Performance

Daylight access to the habitable rooms of the proposed layout of Scholarstown House, in the proposed state, was assessed through a Spatial Daylight Autonomy (SDA). Additionally, daylight access to the habitable rooms of the existing configuration of Scholarstown House, in the baseline state, was assessed to allow for comparison between the two model states. For definition of model states please refer to section "4.1.1 Building the Model States" on page 11.

Sunlight access for the same rooms has been quantified through a Sunlight Exposure (SE) assessment. Both the proposed layout of Scholarstown House and its existing configuration were assessed for SE, in the proposed state and the baseline state respectively.

A Sun On Ground (SOG) study has also been carried out to indicate the level of sunlight on March 21st in the 2 no. proposed private gardens of Scholarstown House. Qualitative assessment may also be taken using the false colour plans provided in section C.1 on page 74 and the hourly rendering of the shadow study on Page 65.

Supplementary scheme performance studies have also been carried out. These include an SDA assessment under the I.S. EN 17037 criterion, and a No Sky Line (NSL) study within within the habitable rooms of Scholarstown House in the two states.

Please see Page 4 for a detailed breakdown of results.

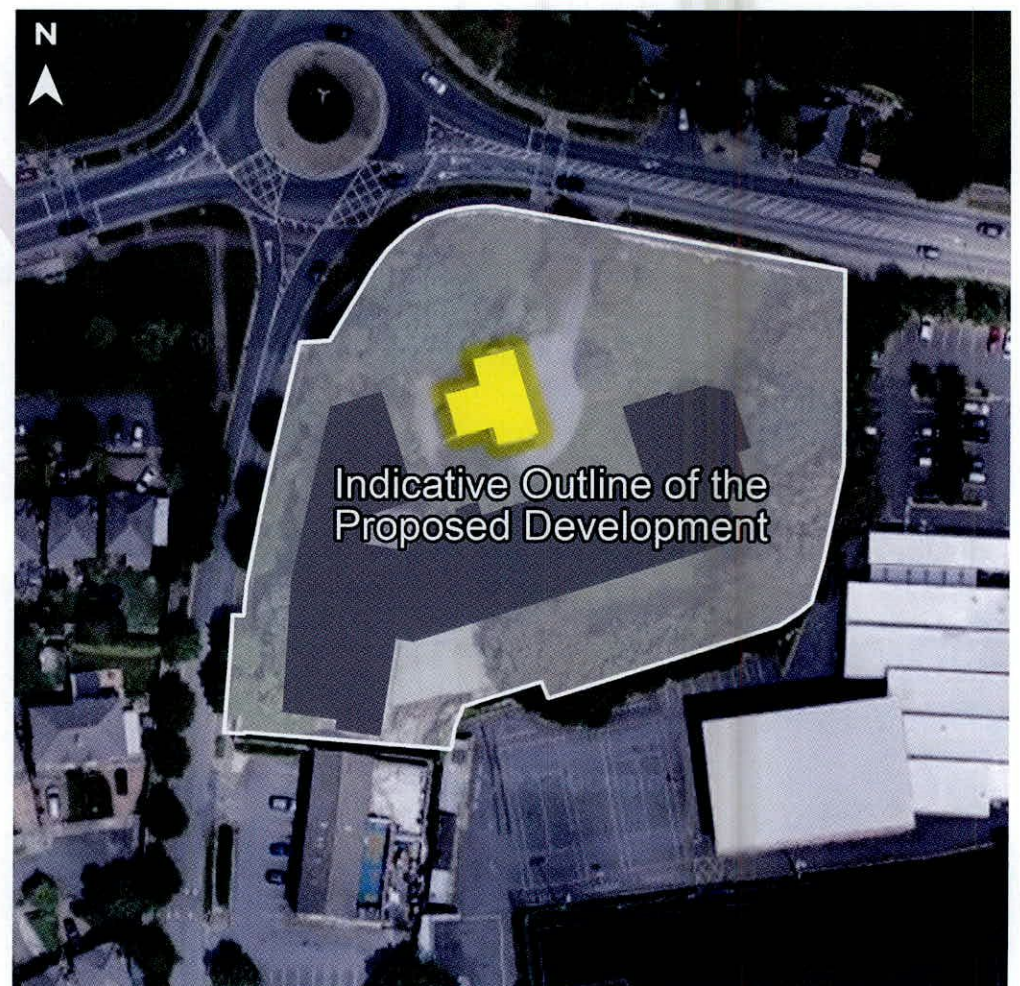


Figure 1.1: Scope of assessments, Scholarstown House.

1.2 Impact Assessment Results Overview:

Effect to Vertical Sky Component (VSC) on neighbouring properties:

The effect on VSC has been assessed for 9 no. windows/rooms.

Using the rationale explained in section 3.2 on page 9, the effect to VSC on 5 no. of these windows (or rooms if an average of multiple windows has been taken) would be considered *negligible*, 3 no. *minor adverse* and 1 no. *moderate adverse*.

Effect to Annual Probable Sunlight Hours (APSH) on neighbouring properties:

The effect on APSH has been assessed for 7 no. of windows/rooms.

Using the rationale explained in section 3.2 on page 9, the effect on the APSH of all of these windows or rooms would be considered *negligible*.

Effect to Winter Probable Sunlight Hours (WPSH) on neighbouring properties:

The effect on WPSH has been assessed for 7 no. of windows/rooms.

Using the rationale explained in section 3.2 on page 9, the effect on the WPSH of 1 no. of these windows or rooms would be considered *negligible*, 1 no. *minor adverse*, 4 no. *major adverse* and 1 no. has been considered *non-applicable*.

Note: In instances where a baseline value is particularly low, levels of effects can appear exaggerated. To mitigate against such occurrences, if the baseline value in the VSC, APSH/WPSH or SOG studies is below 1%, 3DDB have categorised the level of effect as n.a. (non-applicable).

For further explanation of the results please see section "5.1 Analysis of Impact Assessment Results" on page 17.

1.3 Scheme Performance Results Overview:

Sun On Ground (SOG) in proposed gardens:

The level of sunlight on March 21st has been assessed for the 2 no. proposed amenity spaces. Both spaces met the criteria set out in the BRE Guidelines.

Sunlight Exposure (SE):

- **existing state:**

The existing configuration of Scholarstown House consists of 1 no. unit, which was assessed for Sunlight Exposure (SE). Using the rationale explained in section 3.3 on page 10, with and without the inclusion of deciduous trees, the level of sunlight exposure for the unit is considered high.

- **proposed state:**

The proposed configuration of Scholarstown House consists of 2 no. units, which were assessed for Sunlight Exposure (SE). Using the rationale explained in section 3.3 on page 10, with and without the inclusion of deciduous trees, the level of sunlight exposure for the 2 no. units is considered *high*.

The results for each room is also provided in section 5.2.2 on page 18.*

Spatial Daylight Autonomy (SDA):

- **existing state:**

The Spatial Daylight Autonomy (SDA) has been assessed for 9 no. habitable rooms. Under the criteria as set out in the BRE 209, the SDA value in 3 & 5 no. habitable rooms meet or exceed their target values in the summer and winter time calculations respectively.

- **proposed state:**

The Spatial Daylight Autonomy (SDA) has been assessed for 9 no. habitable rooms. Under the criteria as set out in the BRE 209, the SDA value in 2 no. habitable rooms meet or exceed their target values in both summer and winter time calculations.

1.4 Supplementary Assessment Results Overview

Spatial Daylight Autonomy (SDA) under I.S. EN 17037 Criterion:

- **existing state:**

The Spatial Daylight Autonomy (SDA) under I.S. EN 17037 criterion has been assessed for 9 no. habitable rooms. None of them would meet the target value.

- **proposed state:**

The Spatial Daylight Autonomy (SDA) under I.S. EN 17037 criterion has been assessed for 9 no. habitable rooms. None of them would meet the target value.

No Sky Line (NSL):

- **existing state:**

The No Sky Line (NSL) has been assessed for 9 no. habitable rooms. Under the criteria applied by 3DDB, the NSL value in 8 no. habitable rooms meet or exceed their target value.**

- **existing model state:**

The No Sky Line (NSL) has been assessed for 9 no. habitable rooms. Under the criteria applied by 3DDB, the NSL value in 4 no. habitable rooms meet or exceed their target value.**

For further explanation of the results please see section "5.2 Analysis of Scheme Performance Results" on page 18.

* For a unit to be compliant under BRE 209, only one habitable room within the unit needs to meet the guideline values.

** As the BRE Guidelines do not provide a recommended minimum for NSL in proposed developments, compliance rates for NSL are calculated using a criteria applied by 3DDB.

2.0 Guidelines / Standards

Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities. (2022)

In December of 2022, the Department of Housing, Planning and Local Government published a guidance document for new apartments, *Sustainable Urban Housing: Design Standards for New Apartments*. This document makes reference to, *IS EN 17037:2018: Daylight in Buildings* (the European Standard), *BS EN 17037:2018: Daylight in Buildings* (the UK National Annex to the European Standard) and to the 3rd edition of Building Research Establishment's *Site Layout Planning for Daylight and Sunlight: a Guide to Good Practice* (BRE 209 2022).

Note: Section 3.2 of the Urban Development and Building Height Guides 2018, provides similar guidance as above. However, it should be noted that at the time of publication of the *Urban Development and Building Height Guidelines (2018)*, BRE 209 was in the 2nd edition, first published in 2011. Since then, a 3rd edition of BRE 209 has been published (June 2022) and the 2nd edition has been withdrawn. BRE 209 no longer references *BS 8206-2:2008*, which has also been withdrawn. The primary standard used as reference in BRE 209 edition 3 is *BS EN 17037*.

BRE - Site Layout Planning for Daylight and Sunlight: a Guide to Good Practice (2022)

This document will be referred to as *the BRE Guidelines* in this report.

At the time of writing this report, the BRE Guidelines are in the third edition (BRE 209). The BRE Guidelines sets out recommendations for appropriate levels of daylight and sunlight within a proposed development, as well as providing guidance on impacts arising from a proposed development to surrounding properties and amenity areas.

The BRE Guidelines have been used as the primary guiding document in the assessments that have been carried out for the purpose of this report, as they are referenced in Irish guidance documents:

- *Sustainable Urban Housing: Design Standards for New Apartments*, as published in December of 2022 by the Department of Housing, Planning and Local Government and Heritage.
- *Urban Development and Building Heights*, as published in December of 2018 by the Government of Ireland.

Whilst the primary reference document for the BRE Guidelines is *BS EN 17037*, there are some subtle differences between BRE 209 and *BS EN 17037*. For the purposes of this report, the BRE Guidelines (BRE 209) is considered the primary reference.

A detailed description of the various recommendations for impact assessment and scheme performance is contained in section "4.2 Quantitative Impact Assessment Overview" on page 12 of this report.

EN 17037:2018: Daylight in Buildings (2018)

EN 17037 is a European Standard that provides recommendations for daylight within spaces. (Emphasis added)

EN 17037:2018 recommends that 300 lux should be received across 50% of a hypothetical reference plane of any room for half of the daylight hours of the year, with no less than 100 lux received across 95% of the reference plane. No distinction is made for the function of the room for target lux levels within this standard.

The target values given within *EN 17037* are particularly onerous, especially where increased density is desired in a residential setting. It is the opinion of 3D Design Bureau that these target values are less appropriate for proposed residential developments than the recommendations made in the BRE Guidelines, which apply room-specific target values for appropriate LUX levels.

Recommendations made in *EN 17037* regarding Sunlight Exposure for proposed developments have been incorporated into the BRE Guidelines. As such, Sunlight Exposure is the primary assessment for sunlight within habitable rooms of the proposed development.

EN 17037 also makes recommendations related to glare and quality of view out. These aspects are not addressed in this report as these assessments have less relevance in a residential context where occupants have the freedom to move about in order to improve level of glare or alter the view out.

I.S. EN 17037:2018 Daylight in Buildings (2018)

I.S. EN 17037 is a direct adoption of the European Standard *EN 17037:2018* that provides recommendations for daylight within spaces.

The target values given within *I.S. EN 17037* are directly adopted from *EN 17037*. As such, there are no room-specific recommendations for daylight. Because of these limitations, it is the expert opinion of 3D Design Bureau, that the recommendations made in the *BRE Guidelines* are more appropriate to use than that within *I.S. EN 17037*.

Furthermore, Appendix 16 (Section 3.4) of the Dublin City Development Plan 2022 states:

"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*. It is important to note that no amendments were made to this document and unlike *BS EN 17037*, it does not contain a national annex. It offers only a single target for new buildings (there are no space by space targets – e.g. a kitchen would have the same target as a warehouse or office). It does not offer guidance on how new developments will impact on surrounding existing environments. These limitations make it unsuitable for use in planning policy or during planning applications. *BR 209* must still be used for this purpose".

Regardless, a supplementary SDA study has been carried out using the same rooms as assessed under the primary study (BRE 209) using the criterion of *I.S. EN 17037*, with compliance rates stated. However, this should be considered a supplementary study. Compensatory design measures may not be put forward for non-compliant rooms under this standard as the rationale for non-compliance may be that targeting compliance with the *I.S. EN 17037* daylight recommendations is not conducive to a well-balanced proposal.

BS EN 17037:2018: Daylight in Buildings (2018)

BS EN 17037 is the British Annex to the European Standard (see above). The British Annex acknowledges that a rigid application of the European Standard could prove to be a difficult task. It 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, particularly dwellings.”

In BS EN 17037, daylight recommendations differ depending on the function of a room. Target lux levels are applied across 50% of the reference plane of a room for half of the daylight hours. The target lux levels are:

- 200 Lux for kitchens
- 150 Lux for living rooms
- 100 Lux for bedrooms

No minimum is stated to be achieved across 95% of the working plane. If a space has dual purposes it is advised that the higher target value should be applied.

Summary

It is the expert opinion of 3D Design Bureau, that the BRE Guidelines (*BRE 209*) are the most appropriate guiding document for daylight and sunlight assessment, as such BRE 209 will be the primary reference document for all primary studies carried out for this report. For daylight within proposed developments, a supplementary study has been carried out under the criteria of *I.S. EN 17037*.

Neither the British Standard, European Standard, British Annex to the European Standard nor the BRE Guide set out rigid standards or limits. They are all considered advisory documents. The BRE Guide is preceded by the following very clear statement as to how the design advice contained therein should be used:

“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.”

That the recommendations of the BRE Guide are not suitable for rigid application to all developments in all contexts, is of particular importance in the context of national and local policies for the consolidation and densification of urban areas or when assessing applications for highly constrained sites (e.g. lands in close proximity or immediately to the south of residential lands). A compromise may have to be made concerning daylight and sunlight compliance to achieve national or local planning objectives.

3.0 Glossary

3.1 Terms and Definitions

Skylight

Non directional ambient light cast from the sky and environment.

Sunlight

Direct parallel rays of light emitted from the sun.

Daylight

Combined skylight and sunlight.

Overcast sky model

A completely overcast sky model, used for daylight calculation.

Cloudless sky model

A completely cloudless sky model, used for sunlight exposure calculation.

Model State

The model state is a term used to describe the configuration of the digital model used to run analysis. Model states will typically reflect a baseline state and a proposed or cumulative state. For a definition of the model states used in the analysis carried out in this report, please refer to "Preparing the analytical model" on page 11.

Vertical Sky Component (VSC)

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

Annual Probable Sunlight Hours (APSH) / Winter Probable Sunlight Hours (WPSH)

Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours are a measure of sunlight that a given window may expect over a year period (1 Jan - 31 Dec), or the winter period (21 Sep - 21 Mar) respectively.

North facing windows may receive sunlight on only a handful of occasions in a year, and windows facing eastwards or westwards will receive sunlight only at certain times of the day. Taking this into account, the BRE Guidelines suggest that windows with an orientation within 90 degrees of due south should be assessed.

Sun On Ground (SOG)

Assessment of what portion of a garden or amenity space is capable of receiving 2 hours or more of direct sunlight on March 21st.

Sunlight Exposure (SE)

The number of hours of direct sunlight a room can expect to receive on a given date between February 1st and March 21st at a determined point on the windows.

Spatial Daylight Autonomy (SDA)

Spatial Daylight Autonomy assesses whether a space receives sufficient daylight on a working plane during standard operating hours on an annual basis. For compliance, the target value is achieved across 50% of the working plane for half of the occupied period.

No Sky Line (NSL)

The no sky line divides points on the working plane which can and cannot see the sky.

Working plane

Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 850 mm above the floor in houses and factories, 700 mm above the floor in offices. The plane is offset 300mm from the room boundaries under BRE 209 criteria, and 500mm from the room boundaries under I.S. EN 17037 criteria.

LKD

Living / Kitchen / Dining room.

BRE Target Value

When assessing the effect a proposed development would have on a neighbouring property, a target value will be applied. This applied target value is generated as per the criteria set out for each study in the BRE Guidelines.

Alternative Target Value

It could be appropriate to use alternative target values when conducting assessment of effect on existing properties. If such instances occur the rationale will be clearly explained and the instances where the alternative target values have been applied will be clearly identified.

Level of BRE Compliance

Each table in the study that has a column identified as "Level of BRE Compliance", identifies how an assessed instance performs in relation to the appropriate target value. If the instance is in compliance with the recommendations as made in the BRE Guidelines the value will be expressed as "BRE Compliant". If the instance does not meet the criteria as set out in the BRE Guidelines a percentage will be expressed to determine the level of compliance with the recommendation. This value determines the definition of effect.

LUX

Lux is a standardised unit of measurement of light level intensity. A measurement of 1 lux is equal to the illumination of a one metre square surface that is one metre away from a single candle.

3.2 Definition of Effects

The BRE Guidelines state that:

“Adverse impacts occur when there is a significant decrease in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space. The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied.”

As such, planning authorities should consider a range of localised factors when making decisions. The terminology suggested in the BRE Guidelines is as listed below, whilst the assessment of impact should depend on a combination of factors. The BRE Guidelines also state:

“Where a new development affects a number of existing buildings or open spaces, the clearest approach is usually to assess the impact on each one separately. It is also clearer to assess skylight and sunlight impacts separately.”

Taking this advice, 3DDB have categorised the level of effect on each window/room/open space on an individual basis. In quantifying the levels of effect, 3DDB have assigned numerical values to the levels of compliance with the BRE recommendations. By applying a numerical logic to the terminology used in defining the levels of effect there is no ambiguity regarding how the levels of effect have been categorised within this report.

The list of definitions given below is taken from ‘Appendix H: Environmental impact assessment’ of the BRE 209 with a clear indication of how they have been applied in the context of this report.

Negligible

For the purposes of this Sunlight and Daylight Assessment Report an ‘Negligible’ level of effect will be stated if the level of effect is within the criteria as recommended in the BRE Guidelines and the applied target value has been achieved.

Minor Adverse

For the purposes of this Sunlight and Daylight Assessment Report, a ‘Minor Adverse’ level of effect will be stated if the level of effect is marginally outside of the criteria as stated in the BRE Guidelines. Typically a ‘Minor Adverse’ level of effect will be applied if the level of daylight or sunlight is reduced to between 80-99% of the applied target value.

Moderate Adverse

For the purposes of this Sunlight and Daylight Assessment Report, a ‘Moderate Adverse’ level of effect will be stated if the level of daylight or sunlight is reduced to between 50-80% of the applied target value. A ‘Moderate Adverse’ level of effect would be quite typical in instances where a proposed development is planned on an under-developed plot of land. The level of daylight and/or sunlight of an assessed property is reduced in a manner that is consistent with similar properties in the immediate surrounding area.

Major Adverse

An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. For the purposes of this Sunlight and Daylight Assessment Report a ‘Major Adverse’ level of effect will be stated if the proposed development reduces the availability of daylight or sunlight of a neighbouring property to significantly below a baseline level. A ‘Major Adverse’ level of effect will be stated if the level of daylight or sunlight is reduced to less than 50% of the applied target value.

Beneficial Impact

In relation to sunlight or daylight access, it is conceivable that a proposed development could yield positive effects on the neighbouring properties. In such circumstances the development would typically involve a reduction to the size or scale of built form (e.g. such as the demolition of a building or the removal of a large belt of evergreen trees, which might result in an increase in light access). Where such improvements occur, a ‘Beneficial Impact’ will only be stated if the ratio of change is greater than 1.20 (an improvement of 20%). Should less perceptible improvements occur an ‘Negligible’ level of effect will be stated.

Not Applicable (n.a.)

In instances where a baseline value is particularly low, levels of effects can appear exaggerated. To mitigate against such occurrences, if the baseline value in the VSC, APSH/WPSH or SOG studies is below 1%, 3DDB have categorised the level of effect as n.a. (not applicable).

Averaged Windows (-)

If it can be determined or reasonably assumed that multiple windows are servicing the same room, each window will be assessed and a weighted average will be calculated. In such instances the level of effect for the room will be stated, but the level of effect for the individual windows contributing towards the average will be left blank in the table. This will be indicated in the tables with the dash symbol. (-)

3.3 Definition of Levels of Sunlight Exposure

For interiors, access to sunlight can be quantified. BRE 209 recommends that a space should receive a minimum of 1.5 hours of direct sunlight on a selected date between 1 February and 21 March with cloudless conditions. It is suggested that 21 March (equinox) be used. The medium level of recommendation is three hours and the high level of recommendation four hours. For dwellings, at least one habitable room, preferably a main living room, should meet at least the minimum criterion.

The level of sunlight exposure will be stated for each assessed room in the tables under section "C.2 Sunlight Exposure (SE) in Proposed Units" on page 38. Below is a list of the terms used to categorise the levels of sunlight exposure:

Non-compliant

A non-compliant level of sunlight exposure will be stated if the potential sunlight for the assessed room is less than 1.5 hours on March 21st. Note: the recommendation is that a room within a proposed unit is capable of receiving 1.5 hours of direct sunlight on March 21st. If an individual room does not achieve this recommendation, it does not mean that the unit is non compliant.

Minimum

A minimum level of sunlight exposure will be stated if the potential sunlight for the assessed room is between 1.5 hours and 3 hours on March 21st.

Medium

A medium level of sunlight exposure will be stated if the potential sunlight for the assessed room is between 3 hours and 4 hours on March 21st.

High

A high level of sunlight exposure will be stated if the potential sunlight for the assessed room is greater than 4 hours on March 21st.

4.0 Methodology

4.1 Preparing the analytical model

4.1.1 Building the Model States

The project architect, C+W O'Brien, supplied 3DDB with 3D models of the revised apartment building and Scholarstown House. Revised landscape drawings were issued by CSR Land Planning & Design. As standard practice, a combination of survey information, aerial photography, available online photography and/or ordnance survey information were used to model the surrounding context and assessed buildings. **Note:** as the information gathered from online sources is not as accurate as surveyed information, some tolerance should be allowed to the placement of windows, boundary treatments and the results generated.

Baseline model state

The baseline model state reflects the existing environment. It includes the surrounding context and the subject site in their current standing. This includes any structures that are to be demolished as part of this application. Scholarstown House was included in its current standing using the model provided by the architect. Existing trees were placed in the model using photogrammetry information combined with the tree schedule and the tree survey plan to determine their size, position and species.

The BRE Guidelines recommend that impact assessments should be carried out if any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal. This criteria has been used to ensure all windows that could possibly sustain an adverse level of effect have been included in the model when running VSC and APSH/WPSH assessments.

Proposed model state

The proposed model state reflects the subject site if the development is built as per proposed design revision. This includes the demolishing of structures, landscaping etc. Proposed trees were modelled using the information provided by the landscape architect regarding size, position and species.

All of the above information was subsequently used to prepare a digital analytical model in software specifically designed for daylight and sunlight analysis.

4.1.2 Trees

It is generally not possible to accurately represent trees in a digital 3D model as the size and shape will differ greatly from tree to tree. When modelling trees for this assessment assumptions have been made and tree geometry has been simplified.

For the purpose of the analysis carried out in this report, the position, size and species of existing trees and hedges have been determined using photogrammetry information combined with the tree schedule and the tree survey plan. The shape of the trees have been simplified for the modelling purposes. Simplified models of proposed trees within the development have also been included according to the information provided by the landscape architect.

BRE 209 provides guidance on how deciduous trees should be treated depending on the study being carried out, as summarised below:

Impact to Vertical Sky Component (VSC) and Annual / Winter Probable Sunlight Hours (APSH / WPSH)

The BRE Guidelines state that when assessing the effect a new development would have on existing buildings, it is usual to ignore the effect of deciduous trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf. Evergreen trees should be included, particularly where a dense belt or group of evergreens is specifically planned as a windbreak or for privacy purposes.

Sun On Ground (SOG)

The BRE Guidelines states that when assessing the impact of buildings on sunlight in gardens:

"...trees and shrubs are not normally included in the calculation unless a dense belt or group of evergreens is specifically planned as a windbreak or for privacy purposes. This is partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees)."

As such, deciduous trees have not been included in the calculation of SOG in either the impact or scheme performance assessments. Evergreen trees should be included, particularly where a dense belt or group of evergreens is specifically planned as a windbreak or for privacy purposes.

Sunlight Exposure (SE)

The BRE Guidelines state that as deciduous trees would not be in full leaf on the recommended assessment date (March 21st), sunlight would be expected to penetrate deciduous trees. However, as trees have so many variables, it is impossible to accurately represent how they would affect sunlight at a given time. The suggested methodology (BRE 209) to allow for this is to run the sunlight exposure study in two states. Once with trees as opaque objects and secondly without deciduous trees in the assessment model. This gives a range of potential sunlight hours.

Spatial Daylight Autonomy (SDA)

BRE 209 recommends when assessing daylight in a proposed building, it is appropriate to run the assessment with trees represented in both winter and summer conditions. Light transmittance values of 60% and 20% have been applied to deciduous tree canopies for winter and summer assessments respectively. A light transmittance value of 20% has been applied to evergreen trees throughout the year.

I.S. EN 17037 does not give any guidance on how trees should be represented. For the purpose of this report, the SDA calculation under the I.S. EN 17037 criteria has been carried out with deciduous trees in summertime foliage to represent the worst case scenario.

No Sky Line (NSL)

Because some sky can usually be seen through a tree canopy, deciduous trees have not been included in the No Sky Line assessment model. Evergreen trees may be included in this assessment, particularly if there is a dense belt or group planned for windbreak or for privacy purposes.

Shadow Study

The hourly renderings of the shadow study have been generated with evergreen trees represented as opaque objects, where applicable, and without deciduous trees. This method best represents the methodology used for the impact assessment and allows for a better understanding of potential shadows cast by the proposed development through the tree canopy.

4.2 Quantitative Impact Assessment Overview

4.2.1 Effect on Vertical Sky Component (VSC)

A proposed development could potentially have a negative effect on the level of daylight that a neighbouring property receives, if the obstructing building is large in relation to their distance from the existing dwelling.

Figure 4.1 shows a decision chart taken from the BRE Guidelines which is used to determine the appropriate assessment to be carried out when assessing impact to daylight.

For the proposed development, all properties within a radius of three times the height of the proposed development have been considered for impact assessment. Should the angle from the windows to the proposed development subtend 25° in a perpendicular section, then VSC is calculated in both the baseline and proposed model states, and a comparison made.

A no skyline assessment requires accurate dimensions and layouts of both rooms and windows. However, the required information is rarely available for existing dwellings. As such, it is not common practice to carry out a no sky line (NSL) impact assessment.

VSC can be defined as the amount of skylight that falls on a vertical wall or window.

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.

The BRE Guidelines state that if the VSC is:

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

The VSC for each window/room will be calculated in the relevant model states, as outlined in section 4.1 on page 11. A comparison between the results generated with these model states will determine the level of effect.

A proposed development could possibly have a noticeable effect on the daylight received by an existing window, if the following occurs:

- The VSC value drops below the guideline value of 27%; **and**
- The VSC value is less than 0.8 times the existing value.

Under BRE Guidelines, only habitable rooms need to be assessed for effect to VSC. In the absence of design layouts or floor plans, or information pertaining to the internal 'as-built' layouts, assumptions have been made regarding the function of the windows of the existing surrounding properties (i.e. what room type is served by the window being assessed).

Typically, the effect on ground floor windows is greater than the effect on windows of subsequent floors. However, floors above ground floor level have been included in this study to give a more comprehensive assessment.

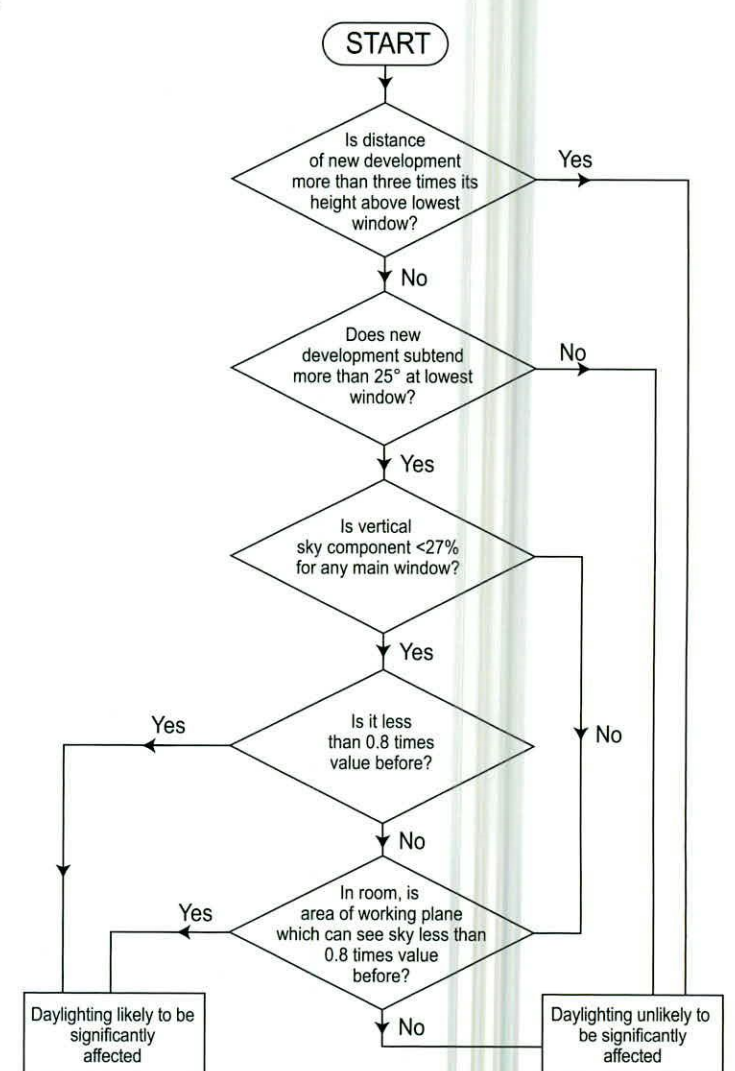


Figure 4.1: VSC decision chart, taken from BRE 209.

Assessment Points

The assessment points for measuring VSC are taken from the centre point of a standard window. If the window being assessed is a full height window, the assessment point is taken at 1600 mm above the finished floor level.

Weighted Averages

If it can be determined or reasonably assumed that multiple windows are servicing the same room, each window has been assessed and a room VSC has been calculated by applying a weighted average calculation to the results.

When calculating weighted averages the proportion of the total glazing area represented for each window is taken into account. It should be noted that assumptions typically need to be made regarding window sizes, so a tolerance should be applied regarding calculated weighted averages.

In instances where weighted averages have been calculated, the VSC figures will be stated for each window on an individual basis as well as the calculated figure to be applied to the room, but the level of effect will only be stated for the room.

Project Assessment

The VSC impact assessment has been carried out on the windows/rooms of the neighbouring properties that could be affected by the proposed development as outlined above.

The results for the VSC assessment can be found in the appendix results section A.1 on page 23, with analysis of the results in section 5.1.1 on page 17.

4.2.2 Effect on Annual/Winter Probable Sunlight Hours (APSH/WPSH)

Annual/Winter Probable Sunlight Hours (APSH/WPSH) is a measure of sunlight that a given window may expect to receive over the period of a year. The percentage of APSH/WPSH that windows in existing properties receive might be affected by a proposed development.

A proposed development could potentially have a negative effect on the level of sunlight that a neighbouring property receives, if the obstructing building is located to the south and is large in relation to their distance from the existing dwelling. This can be determined if the distance of a proposed development is less than three times its height from an existing dwelling, or if the angle from an existing window to the proposed development subtends 25° to the horizontal when measured in a perpendicular section.

Whether a window is considered for APSH/WPSH impact assessment is based on its orientation. A south-facing window will, in general, receive the most sunlight. North facing windows may receive sunlight on only a handful of occasions in a year, and windows facing eastwards or westwards will receive sunlight only at certain times of the day. Taking this into account, the BRE Guidelines suggest that windows with an orientation within 90 degrees of due south should be assessed.

The above criteria has been used to ensure all windows that could possibly sustain an adverse level of effect have been included in the APSH/WPSH assessment.

The APSH/WPSH for each of the assessed windows will be calculated in the relevant model states, as outlined in section 4.1 on page 11. A comparison between the results generated with these model states will determine the level of effect.

If it can be determined or reasonably assumed that multiple windows are servicing the same room, APSH/WPSH has been calculated for the room rather than the individual windows.

If the room can receive more than 25% of APSH, including at least 5% of the WPSH, then the room should receive enough sunlight.

A proposed development could possibly have a noticeable effect on the sunlight received by an existing window, if the following occurs:

- The APSH value drops below the annual (25%) or winter (5%) guidelines; **and**
- The APSH value is less than 0.8 times the baseline value; **and**
- There is a reduction of more than 4% to the annual APSH.

Under BRE Guidelines, only main living-rooms need to be assessed for effect on sunlight. In the absence of design layouts or floor plans, or information pertaining to the internal 'as-built' layouts, all windows assumed to be servicing habitable rooms have been included in the APSH/WPSH assessment provided they are orientated within 90° of due south and are in relative close proximity to the proposed development.

Typically, the effect on ground floor windows is greater than the effect on windows of subsequent floors. However, floors above ground floor level have been included in this study to give a more comprehensive assessment.

If it can be determined or reasonably assumed that multiple windows are servicing the same room, the APSH/WPSH has been assessed for the room as opposed to each individual window. When APSH/WPSH is assessed for a room it considers sunlight coming from all windows, but does not double count if sunlight is reaching multiple windows at the same time.

Assessment Points

The assessment points for measuring APSH/WPSH are taken from the centre point of a standard window. If the window being assessed is a full height window, the assessment point is taken at 1600 mm above the finished floor level.

Project Assessment

The APSH/WPSH impact assessment has been carried out on the windows/rooms of the neighbouring properties that could be affected by the proposed development as outlined above.

The results for the APSH/WPSH assessment can be found in the appendix results section A.2 on page 25, with analysis of the results in section on page 17.

4.3 Qualitative Assessment - Shadow Study

A shadow study has been carried out to allow a qualitative comparison between the relevant model states, as outlined in section 4.1 on page 11. This visual representation of the shadows cast by the proposed development can be found in the hourly shadow diagrams in the appendix results section B.0 on page 27.

Hourly renderings have been shown from sunrise to sunset on the following dates:

- Spring equinox: March 21st Sunrise 6:25 | Sunset 18:40. (GMT)
- Summer solstice: June 21st. Sunrise 4:57 | Sunset 21:57. (BST)
- Winter solstice: December 21st Sunrise 8:38 | Sunset 16:08. (GMT)

The hourly renderings of the shadow study will be generated without deciduous trees and with evergreen trees, where applicable, represented as opaque objects when present in the model states.

Note: The spring equinox (March 21st) and autumn equinox (21st September) yield similar shadows, albeit with a one hour difference as daylight saving time (BST) would be in affect. Only the spring equinox was included in the shadow study images in accordance with the BRE Guidelines.

4.4 Quantitative Scheme Performance Assessment Overview

4.4.1 Sun On Ground in Proposed Outdoor Amenity Areas (SOG)

The BRE Guidelines recommend that for a garden or amenity area to appear adequately sunlit throughout the year, at least half of it should receive at least two hours of sunlight on March 21st.

March 21st, also known as the spring equinox, is chosen as the assessment date as daytime and night-time are of approximately equal duration on this date.

The analytical model for SOG assessment in proposed amenity areas includes evergreen trees, where applicable, as per the BRE Guidelines. Typically deciduous trees will not be included unless there is a particularly dense belt.

A quantitative SOG assessment has been carried out on the areas as indicated by the project architect. The shadow study and false colour plans allow for a qualitative assessment for all other areas.

The portion of each assessed space capable of receiving 2 hours of direct sunlight on March 21st has been calculated individually. These areas can be combined to give the development average where appropriate.

Project Assessment

The levels of sunlighting to proposed amenity areas, as indicated by the architect, have been assessed. However, it should be noted that the numbering of these spaces in the Daylight and Sunlight Assessment Report has been assigned by 3DDB specifically for the purposes of this report. If other consultants are referencing these spaces in their own reports, it is unlikely they will be numbered the same.

The results for the study on sun on ground in the proposed outdoor amenity areas (including a visual representation in the form of 2-hour false colour plans) can be found in the appendix results section C.1 on page 36, with analysis of the results in section 5.2.1 on page 18.

4.4.2 Sunlight Exposure in Proposed Habitable Rooms (SE)

Since the publication of the 3rd edition of the BRE Guidelines (BRE 209 - 2022), Sunlight Exposure (SE) is the recommended metric for assessing sunlight access within a proposed development. Sunlight Exposure replaces APSH/WPSH in this regard, which was the recommended metric under the 2nd edition of the BRE Guidelines (BRE 209 - 2011).

Sunlight exposure (SE) is a measure of sunlight that a given window may expect to receive on a given date between the 1st of February and the 21st of March. The BRE guidelines suggest that March 21st (equinox) is used as the assessment date.

In the presence of trees, SE results have been generated, both with deciduous trees as opaque objects and without the inclusion of deciduous trees, in accordance with the BRE Guidelines. Evergreen trees have been included as opaque objects, where applicable, in both states.

The level of sunlight exposure is categorised as follows:

- 1.5 Hours - Minimum • 3 Hours - Medium • 4 Hours - High

The recommendation for dwellings is that at least one habitable room, preferably a main living room, should receive at least the minimum criterion. Should no room within a given unit meet the recommended minimum level of sunlight exposure, it will be stated as non-compliant.

Sunlight exposure is carried out on habitable rooms within a proposed development. The assessment point for windows is 1.2m above the finished floor level, or 0.3m above the sill level (which ever is higher). If a room has multiple windows, the amount of sunlight received by each can be added together provided they occur at different times and sunlight hours are not double counted.

The criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met. As such, it is not always possible to achieve full compliance, especially in developments that contain single aspect units.

Project Assessment

The results for the study on sunlight exposure can be found in the appendix results section C.2 on page 38, with analysis of the results in section 5.2.2 on page 18.

4.4.3 Spatial Daylight Autonomy in Proposed Habitable Rooms (SDA)

Since the publication of the 3rd edition of the BRE Guidelines (BRE 209 - 2022), Spatial Daylight Autonomy (SDA) is the recommended metric for assessing daylight access within a proposed development. Spatial Daylight Autonomy replaces ADF in this regard, which was the recommended metric under the 2nd edition of the BRE Guidelines (BRE 209 - 2011).

Spatial Daylight Autonomy assesses whether a room receives sufficient daylight on a working plane during standard operating hours on an annual basis. A given target value should be achieved across 50% of the working plane for half of the daylight hours.

There are two methods for calculating SDA:

- **Calculation method using illuminance level:** This requires the use of a detailed daylight calculation method where hourly (or sub-hourly) internal daylight illuminance values for a typical year are computed using hourly (or sub-hourly) sky and sun conditions derived from climate data appropriate to the site. This calculation method determines daylight provision directly from simulated illuminance values on the reference plane. The illuminance value of at least half the required area of the space should equal or exceed the target values.
- **Calculation method using daylight factor:** The daylight factor method assumes a constant ratio between internal and external illuminance. The daylight factors in the space shall be calculated by any reliable method that is based on the ISO 15469:2004 standard overcast sky (TYPE 1 or TYPE 16). Daylight factors are to be predicted across grid of points on a plane 0.85m above the floor of the space. The daylight factor of at least half the required area of the space should equal or exceed the target values.

It is the opinion of 3DDB that the calculation method using illuminance level better represents a real-world scenario as it accounts for the quality of daylight based on orientation. As such, the illuminance methodology has been adopted for all SDA assessments in this report using a localised EnergyPlus Weather File (IRL_Dublin.039690_IWEC.epw) to apply the relevant climate information.

In terms of housing, BRE 209 provides target SDA values to be received across at least 50% of the working plane for at least half the daylight hours. The target values differ based on the function of the room assessed:

- 200 Lux for kitchens
- 150 Lux for living rooms
- 100 Lux for bedrooms

Where rooms serve more than one function, the higher SDA target value should be taken. In new developments, some internal spaces (e.g. studio apartments, shared communal areas etc.) can possibly be of a nature that do not have a predefined target value in BRE 209. In such instances, 3DDB have applied a target value they deem to be appropriate.

In the case of Scholarstown House, the rooms in the attic have no potential for habitable use in the existing configuration. 3DDB have applied a target lux level of 100 Lux to these spaces. The rationale is that part of this space will be converted into a bedroom in the proposed layout. The same target value applied in the two states allows for comparison of results.

Under I.S. EN 17037 at least 50% of the working plane should receive above 300 lux for at least half the daylight hours, with 95% of the working plane receiving above 100 Lux for all rooms. The target SDA values do not vary depending on the room function under this criteria.

This primary study has assessed the Spatial Daylight Autonomy (SDA) received in the habitable rooms of the proposed development under the BRE 209 criterion. The SDA of the proposed development has been calculated under the I.S. EN 17037 criterion as part of a supplementary assessment.

Defining Rooms

Definition of rooms has been taken directly from the architectural drawings supplied by the project architect.

In accordance with the BRE Guidelines circulation spaces, corridors, bathrooms etc. have not been assessed.

Indication of the assessed space in each room is provided in the floor plans that correspond to the SDA results in the appendix section "C.3 Spatial Daylight Autonomy (SDA) in Proposed Units" on page 41.

Working Plane

The calculation of SDA is carried out on a hypothetical working plane which lies 850 mm from the finished floor level in residential units and 700 mm in academic and office spaces.

In the BRE 209 study the working plane is offset 300 mm from the room boundaries. Under the I.S. EN 17037 criteria the working plane is offset 500 mm from the room boundaries. The working plane has a grid density of c. 300 mm.

Material Palette

Following consultation with the design team, material values used for SDA calculations are as per the table below:

Object	Material	Reflectance	Object	Material	Reflectance Transmittance
Exterior walls	Standard Brick	0.3	Interior Walls	Pastel paint	0.70
	Light Brick	0.4	Interior Ceiling	White paint	0.8
	Dark Brick	0.15	Interior Floor	Light timber	0.4
	Render	0.6	Miscellaneous	Miscellaneous	0.5
	Concrete	0.4	Glass	Double glazing	0.68
Paving	0.4	Maintenance Factor		0.91	
Tarmac	0.2	Glass adjusted for maintenance		0.62	
Grass	0.2	Frosted glass		0.5	

Trees

The primary SDA results have been generated with trees represented in both summer and winter states of foliage as per the BRE Guidelines.

I.S. EN 17037 does not give any advice on how to include trees in the assessment. The supplementary SDA study, under the I.S. EN 17037 criterion, has been carried out with trees in summer foliage to represent the worst case scenario.

Project Assessment

The results for the study on SDA can be found in the appendix results section C.3 on page 41.

Analysis of the results can be found in section 5.2.3 on page 19.

The results of the supplementary SDA study under the I.S. EN 17037 criterion can be found in section C.4 on page 44 .

4.4.4 No Sky Line in Proposed Habitable Rooms (NSL)

The no sky line divides the areas of the working plane which can receive direct skylight, from those which cannot. It indicates the distribution of direct daylight within a room.

The BRE Guidelines recommend the No Sky Line study as an appropriate metric for an impact assessment to daylight, but only where room layouts are known.

"The calculation can only be carried out where room layouts are known. Using estimated room layouts is likely to give inaccurate results and is not recommended."

All advice given for NSL in the BRE Guidelines are in relation to impact assessments. NSL is not mentioned in the BRE section regarding daylight in new developments. Regardless, a NSL assessment was carried out on the proposed development as a supplementary study as it is requested in the DCC development plan 2022-2028. Although the proposed development is not located within Dublin City, the NSL study has been included to provide consistency across 3DDB daylight and sunlight assessments.

As the BRE Guidelines does not give advice on target NSL values for proposed rooms, no compliance rate has been stated. However a no skyline of 80% could be considered an appropriate figure given that the BRE Guidelines state that supplementary electric lighting will be needed if a significant part of the working plane (20% of the room or more) lies beyond the no sky line.

The results of the supplementary NSL study can be found in section C.4 on page 44.

5.0 Analysis of Results

5.1 Analysis of Impact Assessment Results

5.1.1 Effect on Vertical Sky Component (VSC)

The effect on VSC has been assessed for 9 no. windows/rooms of Scholarstown House.

Using the rationale explained in section 3.2 on page 9, the effect to VSC on 5 no. of these windows (or rooms if an average of multiple windows has been taken) would be considered *negligible*, 3 no. *minor adverse* and 1 no. *moderate adverse*.

The windows experiencing a certain level of impact are located on the southern facade of Scholarstown House (Figure 5.1 below). The level of effect was categorised as moderate adverse for the room Ha# (which is the average of windows Ha#1 and Ha#2) at the lower ground floor level. However, the level of impact decreases progressively from the first floor. The level of effect for windows Hd and He was categorised as minor adverse. Hi# at the second floor is also experiencing a minor adverse level of effect. It should be noted that Hi# is servicing a non-habitable space in the baseline state and thus there is no real impact on the living functions of that space. All the other windows assessed are experiencing a negligible level of effect.

The results of the study on VSC can be found in section A.1 on page 23.



Figure 5.1: Windows/Rooms impacted for VSC.

5.1.2 Effect on Annual/Winter Probable Sunlight Hours (APSH/WPSH)

The effect on APSH/WPSH has been assessed for 7 no. of windows/rooms of Scholarstown House. Only windows that have an orientation within 90 degrees of due south have been included in this assessment.

Using the rationale explained in section 3.2 on page 9, the effect on the APSH of all of these windows or rooms would be considered *negligible*.

The effect on the WPSH of 1 no. of these windows or rooms would be considered *negligible*, 1 no. *minor adverse*, 4 no. *major adverse* and 1 no. has been considered *non-applicable*.

It is important to note that all the windows/rooms, that have shown adverse impact to WPSH, have met the BRE criteria for Annual Probable Sunlight Hours. This suggests that the height of the proposed apartment building and its distance from the protected structure are adequate as to not obstruct the direct sunlight that windows are capable of receiving throughout most of the year.

The results of the study on APSH/WPSH can be found in Section A.2 on page 25.

5.2 Analysis of Scheme Performance Results

5.2.1 Sun On Ground in Proposed Private Gardens

This study has assessed the level of sunlight on March 21st within the 2 no. proposed private gardens of Scholarstown House. The study excluded the space designated for parking and bin storage from the calculation area. From the results generated, both gardens met the criteria set out in the BRE Guidelines, which is a positive outcome despite the overshadow caused by the proposed apartment building.

The results for the study on sunlighting in the proposed outdoor amenity spaces can be found in section C.1 on page 36.

A visual representation of these readings can be seen in the false colour plan in section C.1 and in the hourly shadow diagrams for March 21st in section B.1 on page 27 of the appendix section of this report.

5.2.2 Sunlight Exposure (SE)

A sunlight exposure assessment has been carried out within all habitable rooms of Scholarstown in both the existing state and the proposed state. The assessment has been carried out with deciduous trees represented both as opaque objects and removed from the model in accordance with the BRE Guidelines.

Where a range of values is expressed in the following summary, this refers to the results generated with the deciduous trees as opaque objects and with deciduous trees not included.

Results for the existing and the proposed state have been presented as follows:

Existing state

The existing configuration of Scholarstown House consists of 1 no. unit, which makes up approximately 9 no. habitable rooms. Using the rationale explained in section 3.3 on page 12, the level of sunlight exposure for 1-5 no. rooms is considered *high*, 0-1 no. *medium*, 3-0 no. have reached the *minimum* recommendation with 5-3 rooms below the *minimum* recommendation. **Note:** For a unit to be compliant under BRE 209, only one habitable room within the unit needs to meet the guideline values. The unit has at least one room considered as *high* in the two calculations.

Therefore, with and without the inclusion of deciduous trees, the level of sunlight exposure for the unit is considered *high*. The unit meets the criteria for sunlight exposure as set out in the BRE Guidelines.

Proposed state

The proposed configuration of Scholarstown House consists of 2 no. units, which makes up approximately 9 no. habitable rooms in total. Using the rationale explained in section 3.3 on page 12, the level of sunlight exposure for 3 no. rooms is considered *high*, 1 no. *medium*, 0-1 no. have reached the *minimum* recommendation with 5-4 rooms below the *minimum* recommendation. **Note:** For a unit to be compliant under BRE 209, only one habitable room within the unit needs to meet the guideline values. Both the units have at least one room considered as *high* in the two calculations.

Therefore, with and without the inclusion of deciduous trees, the level of sunlight exposure for the 2 no. units is considered *high*. The 2 no. units meets the criteria for sunlight exposure as set out in the BRE Guidelines.

Whilst the criterion applies to rooms of all orientations, it should be noted that if a room faces significantly north of due east or west it is unlikely to be met.

It can be concluded that in both the existing state and the proposed state the units would be compliant for sunlight exposure.

The results for the study on SE in the habitable rooms of the proposed units can be seen in section C.2 on page 38.

5.2.3 Spatial Daylight Autonomy (SDA)

This study has assessed the Spatial Daylight Autonomy (SDA) received within all habitable rooms of Scholarstown House in both the existing state and the proposed state. This has ensured that a clear understanding has been obtained regarding the daylight performance of the proposed layout of Scholarstown House in comparison with the existing configuration.

Results for the existing and the proposed state have been presented as follows:

Existing state

The existing configuration of Scholarstown House consists of 1 no. unit, which makes up approximately 9 no. habitable rooms. Under the criteria as set out in the BRE 209, the SDA value in 3 & 5 no. habitable rooms meet or exceed their target values in the summer and winter time calculations respectively.

The results for each room in the existing state can be seen in section C.3.1 on page 42.

Proposed state

The proposed configuration of Scholarstown House consists of 2 no. units, which makes up approximately 9 no. habitable rooms. Under the criteria as set out in the BRE 209, the SDA value in 2 no. habitable rooms meet or exceed their target values in both summer and winter time calculations.

The results for each room in the proposed state can be seen in section C.3.2 on page 43.

I.S. EN 17037 sets out more onerous recommendations for SDA. As such, in both the existing and the proposed state, none of the rooms would be able to achieve compliance.

The SDA study carried out to assess the existing configuration of Scholarstown House has shown that compliance is achieved for the living room located on the South side of the building and 2 no. of the 4 no. bedrooms. The living room to the North would achieve compliance in winter time only. The remaining 2 no. bedrooms and the kitchen would not meet the recommended minimum set by the BRE Guidelines.

The SDA study carried out to assess the proposed layout of Scholarstown House has shown that compliance is achieved for 2 no. bedrooms. None of the living spaces would achieve the recommended minimum required.

Since Scholarstown House is a protected structure, an increase of the glazing area to mitigate for the underperforming daylight levels is not a feasible option. However, the interior re-arrangement of the house does improve daylight levels in some instances, particularly with regards to the resizing of the bedrooms and the inclusion of storage and en-suites at the back of the rooms. This reconfiguration satisfies modern day needs and limits the dispersion of daylight to the back, as seen in the improvements for bedrooms 1, 2, and 3 on the first floor of Unit no.1. While the interior reconfiguration may not completely solve the low daylight levels in certain areas of the house, it does make it fit for purposes for today's living requirements.

The results for the study on SDA can be seen in section C.3 on page 41.

6.0 Conclusion

3D Design Bureau (3DDB) were commissioned to carry out a daylight and sunlight assessment for the protected structure, namely Scholarstown House, located within the proposed residential development at Scholarstown Road, Dublin 16. The full set of assessments and this written report were produced to address the request for further information (reg. ref. SD22A/0401) made by South Dublin County Council (SDCC). For the purpose of this report, the daylight/sunlight performance of the proposed layout of Scholarstown House was assessed and compared with its existing configuration. The potential impact caused by the proposed apartment building, on Scholarstown House, was also measured and recorded.

The results of the VSC study have shown that some of the windows located on the southern facade of Scholarstown House are experiencing varying levels of impact, ranging from “negligible” to “moderate adverse”. However, only one instance has been categorised as “moderate adverse”, with the remaining windows considered “negligible” or “minor adverse”. This is at the lower floor level. In all other instances, the impacts were categorised as minor or negligible.

In terms of sunlight, the calculation carried out has shown that all windows that have shown adverse impact to Winter Probable Sunlight Hours, have met the BRE criteria for Annual Probable Sunlight Hours. The calculation carried out on the annual basis (APSH) has shown that none of the windows would suffer unacceptable drops in their levels of sunlight in this study.

The scheme performance studies were carried out for the existing configuration of Scholarstown House in the baseline state and the new layout of Scholarstown House in the proposed state.

The results have shown that most of the spaces of Scholarstown House would not meet the BRE Guidelines in its existing state. This is mostly due to the historical nature of the structure, which presents features that limit the amount of natural light that can penetrate the interior. In the proposed state a reduction in the levels of daylight, particularly within the single aspect rooms facing the proposed apartment building to the South, has been recorded. Efforts have been made to modernise the interior of the house while preserving its historical integrity as a protected structure. Whilst the increasing of the glazing is not a feasible option to increase daylight levels in the units, the internal re-arrangement of the spaces has shown daylight improvements in certain instances. The new proposed layout also responds to more modern day living requirements. It should be pointed out that numerical guidelines in BRE 209 are not mandatory and should not be used for planning policy, as stated in the guiding document. Daylight is only one of many factors in site layout design. It is opinion of 3DDB that given the constraints in conserving the existing structure of Scholarstown House, while modernising the functionality for future occupants, the reduced levels of daylight could be considered an acceptable compromise.

The sunlight exposure has shown a level of performance which has been considered high for both the 2 no. proposed units within Scholarstown House.

The proposed gardens are both compliant with the BRE Guidelines, being able to receive sufficient levels of sunlight on March 21st.

Appendix - Results



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Assessment criteria and detailed analysis of results can be found in the accompanying report.

A.0 Impact Assessment Results

A.1 Effect on Vertical Sky Component (VSC)

Below is an example of the table used to describe the effect on VSC.

Table Example. A.1 - VSC Impact Assessment						
Window Number	Baseline VSC Value	Proposed VSC Value	Ratio of Proposed VSC to Baseline VSC	Recommended Minimum VSC	Level of Compliance with BRE Guidelines	Effect of Proposed Development
A	B	C	D	E	F	G

A: Window Number

The number in this column will identify the assessed window. All windows are represented visually in the corresponding figure.

B: Baseline VSC Value

The *Baseline VSC Value* represents the VSC value of the assessed window which is calculated in the existing baseline model state (as explained in the "Building the Model States" on page 11).

C: Proposed VSC Value

The *Proposed VSC Value* represents the VSC value of the assessed window which is calculated in the proposed model state (as explained in the "Building the Model States" on page 11).

D: Ratio of Proposed VSC to Baseline VSC

This column expressed the ratio of change between the baseline VSC value and the proposed VSC value. The BRE Guidelines recommend that if the proposed value is less than 0.8 times the baseline value, then the reduction in daylight is more likely to be perceptible.

E: Recommended minimum VSC

The *BRE Target Value* for each window has been set according to the BRE Guidelines. The Guidelines state that a proposed development could possibly have a noticeable effect on the daylight received by an existing window, if the VSC value **both** drops below the guideline value of 27% **and** the VSC value is less than 0.8 times the baseline value.

Therefore, to determine the *recommended minimum Value*, 80% of the *Baseline VSC value* has been calculated. If this value is above the 27% threshold, a target value of 27% will be applied. If 80% of the baseline value is below 27%, then 80% of the baseline value is the appropriate target value.

F: Level of Compliance with the BRE Guidelines

This column states the compliance of the *Proposed VSC Value* with the *recommended minimum VSC* as per the BRE Guidelines. In essence, it shows whether or not the assessed window would experience a perceptible level of impact. If the window complies with the BRE Guidelines this cell will state "*BRE Compliant*". If the window does not meet the criteria as set out in the BRE Guidelines, a percentage of compliance with the *recommended minimum* will be stated.

G: Effect of Proposed Development

The levels of effect in this column describe the effect an assessed window will experience, based on its compliance with the *BRE Target Value*. A full list of definitions and a numerical rationale for each can be found in the section "*Definition of Effects*" on page 9 of the corresponding report.

It should be noted that the figures displayed in the table of results have been rounded off. A manual calculation on these figures may yield a negligible difference and should not be considered an error.

A.1.1 Scholarstown House

Table No. A.1.1 - VSC Results: Scholarstown House

Window Number	Baseline VSC Value	Proposed VSC Value	Ratio of Proposed VSC to Baseline VSC	Recommended minimum VSC*	Level of Compliance with BRE Guidelines	Effect of Proposed Development**
Ha#1	27.81%	16.09%	0.58	22.25%	72%	-
Ha#2	22.30%	12.58%	0.56	17.84%	71%	-
Ha#	25.06%	14.34%	0.57	20.04%	72%	Moderate Adverse
Hb#1	29.18%	16.13%	0.55	23.34%	69%	-
Hb#2	29.79%	29.27%	0.98	23.83%	BRE Compliant	-
Hb#3	29.58%	30.12%	1.02	23.66%	BRE Compliant	-
Hb#	29.58%	30.12%	1.02	23.66%	BRE Compliant	Negligible
Hc#1	30.21%	31.20%	1.03	24.17%	BRE Compliant	-
Hc#2	30.18%	31.13%	1.03	24.14%	BRE Compliant	-
Hc#3	35.55%	35.79%	1.01	27.00%	BRE Compliant	-
Hc#	30.67%	31.57%	1.03	24.53%	BRE Compliant	Negligible
Hd	32.14%	21.40%	0.67	25.71%	83%	Minor Adverse
He	23.31%	15.66%	0.67	18.65%	84%	Minor Adverse
Hf#1	32.24%	21.16%	0.66	25.79%	82%	-
Hf#2	31.62%	32.26%	1.02	25.30%	BRE Compliant	-
Hf#	31.62%	32.26%	1.02	25.30%	BRE Compliant	Negligible
Hg	32.80%	33.71%	1.03	26.24%	BRE Compliant	Negligible
Hh	25.95%	23.57%	0.91	20.76%	BRE Compliant	Negligible
Hi#1	33.97%	25.63%	0.75	27.00%	95%	-
Hi#2	32.27%	25.17%	0.78	25.82%	97%	-
Hi#	33.12%	25.40%	0.77	26.50%	96%	Minor Adverse

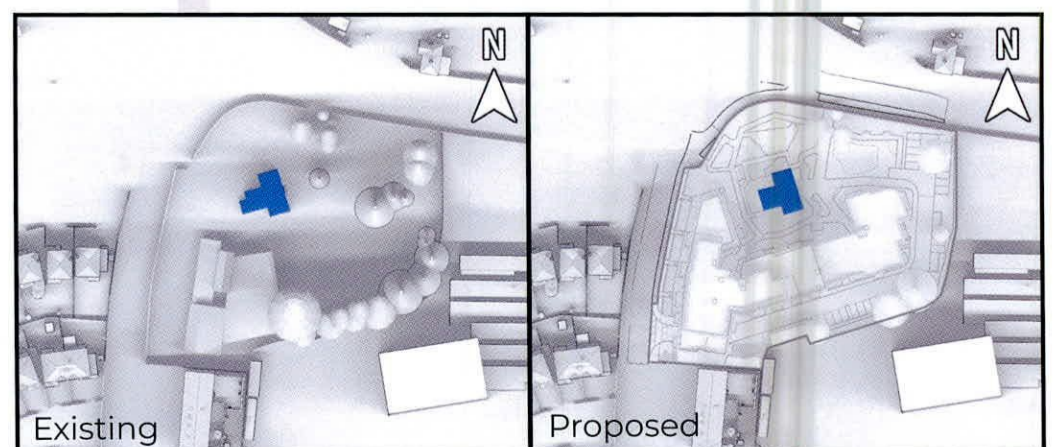
* The BRE Guidelines state that in order for a proposed development to have a noticeable effect on the VSC of an existing window, the value needs to both drop below the stated target value of 27% **and** be less than 0.8 times the baseline value.

** For the interpretation of level of effects please refer to "3.2 Definition of Effects" on page 9 of the corresponding report.

If it can be determined or reasonably assumed that multiple windows are servicing the same room, each window has been assessed and a weighted average has been calculated to determine the level of effect on the room. In such instances, the 'effect of proposed development' column will have the symbol "-" for the individual windows, with the level effect stated in the row associated with the corresponding room.



Figure A.1: Highlighted areas indicate the position of assessed windows (Above), Aerial view of assessed location (Below)



A.2 Effect on Annual/Winter Probable Sunlight Hours (APSH/WPSH)

Below is an example of the table used to describe the effect to the APSH/WPSH of existing windows.

Table Example. A.2 - APSH/WPSH Impact Assessment						
Window Number	Baseline APSH/WPSH	Proposed APSH/WPSH	Ratio of Proposed to Baseline APSH/WPSH	Recommended Minimum APSH/WPSH	Level of Compliance with BRE Guidelines	Effect of Proposed Development
A	B	C	D	E	F	G

A: Window Number

The number in this column will identify the assessed window. All windows are represented visually in the corresponding figure.

B: Baseline APSH/WPSH

The *Baseline APSH/WPSH Value* represents percentage of the probable sunlight hours that the assessed window can receive, calculated in the existing baseline model state (as explained in the “Building the Model States” on page 11). The annual and winter assessments will be represented in separate tables.

C: Proposed APSH/WPSH

The *Proposed APSH/WPSH Value* represents the percentage of probable sunlight hours that the assessed window can receive, calculated in the proposed model state (as explained in the “Building the Model States” on page 11).

D: Ratio of Proposed to Baseline APSH/WPSH

This column expressed the ratio of change between the baseline APSH/WPSH value and the proposed APSH/WPSH value. The BRE Guidelines recommend that if the proposed value is less than 0.8 times the baseline value, then the reduction to sunlight is more likely to be perceptible.

E: Recommended Minimum APSH/WPSH

The *BRE Target Value* for each window has been set according to the BRE Guidelines. The Guidelines state that a proposed development could possibly have a noticeable effect on the sunlight received by an existing window, if the APSH value drops below the annual (25%) or WPSH value below the winter (5%) guidelines; **and** the APSH/WPSH value is less than 0.8 times the baseline value; **and** there is a reduction of more than 4% to the APSH.

Therefore, to determine the *recommended minimum APSH Value* for the annual study, 80% of the *Baseline APSH value* has been calculated. If this value is above the 25% threshold, a target value of 25% will be applied. If 80% of the baseline value is below 25%, then 80% of the baseline value is the appropriate target value.

To determine the *recommended minimum WPSH Value* for the winter study, 80% of the *Baseline winter APSH value* has been calculated. If this value is above the 5% threshold, a target value of 5% will be applied. If 80% of the baseline value is below 5%, then 80% of the baseline value is the appropriate target value.

F: Level of Compliance with BRE Guidelines

This column states the compliance of the *Proposed APSH/WPSH Value* with the *recommended minimum APSH/WPSH* as per the BRE Guidelines. In essence, it shows whether or not the assessed window would experience a perceptible level of impact. If the window complies with the BRE Guidelines this cell will state “*BRE Compliant*”. If the window does not meet the criteria as set out in the BRE Guidelines, a percentage of compliance with the *recommended minimum* will be stated.

G: Effect of Proposed Development

The levels of effect in this column describe the effect an assessed window will experience, based on its compliance with the *BRE Target Value*. A full list of definitions and a numerical rationale for each can be found in the section “*Definition of Effects*” on page 9 of the corresponding report.

It should be noted that the figures displayed in the table of results have been rounded off. A manual calculation on these figures may yield a negligible difference and should not be considered an error.

A.2.1 Scholarstown House - Annual and Winter Probable Sunlight Hours

Table No. A.2.1 - APSH Results: Scholarstown House

Window Number	Baseline APSH	Proposed APSH	Ratio of Proposed APSH to Baseline APSH	Recommended minimum APSH*	Level of Compliance with BRE Guidelines	Effect of Proposed Development
Ha#	61.77%	37.76%	0.61	25.00%	BRE Compliant	Negligible
Hb#	72.34%	48.95%	0.68	25.00%	BRE Compliant	Negligible
Hd	68.38%	46.54%	0.68	25.00%	BRE Compliant	Negligible
He	53.22%	38.23%	0.72	25.00%	BRE Compliant	Negligible
Hf#	74.59%	55.32%	0.74	25.00%	BRE Compliant	Negligible
Hh	23.15%	21.83%	0.94	18.52%	BRE Compliant	Negligible
Hi#	74.36%	57.34%	0.77	25.00%	BRE Compliant	Negligible

Table No. A.2.1 - WPSH Results: Scholarstown House

Window Number	Baseline WPSH	Proposed WPSH	Ratio of Proposed WPSH to Baseline WPSH	Recommended minimum WPSH*	Level of Compliance with BRE Guidelines	Effect of Proposed Development
Ha#	18.49%	0.47%	0.03	5.00%	9%	Major Adverse
Hb#	18.65%	1.48%	0.08	5.00%	30%	Major Adverse
Hd	20.75%	2.41%	0.12	5.00%	48%	Major Adverse
He	15.85%	2.49%	0.16	5.00%	50%	Major Adverse
Hf#	22.77%	4.35%	0.19	5.00%	87%	Minor Adverse
Hh	0.23%	0.00%	0.00	0.19%	BRE Compliant	n.a.
Hi#	22.77%	7.07%	0.31	5.00%	BRE Compliant	Negligible

* The BRE Guidelines state that in order for a proposed development to have a noticeable effect on the APSH/WPSH of an existing window, the value needs to drop below the stated target value of 25% (annual) / 5% (winter) **and** be less than 0.8 times the baseline value **and** it has to have a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

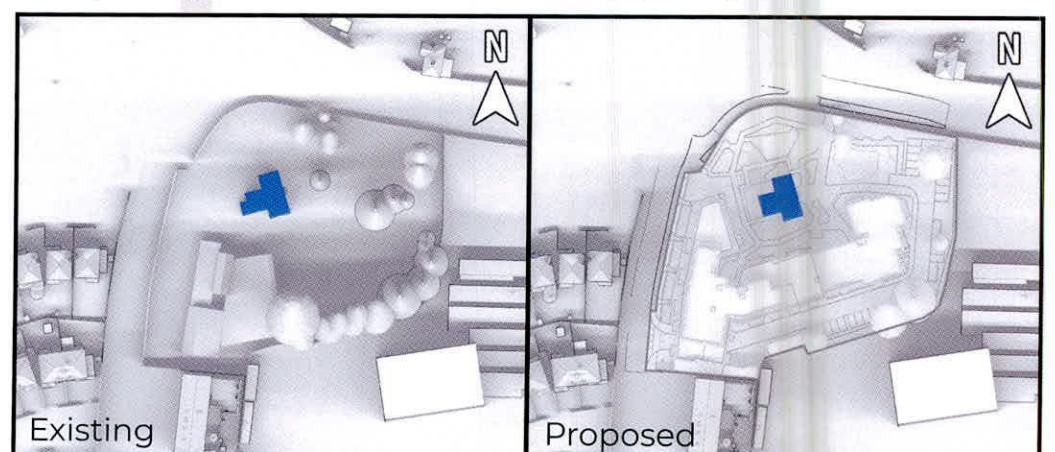
** For the interpretation of level of effects please refer to "3.2 Definition of Effects" on page 9 of the corresponding report.

If it can be determined or reasonably assumed that multiple windows are servicing the same room, APSH/WPSH has been calculated for the room rather than the individual windows.

n.a. In instances where a baseline value is particularly low, levels of effects can appear exaggerated. To mitigate against such occurrences, if the baseline value is below 1%, 3DDB have categorised the level of effect as n.a. (non-applicable).



Figure A.2: Highlighted areas indicate the position of assessed windows (Above), Aerial view of assessed location (Below)



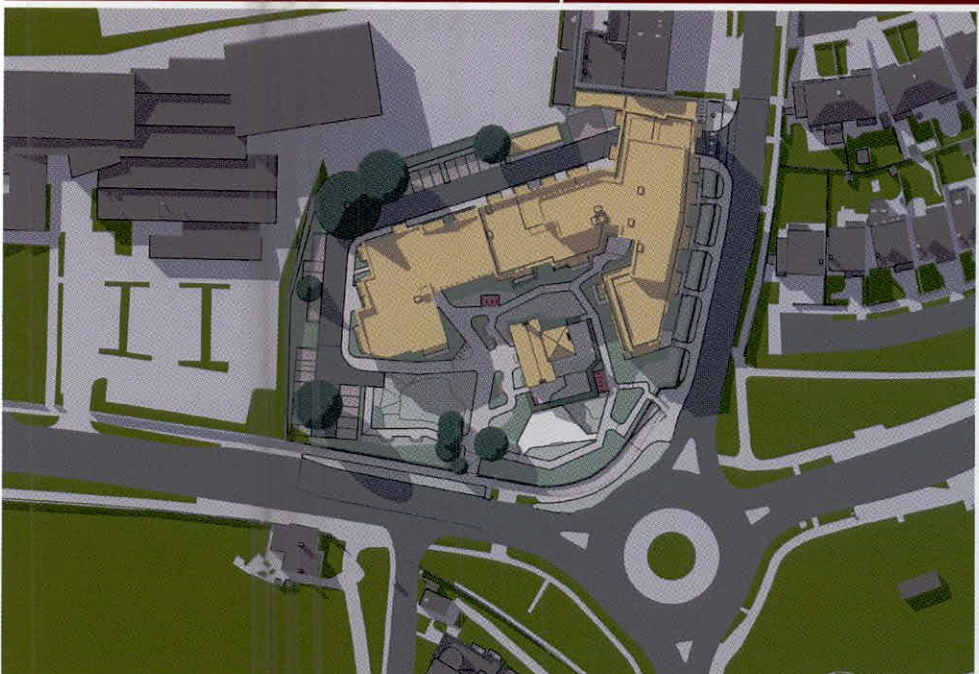
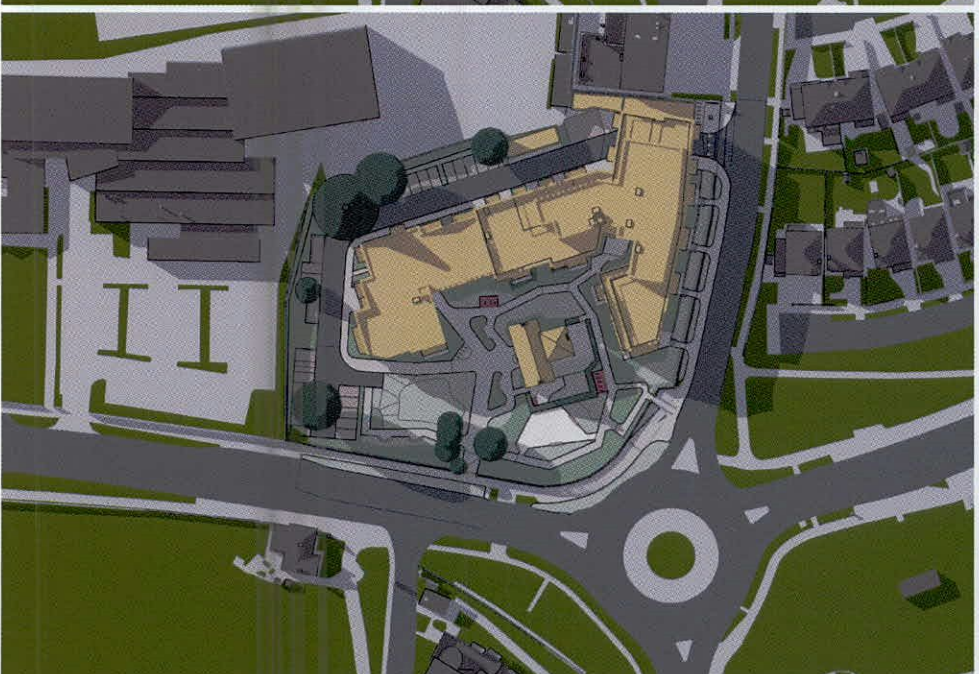
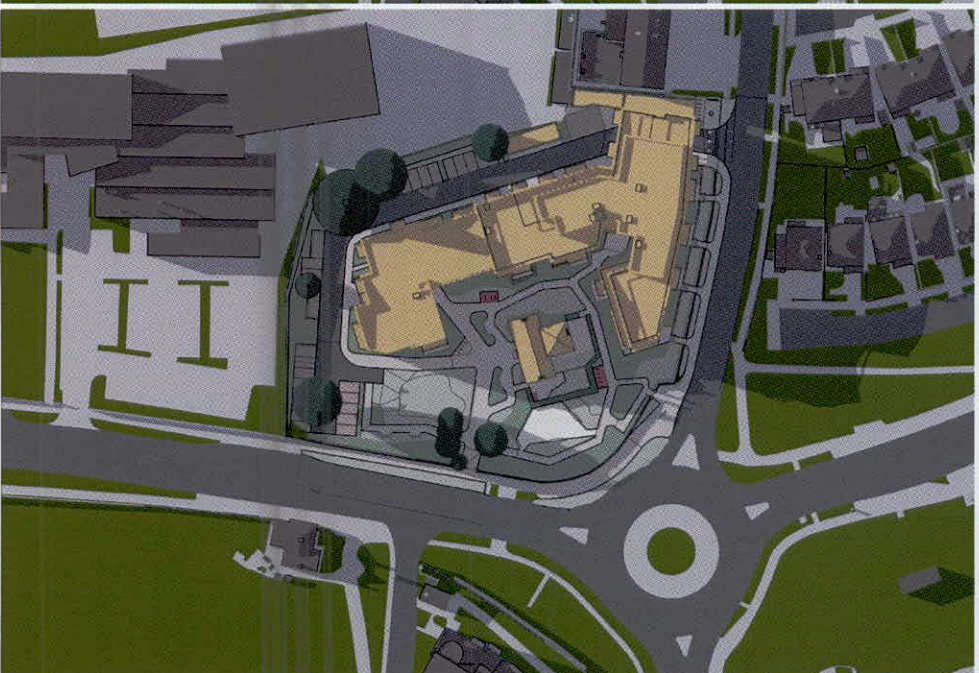
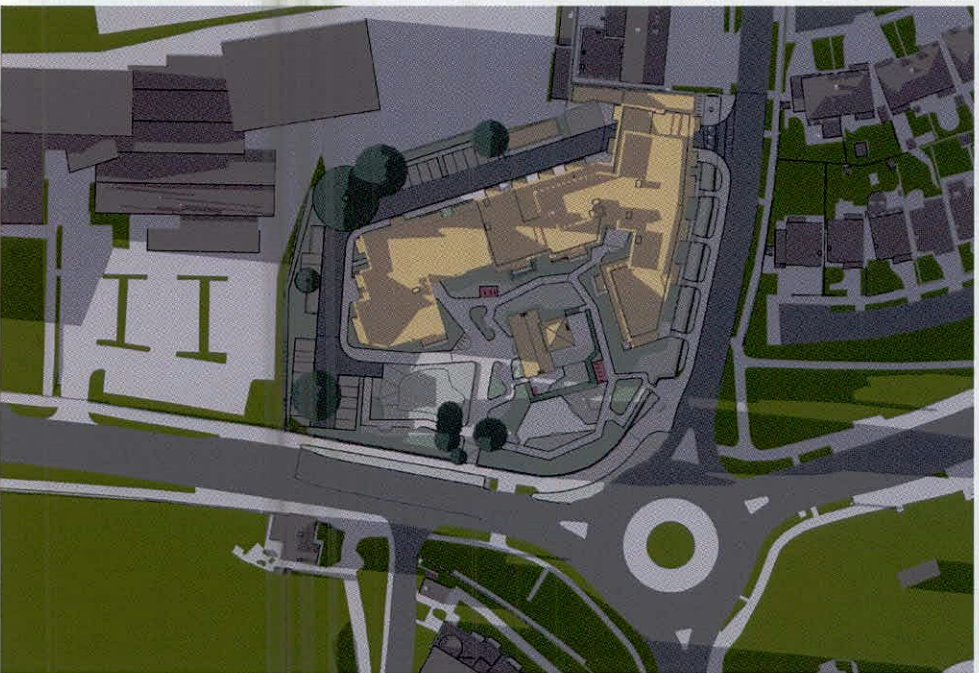
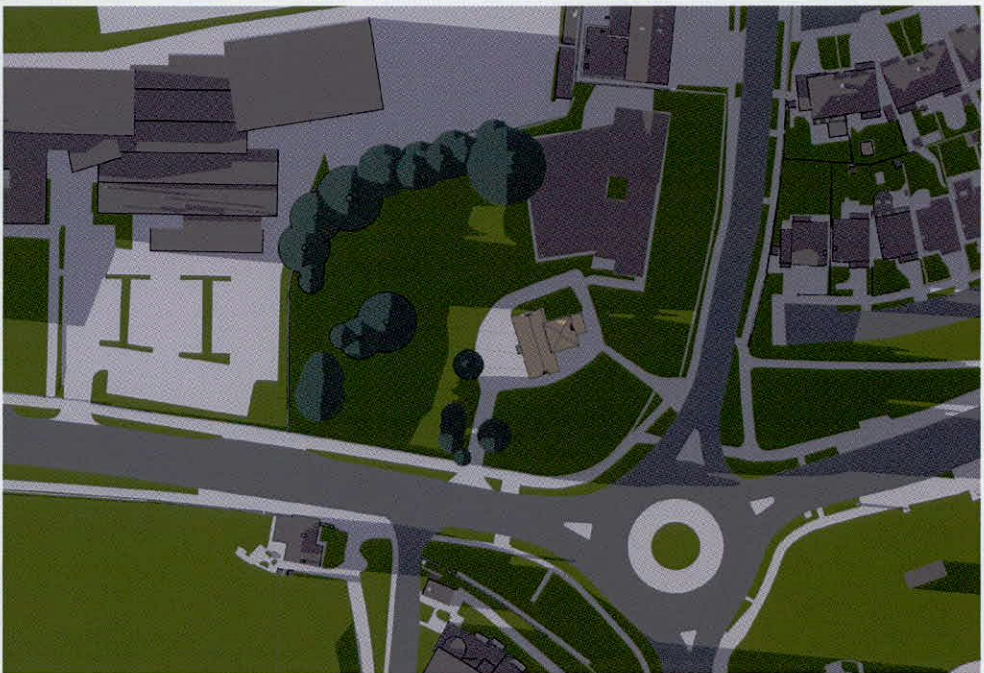
▶ z

March 21st 7:00

March 21st 8:00

March 21st 9:00

March 21st 10:00



Baseline

Proposed

B.0
Shadow Studies
Shadow Study 21 March

Project: Scholarstown House

3D DESIGN
BUREAU

March 21st
Sunrise 6:25 | Sunset 18:40

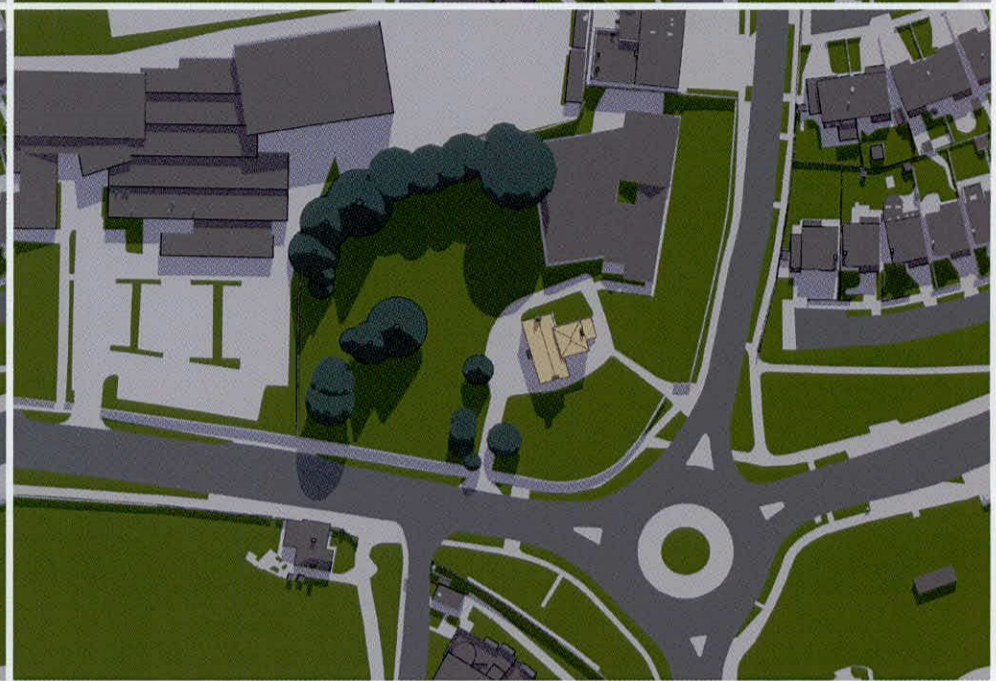
Applicant: Emmaville Ltd.

March 21st 11:00

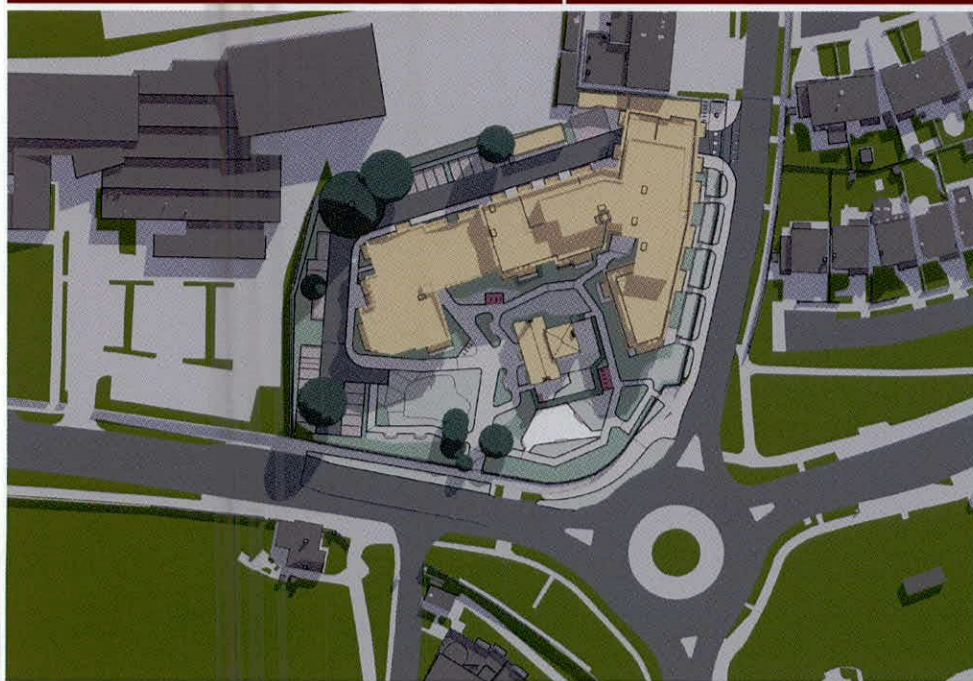
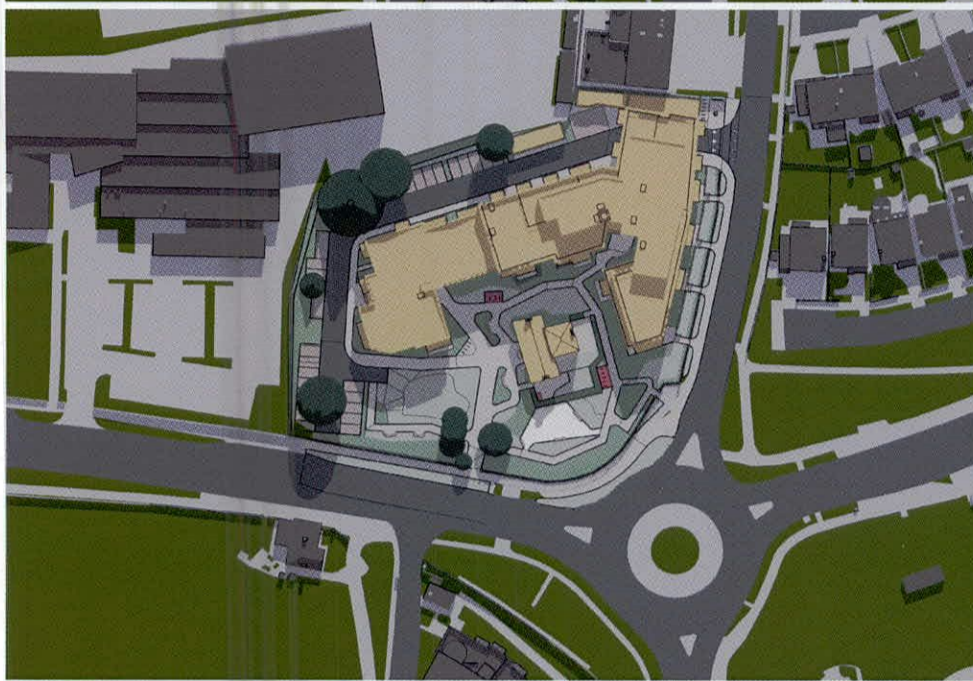
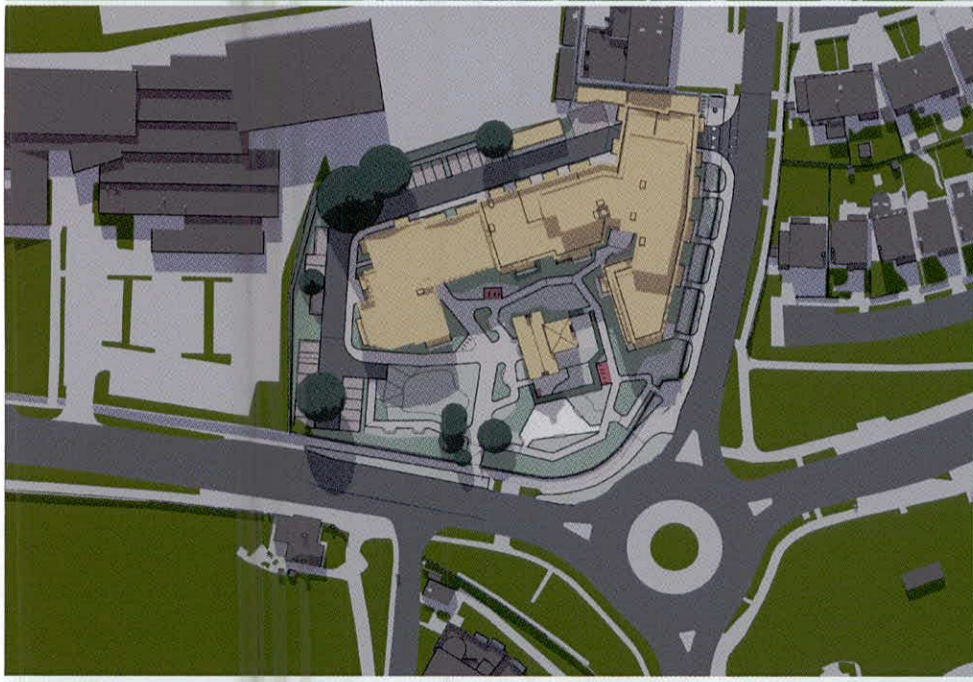
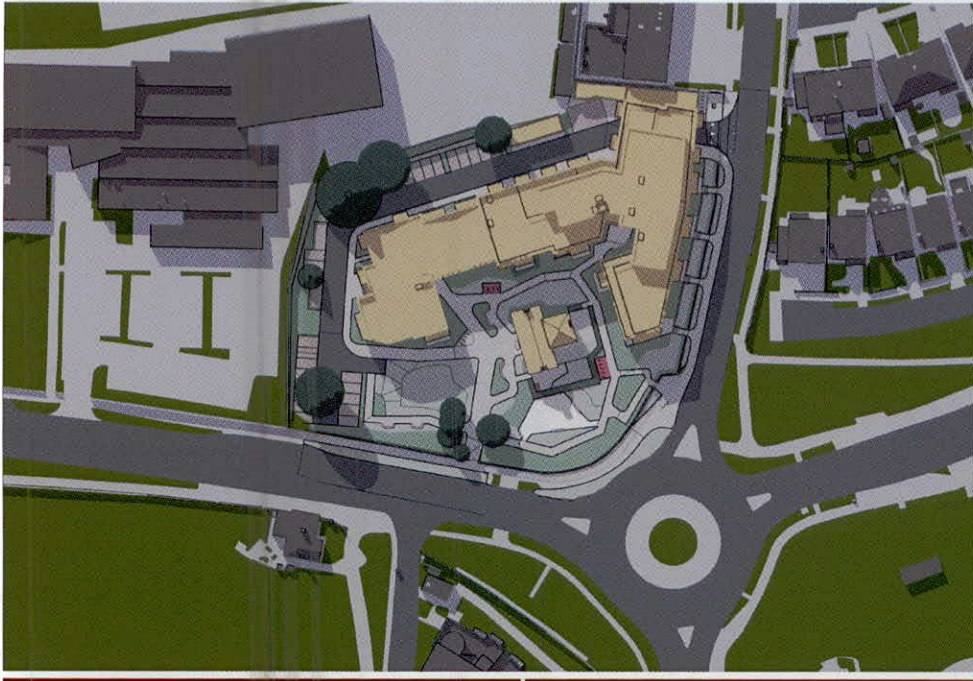
March 21st 12:00

March 21st 13:00

March 21st 14:00



Baseline



Proposed

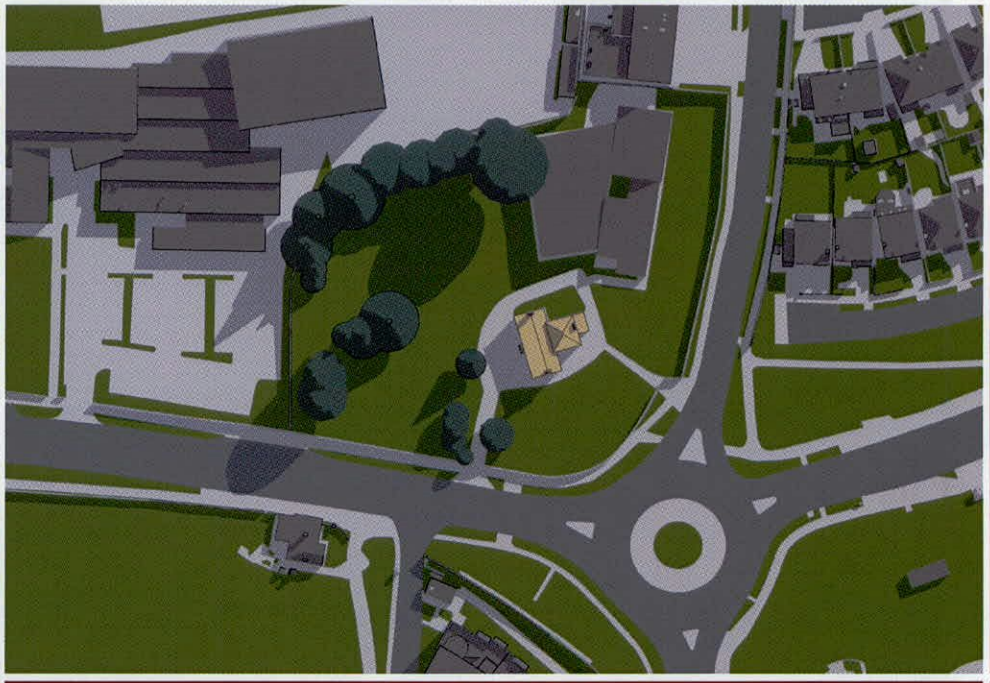
Project: Scholarstown House

Applicant: Emmaville Ltd.



March 21st
Sunrise 6:25 | Sunset 18:40

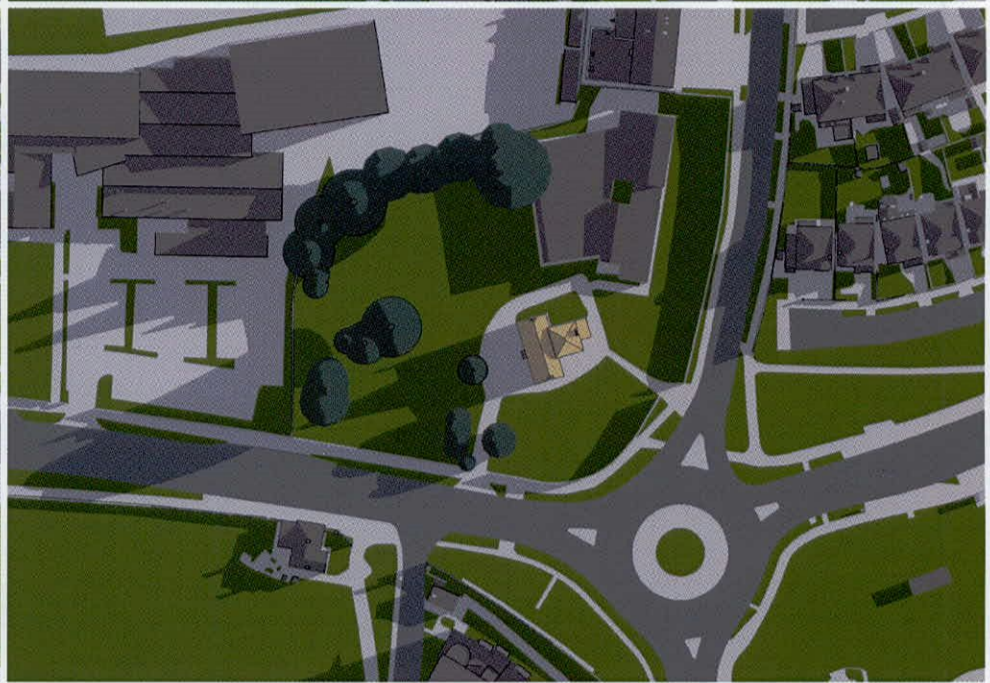
March 21st 15:00



March 21st 16:00



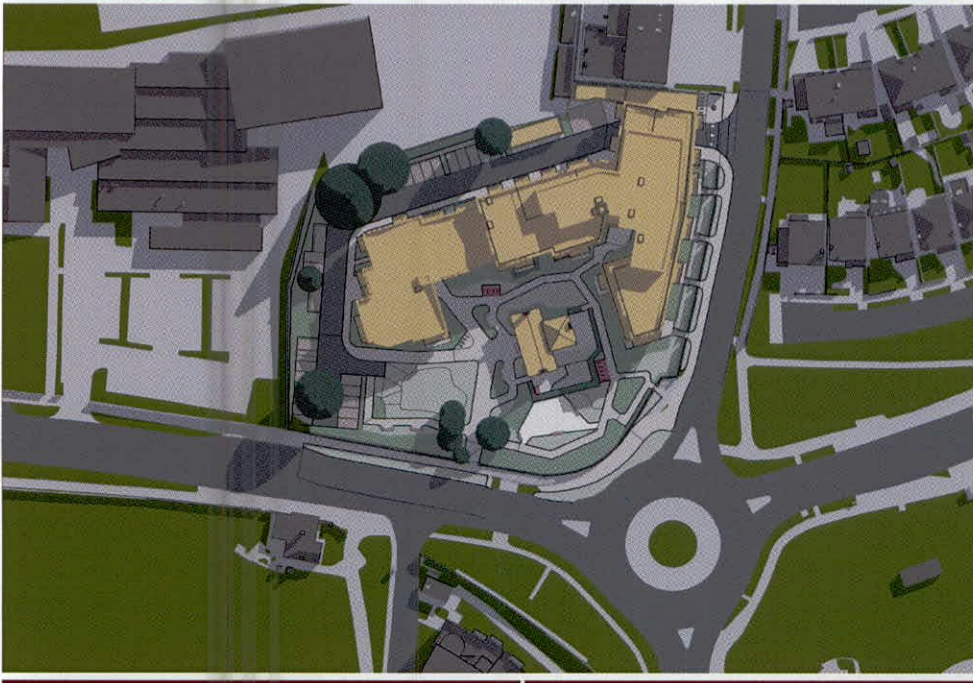
March 21st 17:00



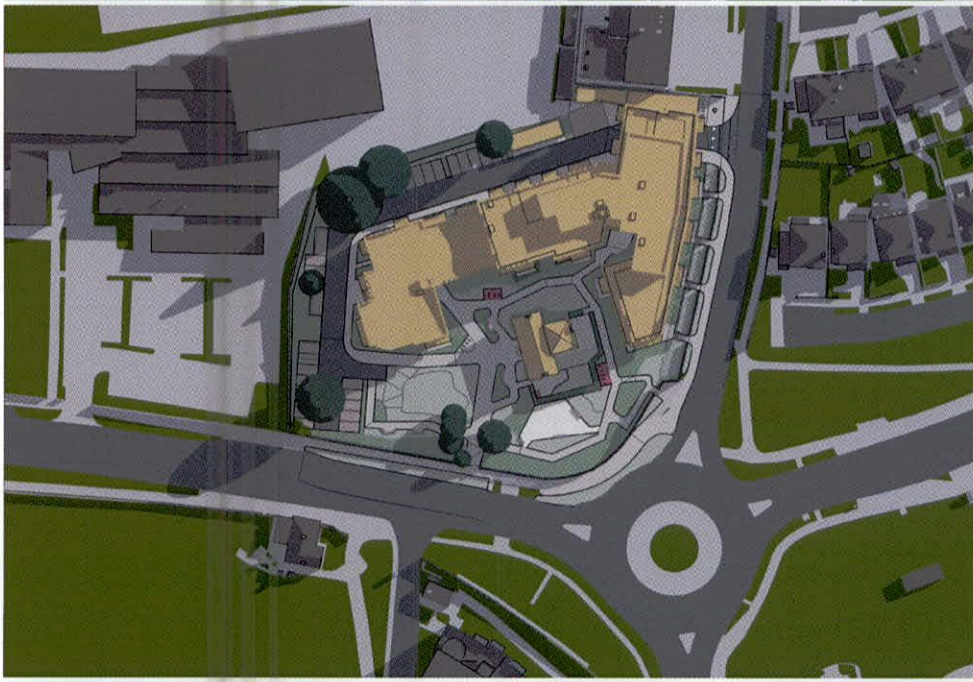
March 21st 18:00



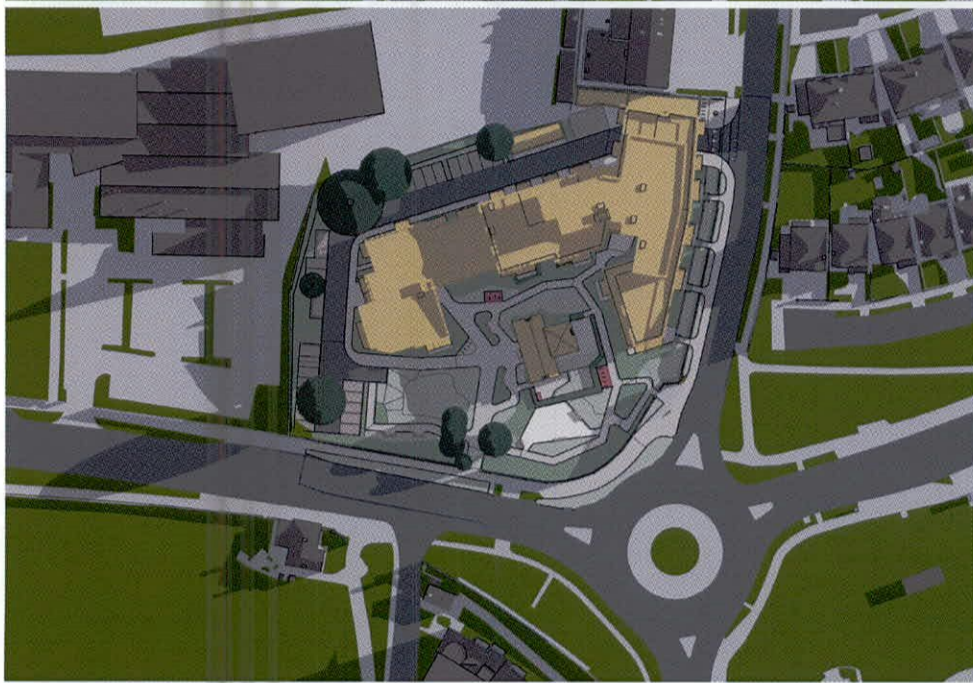
Proposed



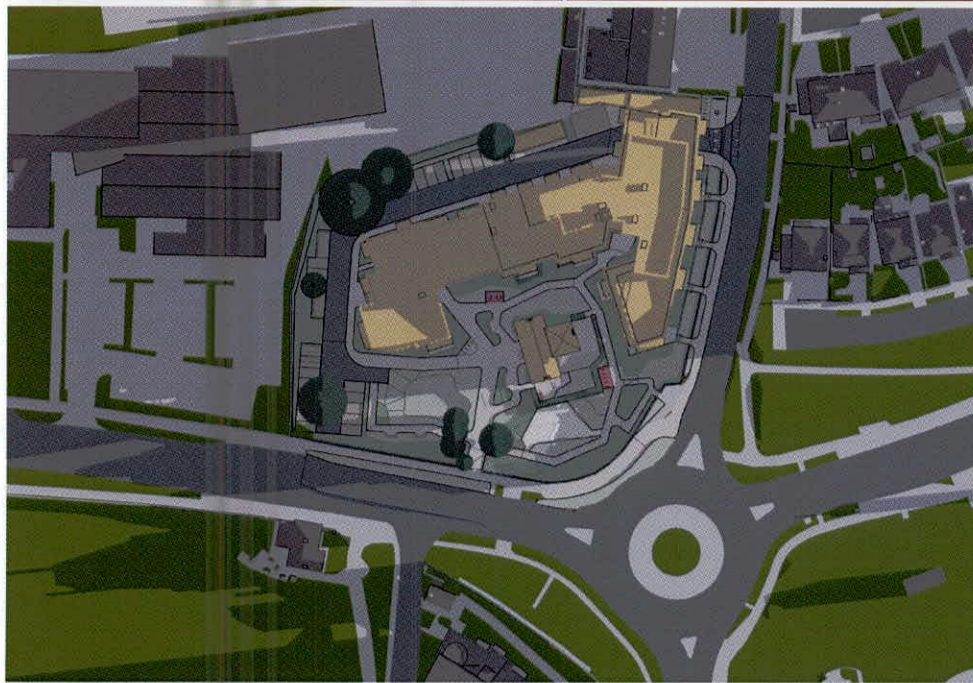
Baseline



March 21st 16:00



March 21st 17:00



March 21st
Sunrise 6:25 | Sunset 18:40

Applicant: Emmaville Ltd.

Project: Schlarstown House



June 21st 6:00

June 21st 7:00

June 21st 8:00

June 21st 9:00

Baseline



Proposed



B.2

Shadow Study 21 June

Project: Schlarstown House

Applicant: Emmaville Ltd.

June 21st
Sunrise 4:57 | Sunset 21:57



June 21st 10:00

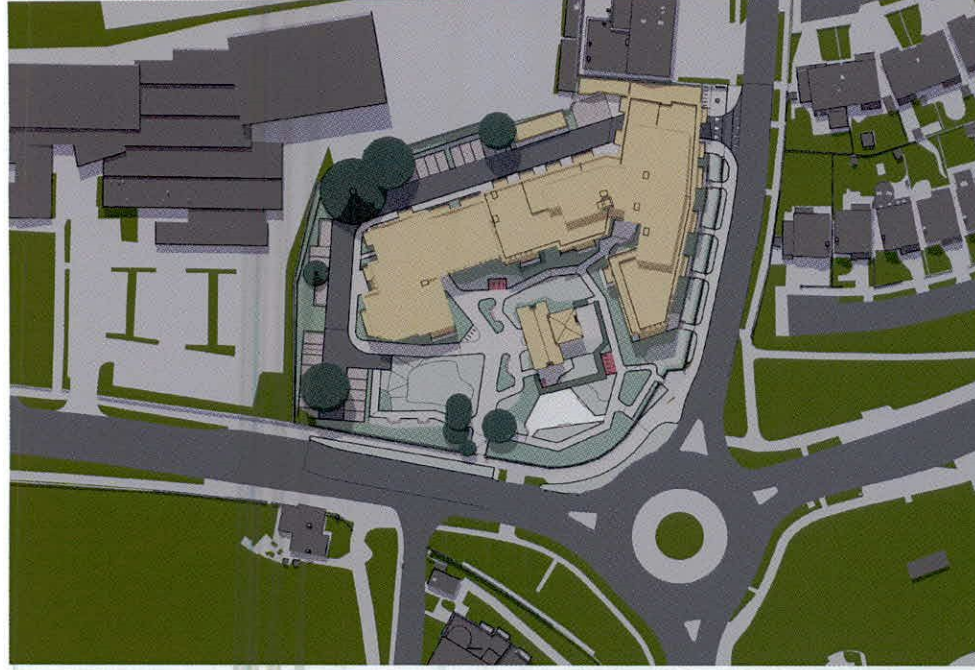
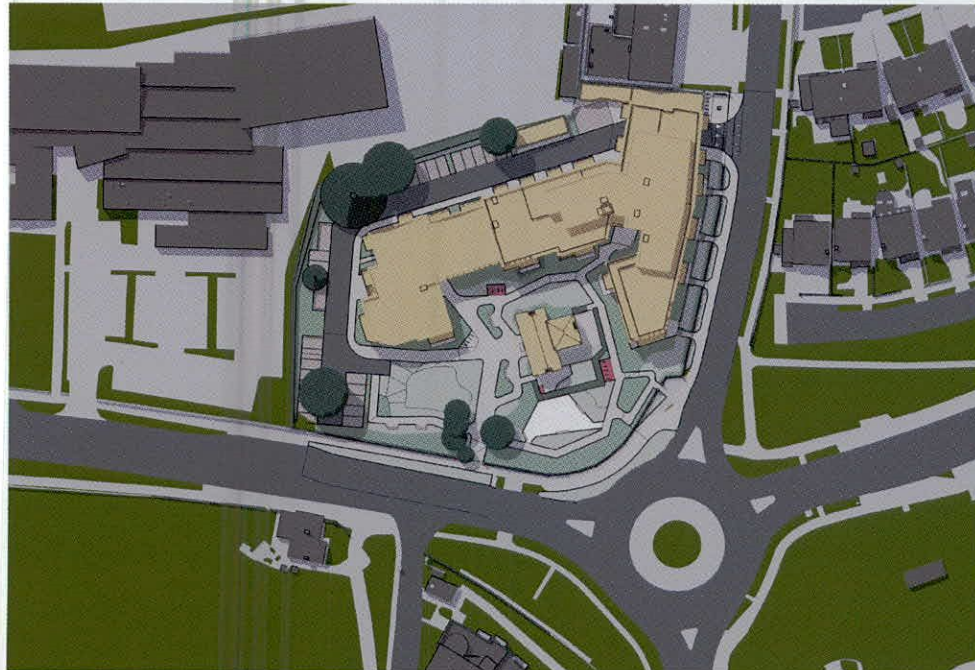
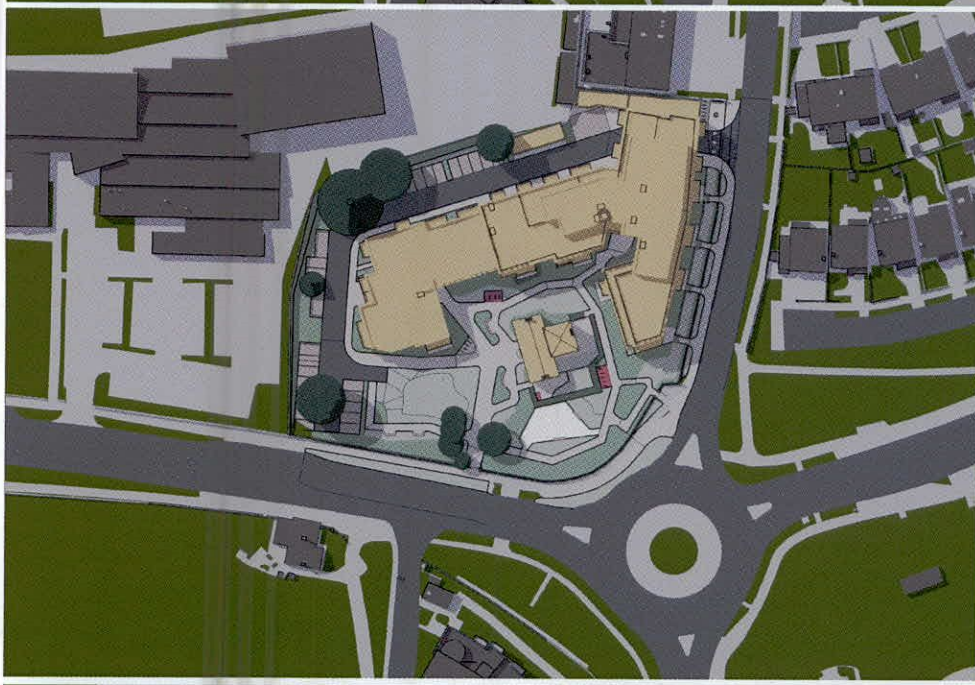
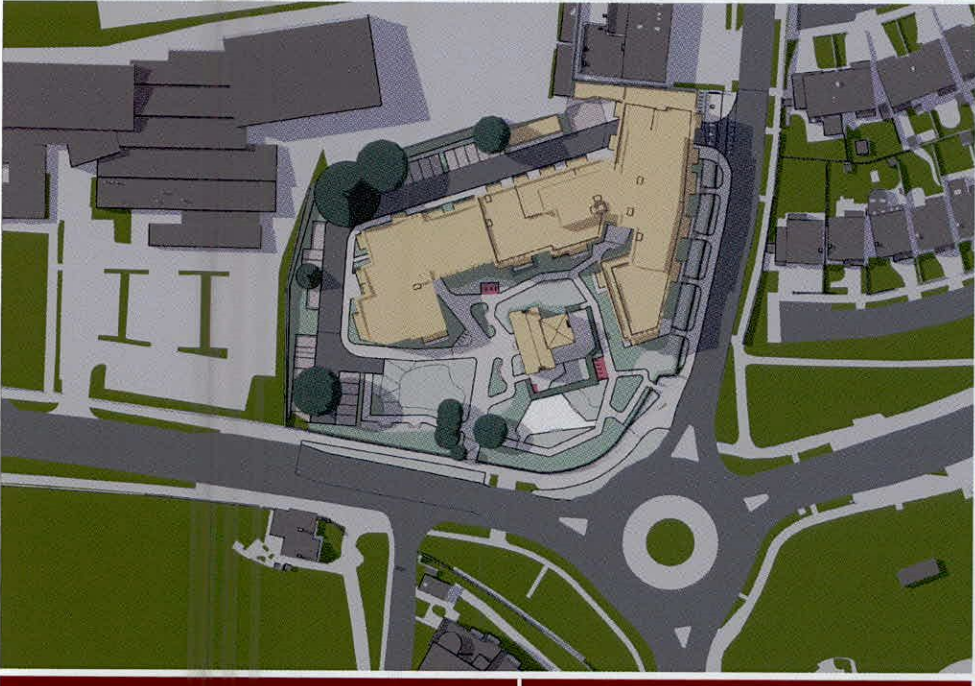
June 21st 11:00

June 21st 12:00

June 21st 13:00



Baseline



Proposed

Project: Scholarstown House

Applicant: Emmaville Ltd.

June 21st
Sunrise 4:57 | Sunset 21:57



June 21st 14:00

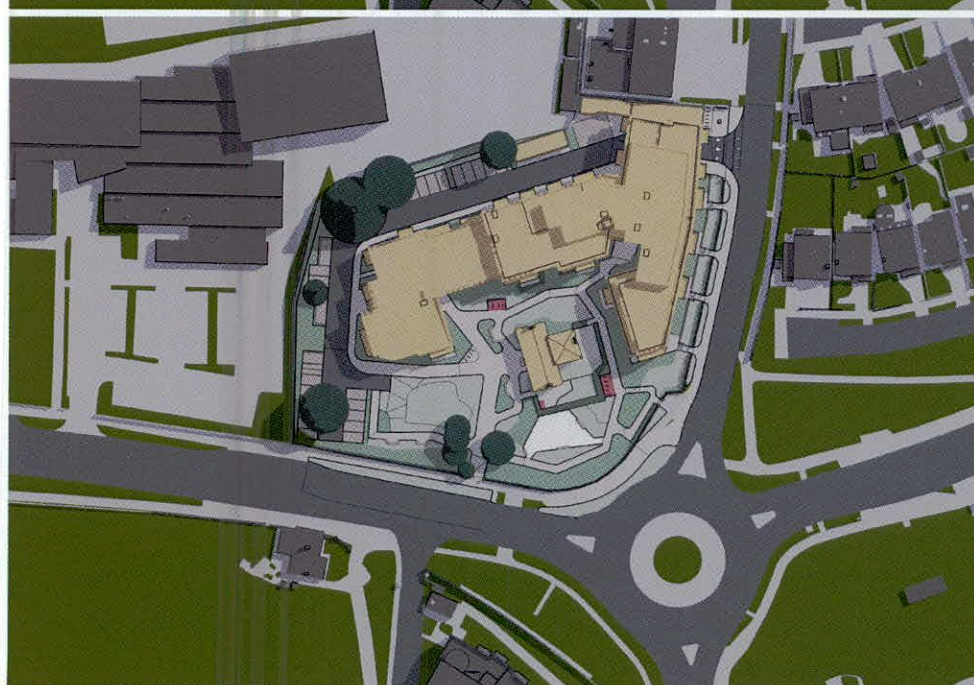
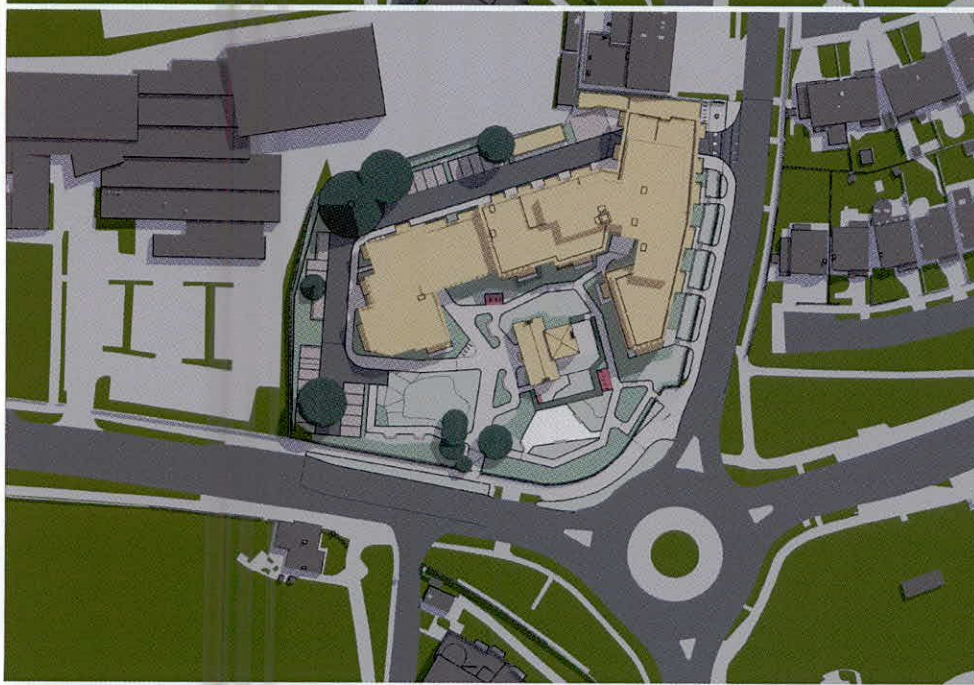
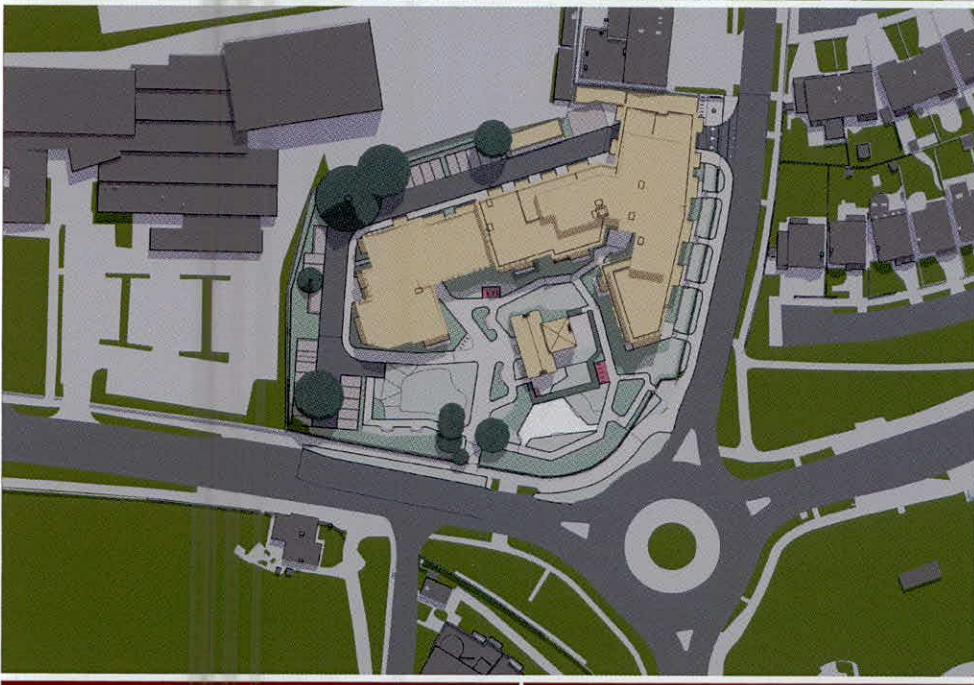
June 21st 15:00

June 21st 16:00

June 21st 17:00



Baseline



Proposed

Project: Scholarstown House

Applicant: Emmaville Ltd.

June 21st
Sunrise 4:57 | Sunset 21:57



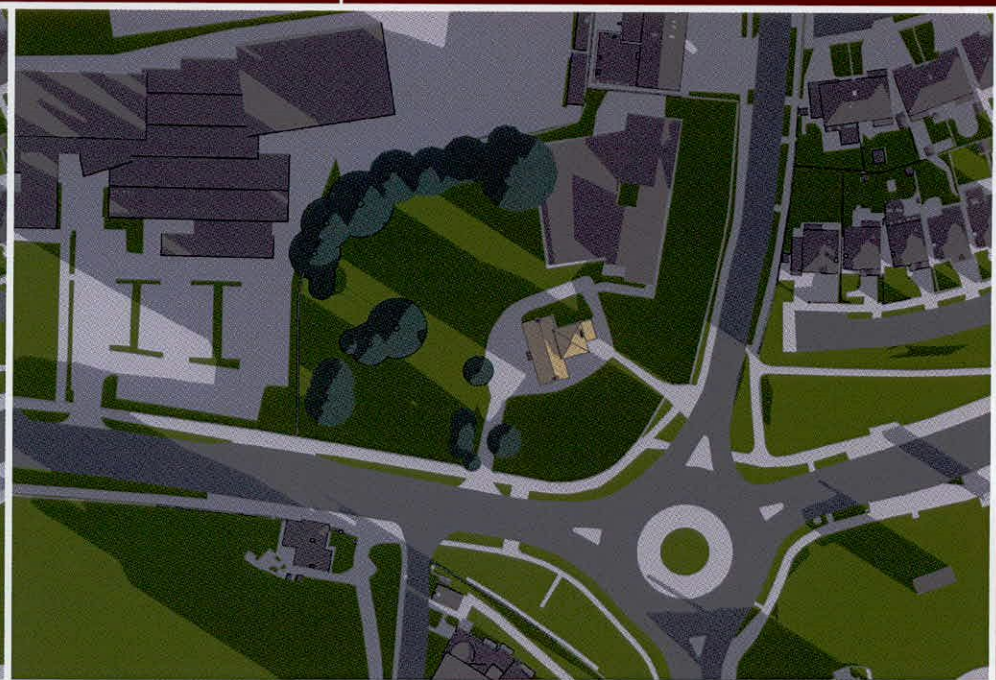


June 21st 18:00

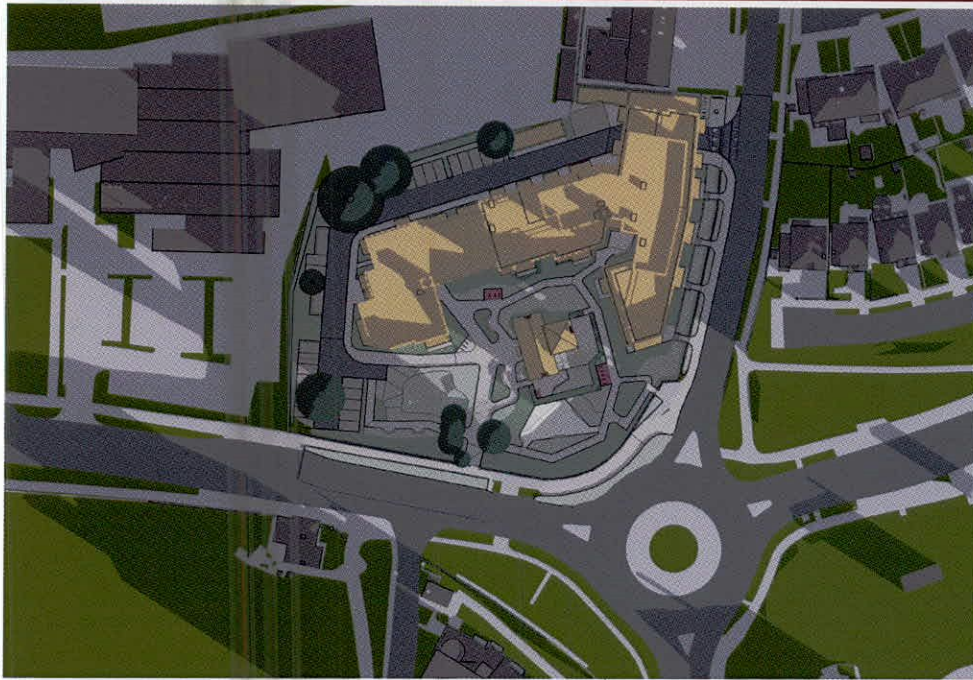
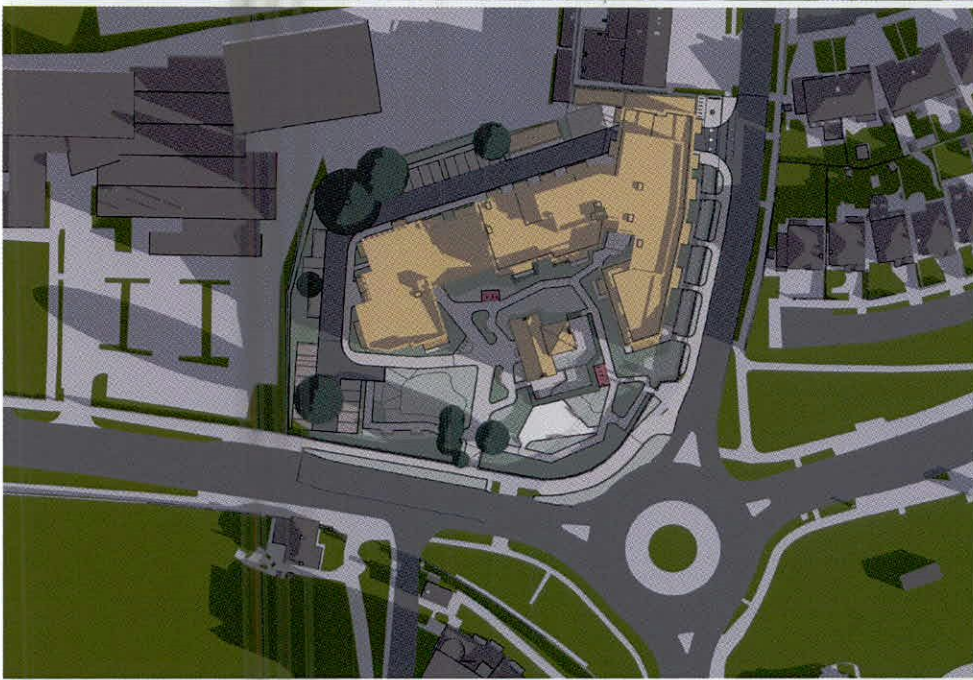
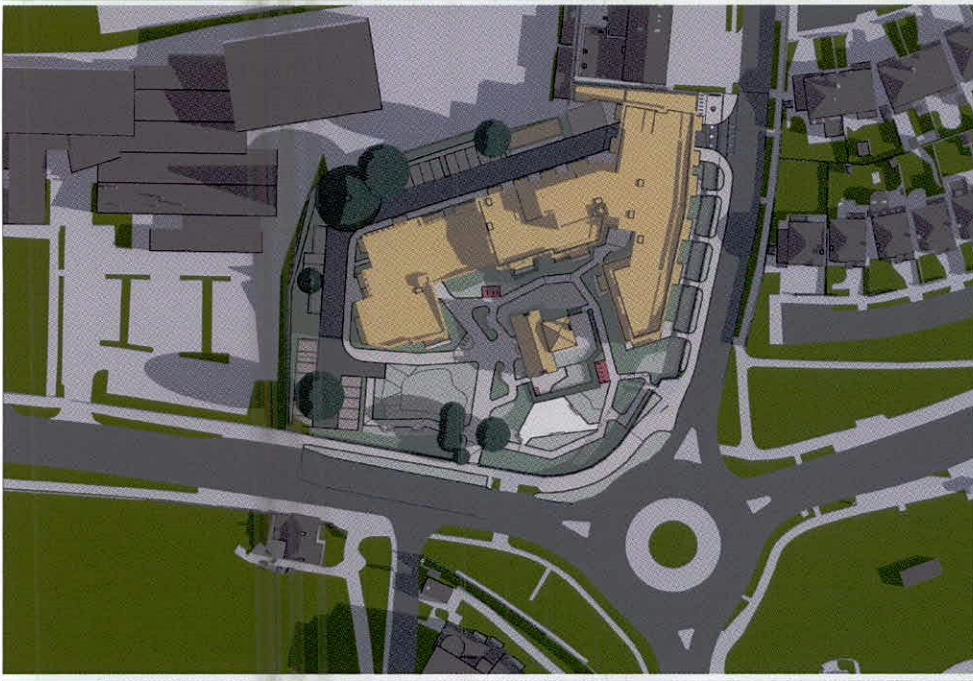
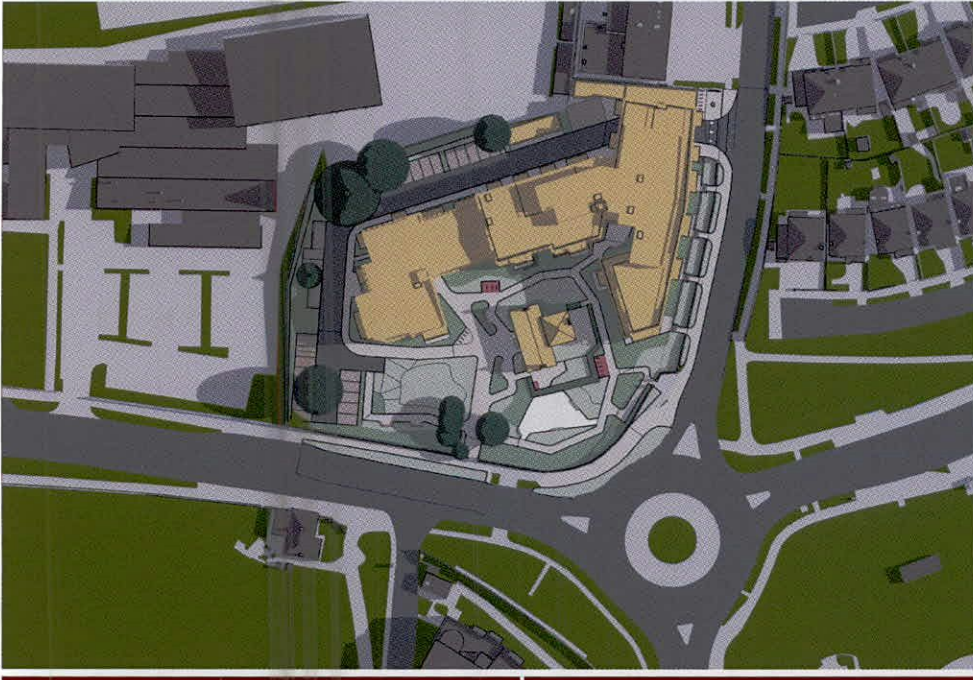
June 21st 19:00

June 21st 20:00

June 21st 21:00



Baseline



Proposed

Project: Scholarstown House

Applicant: Emmaville Ltd.



June 21st
Sunrise 4:57 | Sunset 21:57

December 21st 9:00

December 21st 10:00

December 21st 11:00

December 21st 12:00

B.3

Shadow Study 21 December

December 21st
Sunrise 8:38 | Sunset 16:08

Project: Schlarstown House

Applicant: Emmaville Ltd.



Proposed

Baseline

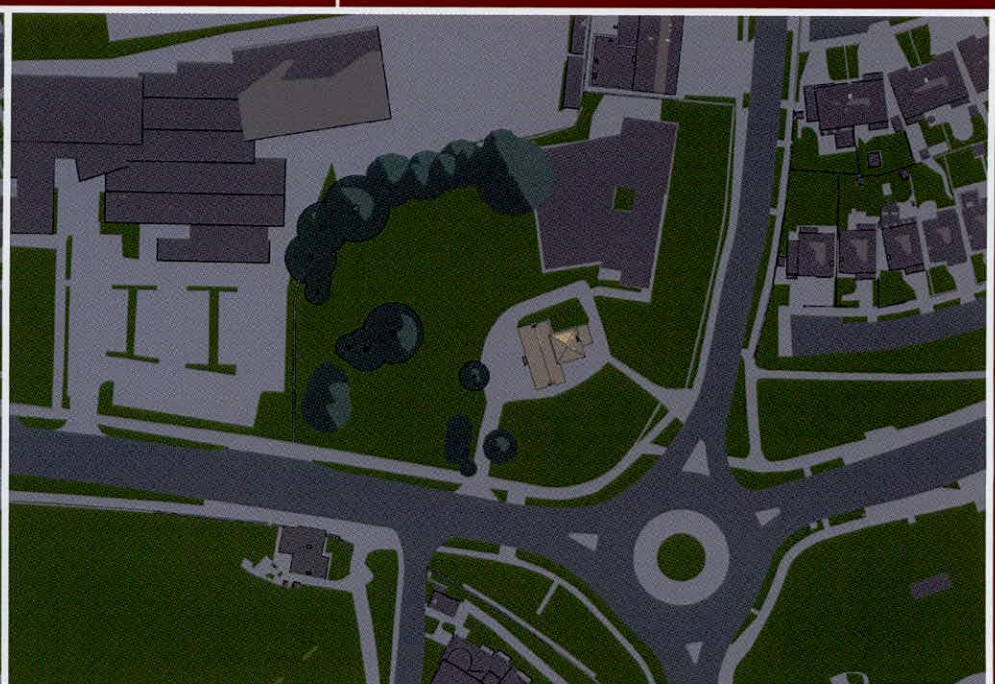
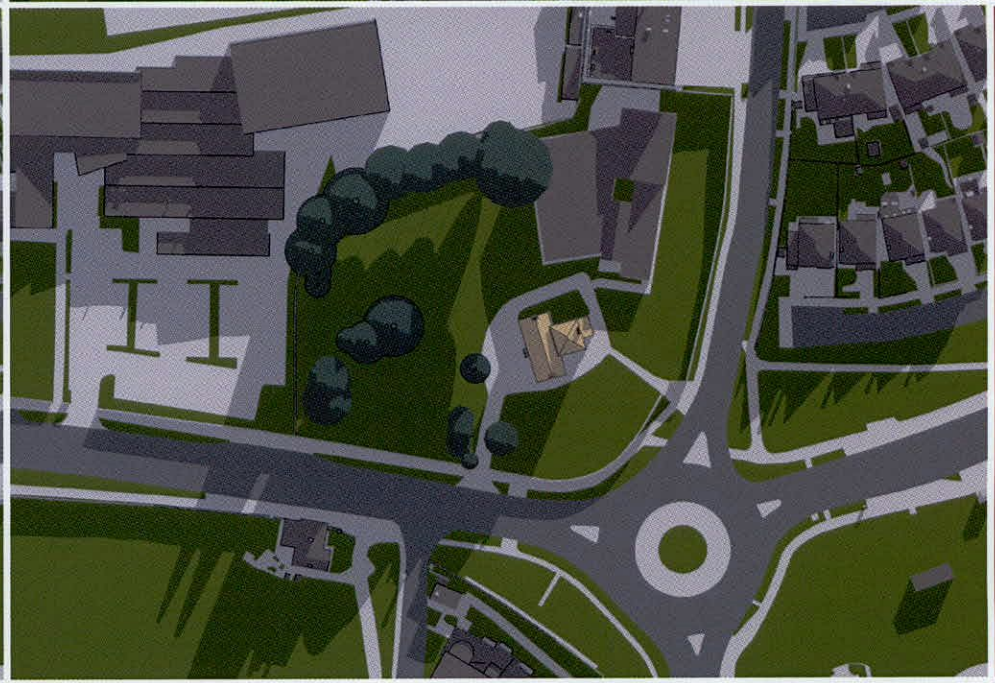


December 21st 13:00

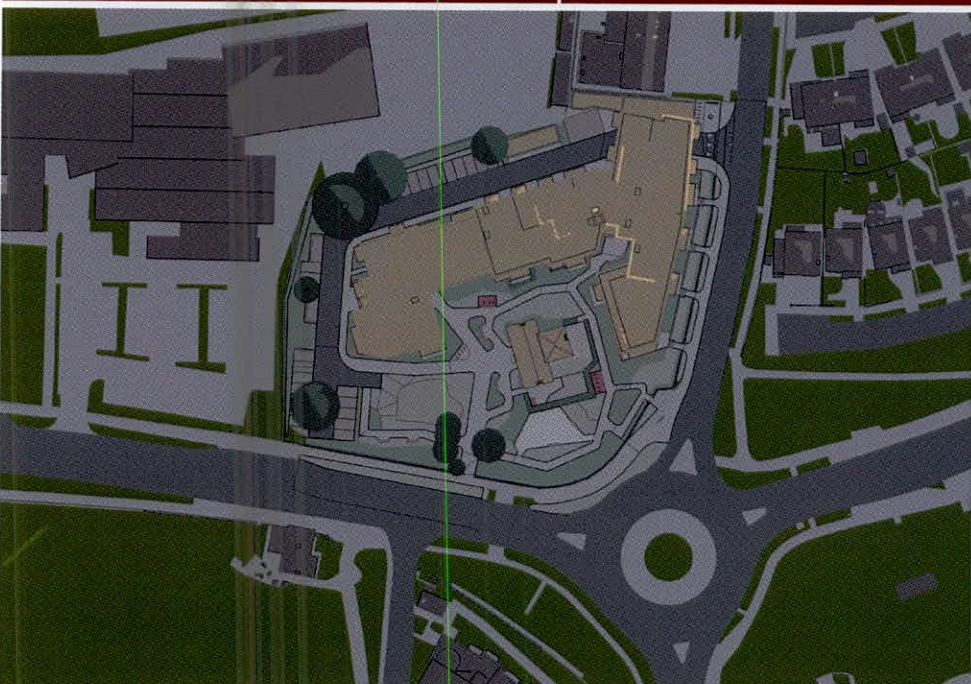
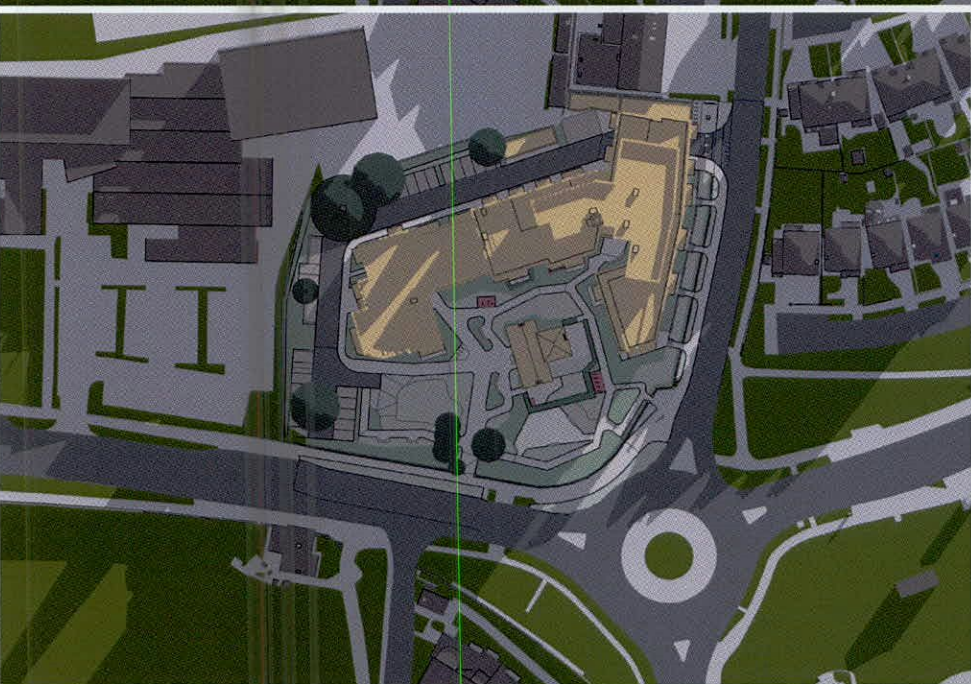
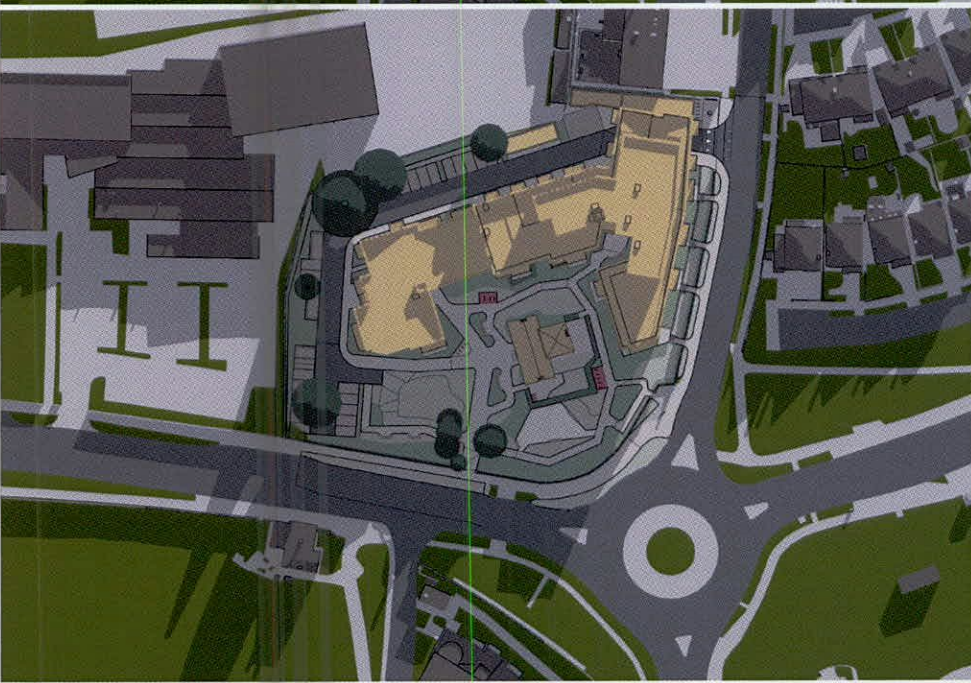
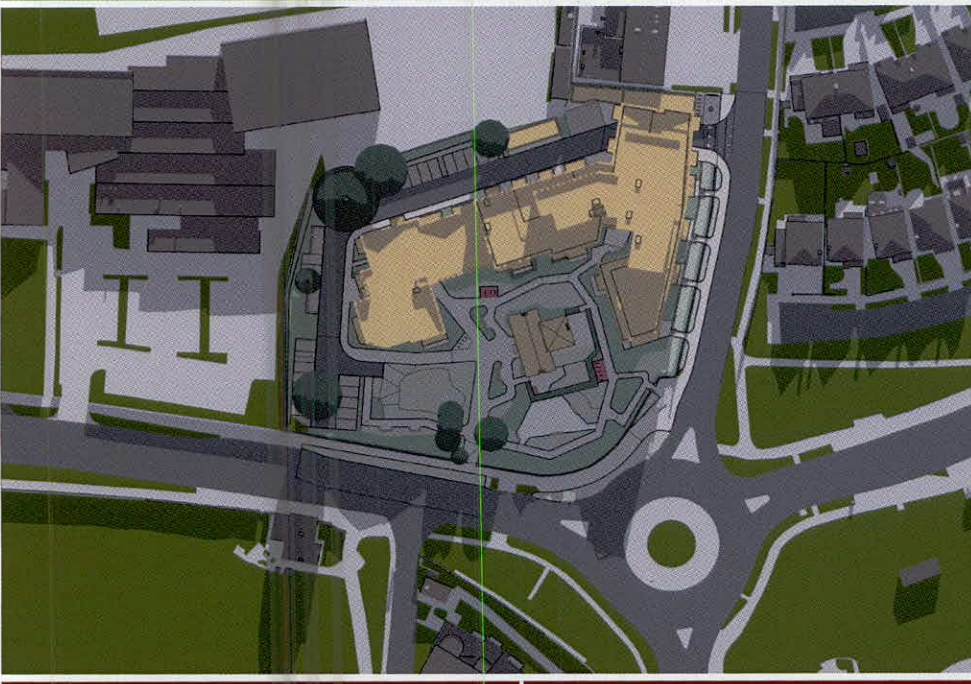
December 21st 14:00

December 21st 15:00

December 21st 16:00



Baseline



Proposed

December 21st
Sunrise 8:38 | Sunset 16:08

Applicant: Emmaville Ltd.

Project: Scholarstown House



C.0 Scheme Performance Results

C.1 Sun On Ground (SOG) in Proposed Private Gardens

Below is an example of the table used to describe SOG in proposed gardens.

Table Example. C.1 - Scheme Performance SOG				
Assessed Area	Area Capable of Receiving 2 Hours of Sunlight on March 21st	Recommended Minimum	Level of Compliance with BRE Guidelines	Meets BRE 209 Criteria
A	B	C	D	E

A: Assessed Area

This column identifies the assessed garden/amenity area.

B: Area Capable of Receiving 2 Hours of Sunlight on March 21st

The percentage of the proposed area that can receive more than 2 hours of sunlight on March 21st.

C: Recommended Minimum

The BRE Guidelines state that the percentage of a garden/amenity area that can receive more than 2 hours of sunlight on March 21st should be 50%. The target value for all spaces is set to 50%.

D: Level of Compliance with BRE Guidelines

This column states the compliance of the assessed space with the *BRE Target Value*. If the assessed garden or amenity area complies with the BRE Guidelines this cell will state "*BRE Compliant*". If the garden or amenity area does not meet the criteria as set out in the BRE Guidelines, a percentage of compliance with the *recommended minimum* will be stated.

E: Meets BRE 209 Criteria

This column states if the assessed room achieves the recommended level of sunlight on March 21st as per BRE 209.

It should be noted that the figures displayed in the table of results have been rounded off. A manual calculation on these figures may yield a negligible difference and should not be considered an error.

C.1.1 Sun On Ground in Proposed Private Gardens

Table No. C.1.1 - SOG in Proposed Private Gardens Results:

Assessed Area	Area Capable of Receiving 2 Hours of Sunlight on March 21st	Recommended minimum	Level of Compliance with BRE Guidelines*	Meets BRE 209 Criteria*
Private Garden No. 1	50.63%	50.00%	BRE Compliant	Yes
Private Garden No. 2	52.08%	50.00%	BRE Compliant	Yes

* The BRE Guidelines recommend that for a garden or amenity 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 March 21st.

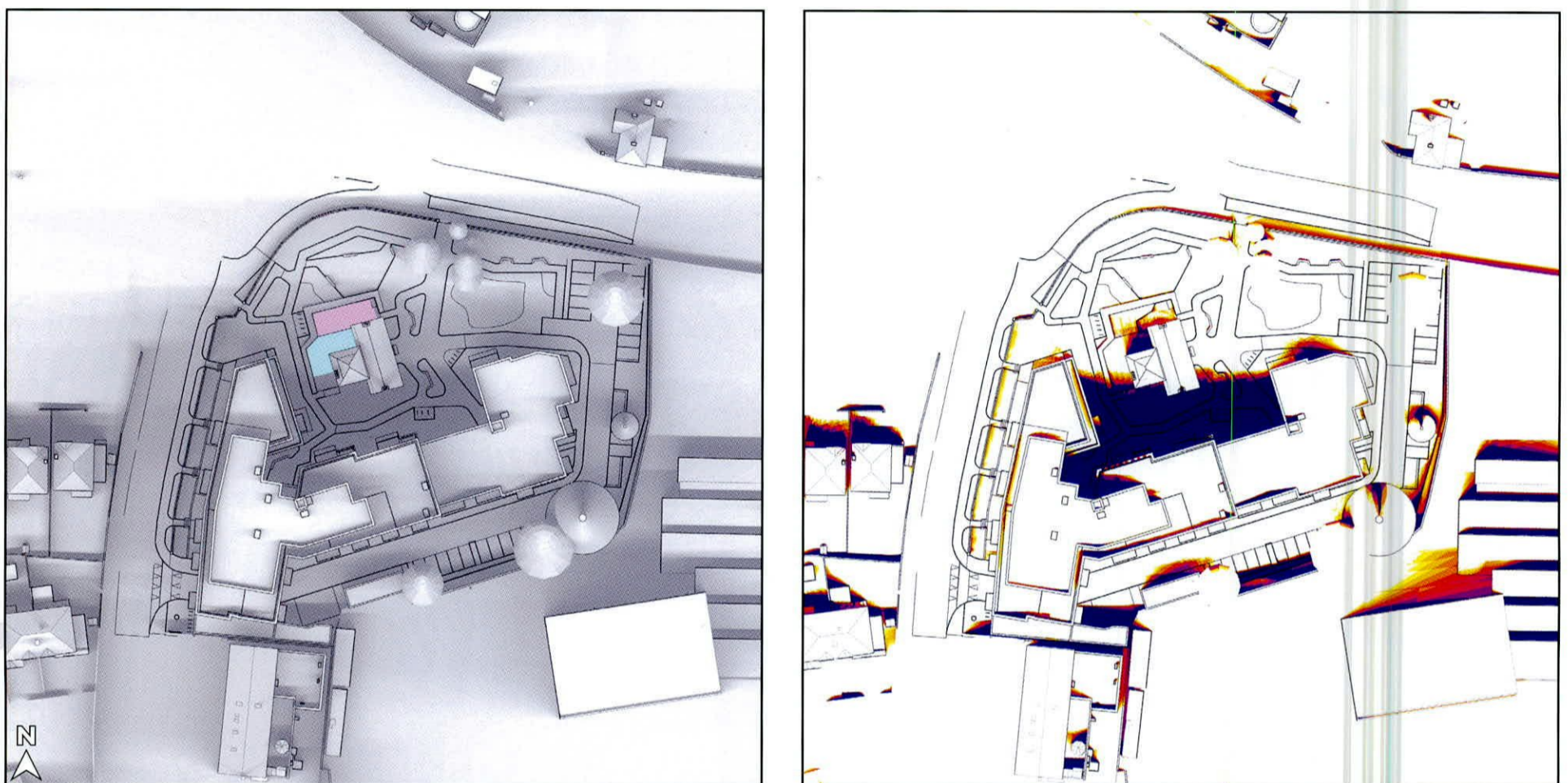


Figure C.1: Indication of the amenity areas that have been analysed (L), Area capable of receiving 2 hours of sunlight on March 21st shown in white (R)

C.2 Sunlight Exposure (SE) in Proposed Units

Below is an example of the table used to describe the SE performance of proposed habitable rooms.

Table Example. C.2 - Scheme Performance Sunlight Exposure							
Unit Number	Room Description	Deciduous Trees as Opaque Objects			Without Deciduous Trees		
		SE Hours on March 21st	Level of SE on March 21st	Unit compliance based on highest performing room	SE Hours on March 21st	Level of SE on March 21st	Unit compliance based on highest performing room
A	B	C	D	E	F	G	H

A: Unit Number

This column identifies the assessed unit. All unit numbers are determined by the architect's drawings, unless otherwise stated.

B: Room Description

Room Description details which room of the unit has been assessed, e.g. bedroom, living room, etc.

C: SE Hours on March 21st (Deciduous Trees as Opaque Objects)

This column will state the number of hours the assessed room can expect to receive on March 21st with the assessment carried out with deciduous trees as opaque objects.

D: Level of SE on March 21st (Deciduous Trees as Opaque Objects)

BRE 209 recommends a minimum sunlight exposure of 1.5 hours for a proposed unit with preference given to main living rooms. BRE 209 categorise sunlight exposure as minimum, medium and high, this column will categorise the level of sunlight exposure with deciduous trees as opaque objects based on the following:

- Less than 1.5 hours: *Non-compliant*,
- Between 1.5 hours and 3 hours: *Minimum*
- Between 3 hours and 4 hours: *Medium*
- More than 4 hours: *High*

E: Unit compliance based on highest performing room (Deciduous Trees as Opaque Objects)

A proposed unit is considered to be compliant provided any habitable room within the unit is capable of receiving at least 1.5 hours of sunlight on March 21st. This column will identify the highest performing room within a unit and state compliance for the associated unit based on that room with the assessment carried out with deciduous trees as opaque objects. Typically only one room per unit will be populated in this column, with lesser performing rooms indicated with a dash (-). However, if more than one room in a given unit is considered to be the best performing room, i.e. they have the same number of SE hours on March 21st, then the unit compliance column will be populated for each.

F: SE Hours on March 21st (Without Deciduous Trees)

This column will state the number of hours the assessed room can expect to receive on March 21st with the assessment carried out without deciduous trees.

G: Level of SE on March 21st (Without Deciduous Trees)

BRE 209 recommends a minimum sunlight exposure of 1.5 hours for a proposed unit with preference given to main living rooms. BRE 209 categorise sunlight exposure as minimum, medium and high, this column will categorise the level of sunlight exposure without deciduous trees using the same criteria as the study with deciduous trees as opaque objects.

H: Unit compliance based on highest performing room (Without Deciduous Trees)

A proposed unit is considered to be compliant provided any habitable room within the unit is capable of receiving at least 1.5 hours of sunlight on March 21st. This column will identify the highest performing room within a unit and state compliance for the associated unit based on that room with the assessment carried out without deciduous trees. Typically only one room per unit will be populated in this column, with lesser performing rooms indicated with a dash (-). However, if more than one room in a given unit is considered to be the best performing room, i.e. they have the same number of SE hours on March 21st, then the unit compliance column will be populated for each.

It should be noted that the figures displayed in the table of results have been rounded off. A manual calculation on these figures may yield a negligible difference and should not be considered an error.

C.2.1 Scholarstown House - Existing state

Unit Number	Room Description	Deciduous Trees as Opaque Objects*			Without Deciduous Trees*		
		SE Hours on March 21st	Level of SE on March 21st***	Unit compliance based on highest performing room**	SE Hours on March 21st	Level of SE on March 21st***	Unit compliance based on highest performing room**
Extg. House	Kitchen	1.20	Non-Compliant	-	5.10	High	-
Extg. House	Living Room 1	1.50	Minimum	-	5.60	High	-
Extg. House	Living Room 2	0.10	Non-Compliant	-	0.20	Non-Compliant	-
Extg. House	Bedroom 1	2.30	Minimum	-	6.20	High	-
Extg. House	Bedroom 2	0.00	Non-Compliant	-	0.90	Non-Compliant	-
Extg. House	Bedroom 3	0.70	Non-Compliant	-	0.70	Non-Compliant	-
Extg. House	Bedroom 4	0.90	Non-Compliant	-	4.60	High	-
Extg. House	Attic 1	6.00	High	Compliant	7.10	High	Compliant
Extg. House	Attic 2	1.80	Minimum	-	3.90	Medium	-

* Rooms are tested with deciduous trees as opaque objects and without deciduous trees to account for the range of possible sunlight hours.
 ** The BRE Guidelines recommend that for a unit to be compliant any room within the unit should receive a minimum of 1.5 hours of direct sunlight on March 21st, preferably a main living room. The SE circa compliance rates across the entire scheme can be found in section 5.2.2 on page 18.
 *** For the interpretation of levels of Sunlight Exposure please refer to "3.3 Definition of Levels of Sunlight Exposure" on page 10 of the corresponding report.

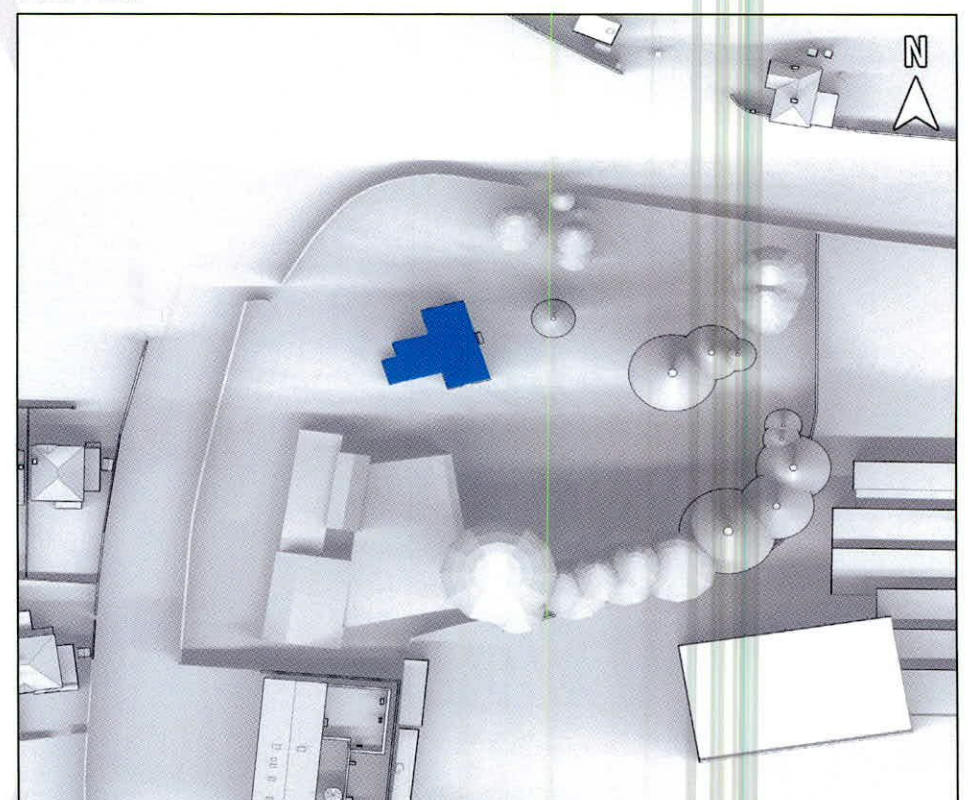
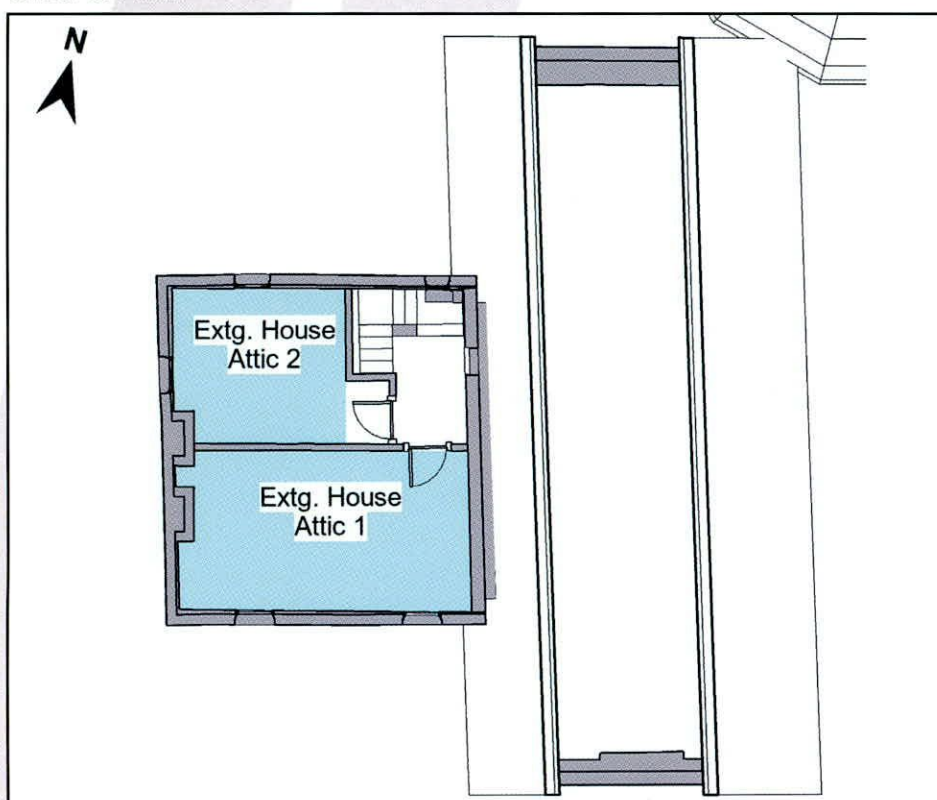
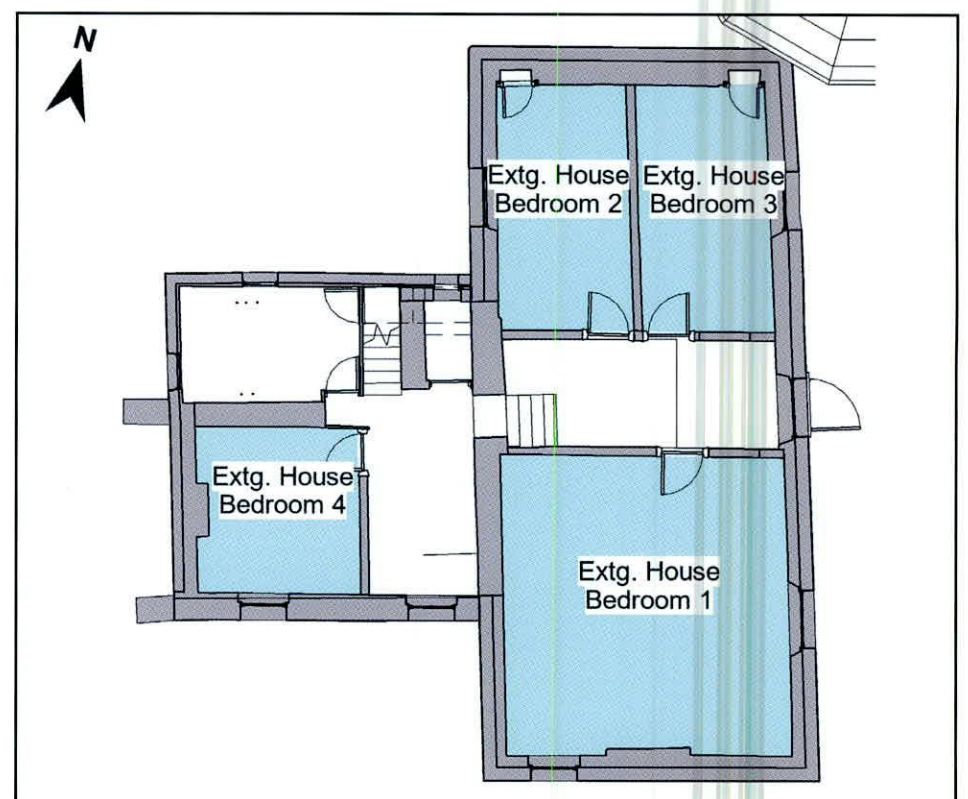
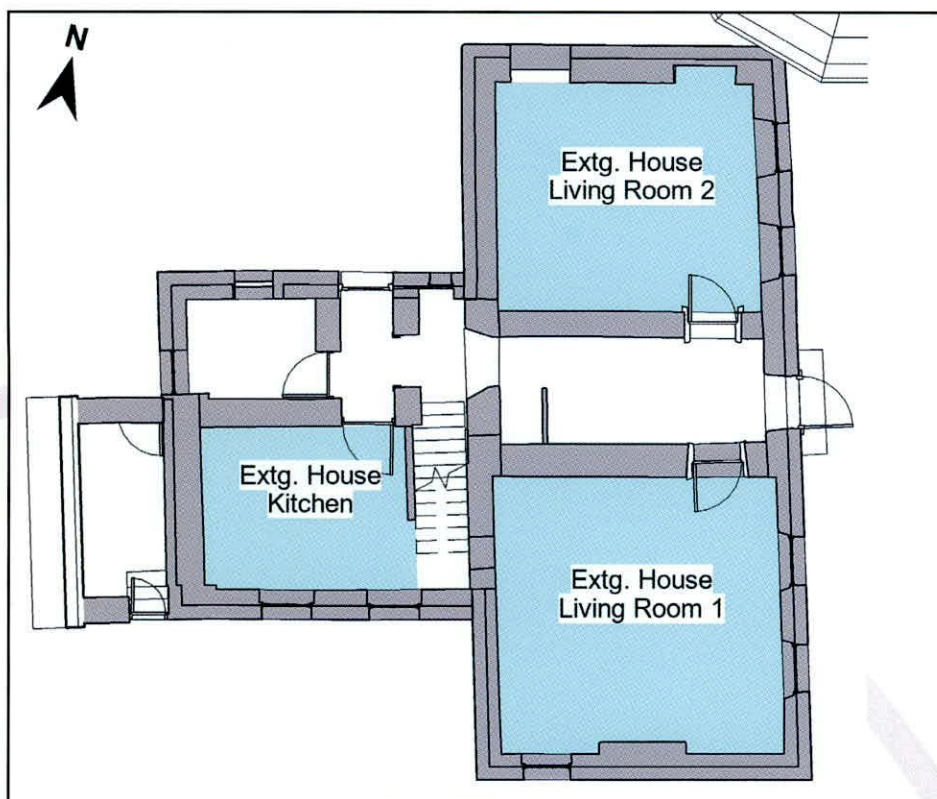


Figure C.2: Floor plan of assessed building, Keyplan highlighting the assessed building (L).

C.2.2 Scholarstown House - Proposed state

Unit Number	Room Description	Deciduous Trees as Opaque Objects*			Without Deciduous Trees*		
		SE Hours on March 21st	Level of SE on March 21st***	Unit compliance based on highest performing room**	SE Hours on March 21st	Level of SE on March 21st***	Unit compliance based on highest performing room**
Unit No. 1	Kitchen	0.00	Non-Compliant	-	0.00	Non-Compliant	-
Unit No. 1	Living Room	0.00	Non-Compliant	-	0.00	Non-Compliant	-
Unit No. 1	Bedroom 1	4.00	High	Compliant	4.50	High	Compliant
Unit No. 1	Bedroom 2	0.00	Non-Compliant	-	0.00	Non-Compliant	-
Unit No. 1	Bedroom 3	0.30	Non-Compliant	-	0.70	Non-Compliant	-
Unit No. 2	Kitchen	1.10	Non-Compliant	-	1.60	Minimum	-
Unit No. 2	Living Room	4.60	High	-	4.60	High	-
Unit No. 2	Bedroom 1	6.60	High	Compliant	6.60	High	Compliant
Unit No. 2	Bedroom 2	3.20	Medium	-	3.20	Medium	-

* Rooms are tested with deciduous trees as opaque objects and without deciduous trees to account for the range of possible sunlight hours.
 ** The BRE Guidelines recommend that for a unit to be compliant any room within the unit should receive a minimum of 1.5 hours of direct sunlight on March 21st, preferably a main living room. The SE circa compliance rates across the entire scheme can be found in section 5.2.2 on page 18.
 *** For the interpretation of levels of Sunlight Exposure please refer to "3.3 Definition of Levels of Sunlight Exposure" on page 10 of the corresponding report.



Figure C.3: Floor plan of assessed building, Keyplan highlighting the assessed building (L).

C.3 Spatial Daylight Autonomy (SDA) in Proposed Units

Below is an example of the table used to describe the spatial daylight autonomy results in proposed units.

Table Example. C.3 - Scheme Performance SDA					
Unit Number	Room Description	Target Lux*	% of area above target Lux* (recommendation >50%)		Compliance with BRE 209 Criteria
			Winter	Summer	
A	B	C	D	E	F

A: Unit Number

This column identifies the assessed unit. All unit numbers are determined by the architect's drawings, unless otherwise stated.

B: Room Description

Room Description details which room in the unit has been assessed, e.g. bedroom, LKD, etc.

C: Target Lux

Under BRE 209 the appropriate target lux levels to be achieved across 50% of the working plane of a room differ depending on the room type. Kitchens have a target lux of 200, living rooms have a target lux of 150 and bedrooms have a target lux of 100. In a room providing more than one function, such as an LKD, the higher target value should be taken i.e. 200 Lux.

D: % of area above target Lux (Winter)

BRE 209 recommends target lux levels to be achieved across at least 50% of the working plane for at least half the daylight hours. The target values differ depending on the room function, 200 lux for Kitchens, 150 lux for Living Rooms or 100 lux for Bedrooms.

This column states percentage of the working plane of the assessed room that is capable of receiving more than the appropriate target lux for at least half the daylight hours with deciduous trees in the winter state, i.e. bare branch.

E: % of area above target Lux (Summer)

BRE 209 recommends target lux levels to be achieved across at least 50% of the working plane for at least half the daylight hours. The target values differ depending on the room function, 200 lux for Kitchens, 150 lux for Living Rooms or 100 lux for Bedrooms.

This column states percentage of the working plane of the assessed room that is capable of receiving more than the appropriate target lux for at least half the daylight hours with deciduous trees in full foliage.

F: Compliance with BRE 209 Criteria

This column states if the assessed room achieves the recommended level of daylight as per BRE 209 with consideration to the various tree states.

If the target lux level is achieved across more than 50% of the working plane, for half the daylight hours, both with and without trees, this column will state: *'Compliant'*.

If the target lux level is not achieved across more than 50% of the working plane, for half the daylight hours, both with and without trees, this column will state: *'Non-compliant'*.

If the target lux level is achieved across more than 50% of the working plane, for half the daylight hours, without trees but is not achieved with trees, this column will state: *'Trees affecting compliance'*.

If the target lux level is achieved across more than 50% of the working plane, for half the daylight hours, with the trees in the winter state but is not achieved with trees in the summer state, this column will state: *'Trees affecting compliance (summer only)'*.

Compliance rates will be stated for SDA compliance with trees in all of the above states.

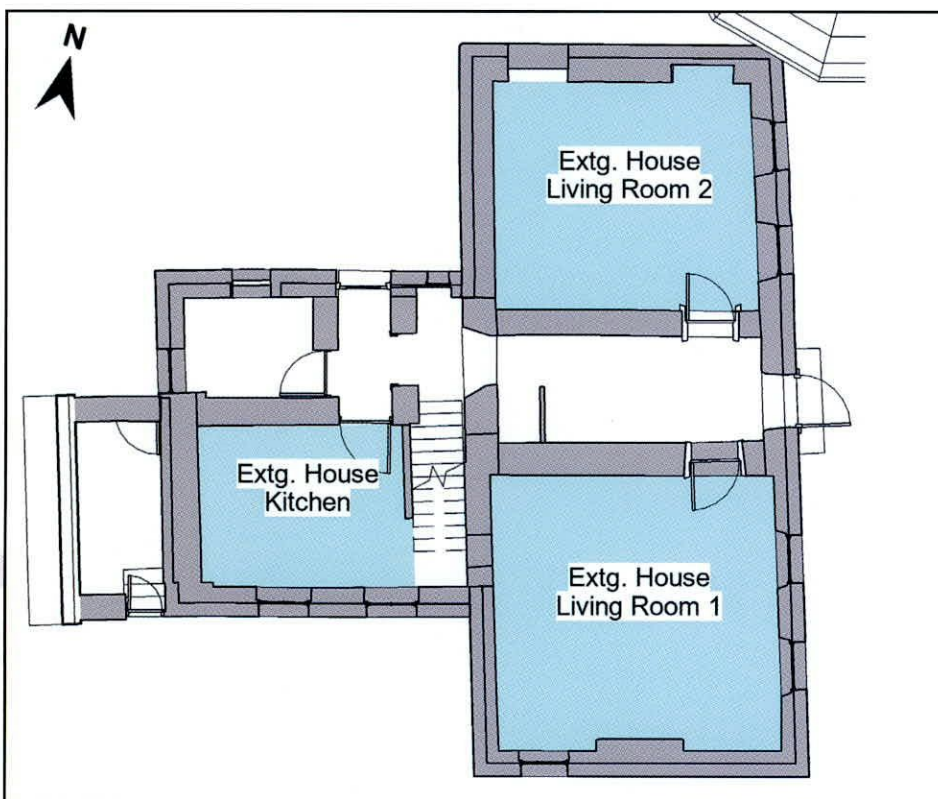
It should be noted that the figures displayed in the table of results have been rounded off. A manual calculation on these figures may yield a negligible difference and should not be considered an error.

C.3.1 Scholarstown House - Existing state

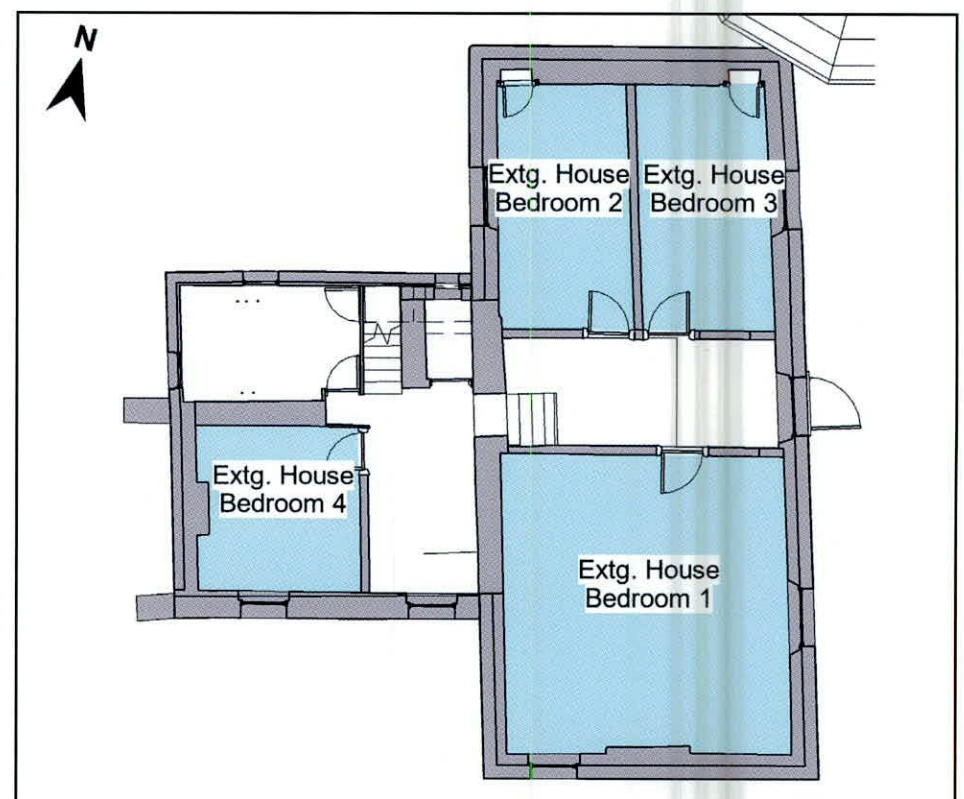
Table No. C.3.1 - SDA Results: Scholarstown House - Existing state

Unit Number	Room Description	Target Lux*	% of area above target Lux* (recommendation >50%)		Compliance with BRE 209 Criteria*
			Winter**	Summer**	
Extg. House	Kitchen	200	46%	23%	Trees affecting compliance
Extg. House	Living Room 1	150	79%	67%	Compliant
Extg. House	Living Room 2	150	50%	45%	Trees affecting compliance (summer only)
Extg. House	Bedroom 1	100	46%	28%	Trees affecting compliance
Extg. House	Bedroom 2	100	20%	13%	Trees affecting compliance
Extg. House	Bedroom 3	100	56%	54%	Compliant
Extg. House	Bedroom 4	100	87%	61%	Compliant
Extg. House	Attic 1	100	41%	19%	Trees affecting compliance
Extg. House	Attic 2	100	69%	33%	Trees affecting compliance (summer only)

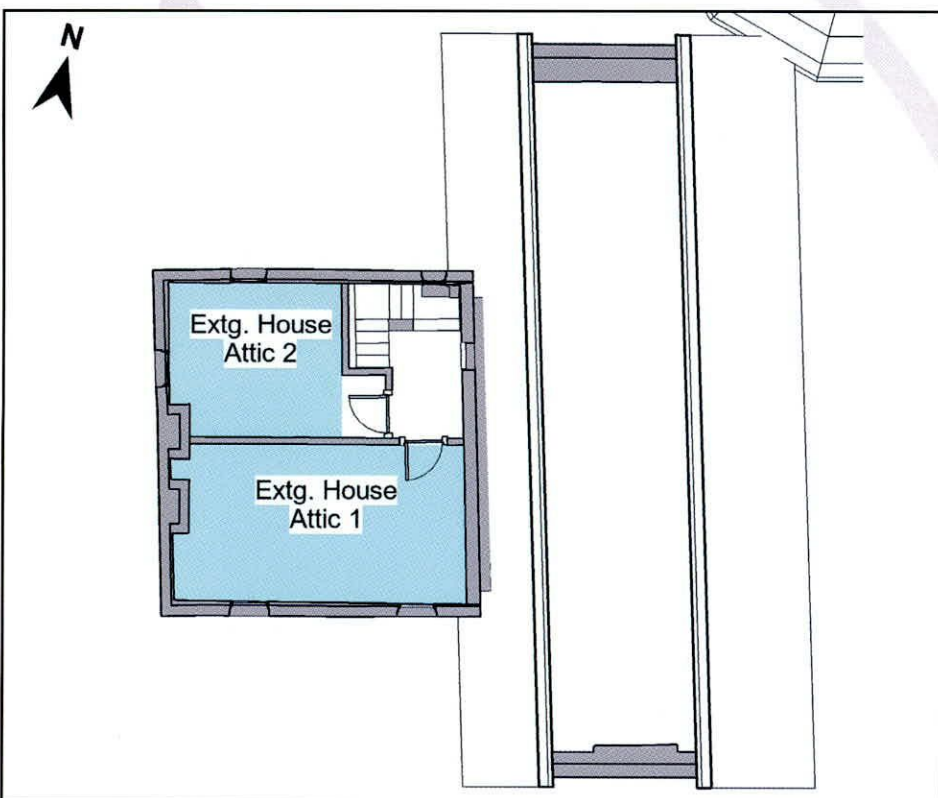
* For information regarding the criteria under the various guidelines including target Lux please refer to section 4.4.3 on page 15.
 ** Under the BRE 209 study the SDA has been calculated with trees represented with both winter and summer foliage.
 The SDA circa compliance rates across the entire scheme can be found in section 5.2.3 on page 19.



Ground Floor



First Floor



Second Floor

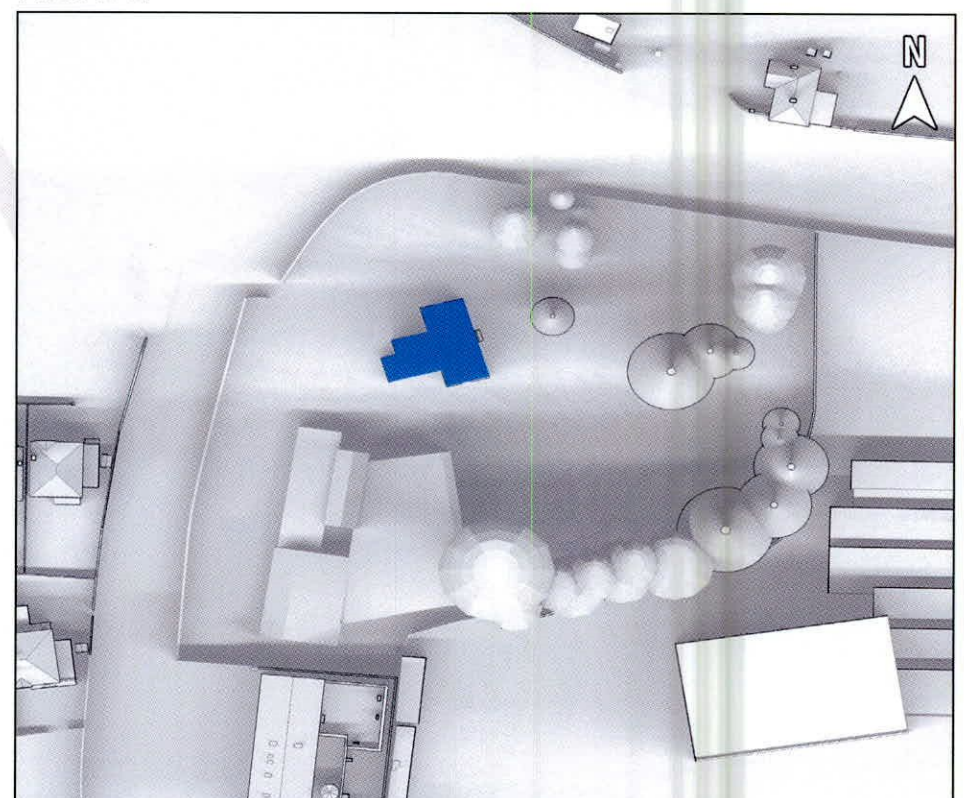


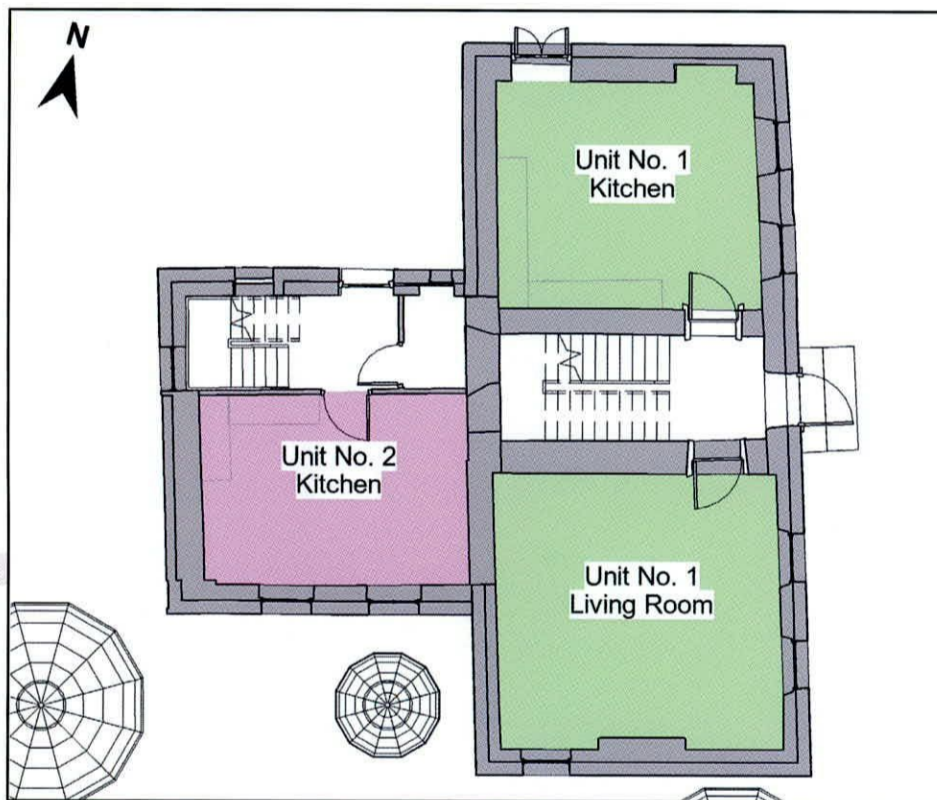
Figure C.4: Floor plan of assessed building, Keyplan highlighting the assessed building (L).

C.3.2 Scholarstown House - Proposed state

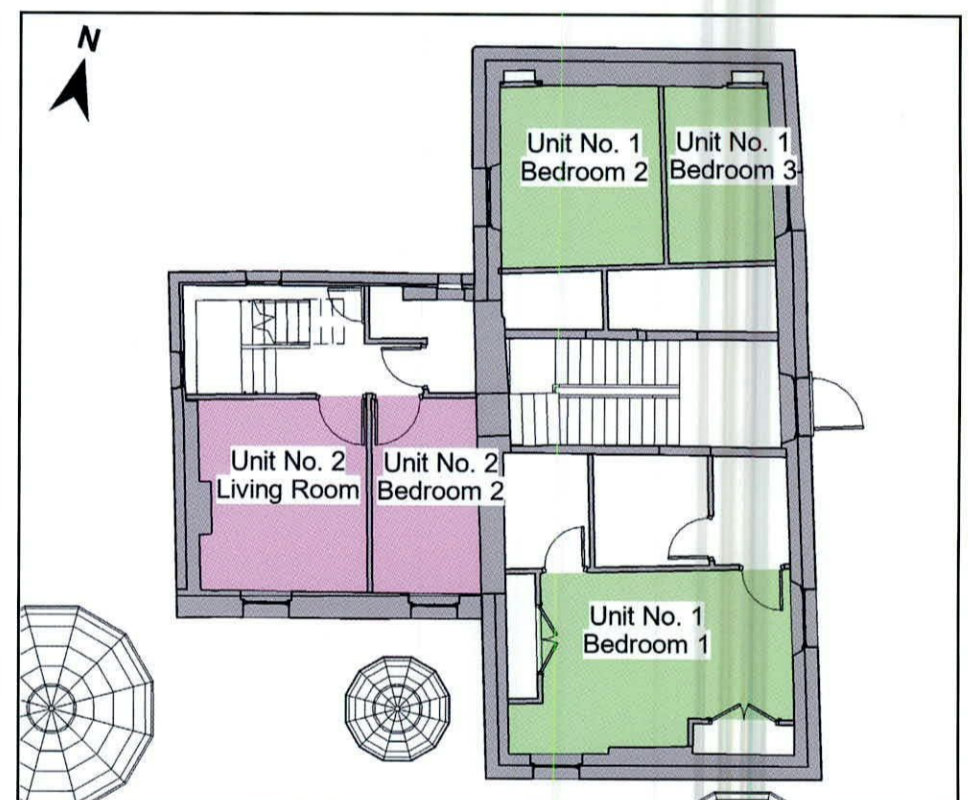
Table No. C.3.2 - SDA Results: Scholarstown House - Proposed state

Unit Number	Room Description	Target Lux*	% of area above target Lux* (recommendation >50%)		Compliance with BRE 209 Criteria*
			Winter**	Summer**	
Unit No. 1	Kitchen	200	36%	33%	Trees affecting compliance
Unit No. 1	Living Room	150	48%	43%	Trees affecting compliance
Unit No. 1	Bedroom 1	100	55%	50%	Compliant
Unit No. 1	Bedroom 2	100	20%	17%	Non-compliant
Unit No. 1	Bedroom 3	100	94%	90%	Compliant
Unit No. 2	Kitchen	200	8%	6%	Non-compliant
Unit No. 2	Living Room	150	19%	19%	Non-compliant
Unit No. 2	Bedroom 1	100	11%	11%	Non-compliant
Unit No. 2	Bedroom 2	100	40%	40%	Non-compliant

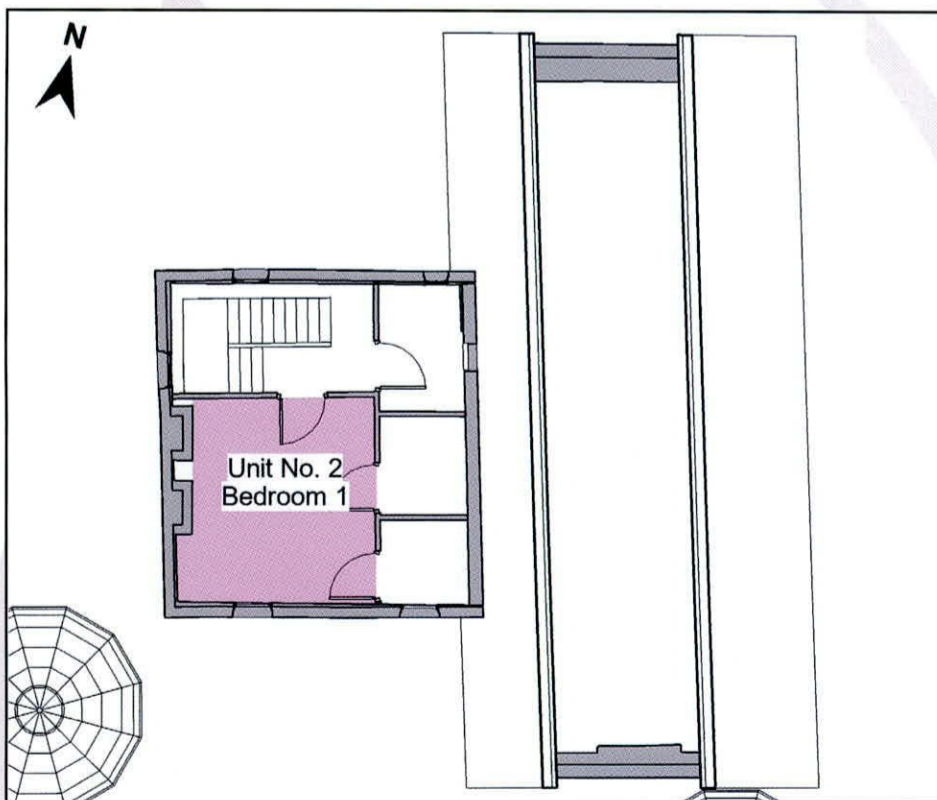
* For information regarding the criteria under the various guidelines including target Lux please refer to section 4.4.3 on page 15.
 ** Under the BRE 209 study the SDA has been calculated with trees represented with both winter and summer foliage.
 The SDA circa compliance rates across the entire scheme can be found in section 5.2.3 on page 19.



Ground Floor



First Floor



Second Floor

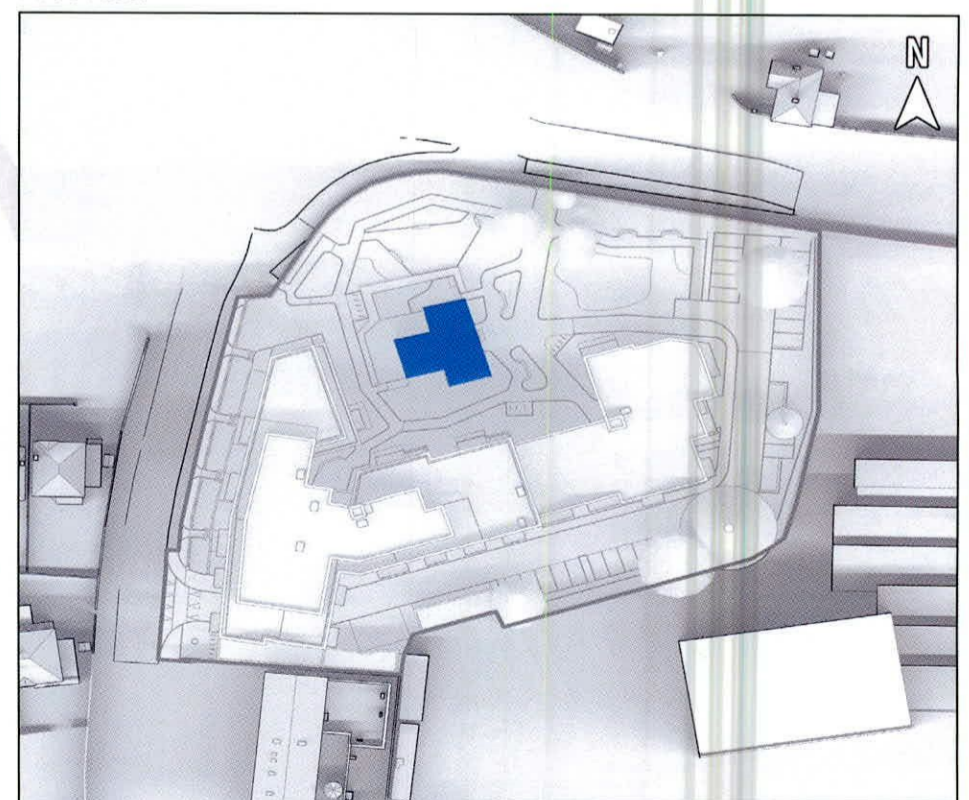


Figure C.5: Floor plan of assessed building, Keyplan highlighting the assessed building (L).

C.4 Supplementary Studies

SDA study, under the I.S. EN 17037 criterion and No Sky Line (NSL) assessment in proposed units.

Below is an example of the table used to describe the supplementary study results for proposed units.

Table Example. C.4 - Scheme Performance SDA						
Unit Number	Room Description	I.S. EN 17037			No Sky Line (NSL)	
		% of area above 300 Lux (recommendation >50%)	% of area above 100 Lux (recommendation >95%)	Meets I.S. EN 17037 Criteria	% of room where the sky is visible from the working plane	Above 80%
A	B	C	D	E	F	G

A: Unit Number

This column identifies the assessed unit. All unit numbers are determined by the architect's drawings, unless otherwise stated.

B: Room Description

Room Description details which room in the unit has been assessed, e.g. bedroom, LKD, etc.

C: % of area above 300 Lux

I.S. EN 17037 recommends at least 50% of the working plane receives above 300 lux for at least half the daylight hours. This column states percentage of the working plane of the assessed room that is capable of receiving more than 300 lux for at least half the daylight hours.

D: % of area above 100 Lux

I.S. EN 17037 recommends at least 95% of the working plane receives above 100 lux for at least half the daylight hours. This column states percentage of the working plane of the assessed room that is capable of receiving more than 100 lux for at least half the daylight hours.

E: Meets I.S. EN 17037 Criteria

This column states if the assessed room achieves the recommended level of daylight as per I.S. EN 17037. (300 lux across more than 50% of the working plane and 100 lux across more than 95% of the working plane for half the daylight hours)

F: % of room where the sky is visible from the working plane

This column states the percentage of the room from which there is a direct line of sight to the sky when assessed at the working plane height, which is 850mm above the finished floor level in residential rooms or 700mm above the finished floor level in offices or classrooms.

G: Above 80%

Whilst the BRE Guidelines only provide recommendations for NSL in the context of an impact analysis, it states that "Supplementary electric lighting will be needed if a significant part of the working plane (20% of the room or more) lies beyond the no sky line."

If this column states: 'Yes', it signifies that the sky will be visible from more than 80% of the working plane.

If this column states: 'No', it signifies that the sky will be visible from less than 80% of the working plane and supplementary electric lighting may be required.

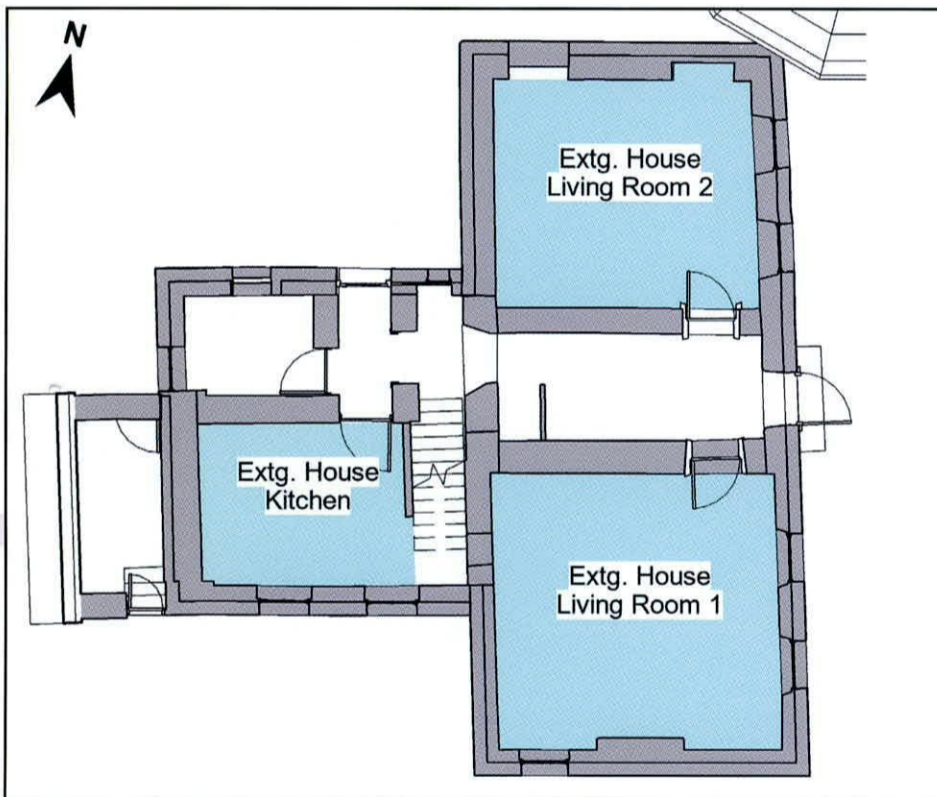
C.4.1 Scholarstown House - Existing state

Table No. C.4.1 - Supplementary Studies: Scholarstown House - Existing state

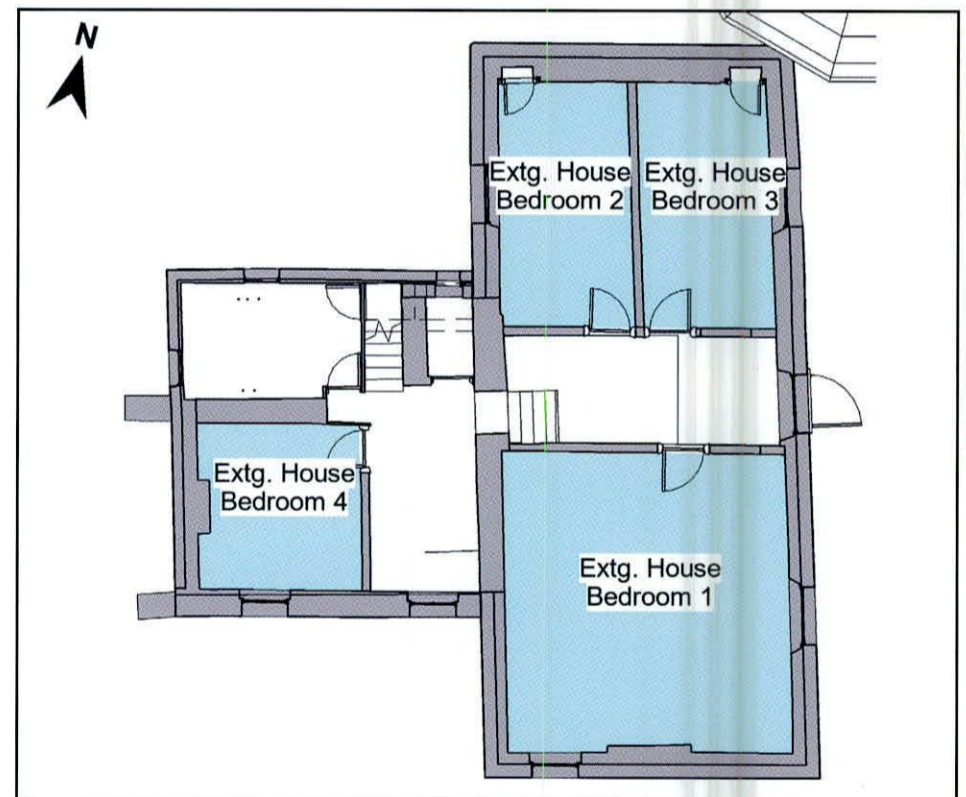
Unit Number	Room Description	SDA (I.S. EN 17037 Criterion)			No Sky Line (NSL)	
		% of area above 300 Lux (recommendation >50%)	% of area above 100 Lux (recommendation >95%)	Meets I.S. EN 17037 Criteria*	% of room where the sky is visible from the working plane	Above 80%**
Extg. House	Kitchen	2%	96%	Non-compliant	95%	Yes
Extg. House	Living Room 1	16%	98%	Non-compliant	99%	Yes
Extg. House	Living Room 2	10%	83%	Non-compliant	98%	Yes
Extg. House	Bedroom 1	2%	24%	Non-compliant	98%	Yes
Extg. House	Bedroom 2	0%	13%	Non-compliant	65%	No
Extg. House	Bedroom 3	6%	65%	Non-compliant	83%	Yes
Extg. House	Bedroom 4	4%	63%	Non-compliant	93%	Yes
Extg. House	Attic 1	0%	18%	Non-compliant	94%	Yes
Extg. House	Attic 2	0%	37%	Non-compliant	98%	Yes

* For information regarding the criteria under the various guidelines including target Lux please refer to section 4.4.3 on page 15.

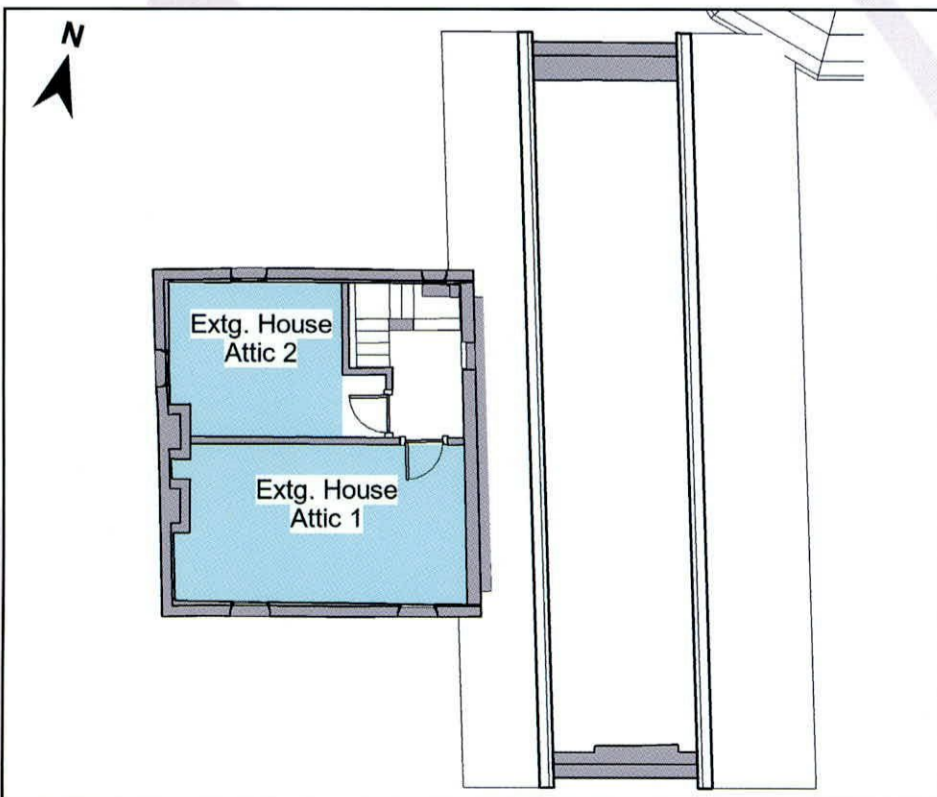
** Whilst the BRE Guidelines do not provide target values for NSL in a proposed development, it states that "Supplementary electric lighting will be needed if a significant part of the working plane (20% of the room or more) lies beyond the no sky line."



Ground Floor



First Floor



Second Floor

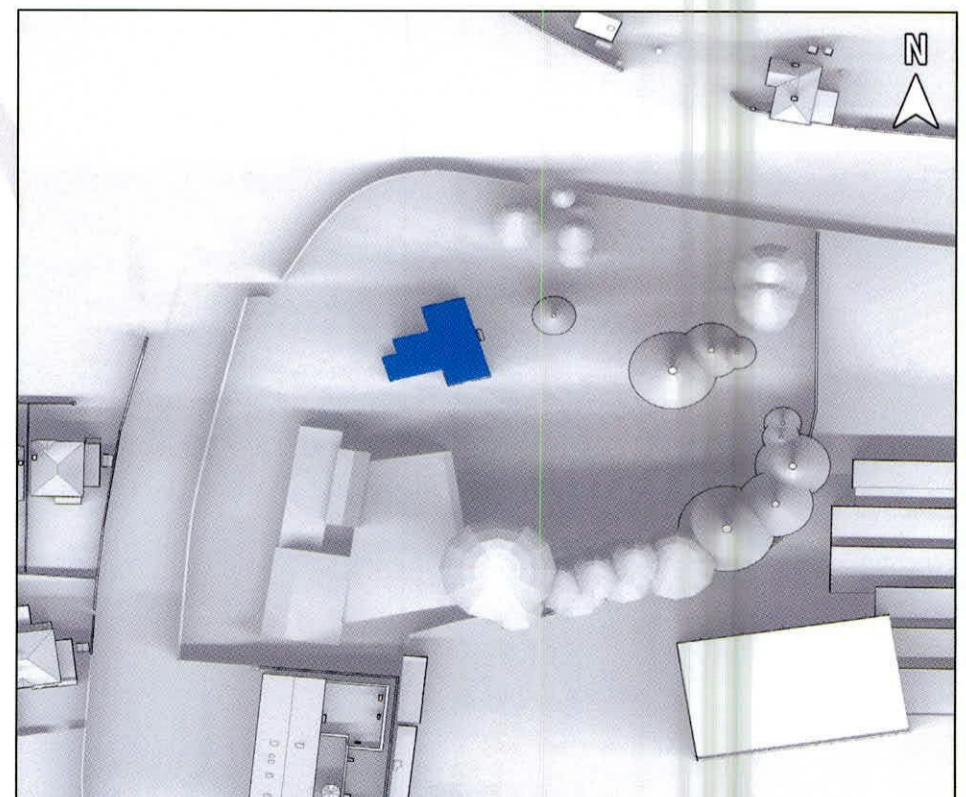


Figure C.6: Floor plan of assessed building, Keyplan highlighting the assessed building (L).

C.4.2 Scholarstown House - Proposed state

Table No. C.4.2 - Supplementary Studies: Scholarstown House - Proposed state

Unit Number	Room Description	SDA (I.S. EN 17037 Criterion)			No Sky Line (NSL)	
		% of area above 300 Lux (recommendation >50%)	% of area above 100 Lux (recommendation >95%)	Meets I.S. EN 17037 Criteria*	% of room where the sky is visible from the working plane	Above 80%**
Unit No. 1	Kitchen	10%	91%	Non-compliant	98%	Yes
Unit No. 1	Living Room	11%	83%	Non-compliant	93%	Yes
Unit No. 1	Bedroom 1	6%	45%	Non-compliant	97%	Yes
Unit No. 1	Bedroom 2	0%	19%	Non-compliant	55%	No
Unit No. 1	Bedroom 3	16%	100%	Non-compliant	92%	Yes
Unit No. 2	Kitchen	1%	16%	Non-compliant	28%	No
Unit No. 2	Living Room	6%	30%	Non-compliant	37%	No
Unit No. 2	Bedroom 1	1%	9%	Non-compliant	21%	No
Unit No. 2	Bedroom 2	8%	38%	Non-compliant	41%	No

* For information regarding the criteria under the various guidelines including target Lux please refer to section 4.4.3 on page 15.

** Whilst the BRE Guidelines do not provide target values for NSL in a proposed development, it states that "Supplementary electric lighting will be needed if a significant part of the working plane (20% of the room or more) lies beyond the no sky line."



Figure C.7: Floor plan of assessed building, Keyplan highlighting the assessed building (L).