11 CLIMATE (DAYLIGHT)

11.1 Introduction

ARC Architectural Consultants Ltd has been commissioned by the Applicant to carry out an analysis of the impact of the proposed development on lands at Woodbrook, Shankill, Co. Dublin on daylight access in the surrounding area.

To date, it is understood that no standards or guidance documents (statutory or otherwise) on the subject of daylight access to buildings or open spaces have been prepared or published in Ireland. In the absence of guidance on the matter of daylight access tailored to Irish climatic conditions, Irish practitioners tend to refer to the relevant British Standard, BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting (the British Standard) and to the Building Research Establishment's Site layout planning for daylight and sunlight: a guide to good practice (the BRE Guide). The standards for daylight access in buildings (and the methodologies for assessment of same) suggested in the British Standard and the BRE Guide have been referenced in this Daylight Access Analysis.

Neither the British Standard nor the BRE Guide set out rigid standards or limits. The BRE Guide is preceded by the following very clear warning 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."* [Emphasis added]

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).

Given that the British Standard and the BRE Guide were drafted in the UK in the context of UK strategic planning policy, recommendations or advices provided in either document that have the potential to conflict with Irish statutory planning policy have been disregarded for the purposes of this analysis.

This Chapter and assessment have been completed having regard to the guidance outlined in the EPA documents Guidelines on information to be contained in EIAR (Draft, August 2017) and Advice note for Preparing Environmental Impact Statements (Draft, September 2015) as outlined under Chapter 1 of this EIAR.

11.2 Assessment Methodology

11.2.1 Context under Technical Guidance Documents

BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting states as follows at Section 8.2.1: Loss of Daylight to Existing Buildings: -

> *"The BRE Report sets out two guidelines regarding the vertical sky component.*
>
> *a) If the vertical sky component at the centre of the existing window would exceed 27% with the new development in place, then enough skylight would still be reaching the existing window.*
>
> *b) If the vertical sky component with the new development in place would be both less than 27% and less than 0.8 times its former value, then the area lit by the window would be likely to appear more gloomy, and electric lighting would be needed for more of the time."*

BS 8206-2:2008: Lighting for buildings – Part 2: Code of practice for daylighting states as follows at Section 5.5: Average daylight factor: -

> *"The average daylight factor is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%.*

If the average daylight factor in a space is at least 5% then electric lighting is not normally needed during the daytime, provided the uniformity is satisfactory…If the average daylight factor in a space is between 2% and 5% supplementary electric lighting is usually required."

The British Standard goes on to recommend a minimum of 1% Average Daylight Factor for bedrooms; 1.5% Average Daylight Factor for living rooms and 2% Average Daylight Factor for kitchens.

In terms of assessing the impact of development on daylight access in an existing room, the British Standard suggests that, where a room has an ADF of 5% (i.e., one not requiring supplemental electric lighting), a reduction in daylight access of between 15% and 8% is likely to be noticed - the room *"would be likely to appear more gloomy, and electric lighting would be needed for more of the time"*. In other words, where daylight access is reduced to between 0.85 times and 0.92 times its former value, the occupant of that residence is likely to notice the change. What this is saying is that, in some cases (the details of which are not explained in the British Standard), a reduction in ADF to anything less than 0.92 times the former light levels will be noticeable. In other cases (again not explained), light levels will have to fall to 0.85 times their former value before the change is noticed. Therefore, in all cases where a room has an ADF of 5%, anything greater than a 15% drop in daylight levels (or a drop to 0.85 times its former value) will be noticed. A general rule of thumb is that if daylight access was reduced by one fifth, the occupants will be likely to notice.

11.2.2 Assessment Methodology

A three dimensional digital model of the proposed development, of the development envisaged under Phase 2 and of existing buildings in the area was constructed by ARC Consultants based on drawings and three dimensional models supplied by the Design Team; and with reference to Dun Laoghaire-Rathdown County Council's online planning register, on-site, satellite and aerial photography. Trees and boundary planting were not included in this model. In assessing the impact of the proposed development on existing buildings, where relevant, assumptions were made as to the use of the existing rooms, the size and layout of the interior of the rooms (informed, where possible, by drawings available on the online planning register), the colour schemes (e.g. materials, reflectances etc.) used in the decoration of the walls, floor and ceiling of the room and the type of glazing used in the window opes. In all cases, rooms are assessed as excluding furniture and window treatments (e.g. curtains, blinds). Assumptions are also made, where relevant, as to the materials and reflectances of external surfaces.

In carrying out the detailed analysis of the proposed development on neighbouring existing buildings, ARC measured daylight access to existing buildings before and after the construction of the proposed development with reference to Vertical Sky Component to identify whether the construction of the proposed development creates the potential for adverse impacts on daylight access. Where testing of the Vertical Sky Component indicated a potential for an adverse reduction in Vertical Sky Component, ARC carried out more detailed analysis of the relevant existing buildings using Average Daylight Factor in order to determine whether the reduction in Vertical Sky Component had the potential to result in an adverse loss of daylight access within the relevant buildings.

In assessing the impact of the proposed development on existing buildings, ARC assessed the Vertical Sky Component of each window at a point at the centre of each window. In assessing daylight access within the proposed development, Average Daylight Factor was assessed on the working plane (i.e., at work top level). Having regard to the extreme variability in sky luminance over the course of any given day depending on weather conditions and the changing seasons, in order for daylight factor to be a meaningful and comparable measure of daylight access, it is necessary to assume a particular luminance distribution for the sky when calculating Average Daylight Factor.

Note: It is noted that BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting was recently replaced with BS EN 17037:2018 Daylight in Buildings. However, given that BS EN 17037:2018 does not provide any recommendations with regard to the assessment of impacts and given that the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities refer to the BS 8206-2:2008 and not to BS EN 17037:2018, BS 8206:2008 has been referenced in the preparation of this Chapter.

This daylight access analysis uses the Commission Internationale de l'Eclairage (CIE) Standard Overcast Sky Distribution model in its calculations, which is the standard sky most commonly used in daylight access analysis. This model assumes that sky luminance varies from horizon to zenith and is considered to correspond to an overcast day.

As such, calculation of Average Daylight Factor in a room in circumstances where the sky luminance corresponds to the CIE Standard Overcast Sky Distribution could be considered to represent a worst-case scenario. Unless specifically referenced, analysis of uniformity of daylight access within a room has not been carried out as part of this assessment.

11.2.3 Definition of Effects on Daylight Access

The assessment of the impact of the proposed development on daylight access had regard to the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports prepared by the Environmental Protection Agency (Draft of 2017), and to Directive 2011/92/EU (as amended by Directive 2014/52/EU) on the assessment of the likely effects of certain public and private projects on the environment.

The list of definitions given below is taken from Table 3.3: Descriptions of Effects contained in the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports prepared by the Environmental Protection Agency. Some comment is also given below on what these definitions might imply in the case of daylight access. The definitions from the EPA document are in italics.

- ***Imperceptible:*** *An effect capable of measurement but without significant consequences. The definition implies that the development would cause a change in the daylight received at a location, capable of measurement, but not noticeable to the casual observer. If the development caused no change in daylight access, there could be no effect.*
- ***Not Significant:*** *An effect which causes noticeable2 changes in the character of the environment but without significant consequences (the footnote "2" to the word "noticeable" is: "for the purposes of planning consent procedures"). The definition implies that the development would cause a change in the daylight received at a location, which is capable of measurement and capable of being noticed by an observer who is taking an active interest in the extent to which the proposal might affect daylight access.*
- ***Slight:*** *An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. For this definition to apply, the amount of daylight received at a location would be changed by the construction of the development to an extent that is both capable of measurement and is noticeable to a minor degree. However, the daylight environment within an existing building should remain largely unchanged.*
- ***Moderate:*** *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. In this case, a development must bring about a change in the daylight environment within an existing building; and this change must be consistent with a pattern of change that is already occurring, is likely to occur, or is envisaged by policy. A moderate effect would occur where other developments were bringing about changes in daylight access of similar extent in the area.*
- ***Significant:*** *An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. The definition implies that the existence of the development would change the extent of daylight access in a manner that is not "consistent with existing and emerging baseline trends". For example, a development resulting in a "significant" diminution of daylight access would reduce daylight to the extent that minimum standards for daylighting are not met and artificial lighting is required for part of the day.*
- ***Very Significant:*** *An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment. The definition implies that the existence of the development would change the extent of daylight access to a considerable degree and in a manner that is not "consistent with existing and emerging baseline trends". For example, a "very significant" effect would occur where a development would result in daylight received in a room falling well below the minimum standards for daylighting and where artificial lighting would be required in that room as the principal source of lighting all the time.*

- ***Profound:*** *An effect which obliterates sensitive characteristics. Examples of development resulting in a "profound" effect on daylight access would include facilitating daylight access to a room in an existing building where the existing room has none (e.g. as a result of the demolition of a building) or by removal of all access to daylight within an existing building.*

In relation to daylight access, it is conceivable that a development could result in positive effects, but this implies that a development would involve a reduction of the size or scale of built form (e.g. such as the demolition of a building, which might result in an increase in daylight access). Though that is possible, it is usually unlikely as most development involves the construction of new obstructions to daylight access.

11.3 Receiving Environment

The application site is a vacant, green field site located on the eastern side of the R119 Regional Road (the Dublin Road), approximately 1 km south of Shankill village centre. It is bounded to the north by Shanganagh Cemetery and to the east and south by lands associated with Woodbrook Golf Club. To the south, the site is bounded by lands associated with the two storey house and associated complex of buildings and gardens at Corke Lodge, a protected structure, and the three storey over basement Woodbrook House, a protected structure, and its associated outbuildings, lands and gardens.

Most residential areas in the vicinity of the application site are located at a considerable remove from the application site or separated from the application site by dense bands of mature trees. Saint James's Lodge and The Parsonage, both detached two storey houses, on Dublin Road are located to the northeast of the site. St James Church, a protected structure, is also located to the northeast of the site. The single storey detached house at Beauchamp Lodge is located on the opposite (western) side of the Dublin Road. A school, Woodbrook College, is located approximately 100m to the southwest of the application site.

11.4 Characteristics of the Proposed Development

The site is generally bounded by the Old Dublin Road (R119) and St. James (Crinken) Church to the west, Shanganagh Public Park and Shanganagh Cemetery to the north, Woodbrook Golf Course to the east and Corke Lodge and woodlands and Woodbrook Golf Clubhouse and car park to the south. The replacement golf hole lands are generally bounded by the existing train line to the west, Shanganagh Public Park to the north and Woodbrook Golf Course to the east and south. The proposed development is within the townlands of Cork Little and Shanganagh, Shankill, Co. Dublin.

In summary, the proposed Strategic Housing Development broadly comprises: -

- 685no. residential units (207no. houses, 48no. duplex and 430no. apartments) in buildings ranging from 2 to 8-storeys.
- 1no. childcare facilities (c. 429 sq. m gross floor area).
- Provision of Woodbrook Distributor Road / Woodbrook Avenue from the Old Dublin Road (R119) to the future Woodbrook DART Station, including the provision of a temporary surface car park (164no. parking spaces including set down areas and ancillary bicycle parking and storage) adjacent the future Woodbrook DART Station in northeast of site.
- Provision of a series of linear parks and green links (Coastal Park and Corridor Park), including 2no. pedestrian / cycle links to Shanganagh Public Park and provision of interim landscaping of future public plaza to serve future Local Centre to allow full north / south connection, supplemented by smaller pocket parks.
- Provision of SuDS infrastructure and connection to existing surface water culvert on Old Dublin Road (R119).

- Provision of waste water infrastructure (pumping station including 24 hour emergency storage and rising foul main through Shanganagh Public Park to tie-in to existing services at St. Anne's Park Residential Estate).
- 2no. replacement golf holes on eastern side of railway line.
- All associated and ancillary site development and infrastructural works, hard and soft landscaping and boundary treatment works.

A full project description is provided in Chapter 3: Description of Proposed Development.

11.5 Potential Impact of the Proposed Development

The BRE Guide provides that *"The quantity and quality of daylight inside a room will be impaired if obstructing buildings are large in relation to their distance away"*. Generally speaking, new development is most likely to affect daylight access in existing buildings in close proximity to the application site.

11.5.1 Proposed Development

11.5.1.1 Construction Stage

The potential impact of the construction phase of the proposed development on daylight access is likely to be, initially, lesser than the potential impact of the completed development. As the proposed development nears completion, the potential impact of the emerging development is likely to be similar in all material respects to that of the completed development. It is noted that temporary structures and machinery (e.g. hoarding, scaffolding, cranes, etc.) have the potential to result in changes in daylight access in buildings, although any additional impacts arising from temporary structures or machinery are likely to be temporary and minor.

11.5.1.2 Operational Stage

All impacts described in this section will be permanent. Impacts described as "imperceptible" and "not significant" are considered to be neutral in character. Any reduction in daylight access resulting in a "slight", "moderate", "significant", "very significant" or "profound" impact would usually be considered to be negative in character, unless otherwise indicated. Any increase in daylight access resulting in a "slight", "moderate", "significant", "very significant" or "profound" impact would usually be considered to be positive in character, unless otherwise indicated.

Overview of the potential impact of the proposed development on daylight access to existing buildings outside the application site

ARC's analysis indicates that the construction of the proposed development will result in little or no change in daylight access within neighbouring existing buildings. The potential impact of the proposed development on daylight access within neighbouring existing buildings surrounding the application site (e.g. at Woodbrook Golf Club, Woodbrook House, Corke Lodge and on the Dublin) is, therefore, likely to range from none to "imperceptible".

Given that the potential for development to result in impacts on daylight access diminishes with distance, it is the finding of ARC's analysis the proposed development will have no undue adverse impact on daylight access within buildings in the wider area surrounding the application site (e.g. such as Woodbrook College to the southwest of the site).

Detailed analysis of the potential impact of the proposed development on daylight access to existing buildings outside the application site

This analysis assesses the impact of the proposed development on all potential receptors surrounding the application site - these impacts are described in the section entitled "Overview of the potential impact of the proposed development on daylight access to existing buildings outside the application site" above.

However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on daylight access to a representative sample of sensitive receptors (i.e. rooms) in buildings in proximity to the application site (please see Figure 11.1 below). The representative sample of buildings includes worst case scenario examples, such as rooms at close proximity to the proposed development and rooms at low levels of accommodation.

Figure 11.1: Indicative diagram showing the location of sample rooms and windows (indicated with a red dot) assessed as part of this analysis.

In carrying out the detailed analysis of the proposed development on neighbouring existing buildings, ARC measured daylight access to existing buildings before and after the construction of the proposed development with reference to Vertical Sky Component to identify whether the construction of the proposed development creates the potential for adverse impacts on daylight access. Where testing of the Vertical Sky Component indicated a potential for an adverse reduction in Vertical Sky Component, ARC carried out more detailed analysis of the relevant existing buildings using Average Daylight Factor in order to determine whether this reduction in Vertical Sky Component had the potential to result in an adverse loss of daylight access within the relevant buildings.

Vertical Sky Component

The Building Research Establishment's Site layout planning for daylight and sunlight: a guide to good practice (the BRE Guide) defines Vertical Sky Component as the *"Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings".*

Section 2.2.21 of the BRE Guide suggests that: -

> *"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, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if ...*
>
> *the VSC measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value..."*

For the purpose of this analysis, where a number of windows serve the room in the studied existing building closest to the application site, the window closest to the application site was analysed.

Average Daylight Factor

While BRE Guide discusses the use of Vertical Sky Component in assessing impact on daylight access, it is notable that, while the relevant British Standard, BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting makes reference to the fact that the BRE Guide recommends the use of Vertical Sky Component in assessment of the impact on existing buildings, the British Standard stops short of making the same recommendation. To the contrary, the British Standard states: *"The vertical sky component is one of the factors on which the average daylight factor in an existing interior depends."* (Emphasis added)

Vertical Sky Component refers to the amount of light from the sky falling directly at a particular point on a vertical surface such as a window or wall. Average Daylight Factor takes into account daylight coming from the sky, externally reflected light and internally reflected light. Given this, it is considered that Average Daylight Factor provides a more comprehensive picture of daylight access within existing buildings and the extent to which new development will change the daylight environment within those existing buildings.

BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting states as follows at Section 5.5: Average daylight factor: -

> *"The average daylight factor is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%."*

In terms of assessing the impact of development on daylight access in an existing room, the British Standard suggests that, where a room has an ADF of 5%, a reduction in daylight access of between 15% and 8% is likely to be noticed - the room *"would be likely to appear more gloomy, and electric lighting would be needed for more of the time".* In other words, where daylight access is reduced to between 0.85 times and 0.92 times its former value, the occupant of that residence is likely to notice the change. What this is saying is that, in some cases (the details of which are not explained in the British Standard), a reduction in ADF to anything less than 0.92 times the former light levels will be noticeable. In other cases (again not explained), light levels will have to fall to 0.85 times their former value before the change is noticed. Therefore, in all cases where a room has an ADF of 5%, anything greater than a 15% drop in daylight levels (or a drop to 0.85 times its former value) will be noticed. A general rule of thumb is that if daylight access was reduced by one fifth, the occupants will be likely to notice.

Where ARC undertook analysis of the Average Daylight Factor within rooms in neighbouring buildings, assumptions were made as to the use of the room, the size and layout of the interior of the rooms within neighbouring buildings, the colour schemes used in the decoration of the walls, floor and ceiling of the room and the type of glazing used in the window opes. As such, the rooms in existing buildings adjoining the application site analysed as part of this analysis must be considered to be notional. While it was necessary, in undertaking the analysis, to make assumptions regarding the parameters of chosen sample rooms, comparative analysis of daylight access within assumed rooms is instructive as to the likely extent of change in the daylight environment in existing buildings in proximity to the application site.

Sample Room	Vertical Sky Component		Comment
	Existing	Proposed	
Zone 01 Floor 00	39.6%	39.0%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 02 Floor 00	19.8%	19.3%	**Potential impact below BRE threshold for adverse impact.** While the potential Vertical Sky Component received by the studied window is likely to fall below 27%, the construction of the proposed development will reduce the Vertical Sky Component of the studied window to 0.97 times its former value (i.e. not less than 0.8 times its former value).
Zone 03 Floor 00	39.6%	38.6%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 04 Floor 00	39.5%	38.4%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 05 Floor 00	38.7%	37.5%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 06 Floor 00	34.6%	34.4%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 07 Floor 00	34.5%	31.0%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 08 Floor 00	27.2%	22.2%	**Further analysis of daylight access undertaken: Potential "imperceptible" impact.** Given that testing indicated a potentially adverse drop in Vertical Sky Component, ARC undertook analysis of Average Daylight Factor (ADF) within a notional room. This suggested that, after the construction of the proposal, ADF within that notional room would drop from 6.76% to 6.29%, a drop to 0.93 times its former value. This is considered to be an "imperceptible" impact on daylight access. After the construction of the proposed development, ARC's analysis indicates that this notional room will continue to receive a level of daylight access in excess of the minimum levels recommended by the British Standard (i.e. 2% ADF for kitchens, 1.5% for living rooms; 1% for bedrooms).

Zone 09 Floor 00	36.3%	35.8%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 10 Floor 00	35.4%	35.2%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 11 Floor 00	39.2%	38.7%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.
Zone 12 Floor 01	39.4%	38.9%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of the proposed development.

Table 11.1: Potential impact of the proposed development on daylight access to sample rooms in buildings in proximity to the application site.

ARC's analysis indicates that the construction of the proposed development has the potential to result in a minor impact on daylight access within neighbouring buildings.

As set out in Table 1, the construction of the proposed development has the potential to result in a minor change in Vertical Sky Component of the ground floor windows in most neighbouring buildings. In the case of ten of the twelve sample studied windows, ARC's analysis indicated that the relevant sample studied windows in most neighbouring buildings (i.e. Woodbrook Golf Club, Woodbrook House, Corke Lodge and on the Dublin Road) have the potential to achieve in excess of 27% Vertical Sky Component after the construction of the proposed development. In the case of one of the twelve sample studied windows (i.e. a ground floor window under at projecting roof at Woodbrook Golf Club), ARC's analysis indicated that the relevant sample window likely does not receive 27% Vertical Sky Component at present, but that the construction of the proposed development does not have the potential to reduce Vertical Sky Component to the window below 0.8 times its former value (i.e. the threshold for an adverse impact set out in the BRE Guide).

In the case of a south-facing window at The Parsonage on the Dublin Road, ARC's analysis indicated that the construction of the proposed development had the potential to result in a potentially adverse reduction in Vertical Sky Component. In order to determine whether this reduction in Vertical Sky Component had the potential to result in an adverse loss of daylight access within the relevant room, ARC carried out analysis of the Average Daylight Factor within the sample notional room at the Parsonage before and after the construction of the proposed development. This analysis indicated that the loss of daylight access within the sample notional rooms likely to occur as a result of the construction of the proposed development was likely to be so minor as to be "imperceptible".

ARC's analysis, therefore, indicates that the construction of the proposed development will not result in any undue adverse impact on daylight access to sample rooms within neighbouring buildings within the meaning of the BRE Guide and the British Standard.

11.5.1.3 Do-Nothing Impact

In a "do nothing" scenario, the existing daylight environment within neighbouring buildings will remain unchanged.

11.5.2 Cumulative – Woodbrook

The subject application comprises the first phase of a two phase development of the Woodbrook lands. As part of this assessment, ARC has assessed the cumulative impact of the development now proposed under the first phase and the emerging design for the envisaged second phase of development on daylight access within existing buildings on lands outside the Woodbrook lands.

11.5.2.1 Construction Stage

The potential cumulative impact of the construction phase of both phases of development on the daylight environment within existing buildings outside the Woodbrook lands on daylight access is likely to be, initially, lesser than the impact of the completed development. As the proposed development nears completion, the potential impact of the emerging development is likely to be similar in all material respects to that of the completed development. It is noted that temporary structures and machinery (e.g. hoarding, scaffolding, cranes, etc.) have the potential to result in changes in daylight access in buildings, although any additional impacts arising from temporary structures or machinery are likely to be temporary and minor.

11.5.2.2 Operational Stage

All impacts described in this section will be permanent. Impacts described as "imperceptible" and "not significant" are considered to be neutral in character. Any reduction in daylight access resulting in a "slight", "moderate", "significant", "very significant" or "profound" impact would usually be considered to be negative in character, unless otherwise indicated. Any increase in daylight access resulting in a "slight", "moderate", "significant", "very significant" or "profound" impact would usually be considered to be positive in character, unless otherwise indicated.

ARC's analysis indicates that the potential cumulative impact of both phases of development on the Woodbrook lands is likely to range from "imperceptible" to "not significant". By way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on daylight access to a representative sample of sensitive receptors (i.e. rooms) in buildings in proximity to the application site (please see Figure 1 below). The representative sample of buildings includes worst case scenario examples, such as rooms at close proximity to the proposed development and rooms at low levels of accommodation. The approach to this assessment is described in more detail in Section 11.5.1.2 above. The results of ARC's analysis of the potential cumulative impact of both phases of development on the Woodbrook lands on representative sample rooms is outlined in Table 11.2 below.

Sample Room	Vertical Sky Component		Comment
	Existing	Proposed	
Zone 01 Floor 00	39.6%	39.0%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 02 Floor 00	19.8%	19.3%	**Potential impact below BRE threshold for adverse impact.** While the potential Vertical Sky Component received by the studied window is likely to fall below 27%, the construction of both phases of development on the Woodbrook lands will reduce the Vertical Sky Component of the studied window to 0.97 times its former value (i.e. not less than 0.8 times its former value).
Zone 03 Floor 00	39.6%	38.6%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.

Zone 04 Floor 00	39.5%	38.4%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 05 Floor 00	38.7%	37.5%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 06 Floor 00	34.6%	34.4%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 07 Floor 00	34.5%	31.0%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 08 Floor 00	27.2%	22.2%	**Further analysis of daylight access undertaken: Potential "imperceptible" impact.** Given that testing indicated a potentially adverse drop in Vertical Sky Component, ARC undertook analysis of Average Daylight Factor (ADF) within a notional room. This suggested that, after the construction of both phases of the proposed development, ADF within that notional room would drop from 6.76% to 6.16%, a drop to 0.91 times its former value. This is considered to be an "imperceptible" impact on daylight access. After the construction of both phases of the proposed development on the Woodbrook lands, ARC's analysis indicates that this notional room will continue to receive a level of daylight access in excess of the minimum levels recommended by the British Standard (i.e. 2% ADF for kitchens, 1.5% for living rooms; 1% for bedrooms).
Zone 09 Floor 00	36.3%	34.3%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 10 Floor 00	35.4%	34.7%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 11 Floor 00	39.2%	37.7%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.
Zone 12 Floor 01	39.4%	38.3%	**Potential impact below BRE threshold for adverse impact.** Vertical Sky Component of the studied window has the potential to remain above 27% after the construction of both phases of development on the Woodbrook lands.

Table 11.2: Potential cumulative impact of both phases of development on the Woodbrook lands on daylight access to sample rooms in buildings in proximity to the application site.

ARC's analysis indicates that the construction of both phases of development on the Woodbrook lands has the potential to result in a minor impact on daylight access within neighbouring buildings.

As set out in Table 11.2, the cumulative impact of the both phases of development on the Woodbrook lands has the potential to result in a minor change in Vertical Sky Component of the ground floor windows in most neighbouring buildings. In the case of ten of the twelve sample studied windows, ARC's analysis indicated that the relevant sample studied windows in most neighbouring buildings (i.e. Woodbrook Golf Club, Woodbrook House, Corke Lodge and on the

Dublin Road) will have the potential to receive in excess of 27% Vertical Sky Component after the construction of both phases of development on the Woodbrook lands. In the case of one of the twelve sample studied windows (i.e. a ground floor window under at projecting roof at Woodbrook Golf Club), ARC's analysis indicated that the relevant sample window is unlikely to receive 27% Vertical Sky Component at present, but that the construction of both phases of development on the Woodbrook lands would not have the potential to reduce Vertical Sky Component to the window below 0.8 times its former value (i.e. the threshold for an adverse impact set out in the BRE Guide).

In the case of a south-facing window at The Parsonage on the Dublin Road, ARC's analysis indicated that the construction of both proposed phases of development on the Woodbrook lands had the potential to result in a potentially adverse reduction in Vertical Sky Component. In order to determine whether this reduction in Vertical Sky Component had the potential to result in an adverse loss of daylight access within the relevant room, ARC carried out analysis of the Average Daylight Factor within the sample notional room at the Parsonage before and after the construction of both phases of development on the Woodbrook lands. This analysis indicated that the loss of daylight access within the sample notional rooms likely to occur as a result of both phases of development on the Woodbrook lands was likely to be so minor as to be "imperceptible". Where noticeable, the potential cumulative effect of both phases of development on the Woodbrook lands on daylight access within the rooms is unlikely to result in significant consequences for the daylight environment within the roof (i.e. ARC's analysis indicates that the notional sample room would likely have the potential to receive a level of daylight access in excess of 5% Average Daylight Factor, the level at which supplemental artificial lighting is not usually required during the day, after the construction of both phases of development). Given this, under a worst case scenario, the potential cumulative impact of both phases of development on the Woodbrook lands on the relevant studied room at The Parsonage is likely to range from "imperceptible" to "not significant".

ARC's analysis, therefore, indicates that the construction of the proposed development does not have the potential to result in any undue adverse impact on daylight access to sample rooms within neighbouring buildings within the meaning of the BRE Guide and the British Standard.

11.5.2.3 Do-Nothing Impact

In a "do nothing" scenario, the daylight environment within existing buildings will remain unchanged.

11.6 Ameliorative, Remedial or Reductive Measures

The subject application proposes the development of a greenfield site identified for major new development under statutory planning policy (i.e. the Woodbrook – Shanganagh Local Area Plan 2017 – 2023). In these circumstances, during the construction or operational phases scope for mitigation measures, which would preserve a sustainable level of density, is limited.

11.7 Residual Impact of the Proposed Development

11.7.1 Proposed Development

11.7.1.1 Construction Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual impact of the proposed development on daylight access is predicted to be as described under Section 11.5.1.1 above.

11.7.1.2 Operational Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual impact of the proposed development on daylight access is predicted to be as described under Section 11.5.1.2 above.

11.7.2 Cumulative – Woodbrook

11.7.2.1 Construction Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual cumulative impact of both phases of development on the Woodbrook lands on daylight access is predicted to be as described under Section 11.5.2.1 above.

11.7.2.2 Operational Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual cumulative impact of both phases of development on the Woodbrook lands on daylight access is predicted to be as described under Section 11.5.2.2 above.

11.7.2.3 Worst Case Impact

Under a worst case scenario, the cumulative impact of both phases of development on the Woodbrook lands on daylight access to lands outside the application site is predicted to range from "imperceptible" to "not significant".

11.8 Monitoring

Monitoring of avoidance, remedial and mitigation measures is not relevant to the assessment of impacts on daylight access in the case of the subject application.

11.9 Reinstatement

Reinstatement is not relevant to the assessment of impacts on daylight access in the case of the subject application. It is intended that the proposed development will be permanent.

11.10 Difficulties Encountered

It was neither possible nor practical for the Design Team to gain unfettered access to every parcel of private property within the study area surrounding the application site in order to carry out measured building survey. Therefore, while ARC has confidence that the three dimensional model used in the assessment of the impact of the proposal on daylight access achieves a high degree of accuracy, it should be noted that some level of assumption was necessary in completing the model.