

5.12 Climate – Sunlight Analysis

5.12.1 Introduction

ARC Architectural Consultants Ltd has been commissioned by the Applicant, Dublin City Council and PSQ Developments Limited (Joint Applicants), to carry out an analysis of the impact of the proposed development on lands at Parnell Square, Dublin 1 on sunlight access in the surrounding area.

To date, it is understood that no standards or guidance documents (statutory or otherwise) on the subject of sunlight access to buildings or open spaces have been prepared or published in Ireland. In the absence of guidance on the matter of sunlight 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 standards for sunlight access in buildings (and the methodologies for assessment of same) suggested in the British Standard have been referenced in this Sunlight Access Analysis.

The Dublin City Development Plan 2016-2022 states as follows in relation to residential development: "Development shall be guided by the principles of Site Layout Planning for Daylight and Sunlight, A guide to good practice (Building Research Establishment Report, 2011)." While the subject development does not propose residential development and most of the lands surrounding the application site accommodate a range of residential & commercial uses, the contents of PJ Littlefair's 2011 revision of the 1991 publication Site layout planning for daylight and sunlight: a guide to good practice for the Building Research Establishment have also been considered in the preparation of the report.

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.

The purpose of this report is to provide a general indication of sunlight access before and after the construction of the proposed development on the basis on numerous assumptions outlined below and with reference to design tools set out in the guidance documents referenced above.

This Chapter and assessment has 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: Introduction, of this EIAR.

5.12.2 Methodology for Sunlight Access Impact Assessment

A three dimensional digital model of the proposed development and, of existing buildings in the area was constructed by ARC Consultants based on drawings and three dimensional models supplied by the Design Team; on drawings and information available from the Dublin City Council online planning register; and with reference to on-site, satellite and aerial photography.

Using the digital model, shadows were cast by ARC at several times of the day at the summer and winter solstices, and at the equinox. An equinox occurs twice a year: the March or vernal equinox (typically in or around the 20th to 21st March) and the September or autumnal equinox (typically in or around the 21st to 23rd September). For the purposes of this analysis and with reference to the BRE Guide, shadows were cast at several times of the day on 21st March. The results are presented in shadow study diagrams accompanying the EIAR under Volume 3, Appendix 5.12.1 & 5.13.1. Two separate pages have been prepared for each time period on each representative date as follows:

Existing shadow baseline: this page shows the shadows cast by the existing buildings only. Existing buildings on the application site are shown in orange, while existing buildings surrounding the application site are shown in light grey. The shadows cast are

shown in a dark grey tone.

Proposed shadow environment - shadows cast by the proposed development: this page shows the shadows cast by the existing buildings together with the shadows cast by the proposed development. The existing buildings surrounding the site are shown in light grey, while the proposed development (including existing buildings to be retained) on the application site is shown in light blue. The shadows cast are shown in a dark grey tone.

In order to calculate sunlight access to rooms, ARC referenced the methodology outlined in Appendix A: Indicators to calculate access to skylight, sunlight and solar radiation of the BRE Guide. Using proprietary sunlight access analysis software, ARC analysed a sunpath diagram overlaid with a shading mask corresponding to the existing or proposed shadow environment (as appropriate) and the sunlight probability diagram for a latitude of 53° N (i.e. Dublin) for a reference point (i.e. the centre point) of each sample study window. The sunlight availability indicator has 100 spots on it. Each of these represents 1% of annual probable sunlight hours (APSH). The percentage of APSH at the reference point is found by counting up all the unobstructed spots. The results of the detailed analysis of sunlight access to sample rooms is presented in the Appendix to this chapter in the interests of completeness.

5.12.3 Definition of Impacts on Sunlight Access

The assessment of impacts on sunlight access had regard to the Guidelines on the Information to be Contained in Environmental Impact Statements prepared by the Environmental Protection Agency (2002), and to Directive 2011/92/EU (as amended) 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 Section 5: Glossary of Impacts contained in the Guidelines on the Information to be Contained in Environmental Impact Statements prepared by the Environmental Protection Agency. Some comment is also given below on what these definitions might imply in the case of impact on sunlight access. The definitions from the EPA document are in italics.

Imperceptible Impact: An impact capable of measurement but without noticeable consequences. The definition implies that the development would cause a change in the sunlight received at a location, capable of measurement, but not noticeable. If the development caused no change in sunlight access, there could be no impact.

Slight Impact: An impact which causes noticeable changes in the character of the environment without affecting its sensitivities. For this definition to apply, the amount of sunlight received at a location would be changed by shadows cast by the development to an extent that is both capable of measurement and is noticeable to a minor degree. However, the shadow environment of the surrounding environment should remain largely unchanged.

Moderate Impact: An impact that alters the character of the environment in a manner that is consistent with emerging trends. In this case, a development must bring about a change in the shadow environment of the area; and this change must be consistent with a pattern of change that is already taking place. This impact would occur where other developments were bringing about changes in sunlight access in the area.

Significant Impact: An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. This impact would occur where the development overshadows a location to the effect that there is a significant change in the amount of direct sunlight received at that location.

Profound Impact: An impact which obliterates sensitive characteristics. In terms of sunlight access, a development must cast shadows over a location, where sunlight access was previously enjoyed, to the extent that all access to sunlight is removed.

The range of possible impacts listed above deal largely with the extent of impact; and the extent of the impact of a development is usually proportional to the extent to which that development is large in scale and/or height and its proximity to the location. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable, and on the interaction between the proposed development, the character of the existing shadow environment and the land use pattern of the receiving environment.

5.12.4 Existing Receiving Environment (Baseline)

The application site is located at Nos. 20 & 21 and Nos. 23-28 inclusive, Parnell Square North, with public realm works extending to Parnell Square West and East, and additional site works occurring at the laneways to the rear of the site at Bethesda Place and Frederick Street North. The site is bounded to the west by Charlemont House, now occupied by the Hugh Lane Gallery, which presents a three storey façade of similar height to its four storey neighbours on to Parnell Square. Charlemont House has been extended very significantly to the rear. The site is bounded to the

southwest by a terrace of buildings ranging in height from one to six storeys at Granby Row; and, to the northwest, three storey residential development at Bethesda Place.

5.12.5 Characteristics of Proposed Development

The proposal, which is the subject of this EIAR, comprises the development of a new Dublin City library and public realm works on a c. 0.99 ha site at Parnell Square North, Dublin 1.

5.12.5.1 Demolition and Construction Phase

As described in more detail in Chapter 3, construction of the proposed development will be carried out in four phases as follows:

- Phase 1 - Enabling Works (including erection of temporary structures such as hoardings, compounds and cranes; and demolitions);
- Phase 2 - Substructure Works;
- Phase 3 - Superstructure and Conservation Works; and
- Phase 4 - Public Realm Works.

5.12.5.2 Operational Phase

In summary, the proposed development for the purposes of the EIAR Assessment comprises development of a new Dublin City library and public realm works, comprising:

- The adaptive re-use of Nos. 20-21 & Nos. 23-28 Parnell Square North (all Protected Structures).
- The construction of a new 5-storey over basement extension, with roof gardens, for library and cultural use c.5,720 sq m gross floor area, and associated demolition of existing 3-storey Amharclann (theatre) building, single storey atrium and 2-storey return, to the rear of Nos. 23-28 Parnell Square North.
- The total Gross Floor Area (existing and new) of the proposed cultural use amounts to c.11,198 sq.m.
- Improvements to the public realm to facilitate a new public plaza, including reconfiguration of vehicular roadway (2-lane), parking and set down areas, street furniture, street art and public lighting, widening of footpaths, and relocation of Dublin Bikes Station, at Parnell Square North, in the area between Parnell Square West and East and the Garden of Remembrance.
- Modifications to Bethesda Place and Frederick Lane North to facilitate access by service and emergency vehicles to Frederick Lane North.

The Proposed Development in its simplistic terms comprises development on a site of c. 0.99 ha.

The accompanying Planning Application Report sets out a list of all of the plans and particulars submitted as part of the Section 175 planning application to the Board, that provide the comprehensive description of the project and that have been made available to the EIA team in preparing this EIAR. Further details in relation to the Proposed Development are described under Chapter 3: Description of the Proposed Development, of this EIAR.

5.12.6 Potential Impact of the Proposed Development on Sunlight Access

The statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e., only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight out of a potential 16.7 hours each day received by Dublin during June (i.e., 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid winter, the shadow environment in all urban and suburban areas is generally dense throughout winter.

In assessing the impact of a development on sunlight access, the comments of PJ Little fair in Site layout planning for daylight and sunlight: a guide to good practice (the BRE Guide) should be taken into consideration. The BRE Guide states that "it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected."

5.12.6.1 Demolition and Construction Phase

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

5.12.6.2 Operational Phase

All impacts described in Section 5.12.6 will be permanent. Impacts described as "imperceptible" are considered to be neutral in character. Any reduction in sunlight access resulting in a "slight", "moderate" and "significant" impact would usually be considered to be negative in character, unless otherwise indicated. Any increase in sunlight access resulting in a "slight", "moderate" and "significant" impact would usually be considered to be positive in character, unless otherwise indicated.

5.12.6.3 Overview of the Potential Impact by the Proposed Development outside the Application Site

Having regard to the shape, layout and orientation of the application site, the potential of the proposed development to result in overshadowing of lands outside the application site is largely limited to neighbouring lands at Parnell Square, Granby Row (Parnell Court), Bethesda Place, Sheridan Place and Frederick Lane North. The potential for the proposed development to result in a change to the shadow environment is limited by the already dense shadow environment of this part of Dublin's urban core. Moreover, the potential for the redevelopment of the central portion of a city block (i.e. where the perimeter buildings of that city block are to be retained) to result in additional overshadowing of the wider area is very limited.

Shadows cast by the proposed development will extend to lands to the north (i.e. the three storey residential development at Sheridan Place) during the mornings and early afternoons throughout the year. While the rear facade of Sheridan Place is punctuated with secondary windows (i.e. principal windows serving living spaces are located on the other or northeast-facing side of the building), it is noted that shadows cast by the proposed development have the potential to reduce sunlight access to the rear façade of Sheridan Place to a "significant" extent, with windows at the western end of Sheridan Place most likely to be affected. While additional overshadowing of the rear of Sheridan Place may be considered to be "significant", it is noted that the scale of the proposed development is broadly similar to developments already built, under construction or permitted in the immediate area. As such, the impact of shadows cast by the proposed development on the rear façade of Sheridan Place may be considered to be consistent with emerging trends for development in the area.

ARC's analysis further indicates that the proposed development has the potential to result in "imperceptible" to "moderate" additional overshadowing of Charlemont House, as extended to accommodate the Hugh Lane Gallery, during the afternoons and evenings throughout the year. The potential for shadows cast by the proposed development to result in negative impacts on the amenity value of rooms within the gallery or on the function of the gallery is strictly limited by the fact that rear-facing windows within Charlemont House do not have a reasonable expectation of sunlight (given that the rear façade faces within 90 degrees of due north) and given that there are few windows serving the modern elements of the gallery.

Shadows cast by the proposed development are also likely to extend to Granby Row (including Parnell Court) as far as Dorset Street Upper for a short time during the very early mornings of spring, summer and autumn months. The impact of shadows cast by the proposed development at this time is likely to be minor and is predicted to range from "imperceptible" to "moderate" in extent. Similarly, for a short time during the late afternoons of the winter months (i.e. November, December, January), shadows cast by the proposed development are predicted to result in an "imperceptible" to "slight" impact on lands to the north to the rear of Parnell Square North and Frederick Lane North.

5.12.6.4 Potential Impact of the Proposed Development on Existing Buildings Outside the Application Site

This analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described in section 5.12.6.3: Overview of the potential impact of shadows cast by the proposed development outside the application site. 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 sunlight access to a representative sample of sensitive receptors (i.e. windows) in buildings in proximity to the application site (please see Figure 5.12.2 below). Within that representative sample of buildings, a worst case scenario was studied whereby windows at the lowest levels of accommodation were analysed. Having regard to the height of the proposed development, ARC also undertook analysis of a number of sample representative rooms on upper floors in neighbouring buildings in the interests of completeness.



Figure 5.12.1: Location of sample windows assessed as part of this sunlight access impact analysis (Shown in yellow)

The British Standard and the BRE Guide recommend that, where a window with a reasonable expectation of sunlight is capable of receiving 25% of annual probable sunlight hours (including 5% of annual probable sunlight hours during the winter months), that window will be adequately sunlit throughout the year. The BRE Guide indicates that "sunlighting of the existing dwelling may be adversely affected" if, after the construction of a proposed development a window with a reasonable expectation of sunlight (i.e. facing within 90 degrees of due south) the following three criteria are met: (i) the centre of the window receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March; and (ii) receives less than 0.8 times its former sunlight hours during either period; and (iii) has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

The BRE Guide does not identify a need to undertake detailed quantitative assessment of the impact of new development on existing buildings, which do not face within 90° of due south, as is the case for the rear facade of Charlemont House and the northeast-facing façade of Parnell Court. This detailed quantitative analysis has, therefore, been carried out on sample windows facing within 90 degrees of due south. The results of ARC's analysis are set out in Table 5.12.1 below.

Table 5.12.1: Impact of the proposed development on sunlight access to sample windows in proximity to the application site

Zone	Existing Probable Sunlight Hours Received			Proposed Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
Sheridan Place						
Zone 00a - Floor 00	40%	34%	6%	7%	7%	0%
Zone 00b - Floor 00	45%	34%	11%	27%	27%	0%
Parnell Court						
Zone 00a - Floor 00	19%	19%	0%	15%	15%	0%
Zone 00c - Floor 00	20%	20%	0%	20%	20%	0%
Charlemont House, Parnell Square						
Zone 01 - Floor 01	43%	35%	7%	33%	30%	3%
Zone 02 – Floor 02	52%	38%	14%	42%	30%	12%
*Note: For the purposes of this calculation, summer is taken to mean the period between March and September, and winter is considered to be the period between September and March						

Shadows cast by the proposed development have the potential to reduce sunlight access to the sample studied windows to the rear of at Sheridan Place below the recommended annual amount and to less than 0.8 times the sunlight hours during either the summer or winter periods. These windows appear to be secondary windows as the principal windows serving living spaces are understood to face northwest. While this might be considered to be a "significant" impact, it is noted that the scale of the proposed development is broadly similar to developments already built, under construction or permitted in the immediate area. In this regard, the following comments set out in the BRE Guide are considered instructive: "Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design. For example, in a historic city centre, or in an area with modern high rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings." Given this, given the character of recent developments in the area and given statutory planning policy for the development of a new library and Cultural Quarter at Parnell Square, the impact of shadows cast by the proposed development on the studied sample windows at Sheridan Place could be considered to be consistent with emerging trends for development in the area and, therefore, "moderate" in extent.

ARC's analysis further indicates that the impact of shadows cast by the proposed development on the studied windows with a reasonable expectation of sunlight in the neighbouring building at Parnell Court (in residential use under DCC Reg. Ref. 3603/16) is not predicted to be of a level, which would suggest that sunlight of an existing building "may be adversely affected" (i.e. the three criteria for an adverse impact set out in the BRE Guide will not be met in the case of the relevant sample windows studied as part of this analysis). The impact of shadows cast by the proposed development on sunlight access to the relevant sample windows at Parnell Court is predicted to range from none to "slight" change in sunlight access. In short, under a worst-case scenario, shadows cast by the proposed development on buildings with a reasonable expectation of sunlight are predicted to be consistent with emerging trends for development in the area.

The rear of Charlemont House (a protected structure) faces northwest and, therefore, does not have a reasonable expectation of sunlight within the meaning of the BRE Guide. In the interests of completeness, ARC analysed the potential for shadows cast by the proposed development to result in impacts on sunlight access to windows in the southern façade of Charlemont House and on the roof light serving the single storey structure immediately to the rear of Charlemont House.

- The impact of the proposed development on the sample studied window in the southern or side façade of Charlemont House (i.e. Zone 02) is not predicted to be of a level, which would suggest that sunlight of an existing building “may be adversely affected” (i.e. the three criteria for an adverse impact set out in the BRE Guide will not be met in the case of the relevant sample window in the southern façade of Charlemont House studied as part of this analysis). Given this, the impact of the proposed development on sunlight access to this sample window is predicted to range from “imperceptible” to “slight”.
- While the roof light at Zone 00 will continue to receive a level of sunlight over the course of the year very considerably in excess of that recommended by the British Standard after the construction of the proposed development, shadows cast by the proposed new structure are likely to reduce sunlight access to this sample window below the recommended 5% Annual Probable Sunlight Hours during the period between September and March. Given that the shadow environment of the historic core of a city is typically dense (particularly during the winter period between September and March), given that densification of existing city blocks often results in impacts on sunlight access to lower level rooms during the winter period and given that Charlemont House was, itself, subject to a large modern extension, the impact of the proposed development on this room is considered to be “moderate” and consistent with emerging trends for development. The potential for shadows cast by the proposed development to result in a noticeable impact on the room served by this window is lowered by the fact that a second window (an opaque and coloured glass window) intervenes between the roof light and the room – this second window lights the relevant room with diffuse light.

5.12.7 Do Nothing Impact

In a “do nothing” scenario, the existing shadow environment will remain unchanged

5.12.8 Mitigation Measures

The subject application proposes the major re-development of a brownfield site situated in an inner-city location characterised by high density development. In these circumstances, during the construction or operational phases scope for mitigation measures, scope for mitigation measures, which would preserve a sustainable level of density, is limited.

5.12.9 Predicted Impacts of the Proposed Development on Sunlight Access

As no ameliorative, remedial or reductive mitigation measures are now proposed, the predicted impact of the proposed development on sunlight access will be as described under Section 5.12.6 above.

5.12.10 Monitoring

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

5.12.11 Reinstatement

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

5.12.12 Interactions

As is always the case where a development will result in a change to the sunlight environment of an area, the impacts of the development on sunlight access will result in interactions with climate, population and human health, material assets and the landscape. In the case of the subject application, having regard to the location of the proposed development within the historic core of Dublin City, there is also likely to be some degree of interaction between the impact of the development on the sunlight access and the impact of the proposal on cultural heritage.

5.12.13 Difficulties Encountered

As is the case in any urban area, 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 sunlight access achieves a high degree of accuracy, it should be noted that some level of assumption was necessary in completing the model.

5.12.14 References

ARC referenced the following documents or sources above:

- British Standards Institution (2008) BS8206: Part 2: 2008 Lighting for Buildings: Part 2 – Code of Practice for Daylight. Milton Keynes, BSI.
- Council Directive 14/52/EU (amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment) (Official Journal No. L 124/1, 25.4.2014)
- Dublin City Development Plan 2016-2022
- Environmental Protection Agency. 2002. Guidelines on the Information to be Contained in Environmental Impact Statements. Wexford: Environmental Protection Agency.
- Environmental Protection Agency. 2017. Guidelines on information to be contained in Environmental Impact Assessment Reports DRAFT. Wexford: Environmental Protection Agency.
- Environmental Protection Agency. 2015. Advice note for Preparing Environmental Impact Statements DRAFT. Wexford: Environmental Protection Agency.
- Littlefair, PJ. 1991. Site Layout Planning for Daylight and Sunlight: A Good Practice Guide. Watford: Building Research Establishment.
- Littlefair, PJ. 2011. Site Layout Planning for Daylight and Sunlight: A Good Practice Guide. Watford: Building Research Establishment.