Consultancy for the Historic Built Environment KMHeritage

New City Court: the effect of the proposed development on the significance of stained glass windows in the Chapel of Guy's Hospital

Contents

Introduction

Purpose

1 This report has been prepared to address comments made by Historic England in a letter dated 27 March 2019 (ref: P01028272) concerning the effect of the proposed New City Court development on Guy's Hospital Chapel. The Historic England letter responded to consultation by the London Borough of Southwark regarding planning application ref. 18/AP/4039 for the New City Court development. The report has been prepared on behalf of GPE (St Thomas Street) Limited.

2 The report relates to one specific aspect of the Historic England letter – its comments in relation to the potential for the proposed development to affect the interior of the Chapel. Historic England states in its letter:

'We consider that additional harm would likely be caused by the impact of the 37 storey tower on the interior of the Hospital Chapel, which is located at the centre of the west range and benefits from a west facing elevation which provides natural light through its stained glass windows. An outstanding daylight assessment will help your Council determine the extent of the harm caused by the blocking of natural light into the Chapel. We understand that Historic England might be reconsulted once this information has been provided'.

3 This report does not purport to be a formal 'Heritage Statement' but rather a consideration of the matters raised by Historic England and the degree to which the proposed development causes harm to heritage significance.

Background

4 The works to the party wall between Keats House and Conybeare House are required in connection with overall proposals for the redevelopment of Nos. 4-8 & 12-16 St Thomas Street, Keats House (Nos. 24-26 St Thomas Street) and New City Court (No. 20 St Thomas Street), London SE1 9BF. These proposals are the subject of separate planning and listed building consent applications.

5 KMHeritage prepared a Listed Building Heritage Statement[1] that accompanies the separate planning and listed building consent applications for the overall development of Nos. 4-8 & 12-16 St Thomas Street, Keats House (Nos. 24-26 St Thomas Street) and New City Court (No. 20 St Thomas Street), London SE1 9BF. The KMHeritage report relates specifically to proposals for the Grade II listed Nos. 4-8 & 12-16 St Thomas Street and Keats House. The Heritage Statement includes, as an appendix, a Listed Building Heritage Assessment of the listed terrace and Keats House. KMHeritage has provided a separate Heritage Statement[2] to support an application for listed building consent for works to the party wall between Conybeare House and Keats House (Nos. 22-24 St Thomas Street).

The Chapel and its windows

History and description

6 Guy's Hospital was founded in 1721 by Thomas Guy (1645–27 December 1724). The central block facing St Thomas Street was built in 1728 to the design of Thomas Dance and remodelled by Richard Jupp in 1774. The east wing was built in 1738-41 and designed by James Steere; it was completely rebuilt in facsimile after the Second World War. The west wing, containing the Chapel, was built by Richard

[1] *Nos. 4-8 & 12-16 St Thomas Street, Keats House (Nos. 24-26 St Thomas Street) and New City Court (No. 20 St Thomas Street) London SE1 9BF - Listed Building Heritage Statement*, KMHeritage, November 2018

[2] *Works to Conybeare House St Thomas Street, London SE1 - Heritage Statement,* KMHeritage, April 2019

Jupp in 1774-77. The original quadrangle ranges to the south pre-dated the central block by a few years, but are now largely 20th century in character and fabric.

7 The original parts of the hospital are now administrative and social accommodation, and are listed Grade II*. The complex experienced substantial bomb damage during World War II, though the original 18th century Chapel remains intact. Conybeare House is the section of the west wing between the Chapel and St Thomas Street. As with many similar historic hospital buildings it has been heavily altered over time.

8 The Survey of London[3] relates how Jupp's Chapel replaced an earlier Chapel in the east wing and describes it as 'square on plan and six bays in length; the sanctuary, with a single row of stalls on either side, occupies the westernmost bay and the vestibule the easternmost. The vestibule, which is completely screened off from the Chapel, has a plaster vaulted ceiling and contains the stairs to the gallery'. The list description notes that the Sanctuary was remodelled in 1959 and that galleries occupy three sides with the altar (unusually) at the western end. The list description is reproduced in full in Appendix A, and the following is the part that relates to the Chapel:

> *'Chapel in centre block of west wing: Richard Jupp c1775 with remodelling of sanctuary, 1959. Almost square plan with galleries on 3 sides, altar at west end. Chapel, which is approached through narrow vestibule beneath east gallery which contains stairs leading to galleries, has aisle of 4 bays formed by Ionic columns supporting north and south galleries. A 5th bay to the west contains the sanctuary in the centre, a vestry to the north and an organ chamber to the south. Entablature above columns has dentil cornice and fluted frieze with paterae, which continues along west wall, broken only by round arch with blue marble architrave, above altar. Round-arched (later) stained-glass windows to central 3 bays of sanctuary, a square-headed leaded one to each gallery either side. 5 sash windows to east gallery. Doors with radial fanlights to vestibule at east end. In centre, a shallow niche with a monument in white marble to Thomas Guy by John Bacon, 1779. It depicts the founder assisting a sick man into his hospital which is shown in relief in the background. A decorative cast-iron railing forms semi-circle around. Groin-vaulted plaster gallery roof supported on columns with foliage capitals. Flat plaster ceiling to main body of Chapel with circular motif in centre and framed by groined semi-vaults'.*

[3] 'Guy's Hospital', in *Survey of London: Volume 22, Bankside (The Parishes of St. Saviour and Christchurch Southwark)*, ed. Howard Roberts and Walter H Godfrey (London, 1950), pp. 36-42. British History Online http://www.british-history.ac.uk/survey-london/vol22/pp36-42 [accessed 20 January 2020].

Designations

9 As noted above 'Guy's Hospital Main Building Including Wings and Chapel' is listed Grade II*, and includes Conybeare House. Both the listed hospital/Chapel complex and the New City Court development site are located in Sub-area 4 of the Borough High Street Conservation Area. The northern boundary of the sub-area runs along St Thomas Street.

The windows

Description

10 The Survey of London elaborates slightly on the stained glass windows, saying that 'three stained glass memorial windows to William Hunt, who died in 1829' are located above the altarpiece. William Hunt was a governor of the hospital who bequeathed £180,000 and some chairs to the hospital when he died; the fact that he was 'of the City of London and of Petersham in the County of Surrey' and donated generously is recorded at the bottom of the left and right hand windows. He appears to be buried in the crypt beneath the Chapel.

11 The windows appear to depict scenes from the Bible or the lives of the saints. Each round-headed window consists of a central coloured portion containing a central figure or figures - a single figure in the left window, three centrally, and two figures in the right window. The central figure in the central panel is Jesus, beneath a dove and flanked by Joseph and Mary. The non-haloed figure on the left stands next to what resembles the Rod of Asclepius, also known as the Staff of Aesculapius and as the *asklepian*, and which is a serpent-entwined rod wielded by the Greek god Asclepius, a deity associated with healing and medicine. The window, however, appears to show the serpent entwined in a crucifix. In each case the figures in the windows are surrounded by what might be considered as supplicants or the ill. Plain glass in a pattern of rectangles and circles surround the central panels of the windows. As mentioned above, inscriptions concerning Hunt sit below the central panels to left and right, and the Guy's Hospital coat of arms at the bottom of the central window.

12 A small external balcony is situated above the right hand window.

The significance of the windows

13 It has not been possible to obtain any detailed information concerning the stained glass windows of the Chapel[4]. They clearly post-date Hunt's death, though no date

[4] Information concerning the Chapel beyond that contained in the Survey of London and the list description is limited. For the preparation of this report one further piece of work was consulted: a research report prepared under the aegis of the Cathedral and Church Buildings Division of the Archbishops' Council of the Church of

for their installation has been found[5]. Similarly, we have no information regarding their designer or manufacturer; a (relatively brief) examination of the output of the principal 19th and early 20th century producers has not revealed any connection between their companies and Guy's Chapel.

14 Extant stained glass in England is largely from the 19th and 20th centuries. The majority of early English glass was destroyed during the Reformation. Churches which retain a substantial amount of early glass are rare. The Industrial Revolution led to the growth of commercial glass production and the metal trades, and the associated technical advancements permitted a very considerable expansion in stained glass production in the course of the 19th century.

15 19th century stained glass design was strongly influenced by the religious, cultural and aesthetic ideas of the period. Leading figures in art, architecture and design – Ruskin, Pugin, Gibert Scott, Alexander 'Greek' Thomson – as well as the Pre-Raphaelite Brotherhood (Rossetti, Burne-Jones, Millais, Hunt), The Arts & Crafts Movement (Morris and others) and the Aesthetic Movement all had a demonstrable influence on the design and production of stained glass in the period. There are many instances of stained glass either listed in its own right or forming part of a listed building (usually a church).

16 It is reasonable to say, that compared to many such examples, the stained glass of Guy's Chapel is relatively simple and unremarkable. During the assumed period of its creation (possibly the late 1850s; see footnote), stained glass designers and manufacturers experimented with subject matter, designs, colour, detail and complexity. Many of the best instances represent not just the implementation of the aesthetic and stylistic concepts referred to above, but exhibit exceptional levels of craftsmanship, expressed in noteworthy detail and intricacy, with outstanding skill displayed not only in the manipulation of coloured glass to create complex and vibrant scenes but in the ingenuity with which leadwork was used to add interest and animation. In our opinion, the Guy's Chapel stained glass, while forming a prominent part of the Chapel interior, does not display the characteristics of some of the better stained glass of the Victorian period.

England (R. Asquith, J. Moore & H. Mead (2017), Canon Clarke Project Research Report, pages 21 to 24). However, this provided no additional information concerning the windows. Canon Clarke (Basil Fulford Lowther Clarke, 1908–78) was a church enthusiast. He 'visited nearly 11,000 in his lifetime, all over England. He kept notes on each in folio books and collected so many postcards that they now fill 112 albums'. He says of Guy's Chapel that 'It was repaired & redecorated in 1858, & has just been redecorated once again [presumably the 1950s work]: we did not much like the latest work. The galleries keep their seating: the fittings on the ground floor are miserable... At the (ritual) W. is the monument of Thomas Guy by Bacon (1779): Wilton also prepared models. This is really the only noteworthy thing in the Chapel'.

[5] *ibid*

17 The absence of information about the windows is suggestive of their relative lack of interest. The list description is clearly based on the Survey of London and both make only very passing reference to the stained glass windows. Pevsner makes no reference to the windows at all, and, like the list description and the Survey of London, talks more about monument in white marble to Thomas Guy by John Bacon (1779) as the principal internal decorative feature[6]. Given the detailed information provided in both the list description and the Survey of London (albeit one based on the other[7]) regarding decorative elements as well as the overall building, this does not suggest notable authorship for the windows.

18 The altarpiece beneath the windows had, according to the Survey of London (1950), 'three painted panels, the centre one, which is pedimented, depicting the Crucifixion and those on each side the figures of St. Luke and St. Barnabas'. These do not survive, presumably removed by Louis Osman[8] in the 1950s remodelling. Two paintings were hung in late 2018/early 2019. The round-headed painted panels would have been reads with the round-headed stained glass windows directly above.

19 Second World War bomb damage records do not suggest that the Chapel suffered any direct damage, though the London Bridge/Bermondsey area was badly hit. It is not possible to say whether the Chapel experienced any peripheral damage and thus whether any repairs were undertaken after the war.

The effect of the proposed development on the stained glass windows

20 This section of the report considers the effect from the proposed development on the heritage significance of the designated heritage asset, the Grade II* listed Chapel.

The evidence base: the GIA report

21 Following Historic England's comments, GIA Chartered Surveyors were commissioned to 'to gain a detailed understanding of the levels of light currently enjoyed by the stained glass windows within Guy's Chapel and how this will be impacted by the proposed development of New City Court'. The GIA report is appended to this report as Appendix B, and it contains illustrations of the Chapel interior and exterior.

22 The GIA report provides *additional* information to that contained within the planning report which sets out the impacts with reference to the BRE guidelines

[6] Pevsner dates the remodelling of sanctuary to 1956, rather than 1959 as suggested by the list description.

[7] The original 1972 list description was, however, updated in 1998.

[8] *ibid*

and the Vertical Sky Component and No Sky Line methods of assessment. It uses 'a form of Climate-Based Daylight Modelling (CBDM) in order to understand light levels in terms of illuminance throughout the entire year rather than the single-figure VSC or NSL'. This methodology is explained in detail in Section 2 of the report.

23 The report summarises its finds at Pages 2 and 3, and these are, briefly:

- There is, on average, a loss of 43% to overall light levels with the greatest losses in the summer afternoons when sunlight is blocked and the least either just before this, when sunlight isn't blocked, or in the mornings when a portion of sunlight is reflected;
- With the lowest monthly levels of light currently being seen during the winter, there are only three months of the year where the averaged predicted levels of light are below those winter levels currently experienced (November, December and January);
- Given the above, by simply observing the windows in their current condition, it is possible to currently experience the predicted monthly levels of light for nine months (75%) of the year should the development be constructed as proposed (i.e. the levels from February to October (inc.) are predicted to be higher than those currently experienced in December). For the remaining three months, it would be necessary to review different times of day...;
- In terms of sunlight, the development does block some sunlight but does not remove all sunlight in any given month.
- When considering the historical climate data, the greatest sunlight losses for windows 2 and 3 are predicted in June (8 hours over the month for window 2 and 6 hours 45 minutes for window 3). Window 1 is somewhat an anomaly owing to the balcony directly above and here up to 12 hours 45 minutes of predicted sunlight is lost in July.

24 Broadly speaking, and taking account of the existing balcony above the right hand window (Window 1 in the GIA report), the reduction in the quantum of direct sunlight reaching the windows as a result of the New City Court development will be greatest in mid-summer and lesser in at the start and end of the summer months There will be no direct sunlight on any of the windows in November, December and January – this represents no reduction in direct sunlight. There will be minimal sunlight in February, March and October and, again, no reduction in direct sunlight. For the remaining six months, there will be good sunlight and losses of between 5 and 15 hours per month. In both existing and proposed conditions the amount of sunlight reaching the windows is lowest for the right hand window

(Window 1), greater for the central window (Window 2) and greatest for the left hand window (Window 3); the same amount of sunlight does not, at present, reach each of the three windows. The GIA report concludes 'As is also to be expected, the development serves to reduce the levels of light reaching these windows, but great variation still remains with low levels of light in the winter and high in summer', and continues:

> *'Of the three windows tested, Window 1 sees the lowest levels of light currently whilst Window 3 sees the highest. This also correlates to the levels predicted with the development in place. Owing to the windows' location in relation to the development and the balcony above Window 1, the greatest percentage losses are seen to Window 1 whilst the lowest are seen to Window 3'.*

25 The GIA report points out that 'there is no recommendation for illuminance levels reaching stained glass windows' – in other words, no measure or standard exists as to how much light should reach a stained glass window[9].

The nature of the effect

26 The level of light reaching the stained glass windows will, therefore, be reduced throughout the year. That, by itself, cannot automatically lead to an assessment of harm. Such a position would rely on two questionable assumptions: firstly that the windows were designed for, and rely upon, a fixed level of light and, secondly, the idea that in respect of stained glass windows generally the measure of acceptability of effect should be 'the more light the better'. In terms of the first assumption, it is highly unlikely that a 19th century window designer – particularly in an era of significant air pollution – would have assumed any fixed level of light, and not just because light levels vary throughout the year. Secondly, the fact that stained glass is seen throughout the year means that the experience of seeing it inherently involves seeing it with more and less light.

27 In considering the effect of the reduction in light reaching the windows, a number of matters need to be borne in mind:

- The role of the stained glass windows in the overall significance of the listed Chapel;
- The location of the Chapel;
- The experience of the windows once the development is completed.

<u>*The role of the stained glass windows in the overall significance of the listed Chapel*</u>

[9] English Heritage/Historic England guidance as it relates to stained glass is essentially technical, dealing with the condition and repair of window fabric.

28 The stained glass in Guy's Chapel is, as acknowledged earlier, a prominent part of the Chapel interior. It forms part of the architectural design of the church, specifically as part of the evolution of the design over time[10] as opposed to forming part of Jupp's original concept (in which the windows would have held plain, uncoloured glass). The windows are neither the most or least important part of the overall heritage significance, or special architectural or historic interest, of the listed church. In our opinion, what is of significance – as part of Jupp's 1774-77 design – are the round-headed window openings, which form part of the neo-classical architectural language of the Jupp Chapel. The later stained glass is not particularly consistent with that language nor, as we discuss earlier, of particular note in itself[11]. Finally, it seems that the stained glass would formerly have been seen with the now-lost painted panels of the altar wall below.

The location of the Chapel

29 The Chapel of Guy's Hospital is located in central London, and the setting of many churches in such circumstances, listed or otherwise, is that typical of a dense urban environment – central urban churches are frequently cheek-by-jowl with other buildings, often of significant scale and often a few metres away or less. Two examples can be given.

30 Firstly, the Grade I Church of St Michael in Cornhill (Wren, remodelled by Hawksmoor, reworked by Gilbert Scott c. 1860) contains, at its eastern end, a large stained glass rose window as well as stained glass windows to the aisles, both of which form part of the 1860s work. The list description describes the stained glass as 'fine'. While the aisle windows give on to Cornhill to the north and a garden to the south, the rose window is approximately twelve metres from the nine-storey western flank wall of the Grade II No 50 Cornhill (Former offices and banking hall, 1891-92 by Henry Cowell Boyes, FRIBA).

31 Secondly, the stained glass windows of the Grade I Church of St Mary-at-Hill are either in close proximity to the post-war nine-storey 37 St Mary-at-Hill (on the opposite side of the street) or, in the case of the aisle windows, to older buildings surrounding the very small northern churchyard and (as is also the case with the fine northern aisle stained glass windows in the Grade I St Martin-within-Ludgate) a large mature tree in the even smaller space to the south.

[10] Possibly 1858, according to Canon Clarke (see earlier footnote).

[11] The list description for St Michael, Cornhill notes that the 'fine' 1860s stained glass is within a church whose 'interior owes nearly as much to Scott as to Wren' and thus sits within a largely consistent stylistic environment. In any event, a distinction must be made between later stained glass work of high significance in itself - regardless of the architectural period and style of the host building - and later work of lesser significance in an older context of greater importance.

32 The stained glass in these churches or those in similar circumstances - often of more interest than that in Guy's Chapel – do not rely upon either a specific light level or a maximum light level for the windows to contribute to the special architectural or historic interest of the listed churches.

The experience of the windows once the development is completed

33 Will the windows still be legible? Will the nature, colouration, pattern, artistic intention and subject matter of the windows be clear to a viewer standing in the nave and looking up? The clear implication of the GIA report is that the answer to these questions is 'yes' – while light levels reduce throughout the year, it is obvious form the GIA work that they will not reduce to such a level that the stained glass cannot be seen or appreciated and will be the same for long periods of the year. The experience of the stained glass may - at certain times - be somewhat different from that available to the visitor to the church at present, but it is essentially preserved. Importantly, the stained glass will be able to continue to perform its role in the church interior and thus make its contribution to the overall heritage significance of the Chapel.

The level of harm caused by the proposed development to the significance of the Chapel

34 As set out in the National Planning Policy Framework (NPPF), 'harm' is caused to the 'heritage significance' of heritage assets. Harm is judged as occurring to the *overall* significance of the heritage asset, though clearly harm to an important aspect of a heritage asset, including setting, can contribute to harm to overall significance. The NPPF identifies two levels of potential 'harm' that might be caused to a designated heritage asset by a development: 'substantial harm...or total loss of significance' or 'less than substantial'. To be susceptible to a specific level of harm, that level of harm must be caused to a designated heritage asset; no distinction in the level of level of harm is applied to non-designated heritage assets.

35 To repeat our view set out above – the measure of harm caused by the proposed development to the Guy's Chapel stained glass cannot simply be made a function of the diminution of the amount of light reaching their surface. Their significance, and the contribution that they make to the special interest or heritage significance of the listed Chapel, cannot rely on the concept of an 'original' or designed or required level of light on the one had or the attitude of 'the more light the better' , for the reasons given. The glass performs its role, and always has, over time and throughout the year, with a wide range of light levels.

36 Using the simple concept of diminution in light directly causing harm, a hypothetical situation can be considered. Let us imagine that a (now) listed church

possessed stained glass windows added in, say, the 1860s that, when inserted, faced (perhaps across a street or courtyard) a building of a similar or greater height and mass than the listed church. Let us imagine furthermore that, following wartime damage or later demolition, the site of the adjacent building became vacant but that now a proposal has come forward to reinstate a building on the vacant site to the same height and mass as previously. The stained glass may have enjoyed greatly increased light levels over their original condition for many decades, but would the re-erection of a building on the vacant site, and thus the reduction in light reaching the windows to original levels, equate to harm? Such a conclusion would seem flawed.

37 Would the erection of a building on the vacant site to a *greater* height and mass than previously (and thus reducing light levels to lower than the original condition) therefore amount to harm? Again, this conclusion would be questionable. The Victorian designer of the stained glass -in a period of heavy atmospheric pollution - almost certainly would not have assumed any specific light level, and would have known that their work would be appreciated in the dark days of November as much as the bright days of July.

38 When this analysis is joined with a realistic assessment of the quality of the stained glass and its role in the overall heritage significance/special interest of the listed church, then the reduction in light levels for part of the year described in the cannot be said to amount to harm. Change, of itself, does not equate to harm.

39 If, however, a decision-maker chooses to disagree with the two basic points made within Paragraphs 26 and 35 above, then the 'harm' caused to the significance of Guy's Chapel could only be a very low level of less than substantial harm, and this is more than outweighed by the public and heritage benefits flowing form the overall New City Court development.

Summary and conclusions

40 The levels of light reaching the Guy's Chapel windows will be reduced as a result of the proposed New City Court development but the stained glass windows will remain legible and what aesthetic merit they possess will remain accessible to users of the Chapel. The physical context of the chapel has changed over time and its circumstances are similar to many other churches in dense urban environments, where such windows are often a short distance away from much taller structures. It cannot be assumed that they were designed with a fixed level of light in mind, but, in any event, they were designed to be seen not just at the brightest point in the year, but throughout each day and throughout the year. The windows clearly contribute to the overall heritage significance of the Chapel, but as scholarship and

the list description show, that contribution is only at a certain level and is not central to the overall special interest of the listed Chapel.

41 In conclusion, therefore, the proposed New City Court development will alter the manner in which the stained glass windows of Guy's Chapel are perceived, but it will not reduce their contribution to the special architectural or historic interest of the listed building, nor reduce their ability to be understood and appreciated.

Kevin Murphy B.Arch MUBC RIBA IHBC
February 2020

Appendix A: The list description for Guy's Chapel

SOUTHWARK

TQ3280SE ST THOMAS STREET 636-1/17/739 (South side) 27/09/72 Guy's Hospital main building including wings and chapel (Formerly Listed as: ST THOMAS'S STREET (South side) Guy's Hospital including Centre Block, West Wing and Chapel)

GV II*

Hospital and chapel. 1721-5 & 1728 with other C18 additions, part rebuilt later C20. Ranges around inner quadrangles, 1721-5; central main entrance block by Thomas Dance, 1728 (remodelled by Richard Jupp, 1774); east wing originally by James Steere, 1738-41, completely rebuilt in facsimile after World War II; chapel and west wing by Richard Jupp, 1774-7. MATERIALS: centre block: multi-coloured stock brick and Portland stone; slate mansard with dormers behind brick parapet over stone cornice to outer sections. Wings similar, with stucco to ground floor; slate mansard with dormers with alternating triangular and segmental pediments to side sections behind brick parapet above stone cornice. PLAN: large forecourt with buildings on 3 sides, 2 inner quadrangles behind. EXTERIOR: centre block: 3 storeys, sunk basement and attic, 13 bays. Projecting central frontispiece of 5 bays in stone with rusticated ground floor containing 5 round-headed openings with rusticated voussoirs, the central 3 bays, with decorative wrought-iron gates and fanlights, forming an open arcade leading to the cloister behind, the outer ones glazed in round-headed recesses. Above, 4 giant Ionic attached columns flanked by 2 giant Ionic pilasters rise through 1st and 2nd floors to support entablature with paterae in frieze, with pediment above over central, slightly projecting 3 bays. 3 panels with bas reliefs of putti between 1st- and 2nd-floor windows, statues of Aesculapius and Hygeia in niches at 1st floor, and allegorical figures in tympanum all by John Bacon. Stone rustication continues across outer sections of ground floor, which are set in advance of upper floors and have rusticated voussoirs to recessed round-headed windows, and balustraded parapet above. All windows are sashes with glazing bars and flat, gauged-brick arches. West wing: 3 storeys and attic, 15 bays. Slightly projecting central section of 5 bays with ground-floor of rusticated stone containing round-headed sash windows with glazing bars in round-headed recesses with rusticated voussoirs and plain band at spring, the central opening a double door of 8 panels with radial fanlight, cornice head, and iron gates with overhanging lamp holder. Keystones support cornice with broad band above containing balustraded panels beneath 1st-floor windows. Stone architraves to 1st- and 2nd-floor windows, with pulvinated friezes and alternating triangular and segmental pediments over cornices to 1st-floor windows. Stone-coped pediment above stone cornice containing clock face. Side sections are stucco at ground floor with

similar windows and doors with keystones supporting cornice beneath broad band at 1st-floor sills continuous with that across central section. All 1st- and 2nd-floor windows are sashes with glazing bars, outer sections with gauged, flat brick arches. Gabled end of 5 bays to street. East wing (Boland House): a copy of west wing except that it has a sunk basement, a wind-vane dial in the pediment instead of a clock, and no doors to side sections or iron gates with overhanging lamp holder to central door. Unmatching, pedimented 5 bay end to street. Chapel in centre block of west wing: Richard Jupp c1775 with remodelling of sanctuary, 1959. Almost square plan with galleries on 3 sides, altar at west end. Chapel, which is approached through narrow vestibule beneath east gallery which contains stairs leading to galleries, has aisle of 4 bays formed by Ionic columns supporting north and south galleries. A 5th bay to the west contains the sanctuary in the centre, a vestry to the north and an organ chamber to the south. Entablature above columns has dentil cornice and fluted frieze with paterae, which continues along west wall, broken only by round arch with blue marble architrave, above altar. Round-arched (later) stained-glass windows to central 3 bays of sanctuary, a square-headed leaded one to each gallery either side. 5 sash windows to east gallery. Doors with radial fanlights to vestibule at east end. In centre, a shallow niche with a monument in white marble to Thomas Guy by John Bacon, 1779. It depicts the founder assisting a sick man into his hospital which is shown in relief in the background. A decorative cast-iron railing forms semi-circle around. Groin-vaulted plaster gallery roof supported on columns with foliage capitals. Flat plaster ceiling to main body of chapel with circular motif in centre and framed by groined semi-vaults. Quadrangle ranges south of main entrance: rectangular plan with 2 inner courtyards separated by a loggia of 10 bays with round-headed arches on stone piers running north/south.

Elevations to courtyards of 3 storeys with attic in mansard roof, east/west elevations 8 bays, north/south elevations 7 bays. Round-headed arches to stone ground-floor with keystones and impost blocks, originally filled in c1780 with windows (and some doors). Upper floors of brick have segmental, gauged-brick arches to sash windows with glazing bars. Much rebuilt after war damage. INTERIOR: not inspected. The chapel is a unique survival, the only C18 hospital chapel in England. It was restored in 1980. (Survey of London: Roberts H: Bankside: London: 1950-).

Listing NGR: TQ3273080143

Appendix B: The GIA report

gia CHARTERED SURVEYORS

DAYLIGHT & SUNLIGHT

GUY'S CHAPEL
DAYLIGHT ASSESSMENT

New City Court

28 November 2019

GIA No: **8684**

PROJECT DATA:

Client	**Great Portland Estates**
Architect	**AHMM**
Project Title	**New City Court**
Project Number	**8684**

REPORT DATA:

Report Title	**Guy's Chapel Daylight Assessment**
GIA Department	**Daylight & Sunlight**
Dated	**28 November 2019**

Prepared by	**ABU**
Checked by	
Type	**Planning**

Revisions	No:	Date:	Notes:	Signed:

SOURCES OF INFORMATION:

Information Received	**IR-46-8684**
Release Number	**Rel_06_8684_DSD**
Issue Number	**09**
Site Photos	**GIA**
3D models	**VERTEX**
OS Data	**FIND Maps**

Map data

CONTENTS

1 INTRODUCTION AND SUMMARY

The purpose of the assessments set out within this report is to gain a detailed understanding of the levels of light currently enjoyed by the stained glass windows within Guy's Chapel and how this will be impacted by the proposed development of New City Court.

This report should be considered as providing additional information to that contained within the planning report which sets out the impacts with reference to the BRE guidelines and the Vertical Sky Component and No Sky Line methods of assessment.

In seeking to provide additional information to that contained within the above referenced report, the assessments contained here have been undertaken using a form of Climate-Based Daylight Modelling (CBDM) in order to understand light levels in terms of illuminance throughout the entire year rather than the single-figure VSC or NSL. Owing to the unique focus of this assessment (effects to stained glass windows), the methodology differs from that normally used to quantify the light within a space and this is discussed in detail within Section 2 below.

It is important to note here that the purpose of this report is not to determine compliance with any published guidance or the acceptability of any impact but rather to provide tools to understand the true experiential effect of the proposed development.

To this end, Section 4 of this report presents the predicted overall levels of light (illuminance) reaching each of the windows for each hour of the year in both the existing and proposed scenarios as well as the percentage loss for each hour and the cumulative predicted hours of sunlight for each month considering the historical levels of sunlight recorded in past climate data.

This has shown that:

- There is, on average, a loss of 43% to overall light levels with the greatest losses in the summer afternoons when sunlight is blocked and the least either just before this, when sunlight isn't blocked, or in the mornings when a portion of sunlight is reflected;
- With the lowest monthly levels of light currently being seen during the winter, there are only three months of the year where the averaged predicted levels of light are below those winter levels

Fig. 01: 'The Chapel, Guys Hospital' by Steve Cadman licensed by CC BY-SA 2.0 (https://flic.kr/p/GnMha)

currently experienced (November, December and January);

- Given the above, by simply observing the windows in their current condition, it is possible to currently experience the predicted monthly levels of light for nine months (75%) of the year should the development be constructed as proposed (i.e. the levels from February to October (inc.) are predicted to be higher than those currently experienced in December). For the remaining three months, it would be necessary to review different times of day, such as:

  For the middle window in December, the predicted levels of light between 10:00 and 14:00 will be similar to those currently experienced from 09:00 to 10:00 and 14:00 to 15:00.

- In terms of sunlight, the development does block some sunlight but does not remove all sunlight in any given month.
- When considering the historical climate data, the greatest sunlight losses for windows 2 and 3 are predicted in June (8 hours over the month for window 2 and 6 hours 45 minutes for window 3). Window 1 is somewhat an anomaly owing to the balcony directly above and here up to 12 hours 45 minutes of predicted sunlight is lost in July.

Overall, the studies undertaken can be used to understand the potential losses in light throughout the year as well as beginning to relate these back to current experiences.

In addition to the three assessments at the windows, a further assessment point has been included within the courtyard and this can be used to correlate a measurement within the courtyard to likely levels of light reaching the windows at that time. It should be noted though that this should only be used as an indicator of likely light levels as predicting specific climate conditions is notoriously difficult.

Should further information on how these windows may feel after the implementation of the propsoed development be desired, a potential future piece of work could be to repeat the assessments within this report for alternative stained glass windows in central London. A study would be undertaken to identify windows with similar levels of light and then, through assessment, parallels could be drawn where appropriate.

Fig. 02: Guy's Chapel - GIA photograph from July 2016

2 METHODOLOGY

To date, the effects to the stained-glass windows of Guy's Chapel have been categorised through the use of Vertical Sky Component (VSC) studies which consider the amount of light reaching them direct from an overcast sky. Whilst this provides a good understanding of the potential effects and is in line with planning guidance on daylight impacts, linking it to true experiential effect is more challenging owing to the static nature of the environment within which the test is conducted (standard overcast conditions).

In seeking to provide further information on any potential effect it therefore follows that the first step would be to replace the static conditions with an alternative, able to consider the effects of time of day and year as well as the general climate of London. To this end we have looked to Climate-Based Daylight Modelling (CBDM) which uses recorded climate data to arrive at a picture of the light levels over every hour of the year. CBDM also differs from the standard planning assessments in that sunlight is included within the hourly model rather than being a sperate assessment and that reflectance is allowed for through accurately modelling the context's materials.

CBDM assessments are discussed and recommended within documents such as the British Standard 'Daylight in buildings' (BS EN 17037:2018) as well as BREEAM and the Educational Funding Agency's 'EFA Daylight Design Guide' (2014).

The more commonly found methodologies utilising CBDM, such as those above, seek to answer the question of whether a space is well daylit or not through assessing the levels of light within that space throughout all the hours it is occupied and reviewing this through various statistical forms of analysis. In the case of Guy's Chapel, however, the concern is less with how well daylit the chapel is, as it will likely retain acceptable levels of light owing to its dual aspect nature. Instead, the question relates to aesthetics; how the stained-glass windows themselves will look and feel from within the chapel and will they continue to be aesthetically pleasing.

Instead of considering the levels of light within the space, therefore, the focus of this assessment is to assess the quantum of light reaching the windows at hourly intervals, with climate information obtained from the nearest available recorded climate data (Gatwick for London). This is presented as 'Global Illuminance', defined as the total quantum of natural light considering both sunlight and diffuse light from the sky.

The core analysis has been conducted both in the current condition to provide a reference and the proposed scenario to allow for a direct comparison.

With results presented in lux, the standard measurement of illuminance used in lighting, a prediction of the quantum of loss and retained illuminance can then be attained considering that this will alter as the sun moves through the sky. The effects are presented in illuminance (light reaching the window) rather than luminance (brightness of the window) owing to the complex and unknown light transmittance and diffusion of the stained glass windows.

Presenting such a large amount of data (one measurement for each of the 8,760 hours of the year) clearly and succinctly is challenging however, and so each hour has been averaged across the month so as to arrive at more readable data. This is then presented in two forms, the first being a series of 12 histograms, each representing a month of the year. These histograms show the average illuminance levels for each hour of the month in question (in GMT). To aid comparison, both the existing and proposed conditions are presented in each chart.

The second method of visualising the data shows an entire year on each chart, with months on the x-axis and hours on the y-axis. The values within the chart are presented numerically as well as falsecoloured and three charts are presented for each assessment point (existing, proposed and percentage loss). This provides a simpler to use overall understanding of the quantum of light throughout the year.

Whilst illuminance levels should be more approachable than VSC assessments, it is accepted that it is very challenging to understand the true effect without a direct point of reference. Ideally, it would be possible to place a sensor external to the stained-glass windows in question to enable a direct understanding of a level of illuminance, but it is understood that this is not possible owing to access.

With the desire to equate the assessment to experience remaining therefore, an additional assessment has been undertaken within the courtyard, showing the predicted illuminance levels here on the same hourly basis. From measuring the illuminance at this point at a particular time,

the analysis undertaken can be used to arrive at an approximate range of illuminance levels likely to be reaching the stained-glass windows at that time (the range corresponding to the variety of weather conditions and sun positions able to cast a particular level of illuminance within this courtyard). Owing to the windows' westerly orientation, two ranges are provided; am and pm, which seeks to consider the effect of direct afternoon sunlight.

Whilst sunlight is considered within the illuminance assessments above, the fact that stained glass windows often look their most impressive when in direct sunlight means that separate sunlight assessments were considered valuable. The quantum of sunlight reaching each of the windows was tested every 15 minutes at which point the results were filtered to respect the information on historic sunlight levels from the same climate data used previously (Gatwick). A timestep was considered 'sunny' if the direct irradiance level was at least 120 W/m2 at that time, as stipulated by the World Meteorological Organisation.

The hours of sunlight, now 'predicted' based upon historical climate data, were summed over each month, and a comparison made between existing and proposed. This provides each window with a single chart showing the hours of sunlight over the entire year.

2.1 3D MODEL

To undertake the assessments outlined above, an accurate 3D model of Guy's Chapel, the existing context and the proposed development was created. The existing buildings were provided as a measured survey model from Plowman Craven with extended context provided from photogrammetric survey whilst the proposed development was provided as a detailed 3D model from AHMM.

As the analysis above also considers reflected light, the existing and proposed buildings on the site were modelled in detail as shown in the images below. The existing building's white cladding was assumed to be 60% reflective whilst the dark glass was considered to be 5% reflective. The proposed building's reflectance was provided by AHMM, the majority of which is glass reflecting approximately 10%.

Renders of the model in both 'existing' and 'proposed' scenarios can be found on the following pages whilst the below presents the Chapel's rear facade.

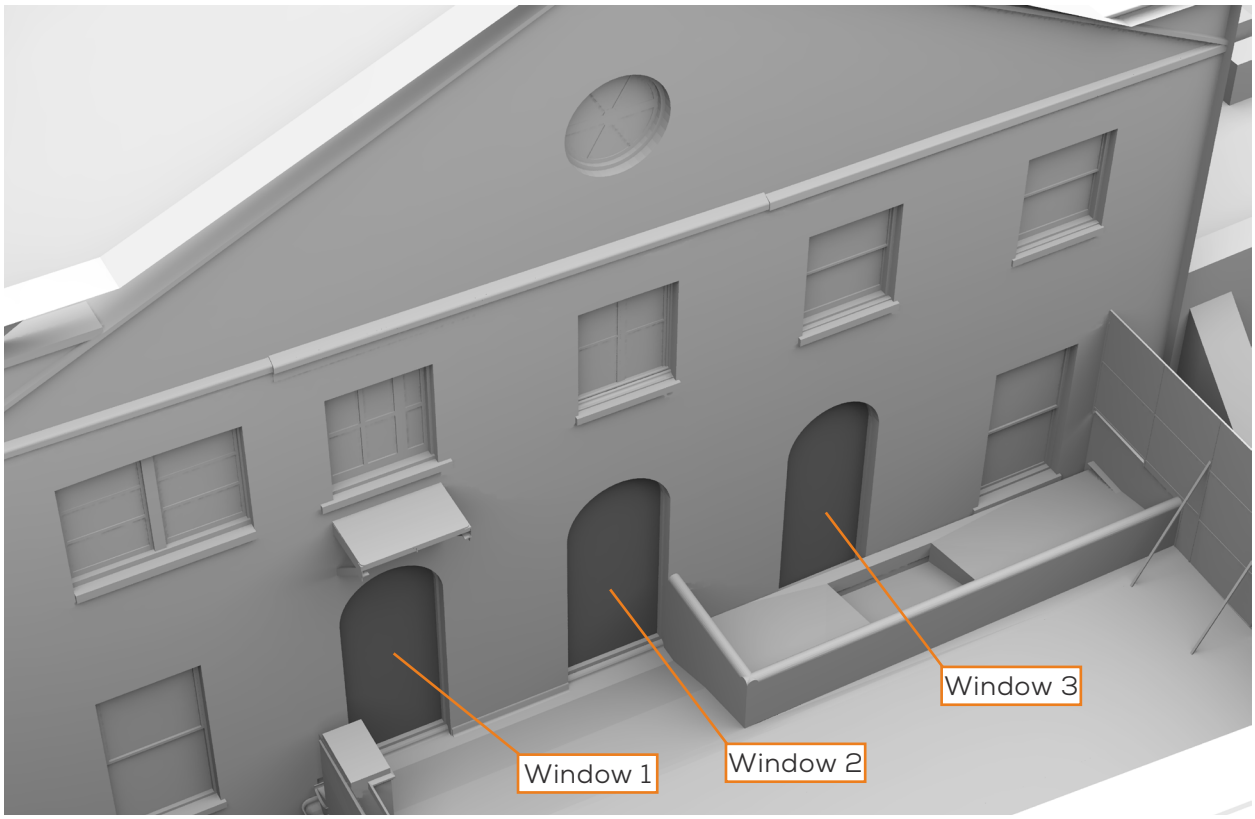


Fig. 03: Guy's Chapel - 3D Model

3 SITE OVERVIEWS

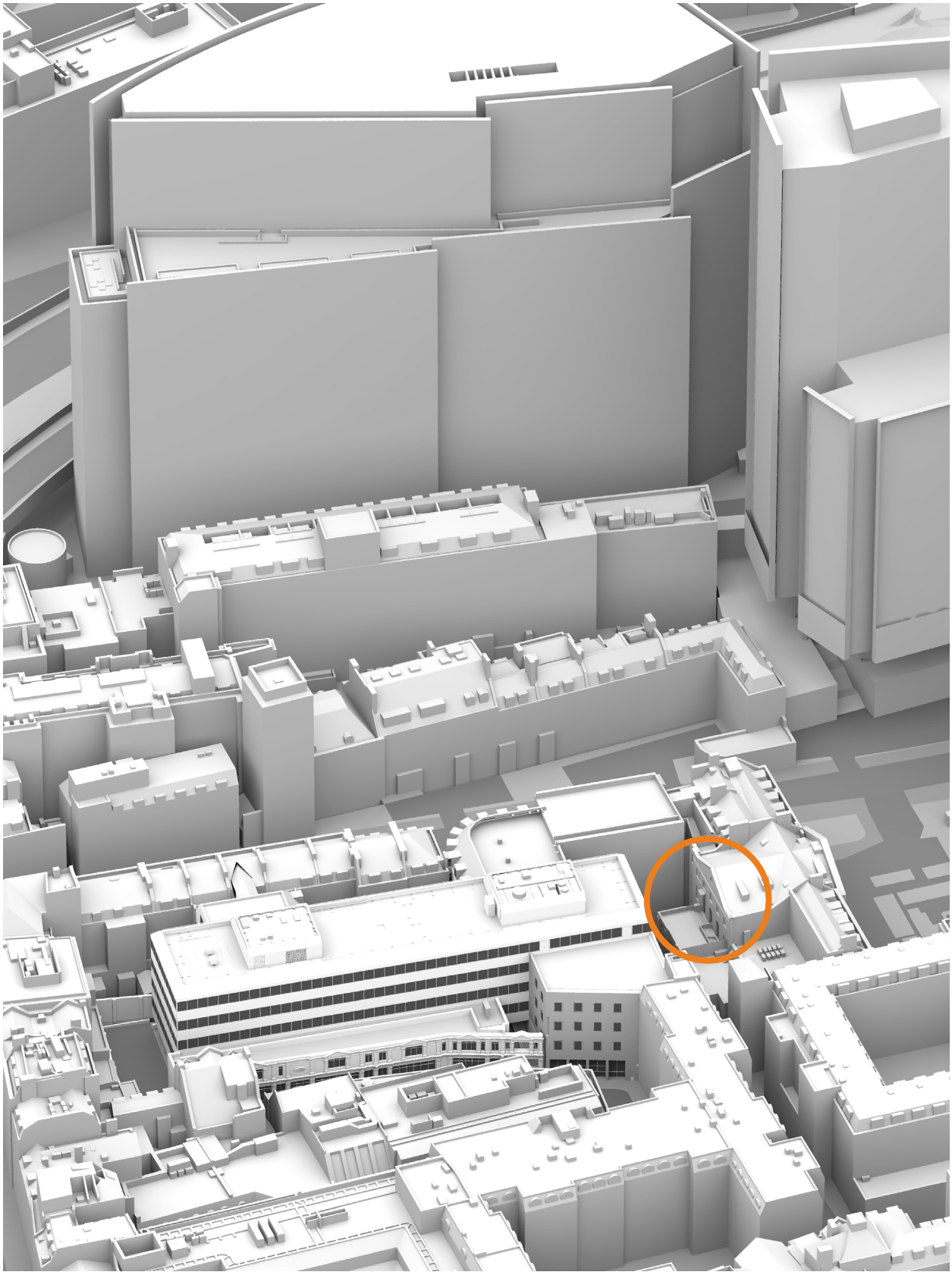


Fig. 04: Existing

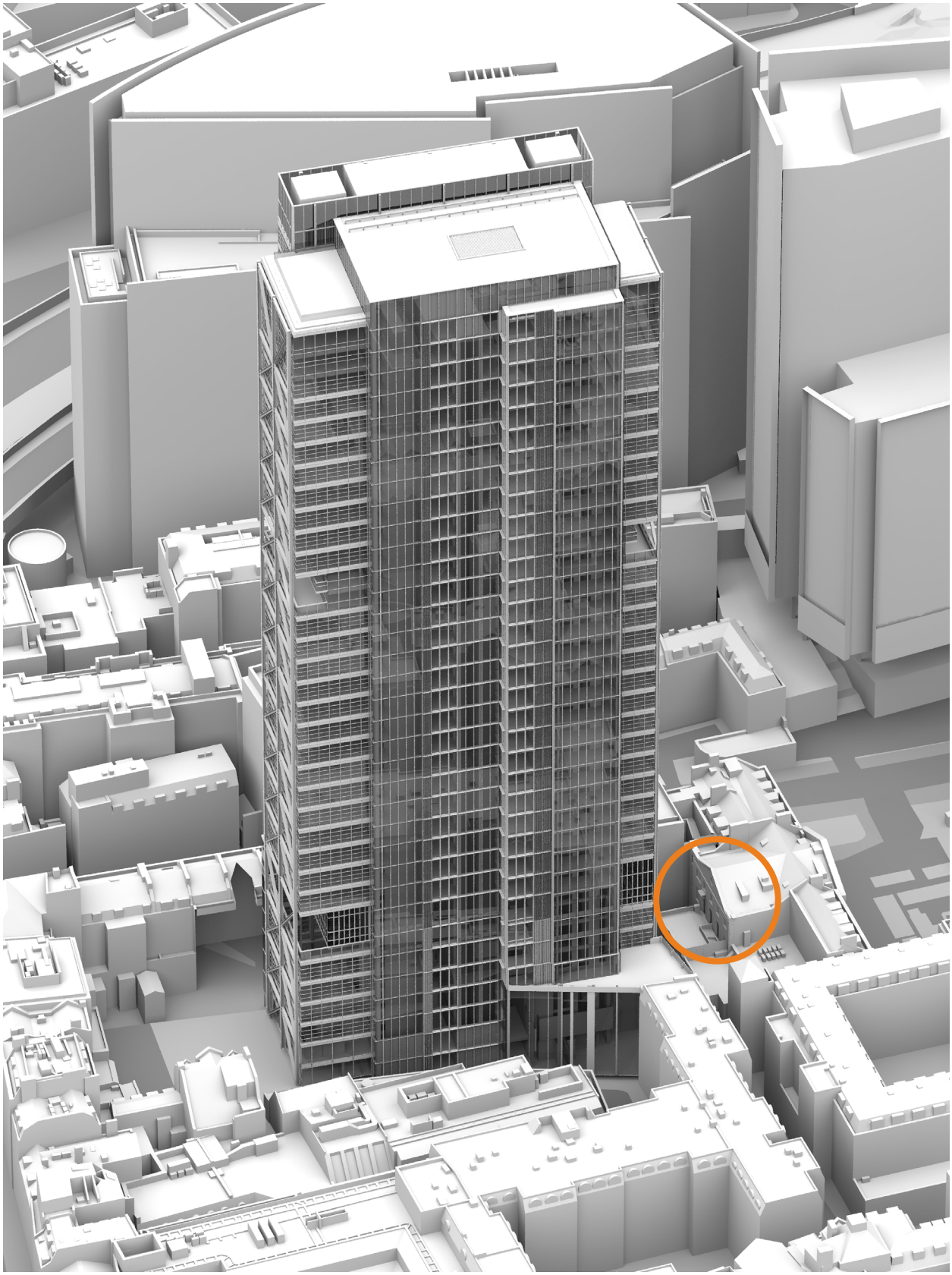
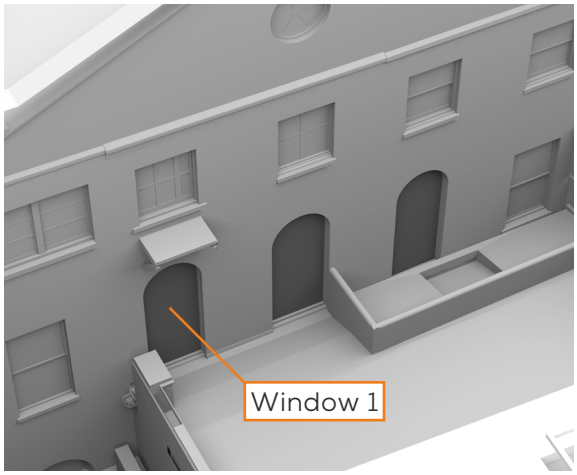


Fig. 05: Proposed

4 DISCUSSION OF RESULTS

4.1 CHAPEL WINDOW 1



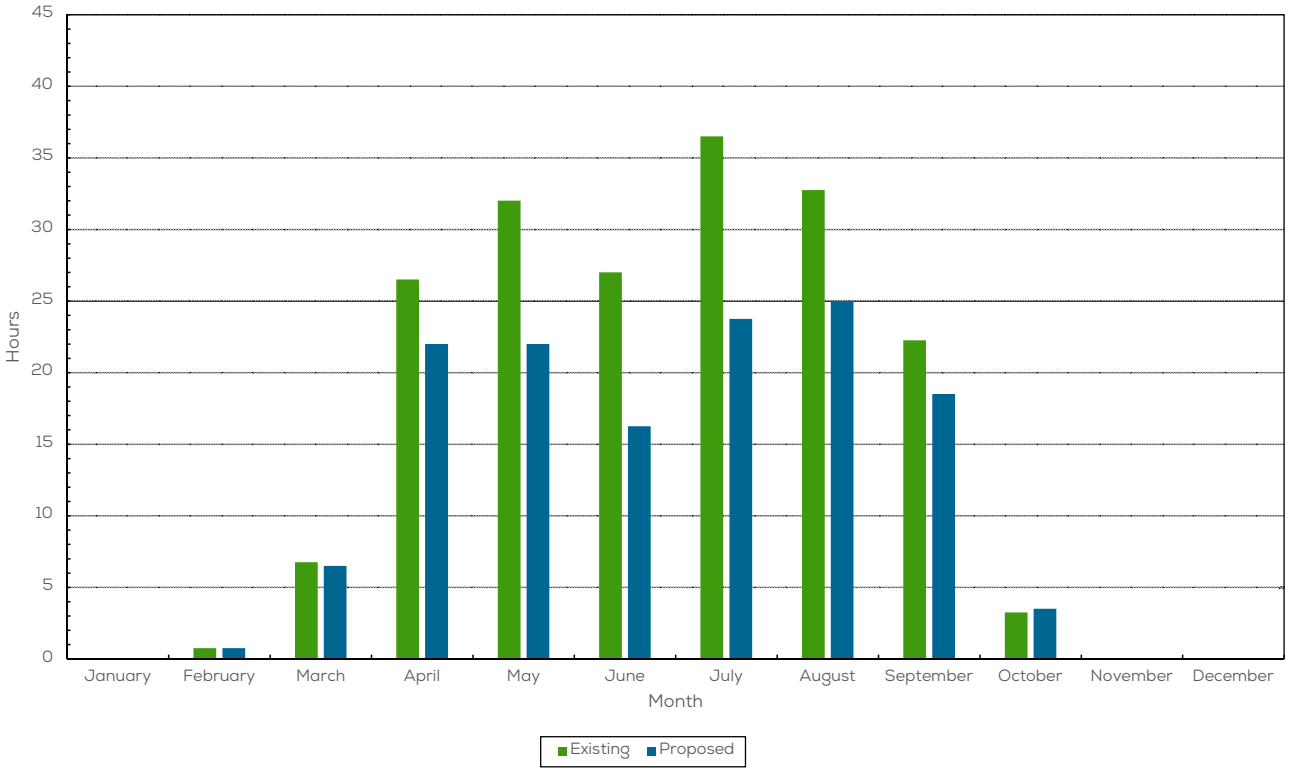
The chart below presents the predicted sunlight levels alone, having been run at a higher resolution of 15 minutes. This agrees with those opposite in that the greatest hours of sunlight are currently likely to be seen between April and September with between 22 and 36.5 hours of sunlight in total in each month. From May to August, losses of between 7.75 and 12.75 hours of sunlight are predicted whilst in April and September the loss is reduced to between 3.75 and 4.5 hours across the month. There is little sunlight currently from October to March and this is unaffected by the proposed development.

The charts opposite present the average monthly levels of predicted illuminance across the whole year. From these we can see peak levels at 14:30 and 15:30 solar time (representative of 14:00-15:00 and 15:00-16:00 respectively) from April until August/ September. These peak levels of light correspond to sunlight reaching the windows at this time.

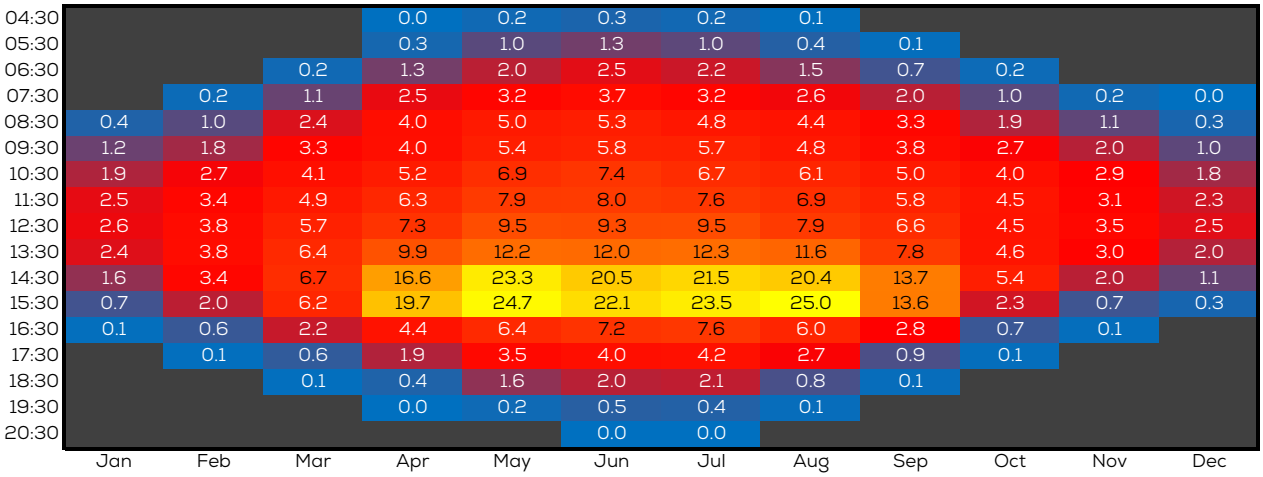
In the proposed condition, the peak remains at this time as sunlight still reaches the windows but it is reduced by shade from the proposed development.

In terms of percentage loss, again the greatest can be seen at 15:30 (representing 15:00-16;00) when sunlight is blocked whilst the least is at 14:30 (1400-1500) when sunlight still reaches the window leading to high levels of illuminance. The percentage loss at other times fluctuates around the 40% mark with another drop in the mid-morning when a certain level of sunlight is reflected from the proposed development (somewhat mitigating the loss of light direct from the sky).

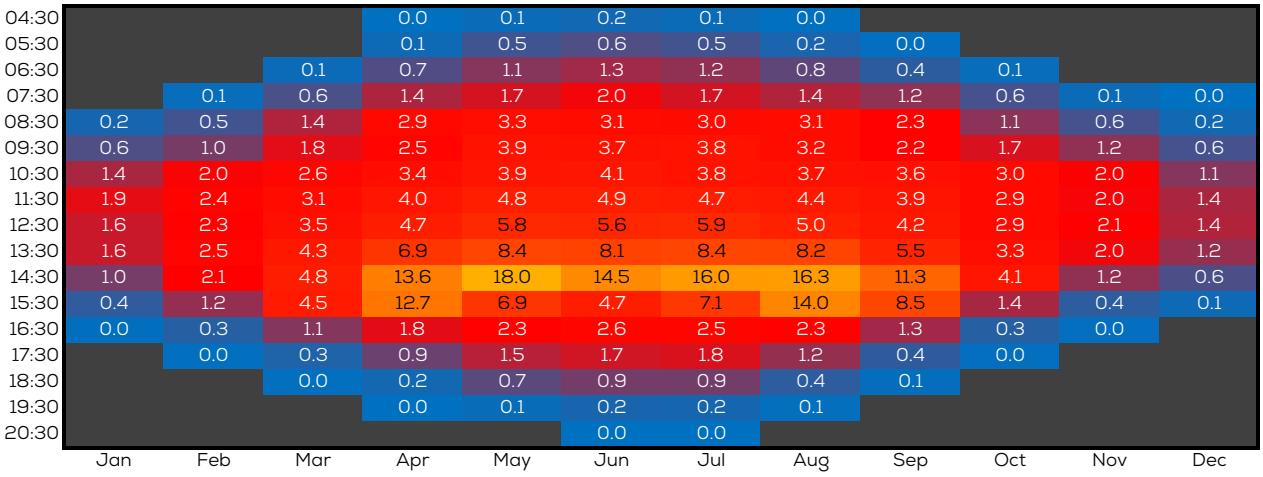
Total Predicted Sunlight Hours
CHAPEL WINDOW 1



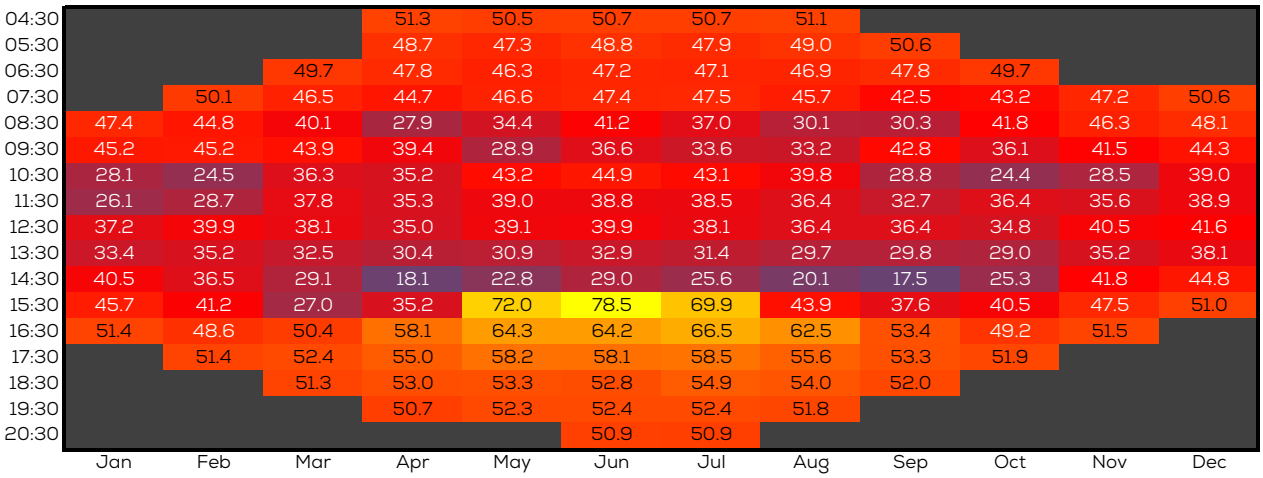
CHAPEL WINDOW 1 - GLOBAL ILLUMINANCE - EXISTING (KLUX)



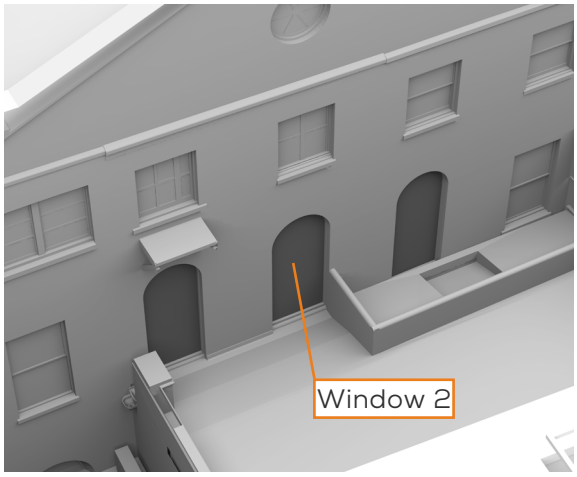
CHAPEL WINDOW 1 - GLOBAL ILLUMINANCE - PROPOSED (KLUX)



CHAPEL WINDOW 1 - GLOBAL ILLUMINANCE - PERCENTAGE LOSS



4.2 CHAPEL WINDOW 2



The overall levels of light reaching Window 2 are higher than those of Window 1, discussed above, owing to the balcony shading Window 1.

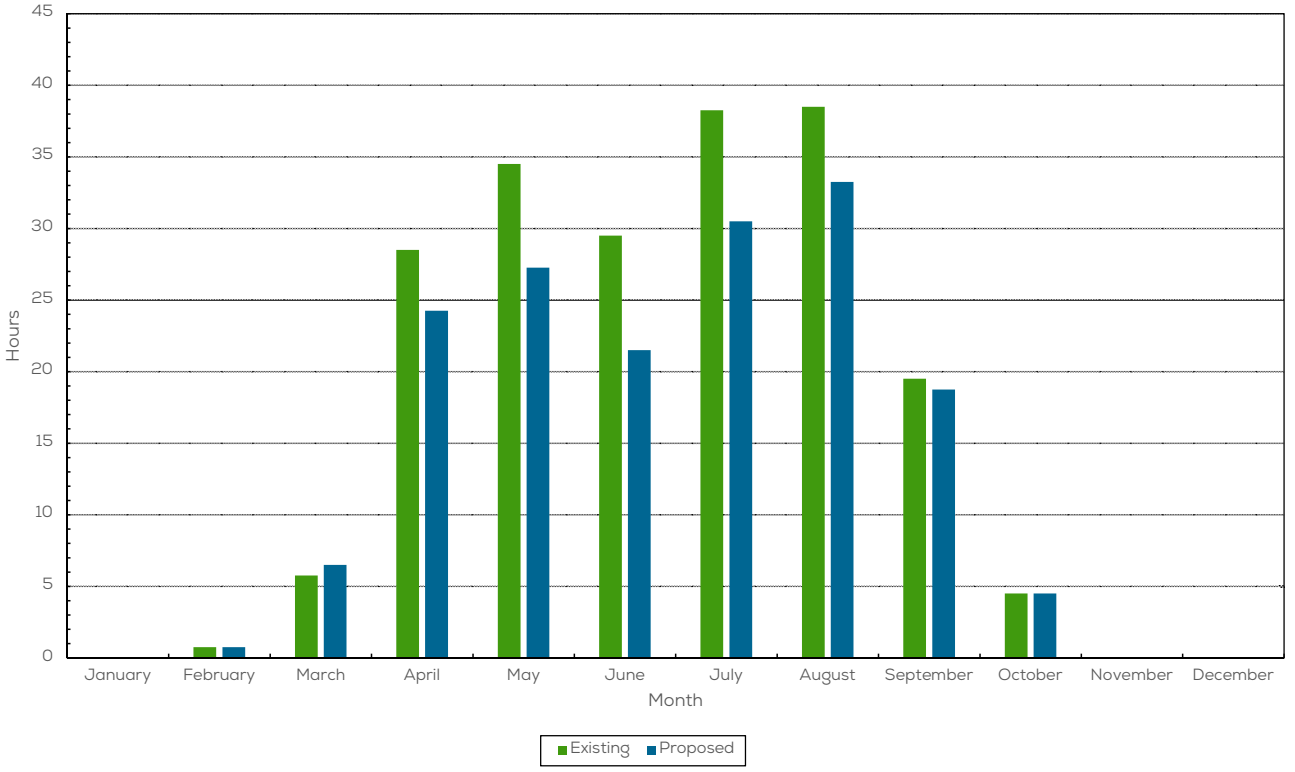
Compared with Window 1, the below chart shows generally higher levels of sunlight owing to the lack of shadow from the balcony above and this window's position further south. The predicted losses are also lower with circa eight hours lost in each month of May, June and July and around five hours lost in both April and August. No significant loss of sunlight is predicted in the six months from September to March.

The principle of the charts opposite remain, however, with peak levels of illuminance at 14:30 and 15:30 solar time from April until August/September, again corresponding to sunlight reaching the windows at this time.

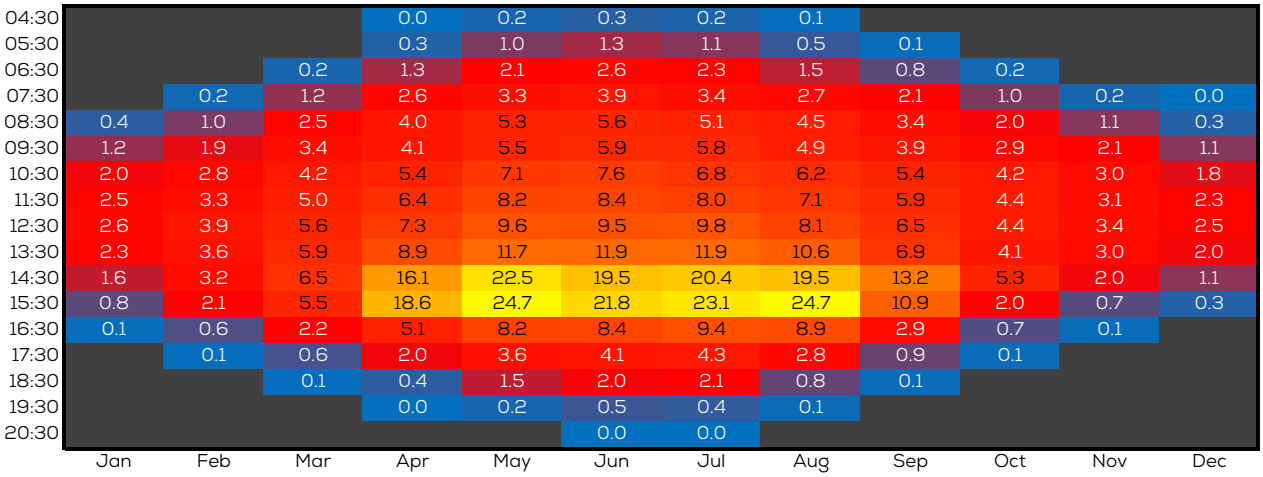
In the proposed condition, the peak remains at this time as sunlight still reaches the windows but it is reduced by shade from the proposed development.

In terms of percentage loss, the greatest can be seen at 16:30 (representing 16:00-17:00) when sunlight is blocked whilst the least is at 14:30 (1400-1500) when sunlight still reaches the window leading to high levels of illuminance. The percentage loss at other times continues to fluctuate around the 40% mark with another drop in the mid-morning when a certain level of sunlight is reflected from the proposed development

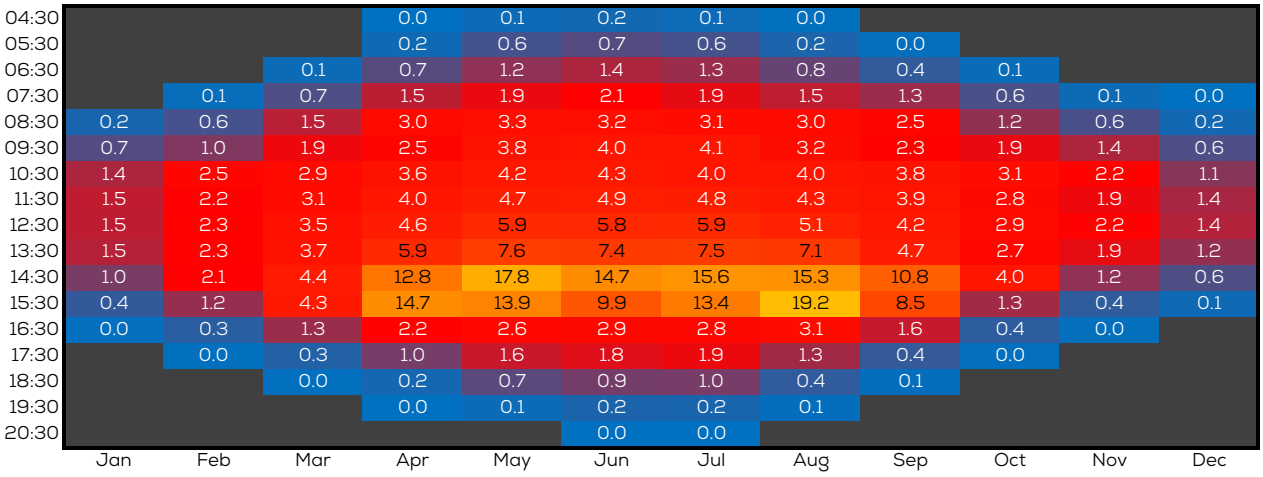
Total Predicted Sunlight Hours
CHAPEL WINDOW 2



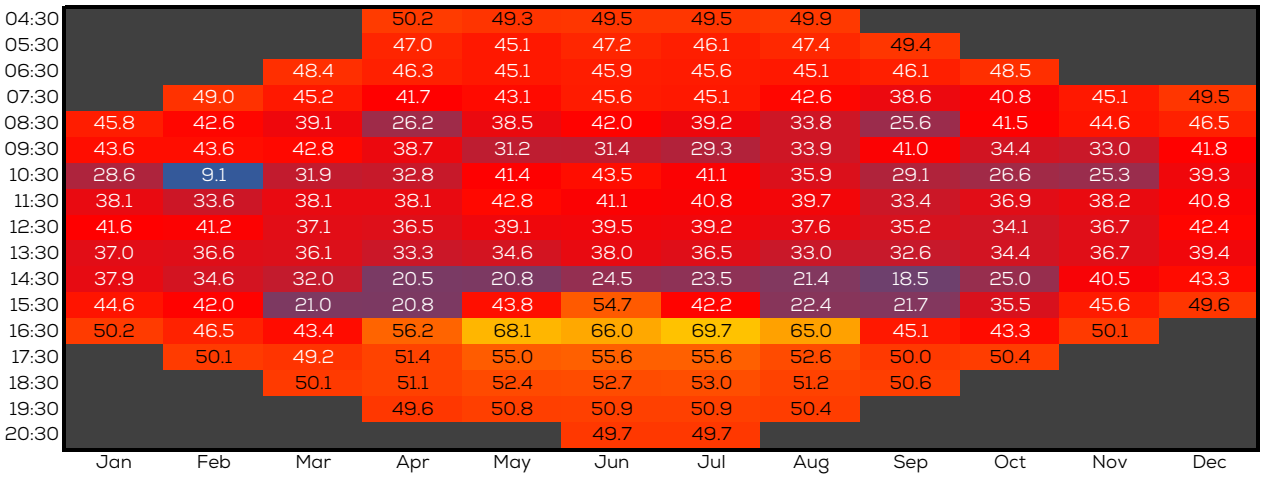
CHAPEL WINDOW 2 - GLOBAL ILLUMINANCE - EXISTING (KLUX)



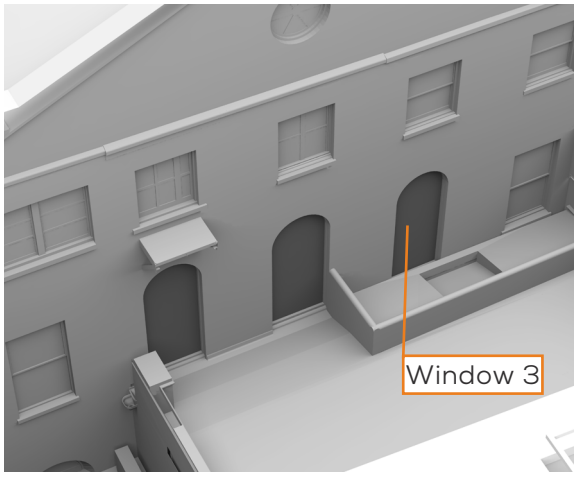
CHAPEL WINDOW 2 - GLOBAL ILLUMINANCE - PROPOSED (KLUX)



CHAPEL WINDOW 2 - GLOBAL ILLUMINANCE - PERCENTAGE LOSS



4.3 CHAPEL WINDOW 3



The overall levels of light reaching Window 3 are the highest of the three windows assessed.

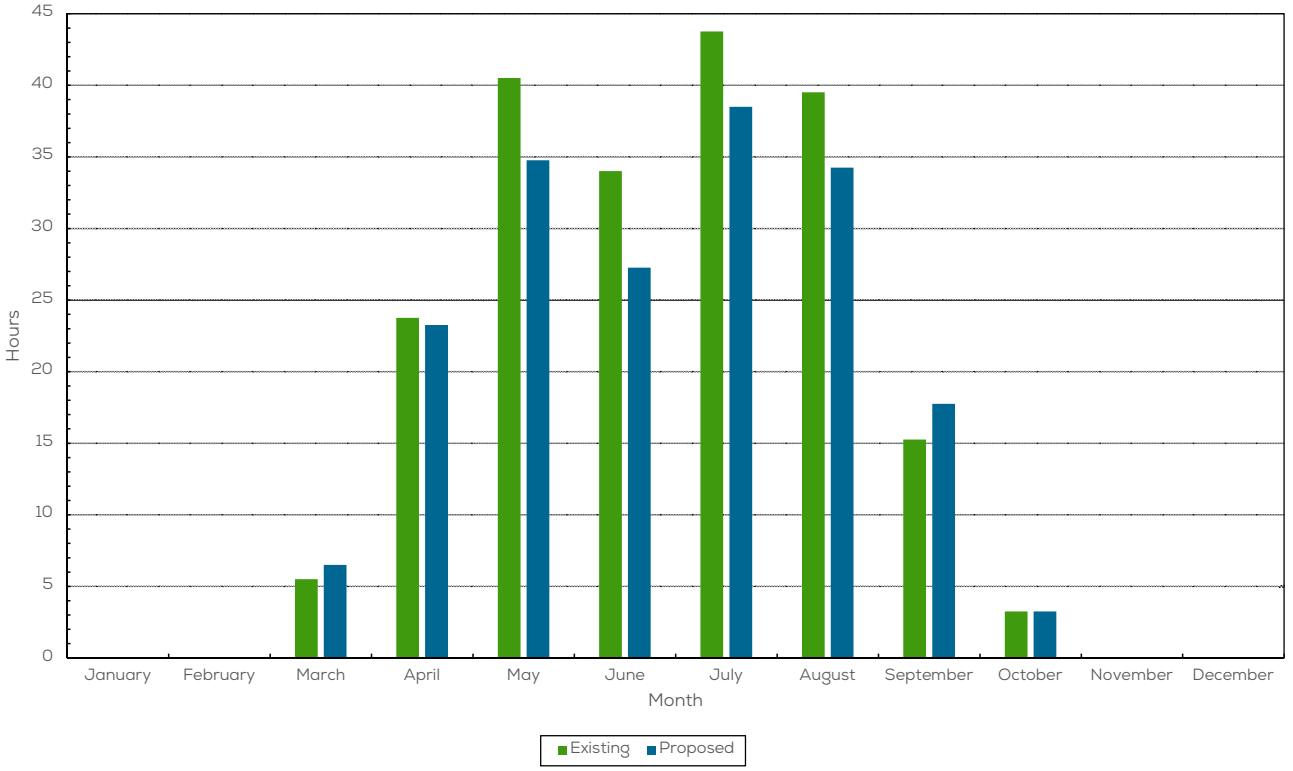
Compared with both Windows 1 and 2, the below chart shows still higher levels of sunlight owing to this window's position furthest south. The predicted losses are also the least with circa six hours lost in each month of May, June and July and no significant loss of sunlight predicted for the other nine months.

The principle of the charts opposite remain again, with peak levels of illuminance at 14:30 and 15:30 solar time from April until August/September, corresponding to sunlight reaching the windows.

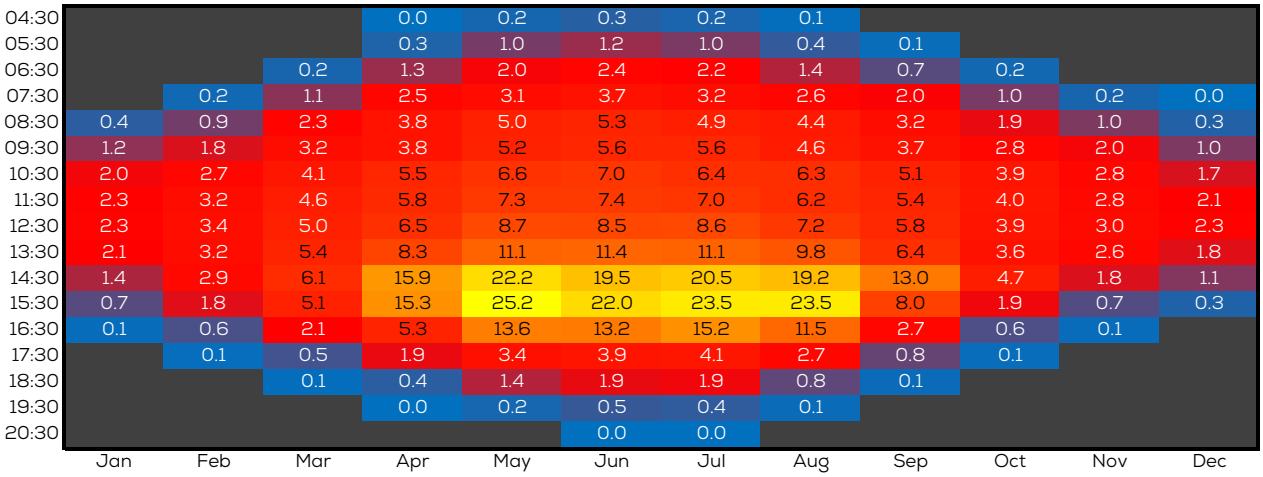
In the proposed condition, the peak remains at this time as sunlight still reaches the windows but it is reduced by shade from the proposed development.

In terms of percentage loss, again the greatest can be seen at 16:30 (representing 16:00-17;00) when sunlight is blocked whilst the least is at 14:30 (1400-1500) when sunlight still reaches the window leading to high levels of illuminance. The percentage loss at other times continues to fluctuate around 45% with another drop in the mid-morning when a certain level of sunlight is reflected from the proposed development

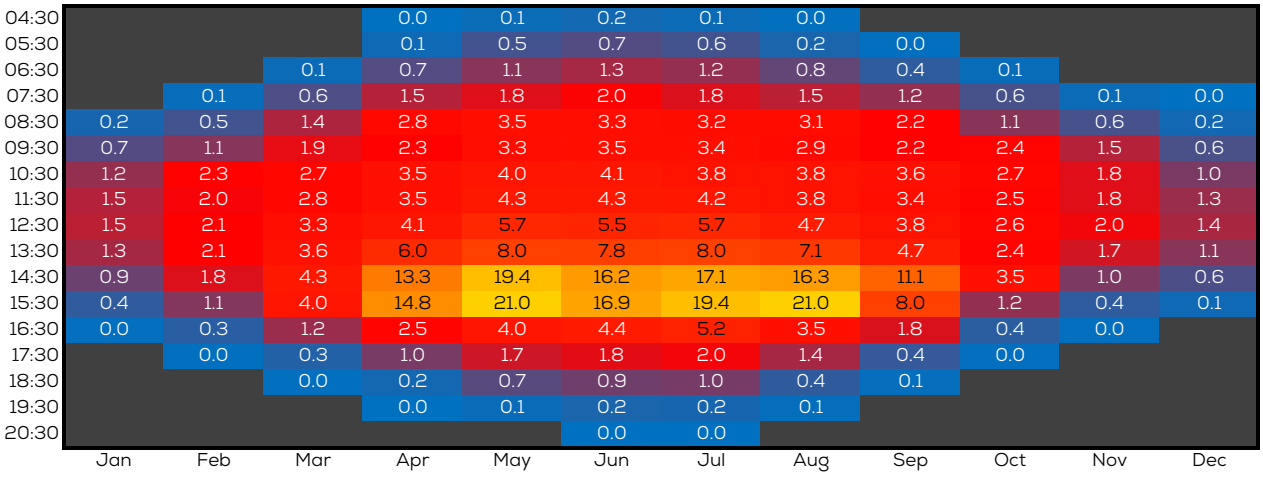
Total Predicted Sunlight Hours
CHAPEL WINDOW 3



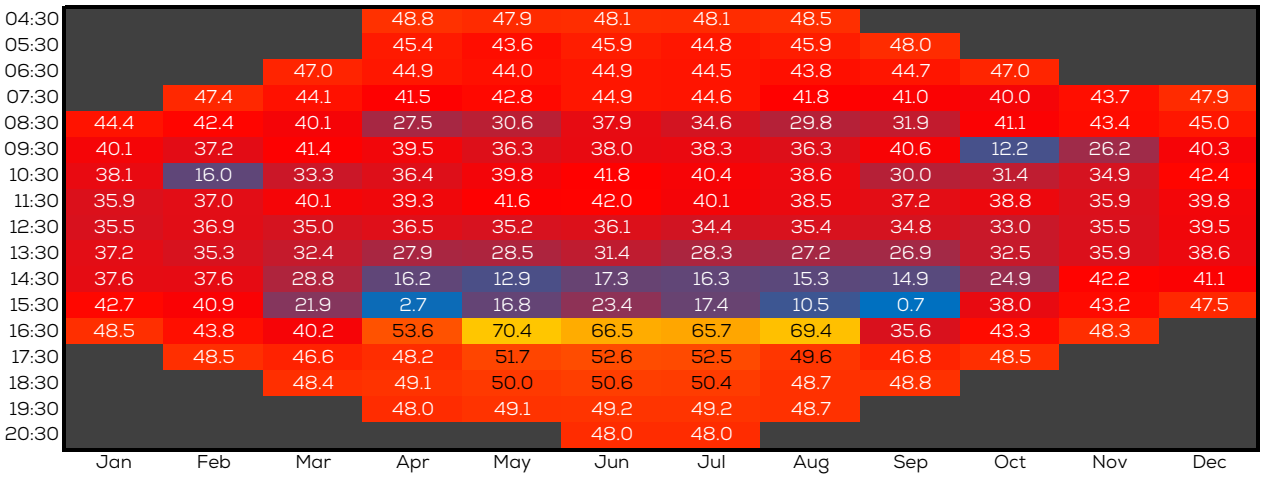
CHAPEL WINDOW 3 - GLOBAL ILLUMINANCE - EXISTING (KLUX)



CHAPEL WINDOW 3 - GLOBAL ILLUMINANCE - PROPOSED (KLUX)



CHAPEL WINDOW 3 - GLOBAL ILLUMINANCE - PERCENTAGE LOSS



5 EXPERIENCING ILLUMINANCE

As discussed within the Methodology section of this report, whilst knowing percentage reductions to illuminance levels is useful, this needs to be put in context, preferably through personal experience. It is therefore important to be able to show what a particular level of light reaching these windows may feel like.

With constantly fluctuating light levels, the windows are currently experiencing all potential levels of light at some point of the day or year and so this should be possible. However, with no measurement systems on the outside of these windows, it is not possible to directly read a quantum of light and so an alternative method to predict light levels was needed.

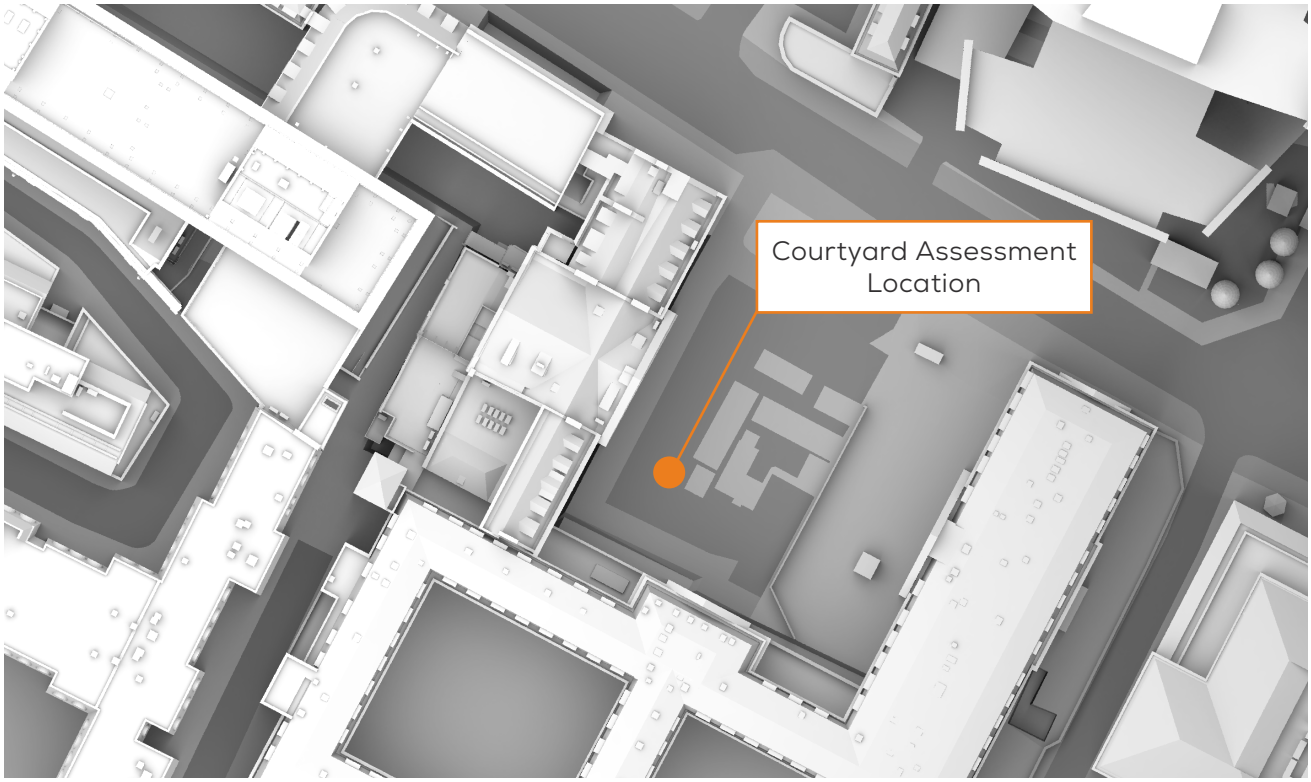
To do this, the levels of light reaching a point within the Guy's Hospital courtyard was also simulated at the same time as the three for the windows. By correlating these, therefore, it should be possible to arrive at a range of potential illuminance levels likely to be reaching the windows by referring to a measurement taken in the courtyard.

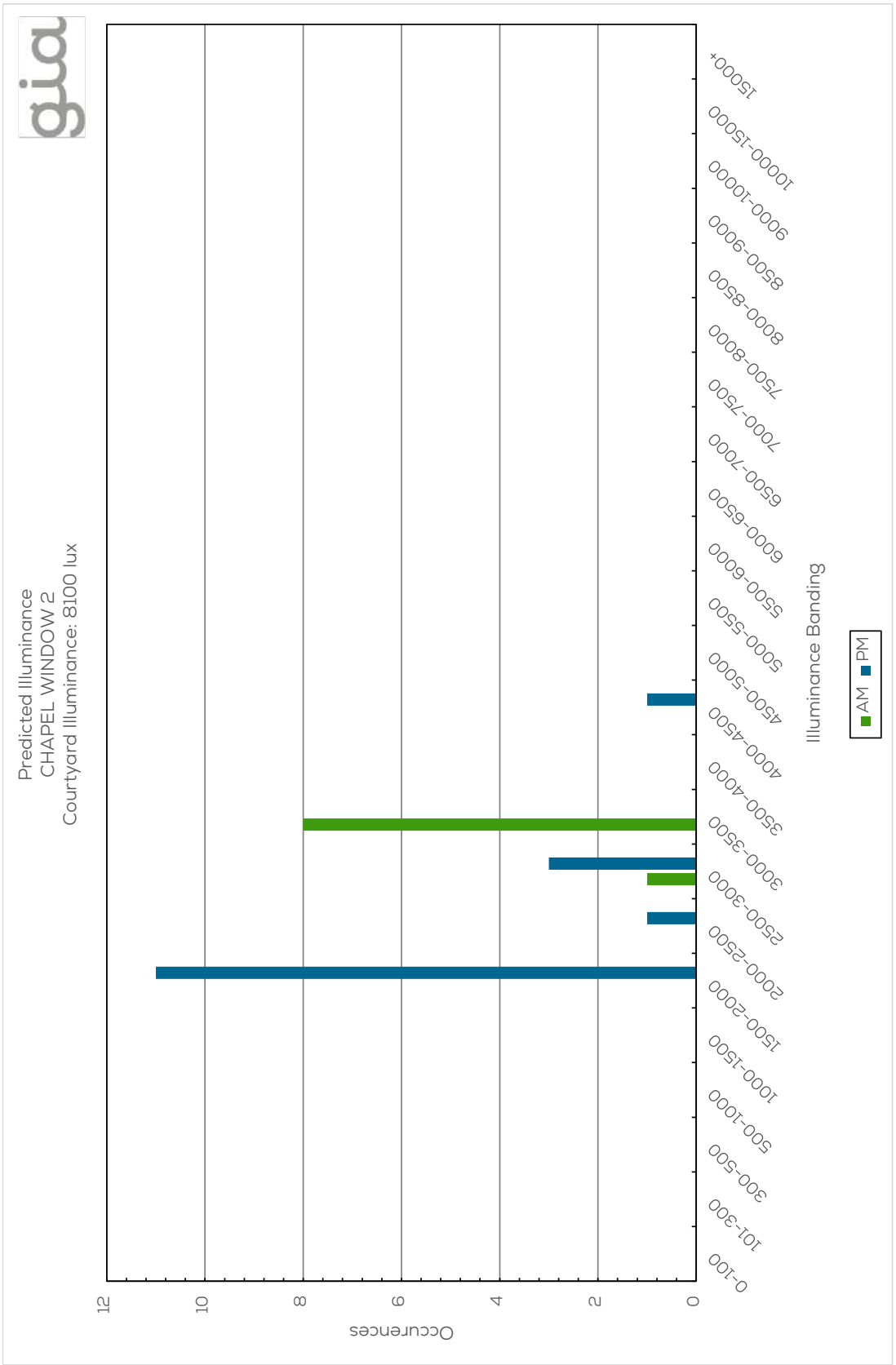
As an example, the chart opposite identifies the predicted illuminance levels reaching Window 2 when a courtyard measurement of 8,100 lux is recorded. Owing to the westerly orientation of the windows, this has been split between morning and afternoon to account for potential sunlight.

From the chart opposire, therefore, we can tell that when 8,100 lux is read in the courtyard, it is likely that the levels of light will be between 2,500 and 3,500 lux in the mornings and 1,500 and 4,500 in the afternoons, with the greatest probability for the latter being being between 1,500 and 2,000 lux.

With no readings at the upper end (i.e. 10,000+ lux), it is unlikely that sunlight will be reaching these windows at this time.

It should be noted here that 3,743 individual results were arrived at for the courtyard and so these have been rounded to two significant figures. This results in 249 charts (Appendix B) representing a wide range of illuminance levels (from 76 to 93,000 lux).




Predicted Illuminance
CHAPEL WINDOW 2
Courtyard Illuminance: 8100 lux
Occurrences
0
2
4
6
8
10
12
0-100
101-300
300-500
500-1000
1000-1500
1500-2000
2000-2500
2500-3000
3000-3500
3500-4000
4000-4500
4500-5000
5000-5500
5500-6000
6000-6500
6500-7000
7000-7500
7500-8000
8000-8500
8500-9000
9000-10000
10000-15000
15000+
Illuminance Banding
AM
PM

6 CONCLUSIONS

As is to be expected, the studies undertaken have shown significant variations in the levels of light reaching all three windows over the year with the lowest levels of light seen during December and the greatest between May and July. The extreme highs are currently seen between approximately 14:00 and 16:00 (GMT) when direct sunlight reaches the windows.

As is also to be expected, the development serves to reduce the levels of light reaching these windows, but great variation still remains with low levels of light in the winter and high in summer.

Of the three windows tested, Window 1 sees the lowest levels of light currently whilst Window 3 sees the highest. This also correlates to the levels predicted with the development in place. Owing to the windows' location in relation to the development and the balcony above Window 1, the greatest percentage losses are seen to Window 1 whilst the lowest are seen to Window 3.

There is no recommendation for illuminance levels reaching stained glass windows, and indeed none for CBDM illuminance levels at windows either. Therefore, this report seeks to aid the understanding of impact rather than to conclude on whether that impact is acceptable or not.

In assisting to understand the impact and how this may be experienced, the following can be stated:

- There is, on average, a loss of 43% to overall light levels with the greatest losses in the summer afternoons, when sunlight is blocked, and the least either just before this, when sunlight isn't blocked, or in the mornings, when a portion of sunlight is reflected;
- With the lowest monthly levels of light currently being seen during the winter, there are only three months of the year where the averaged predicted levels of light are below those winter levels currently experienced (November, December and January);
- Given the above, by simply observing the windows in their current condition, it is possible to currently experience the predicted monthly levels of light for nine months (75%) of the year should the development be constructed as proposed (i.e. the levels from February to October (inc.) are predicted to be higher than those currently experienced in December). For the remaining three months, it would be necessary to review different times of day, such as:

For Window 2 in December, the predicted levels of light between 10:00 and 14:00 will be similar to those currently experienced from 09:00 to 10:00 and 14:00 to 15:00.

- In terms of sunlight, the development does block some sunlight but does not remove all sunlight in any given month.
- When considering the historical climate data, the greatest sunlight losses for windows 2 and 3 are predicted in June (8 hours over the month for window 2 and 6 hours 45 minutes for window 3). Window 1 is somewhat an anomaly owing to the balcony directly above and here up to 12 hours 45 minutes of predicted sunlight is lost in July.

Overall, the studies undertaken can be used to understand the potential losses in light throughout the year as well as beginning to relate these back to current experiences.

Whilst illuminance readings in the courtyard can be used to predict the levels of light at the windows, this should only be used as an indicator of likely light levels as predicting specific climate conditions is notoriously difficult.

Should further information on how these windows may feel after the implementation of the propsoed deveopment be desired, a potential future piece of work could be to repeat the assessments within this report for alternative stained glass windows in central London. A study would be undertaken to identify windows with similar levels of light and then, through assessment, parallels could be drawn where appropriate.

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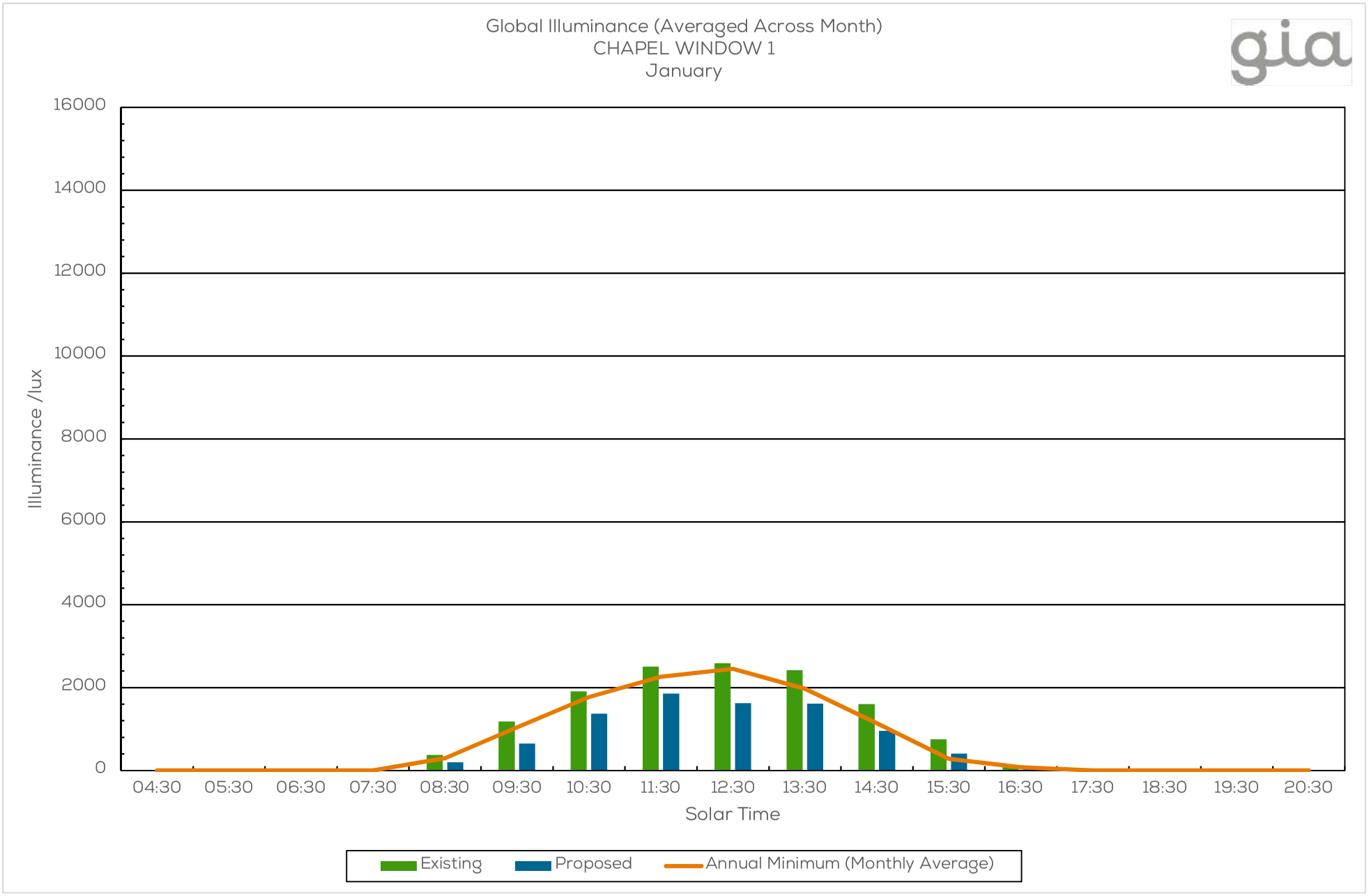
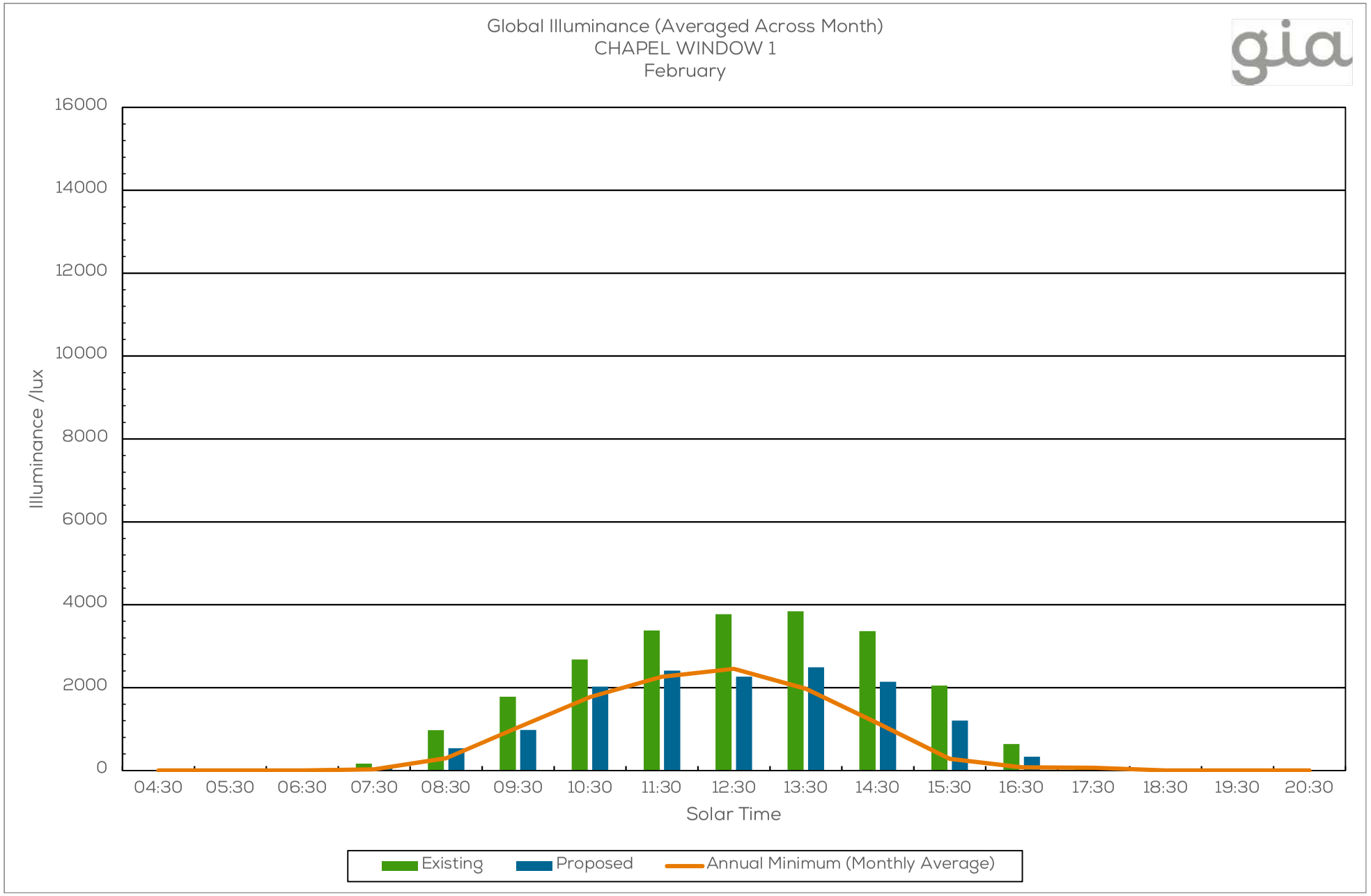
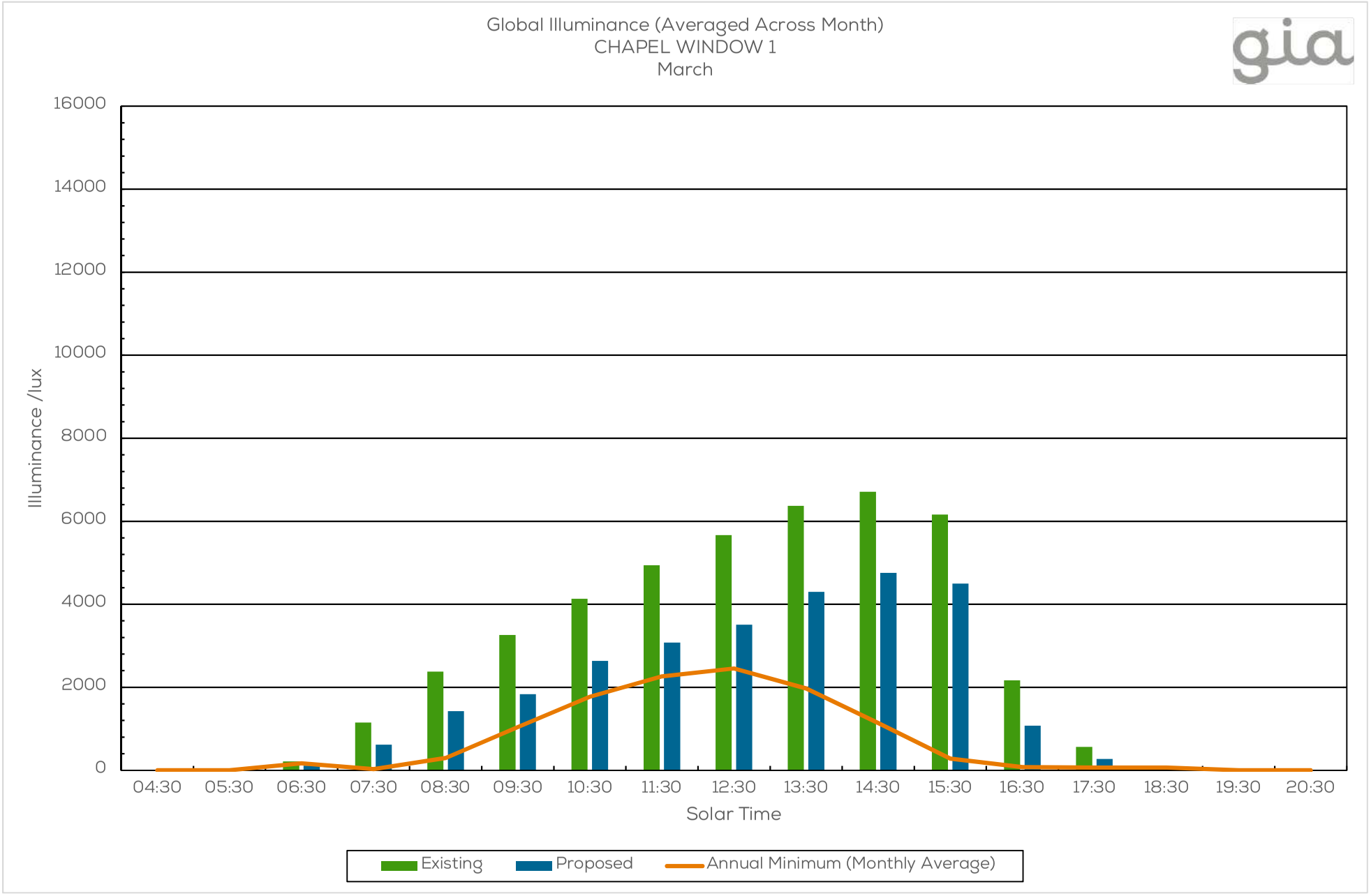
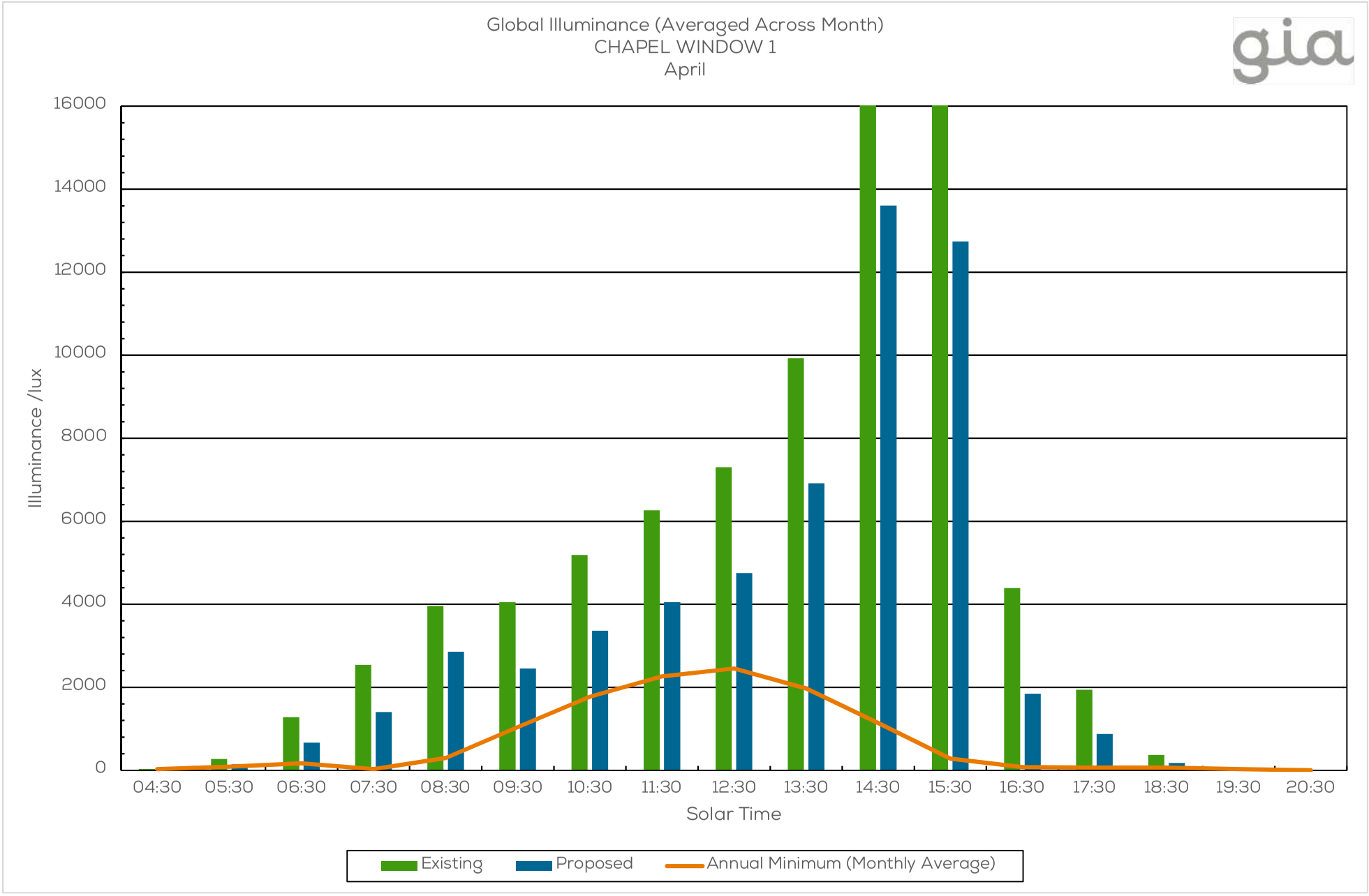
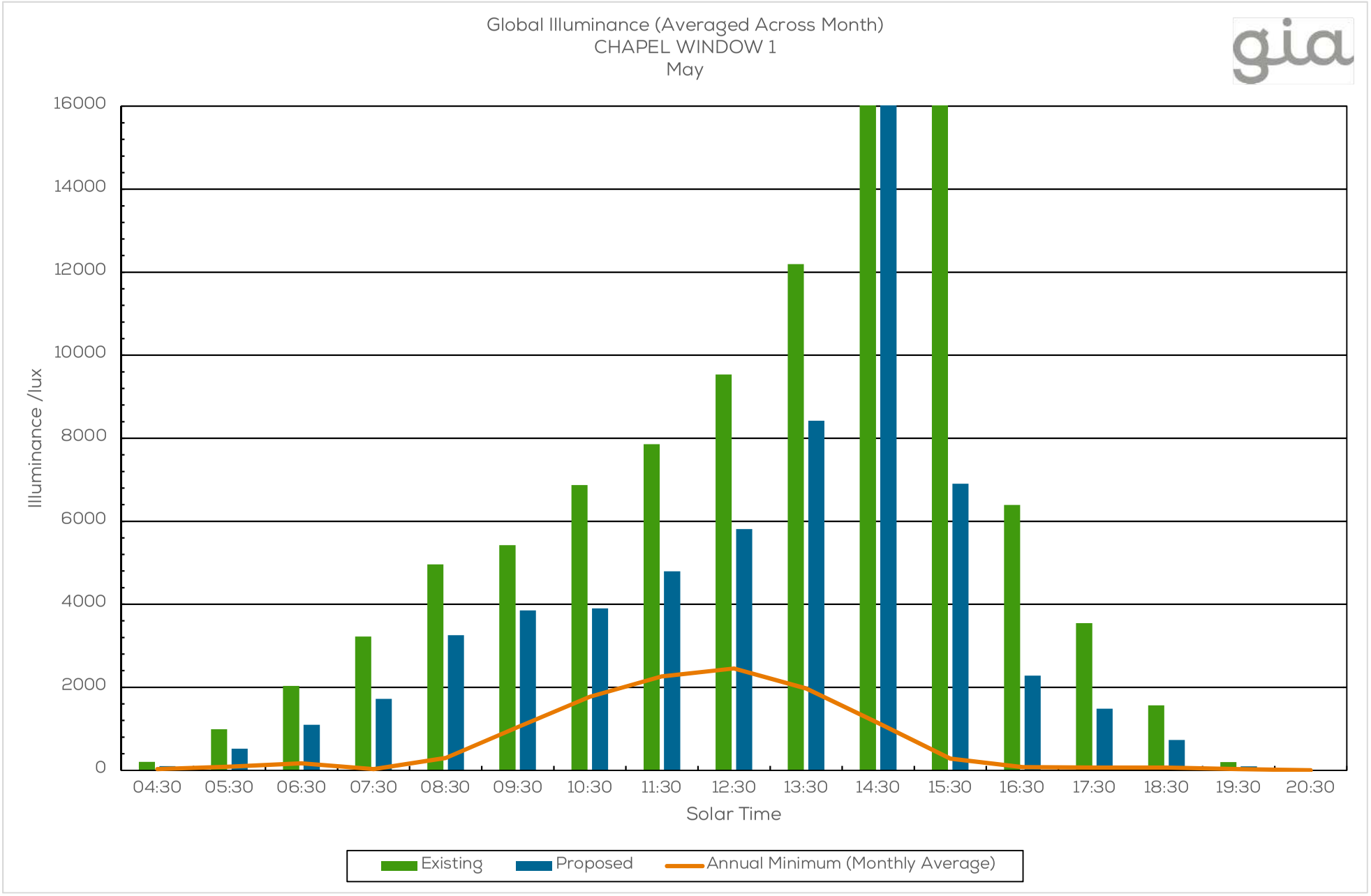
APPENDIX A
GLOBAL ILLUMINANCE CHARTS
WINDOW 1

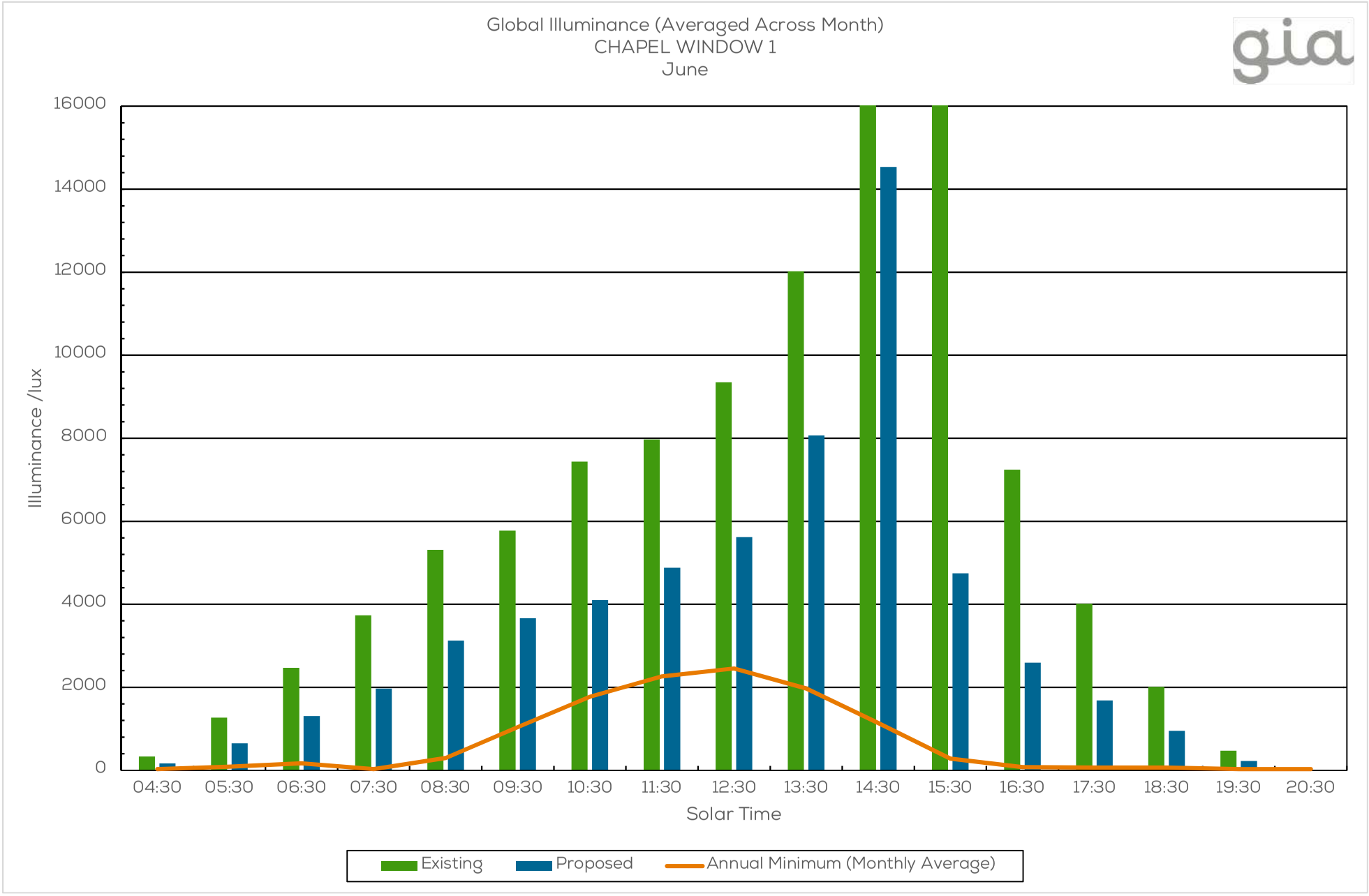

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
January
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

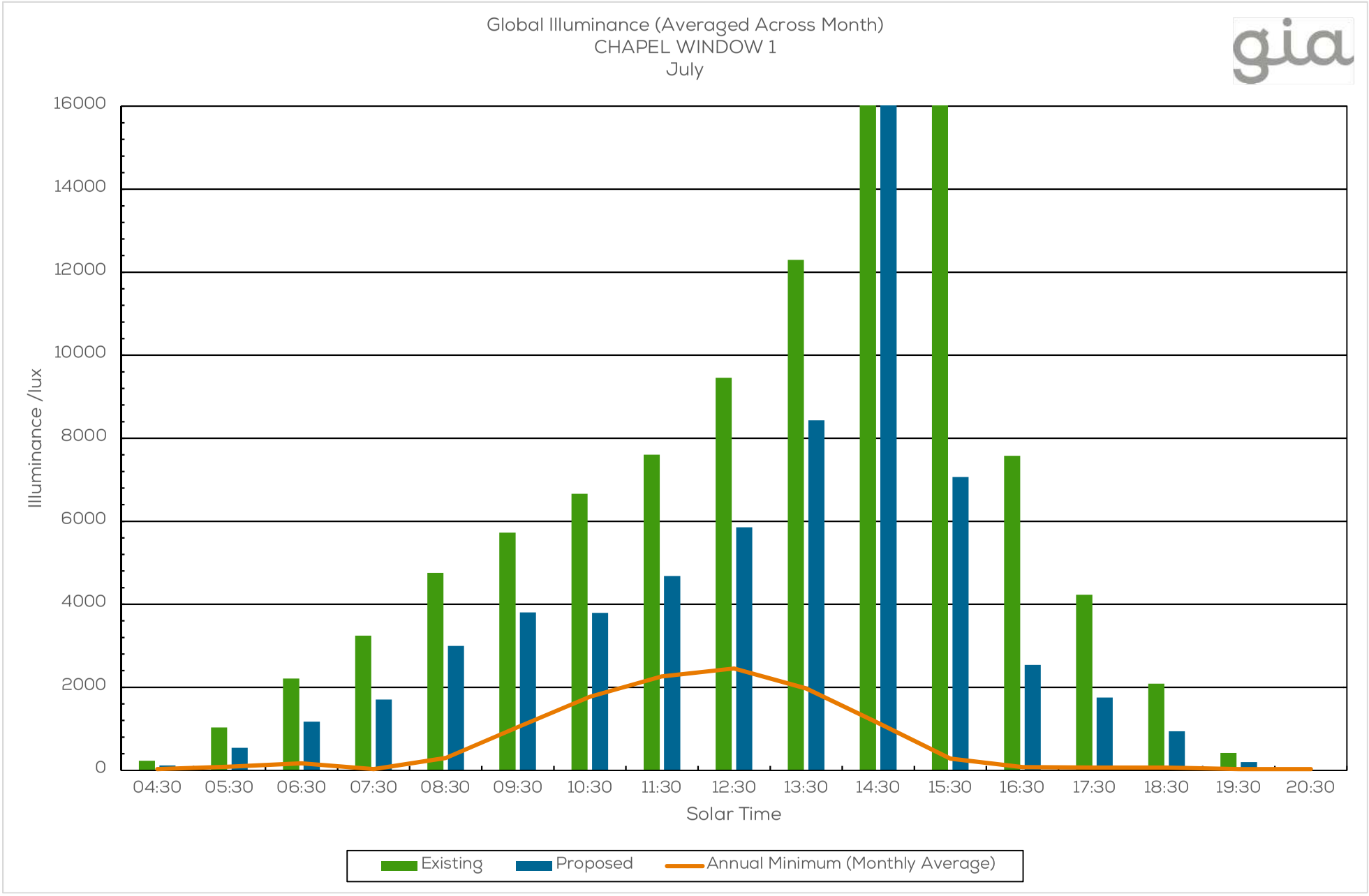

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
February
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

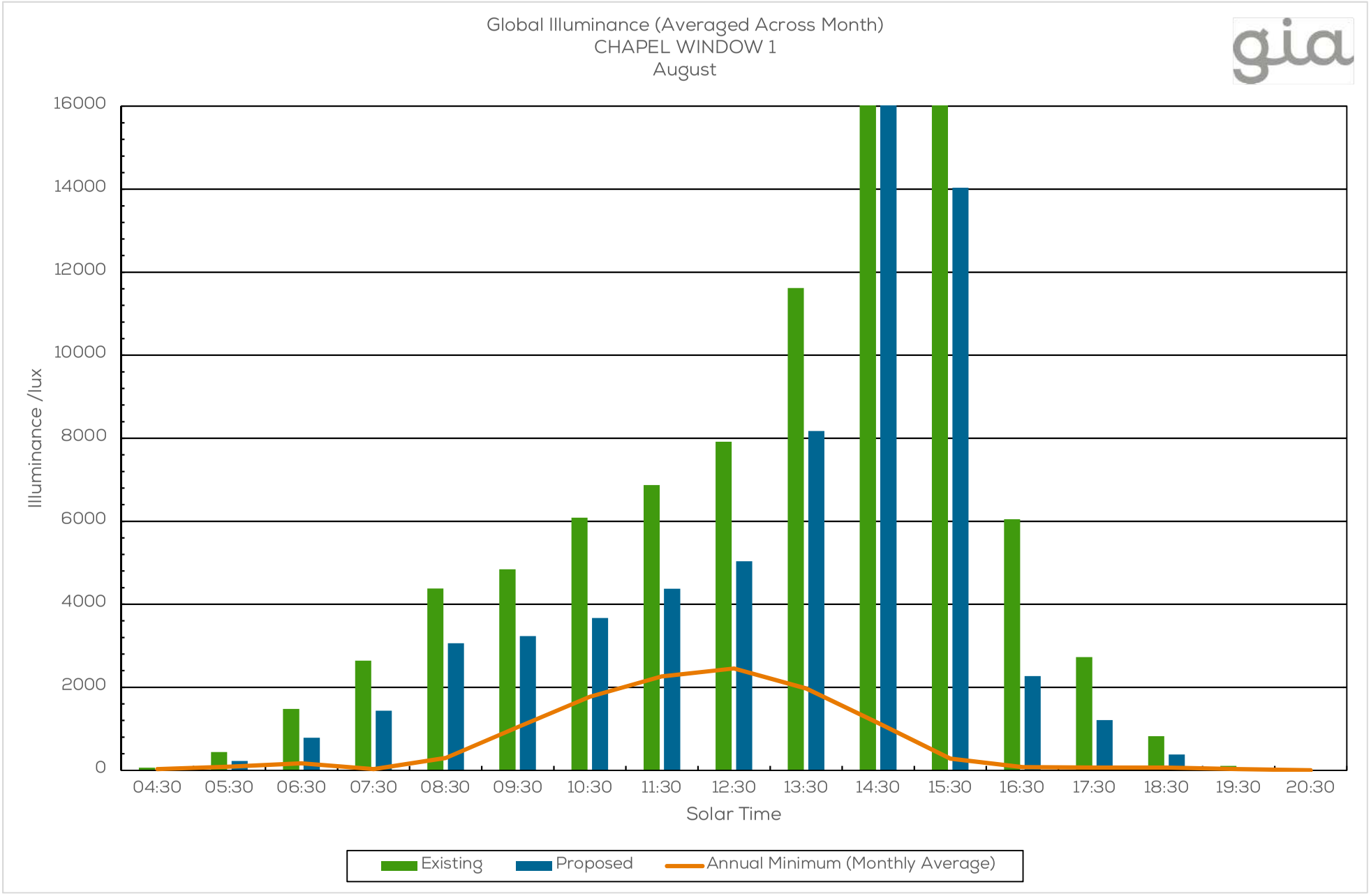

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
March
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

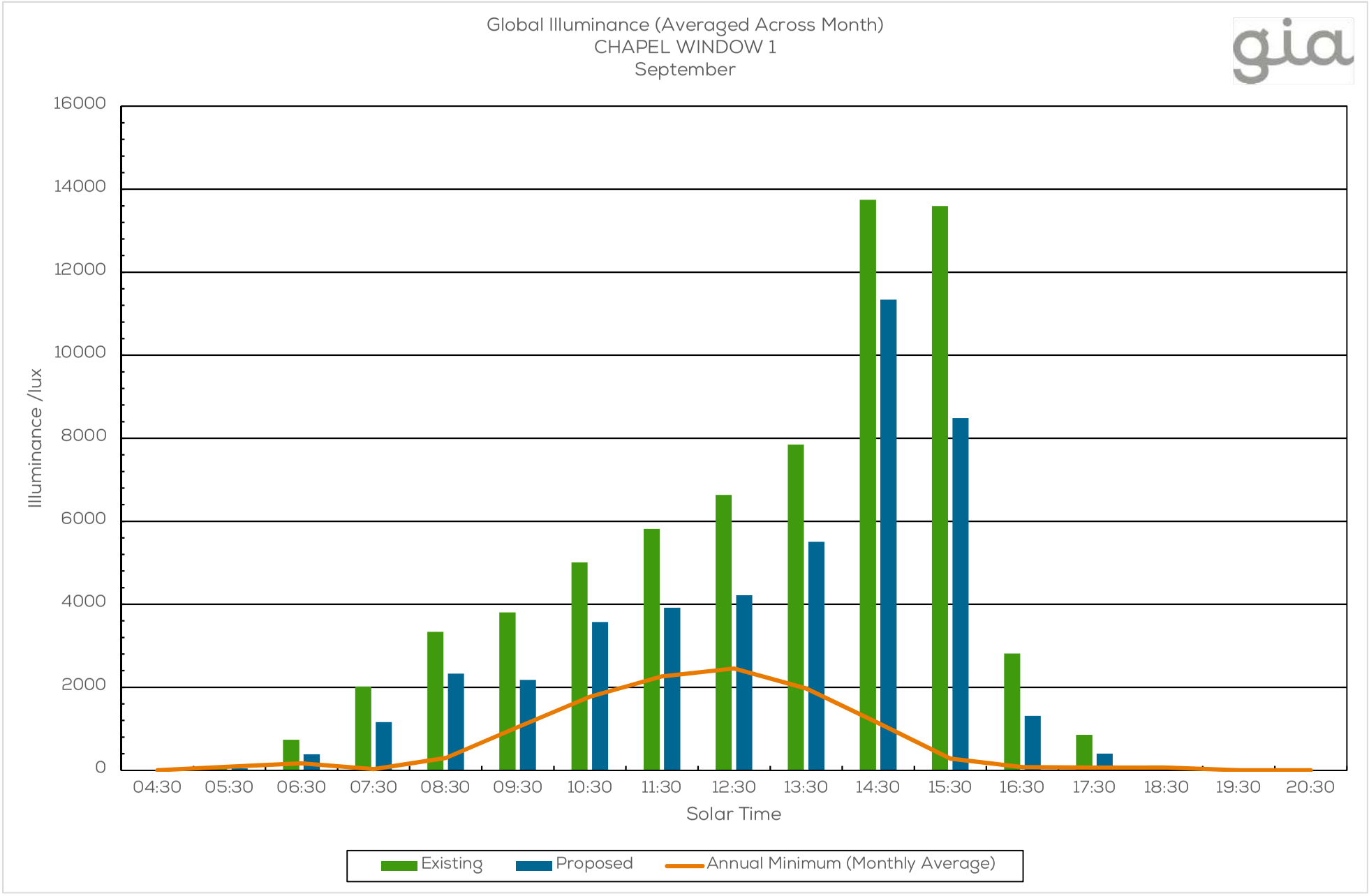

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
April
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

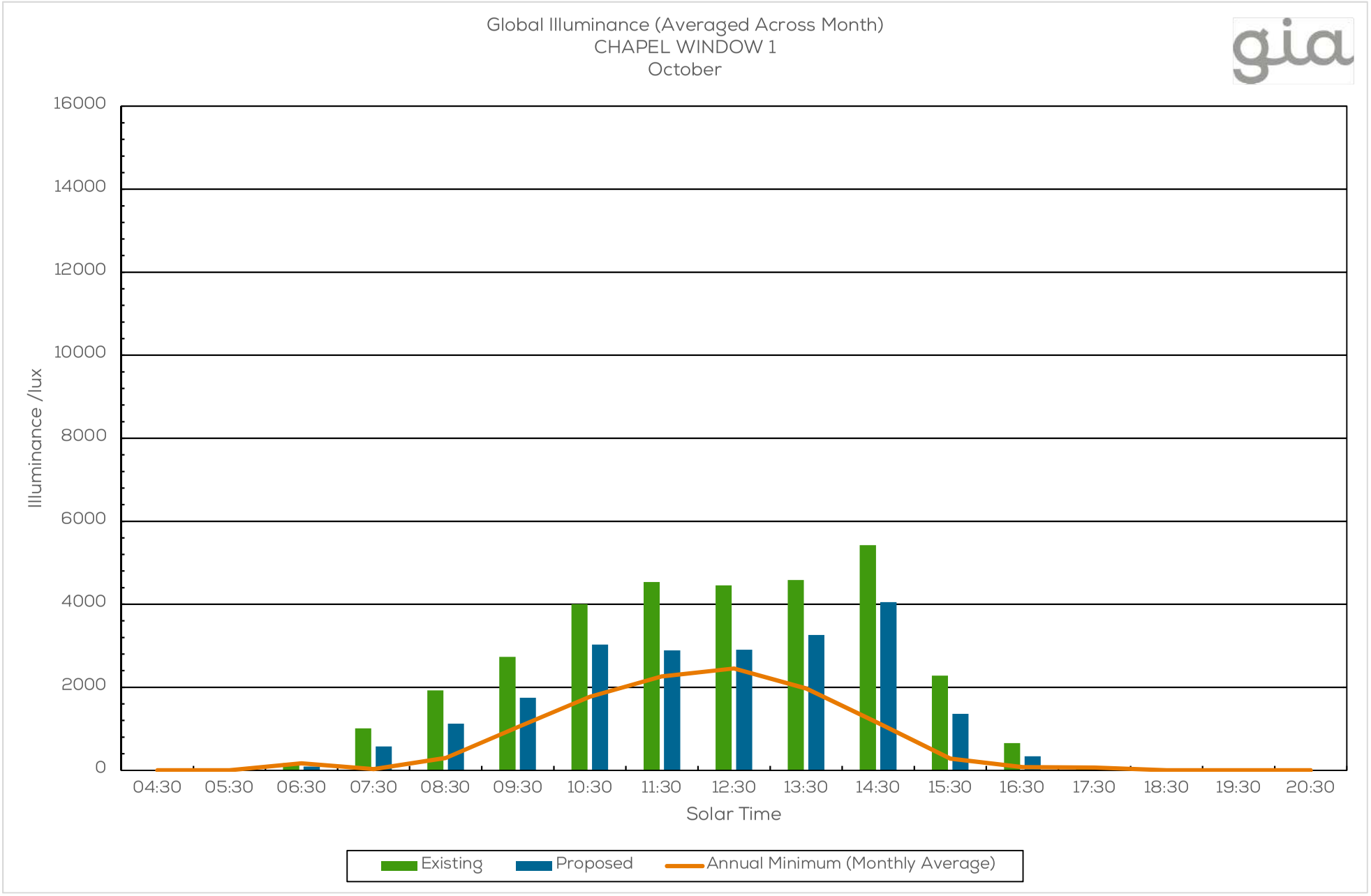

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
May
gia
Illuminance /lux
16000
14000
12000
10000
8000
6000
4000
2000
0
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

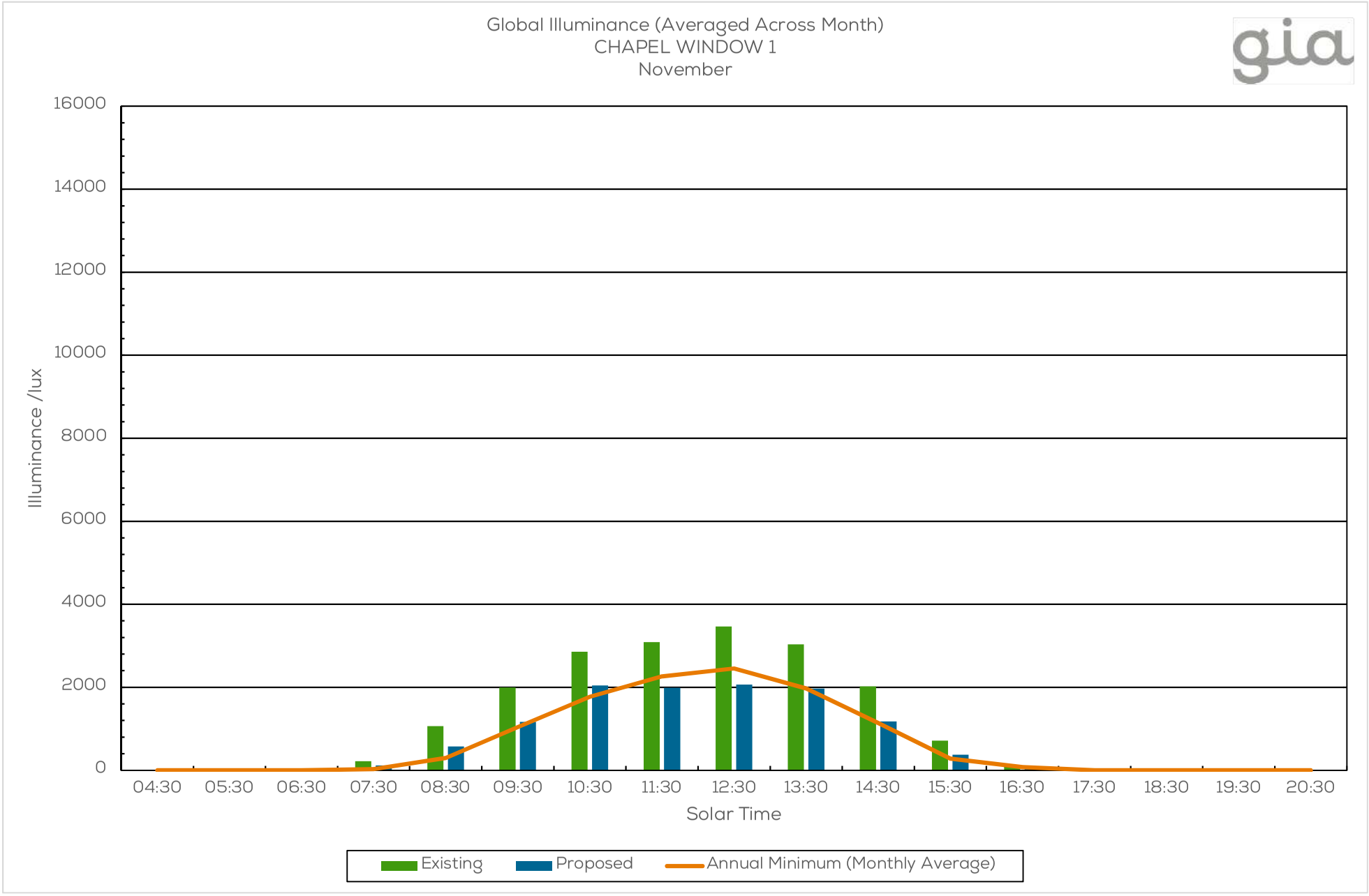

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
June
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

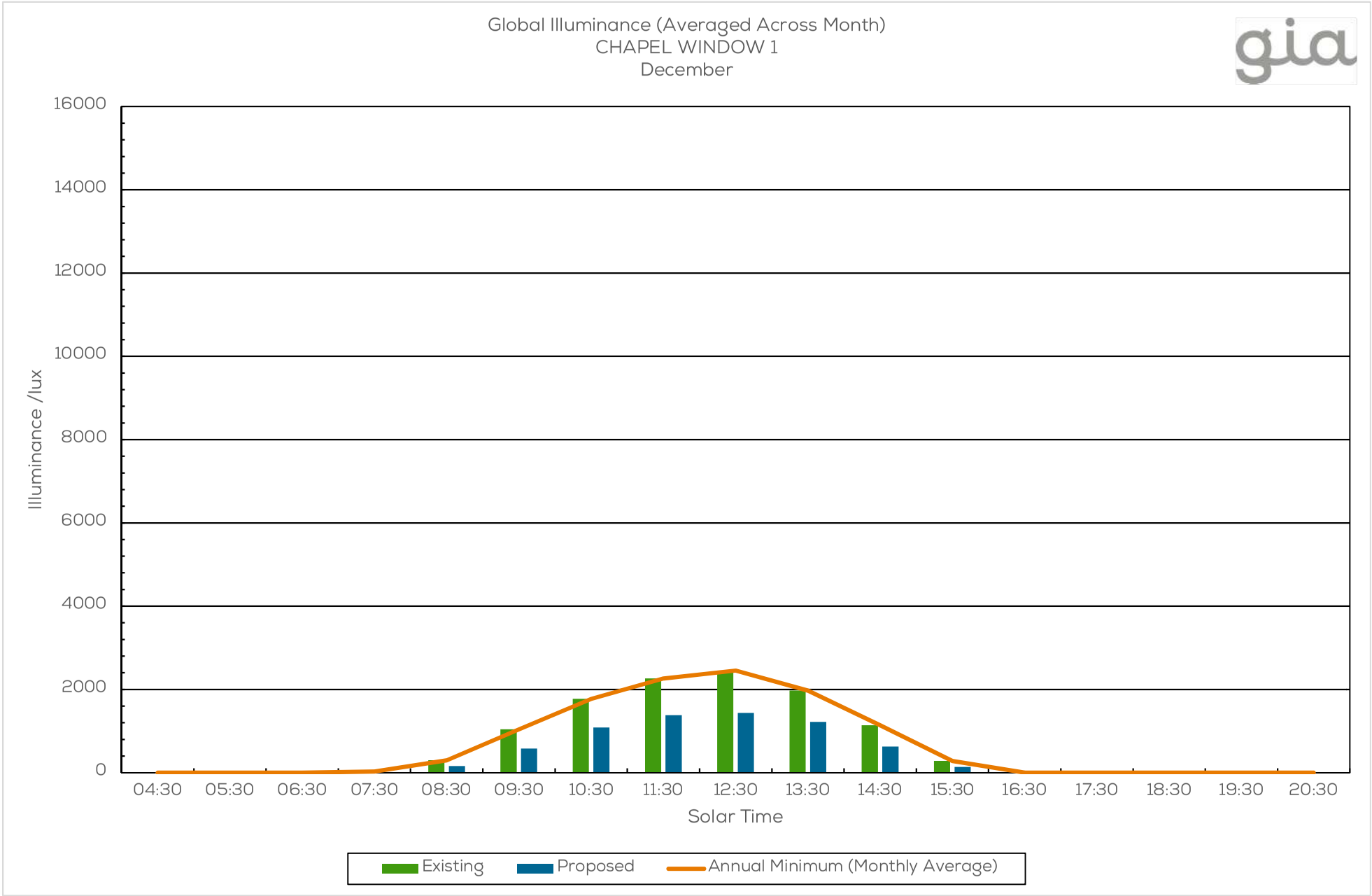

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
July
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
August
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
September
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

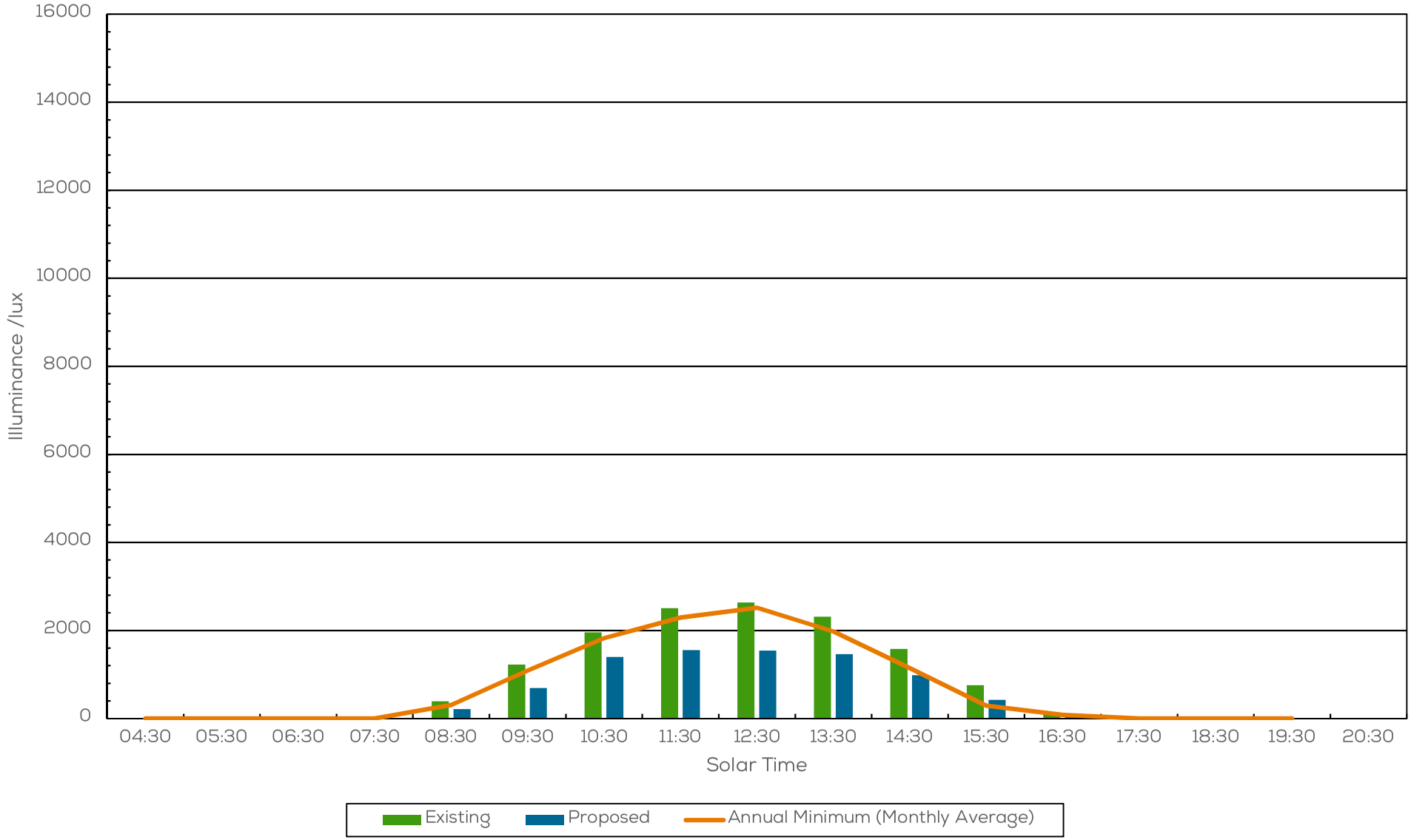

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
October
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

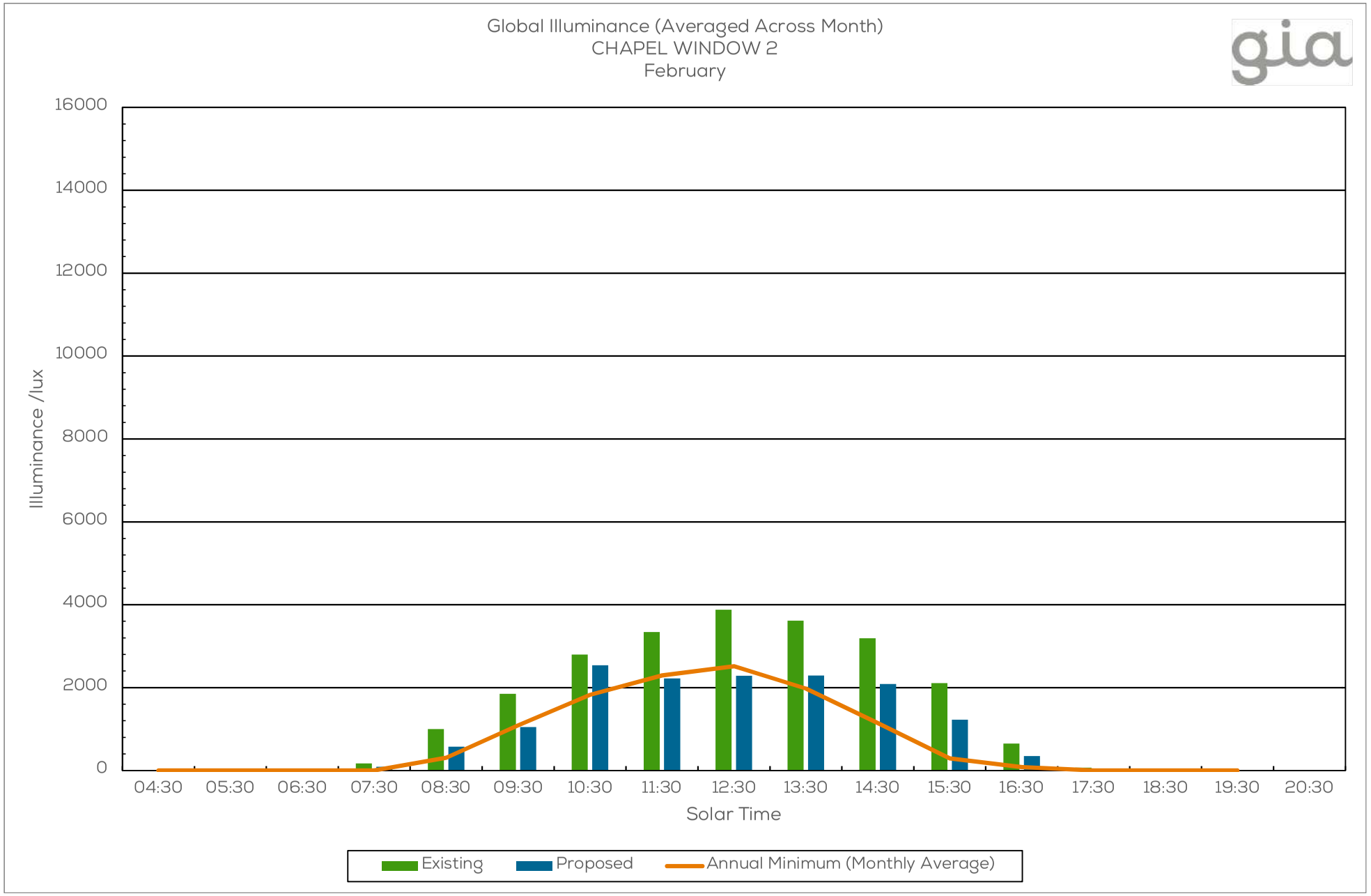

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
November
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

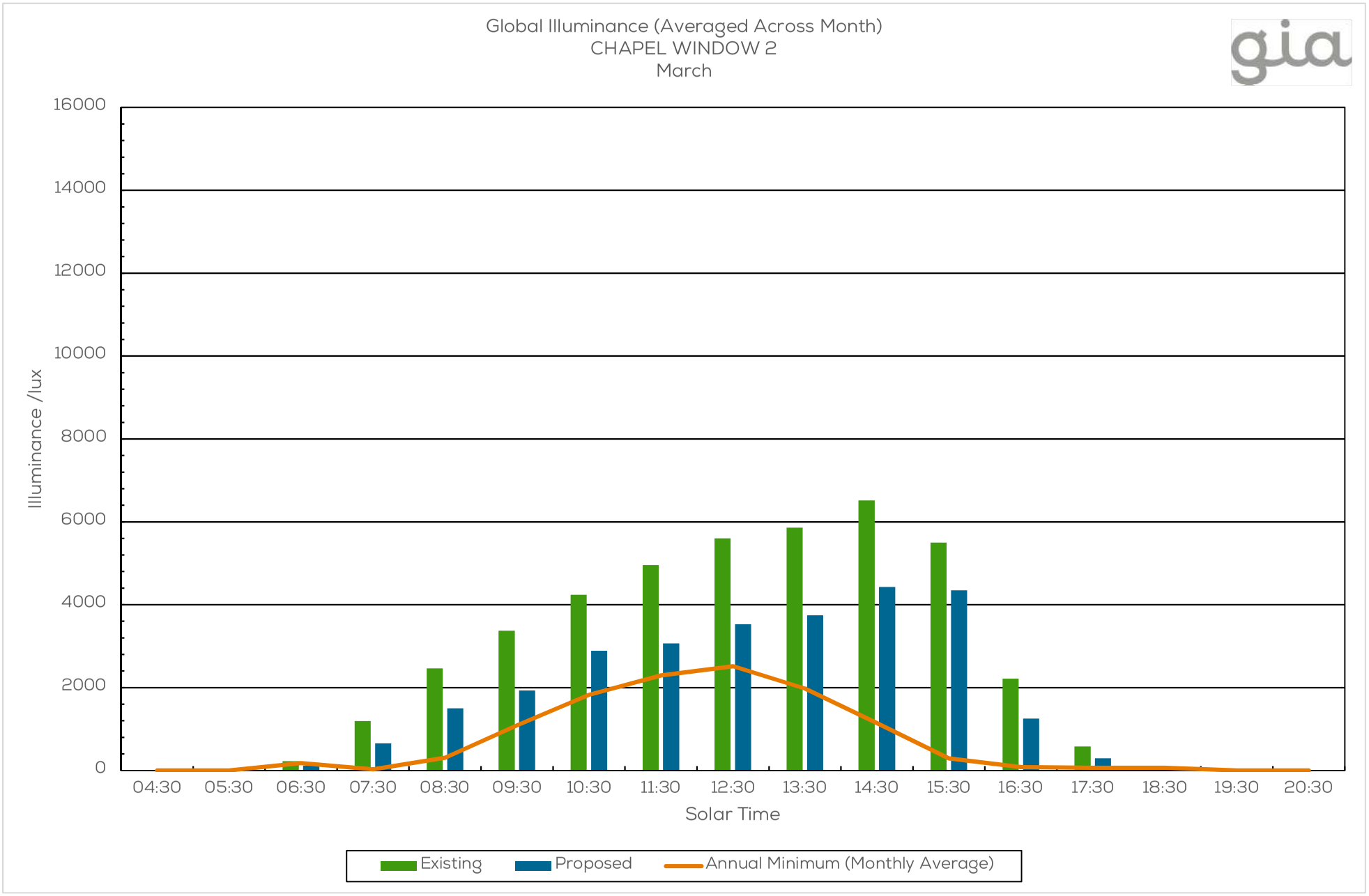

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 1
December
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

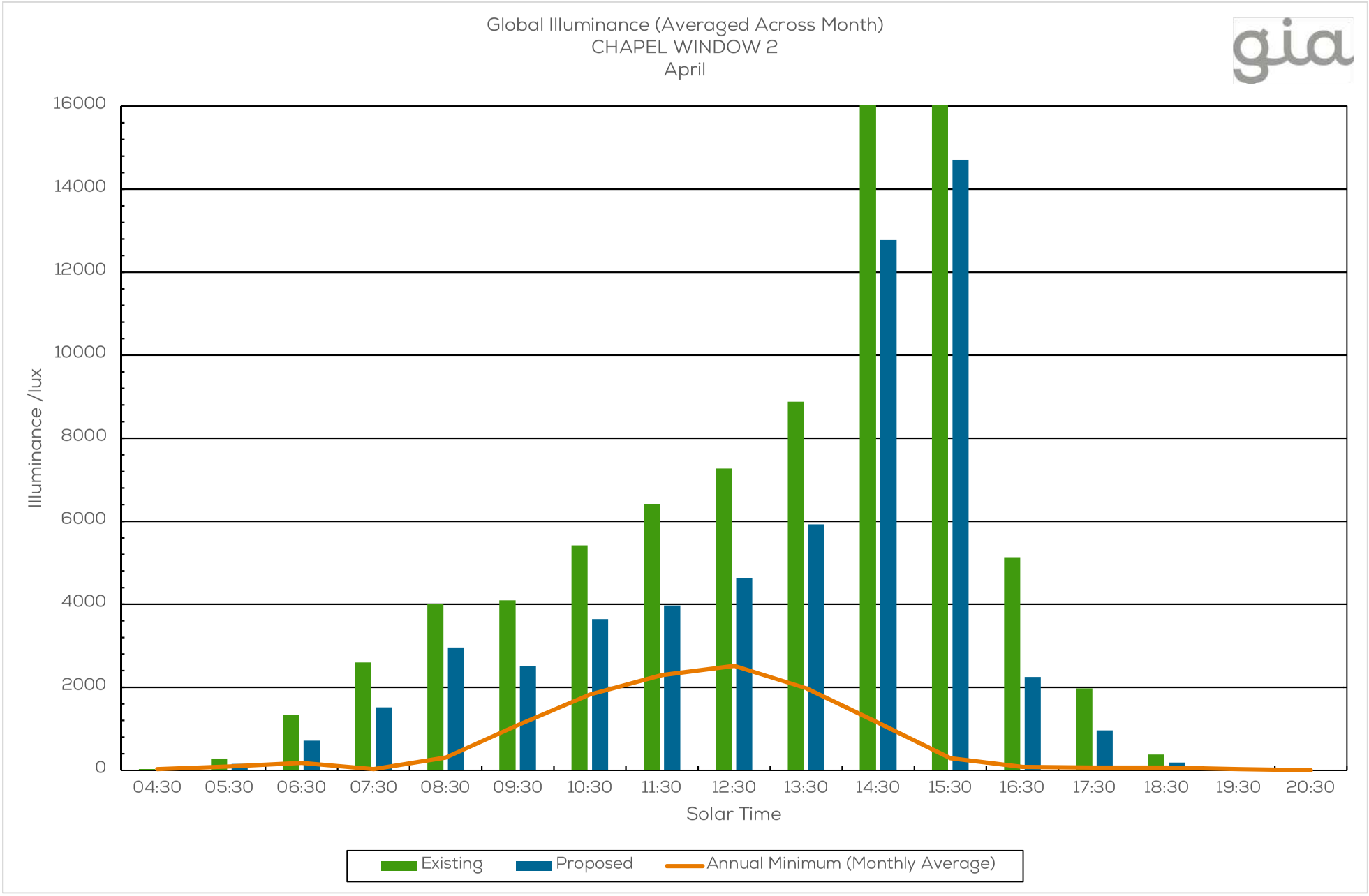
APPENDIX B
GLOBAL ILLUMINANCE CHARTS
WINDOW 2

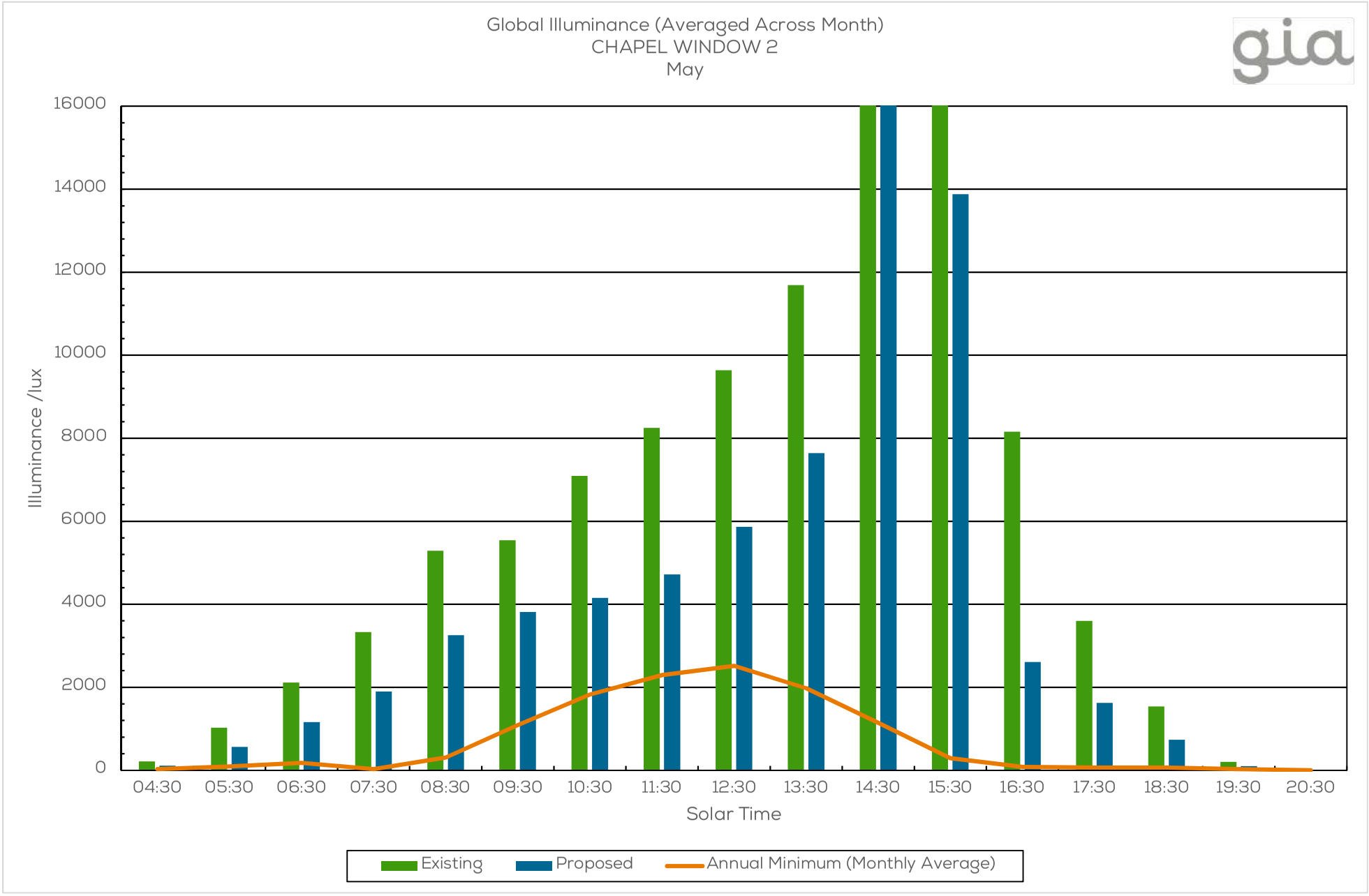
Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
January

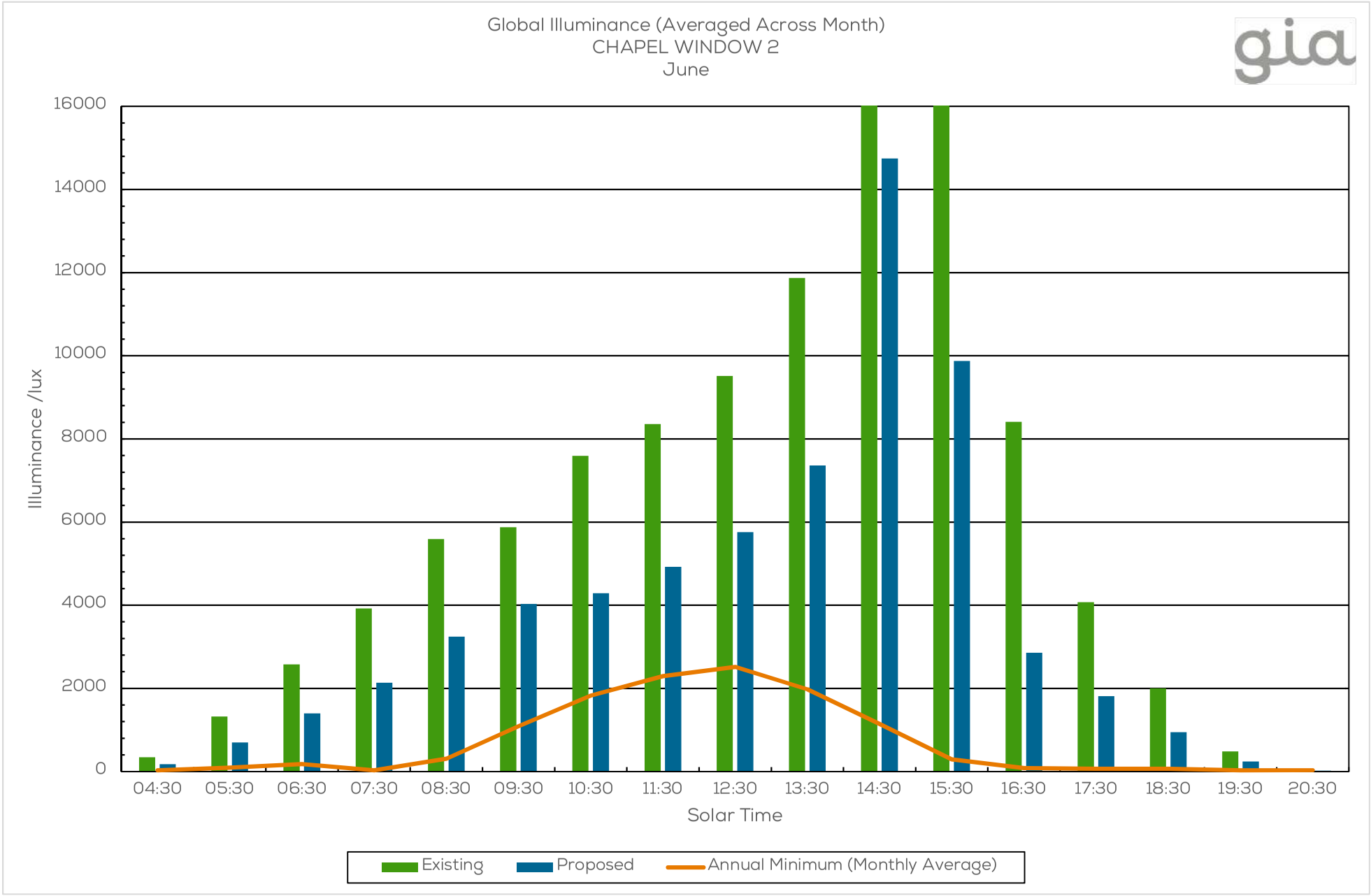


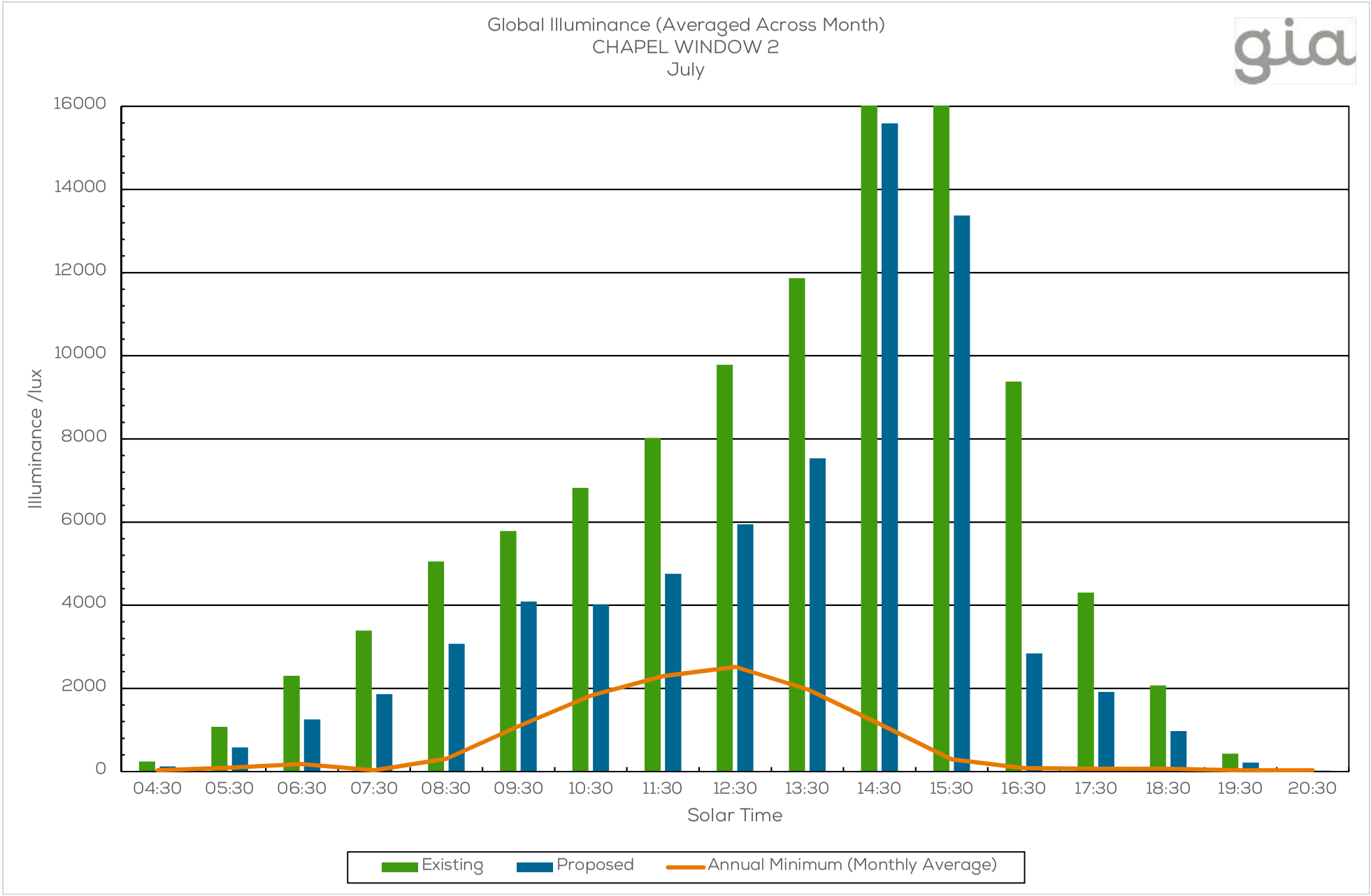

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
February
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

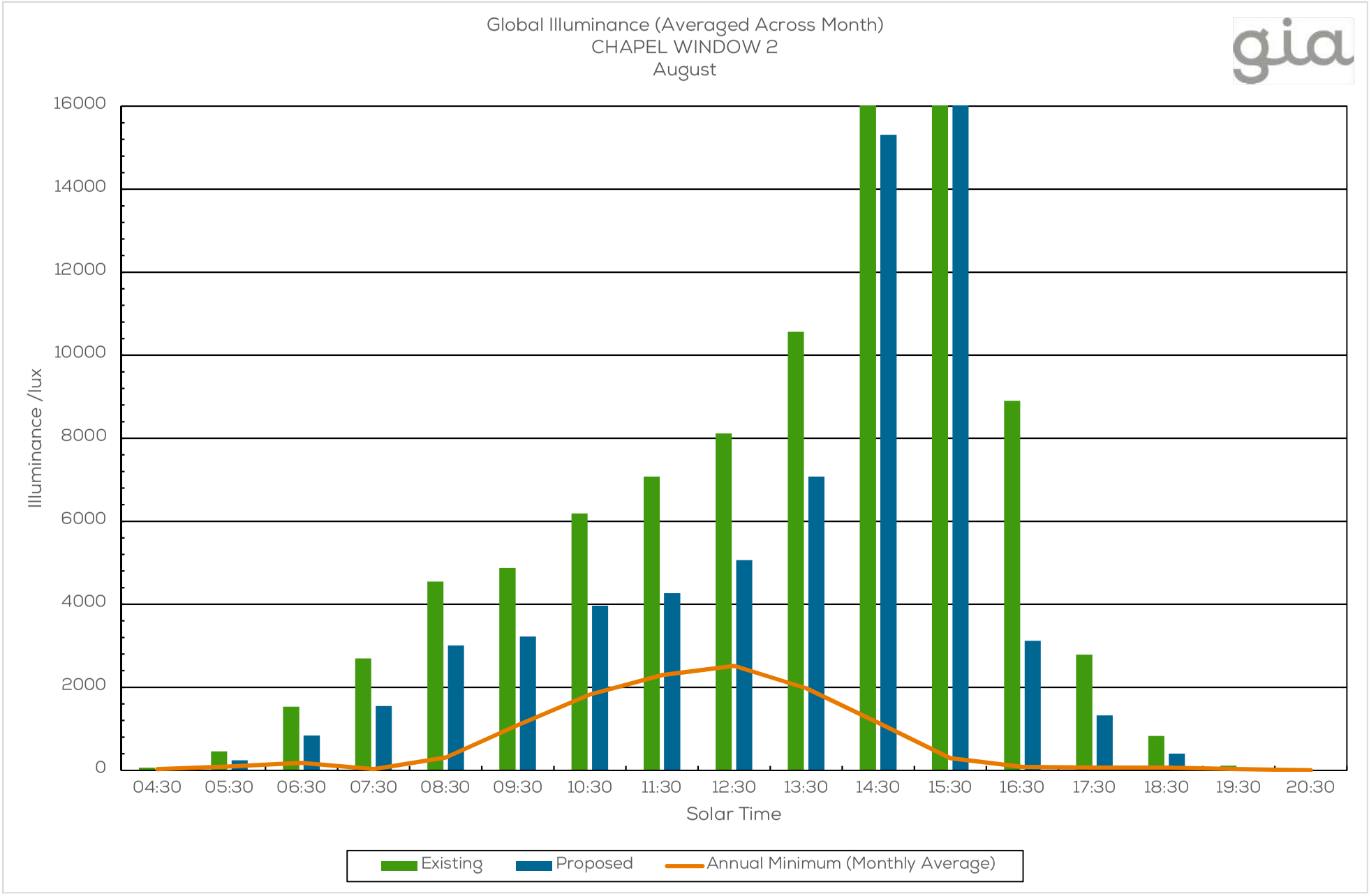

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
March
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

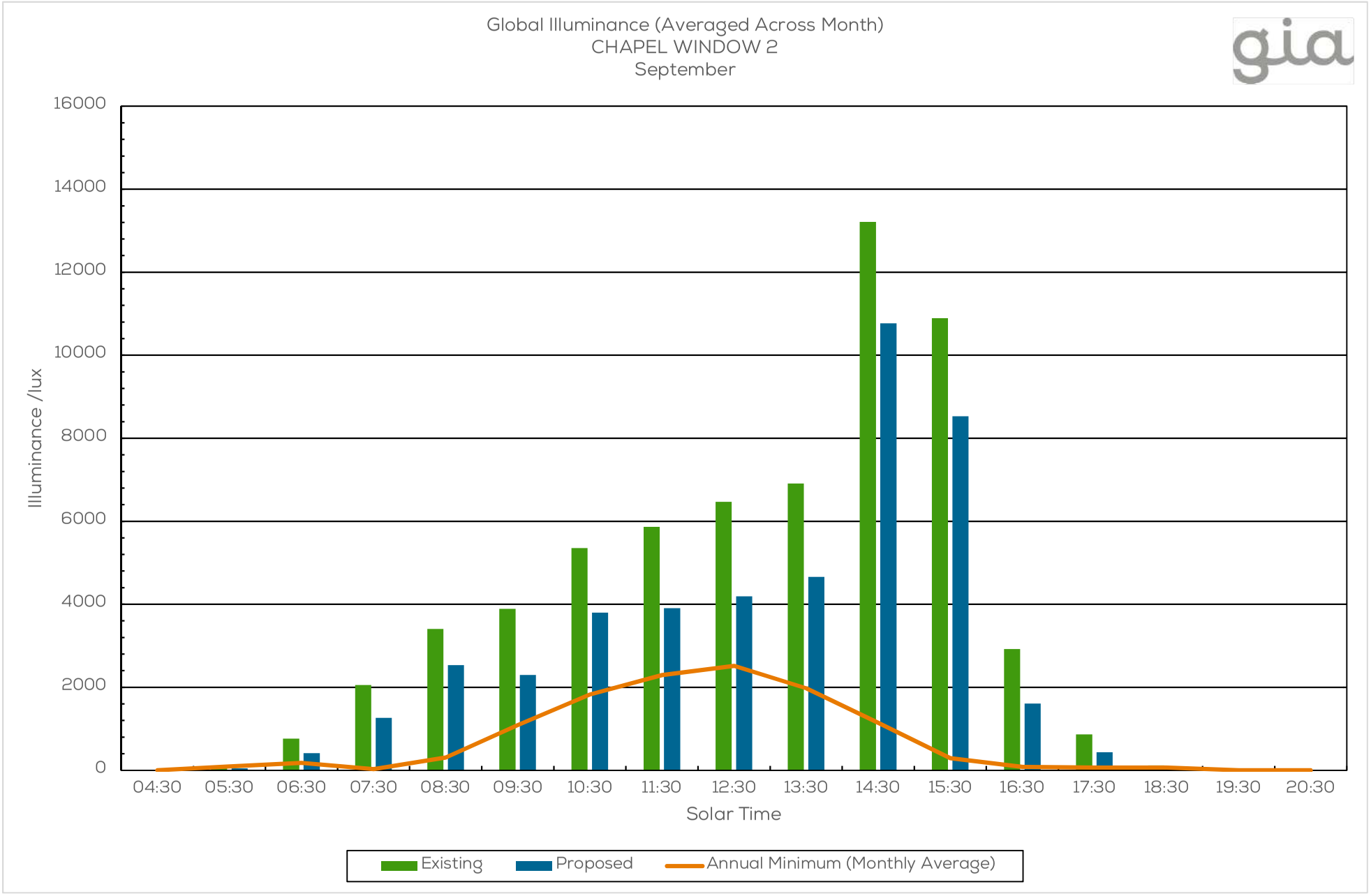

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
April
gia
Illuminance /lux
16000
14000
12000
10000
8000
6000
4000
2000
0
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

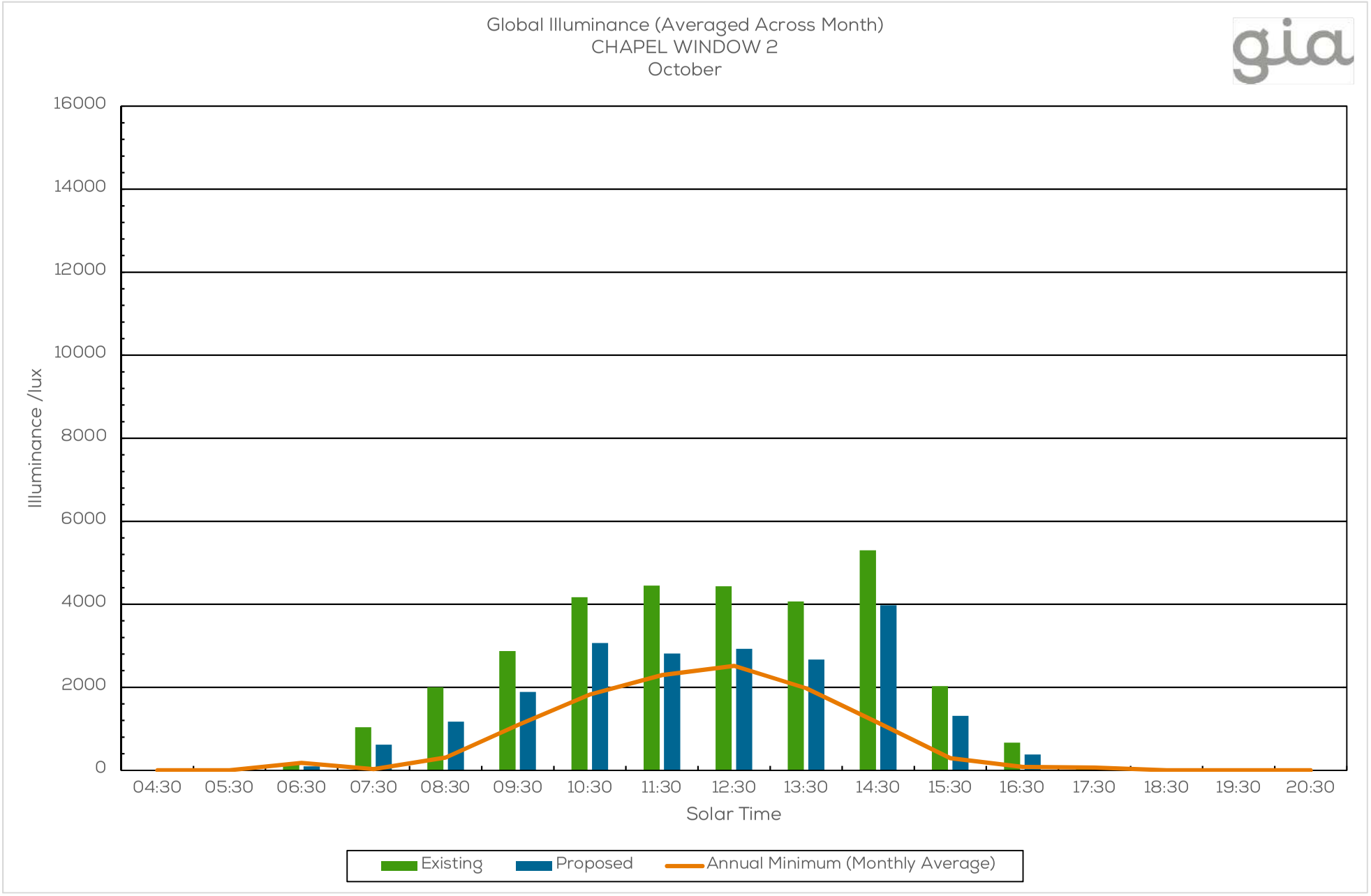

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
May
gia
Illuminance /lux
16000
14000
12000
10000
8000
6000
4000
2000
0
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

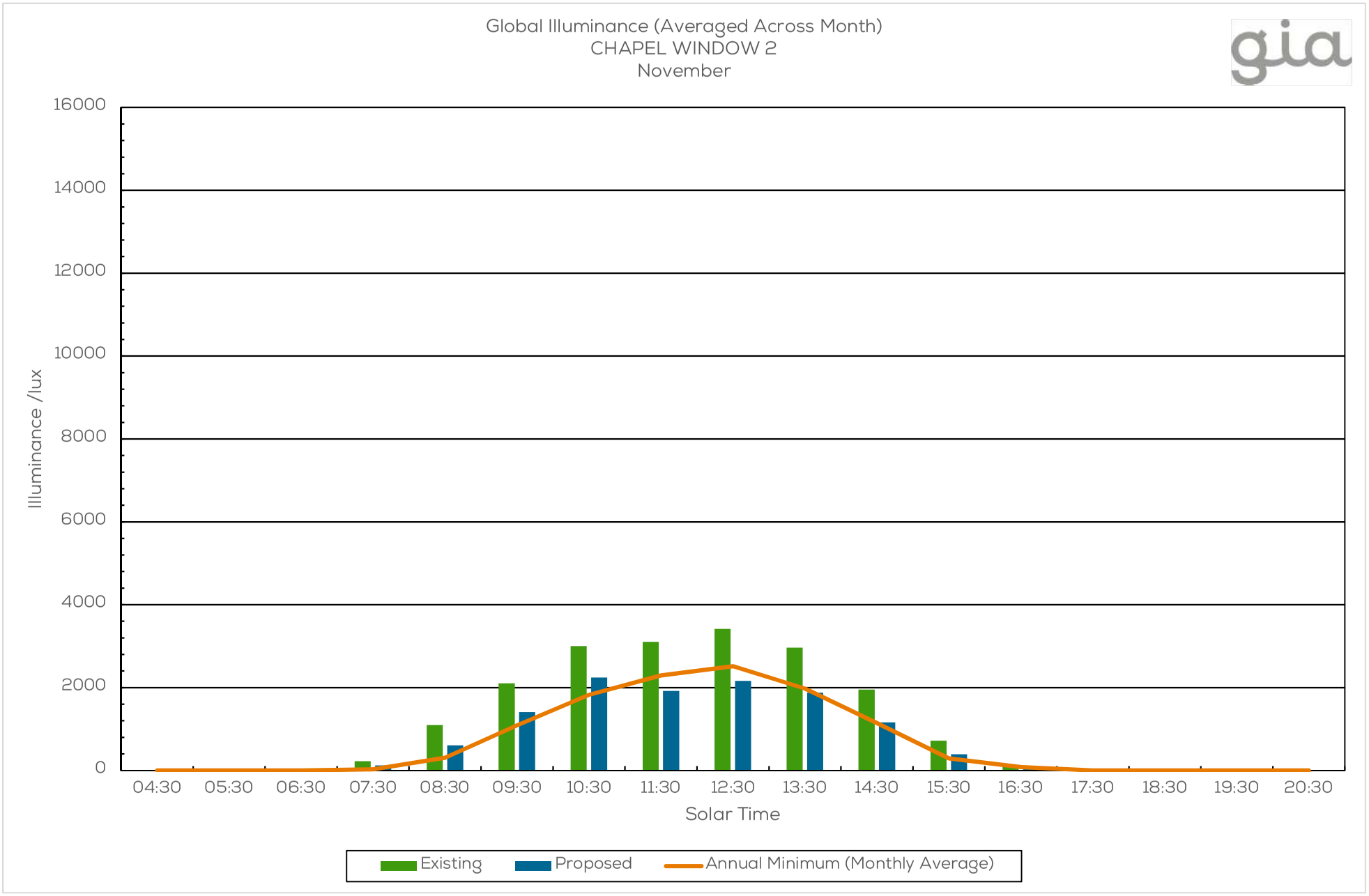

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
June
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

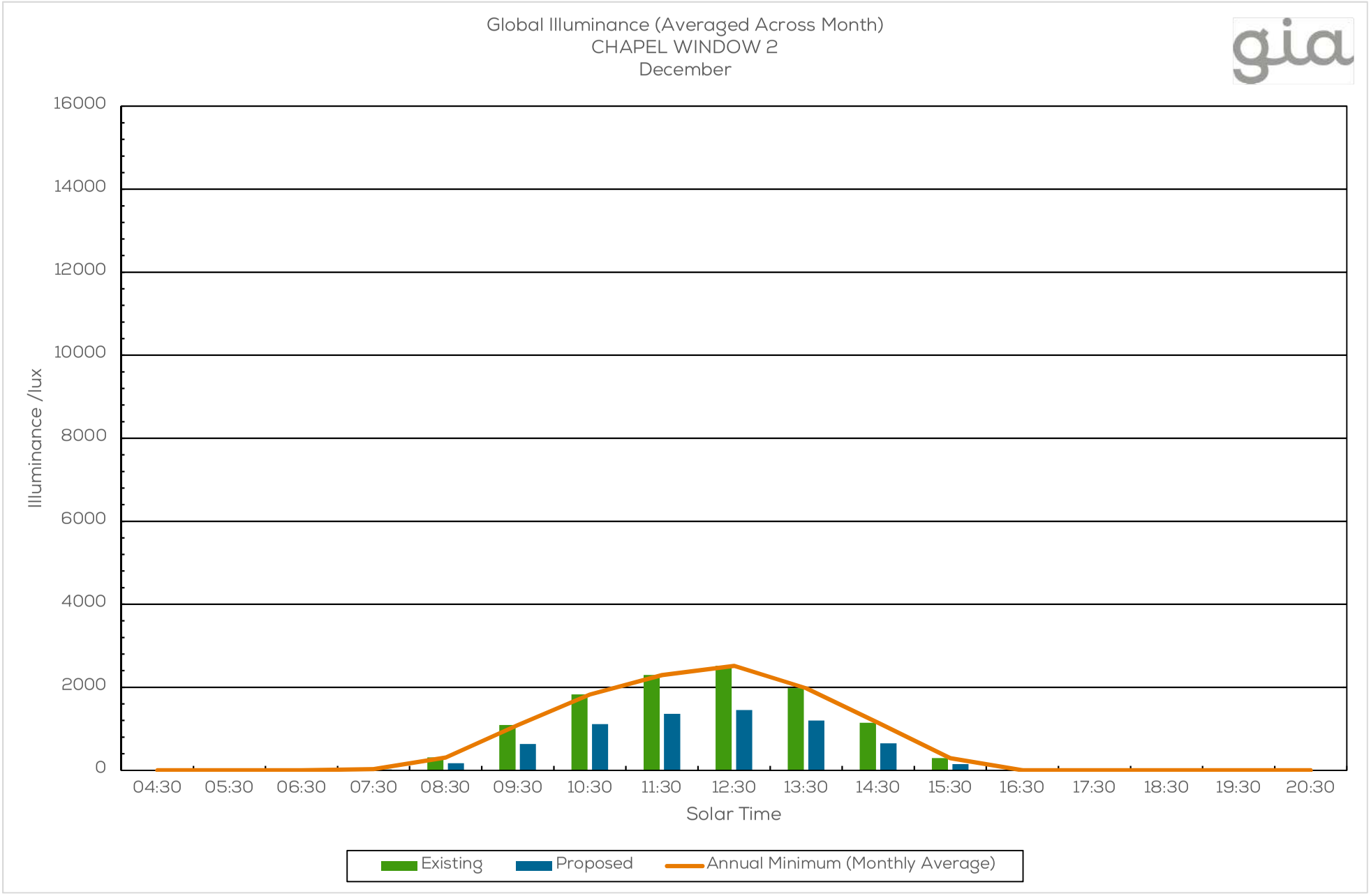

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
July
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
August
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

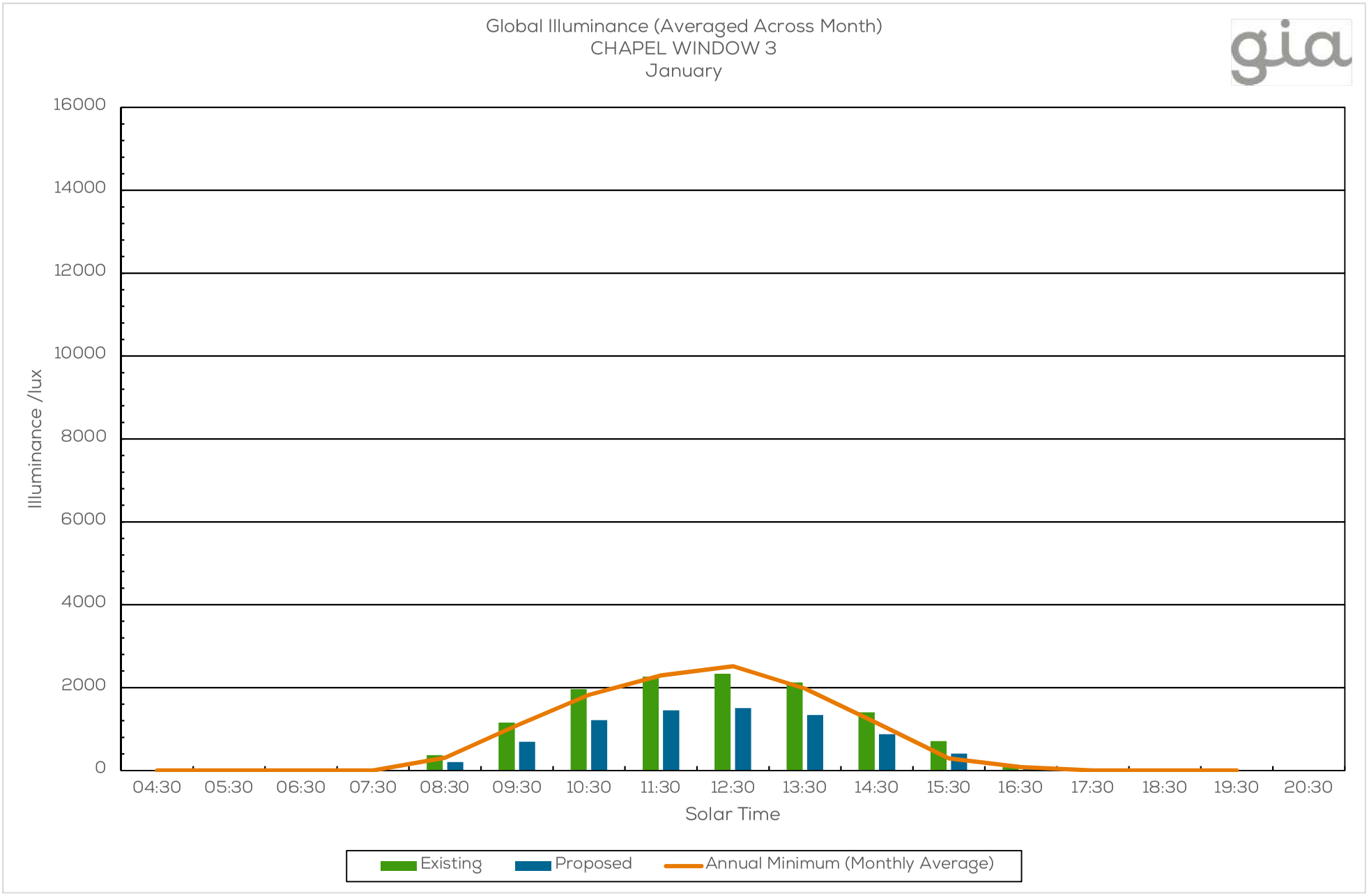

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
September
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

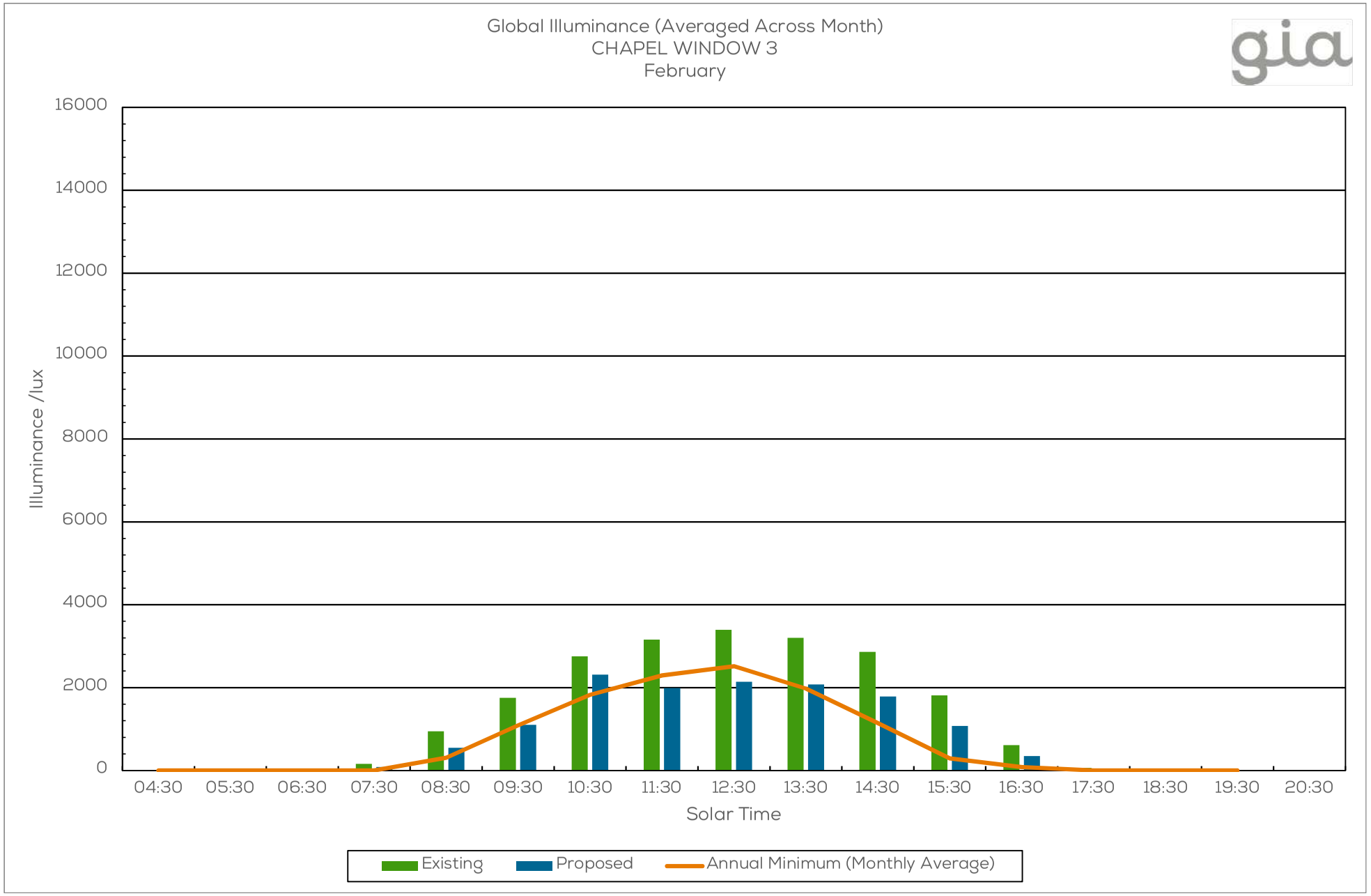

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
October
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

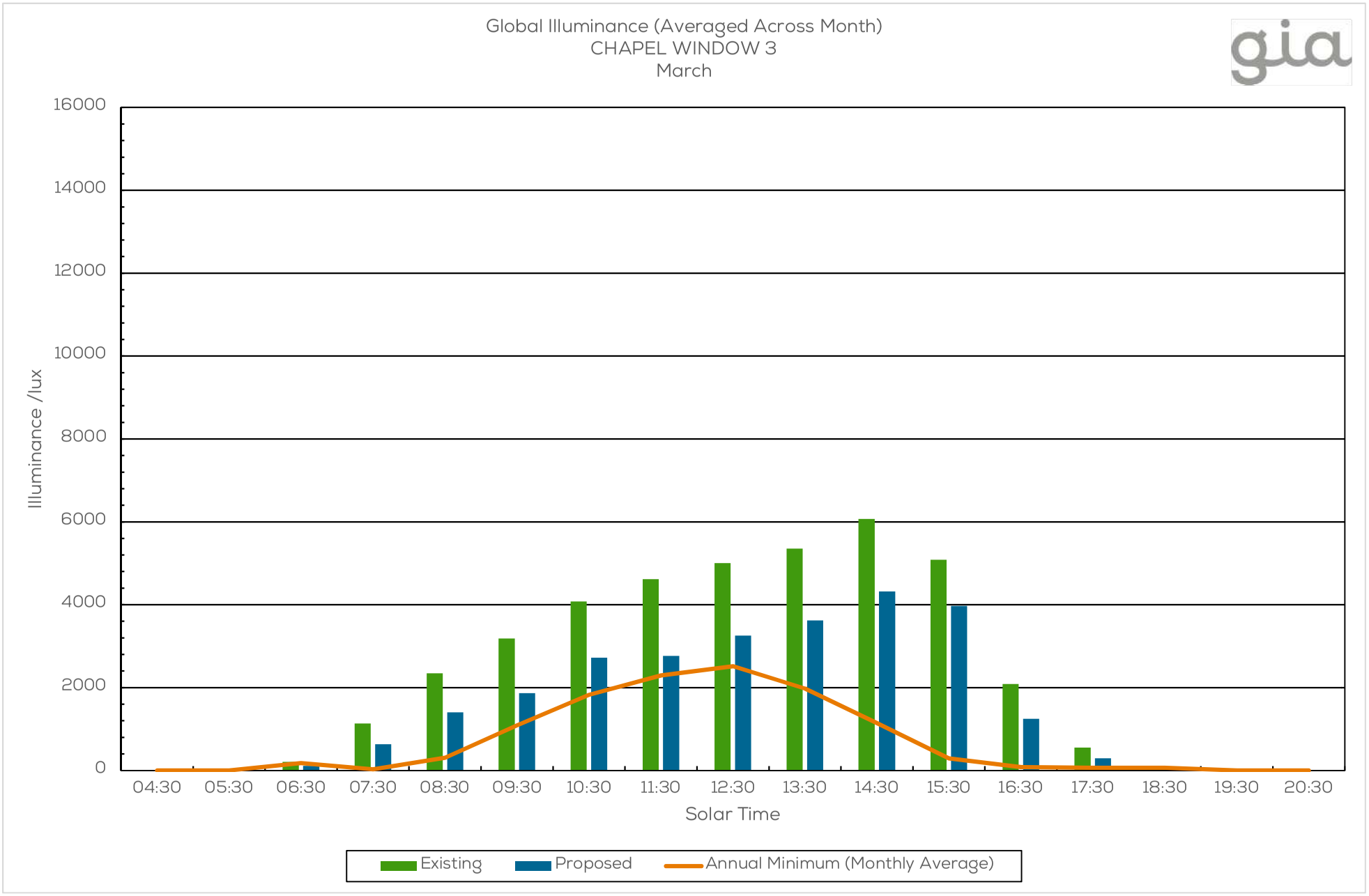

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
November
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

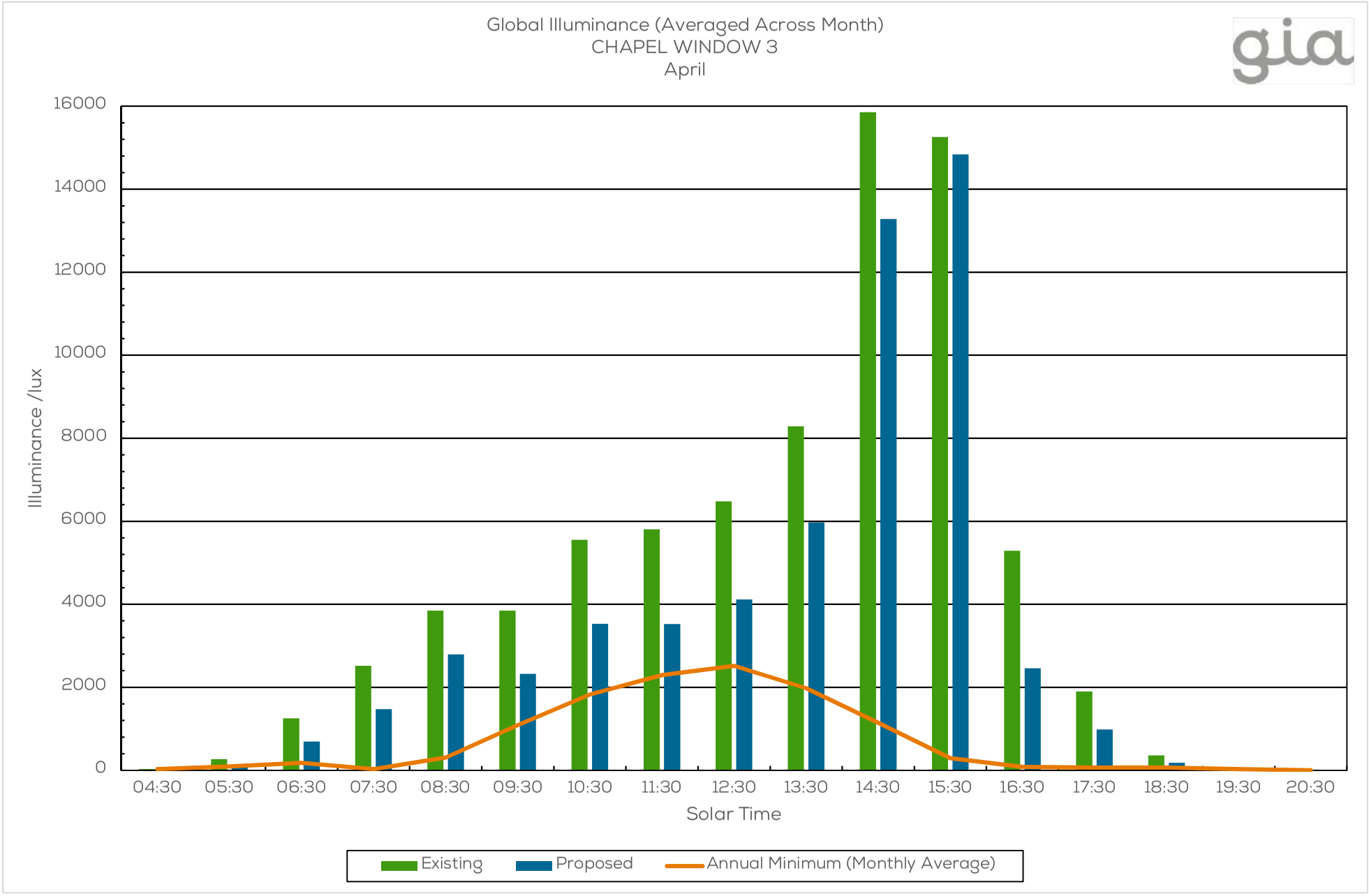

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 2
December
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

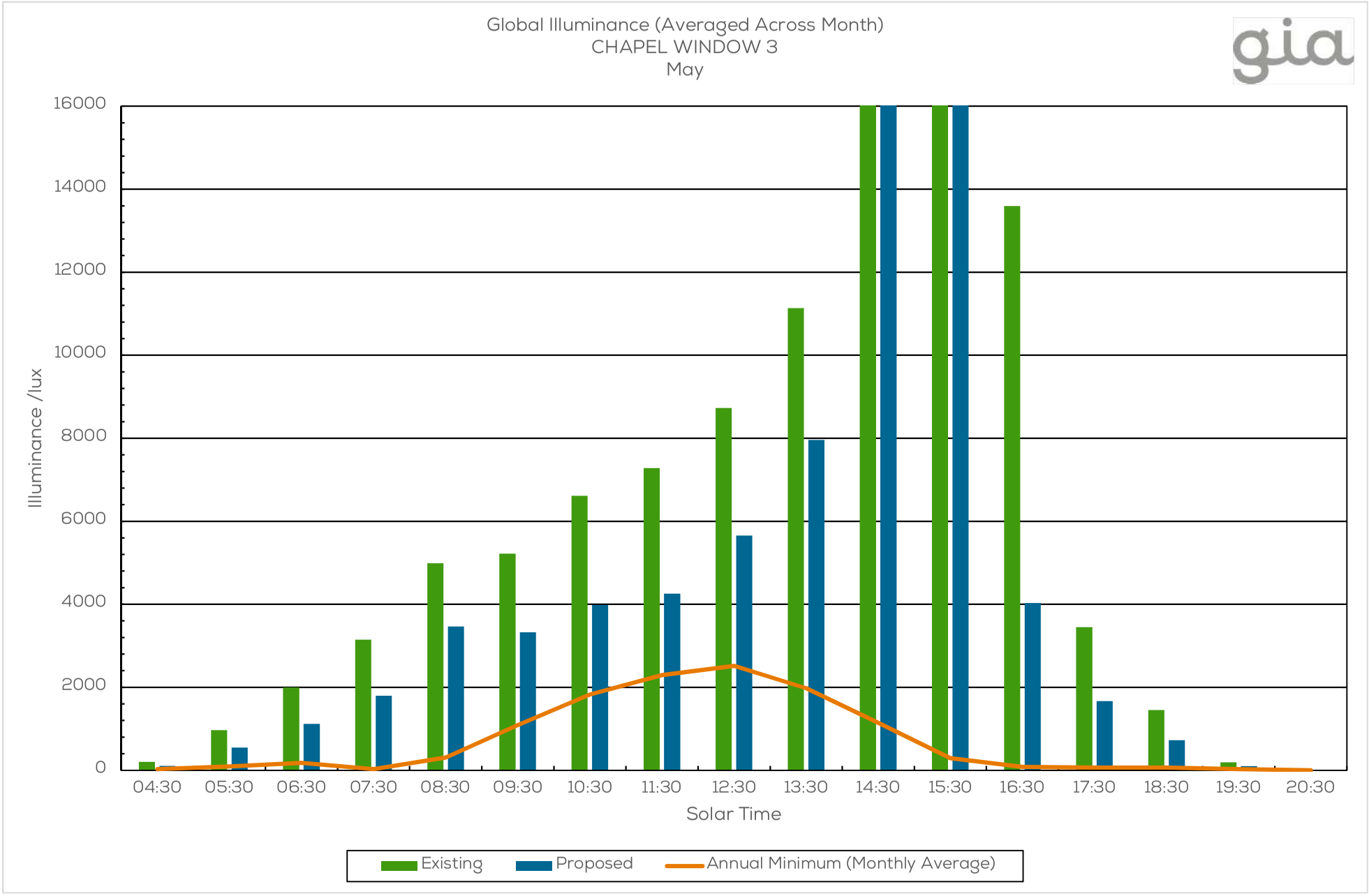
APPENDIX C
GLOBAL ILLUMINANCE CHARTS
WINDOW 3

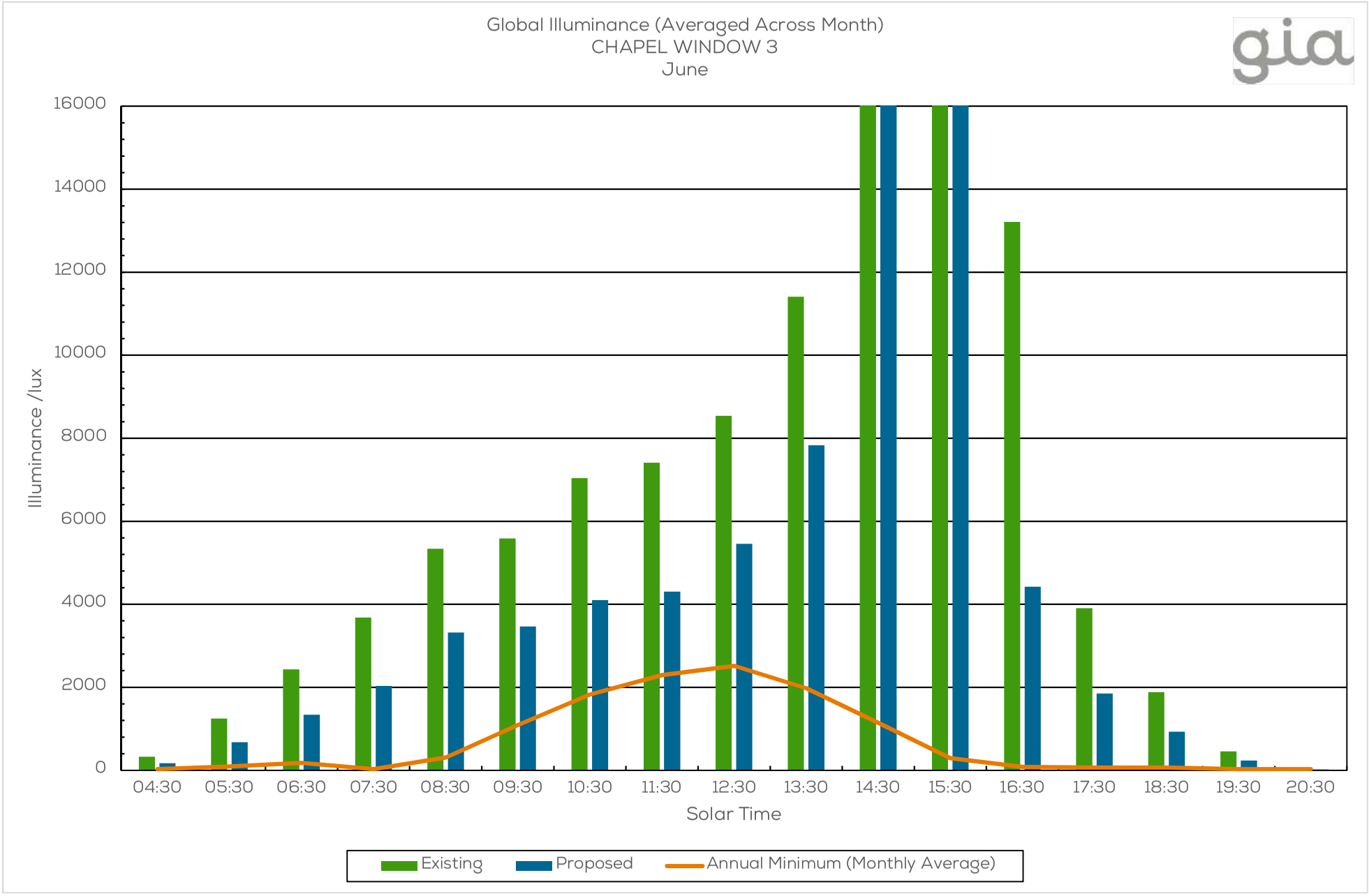

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
January
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

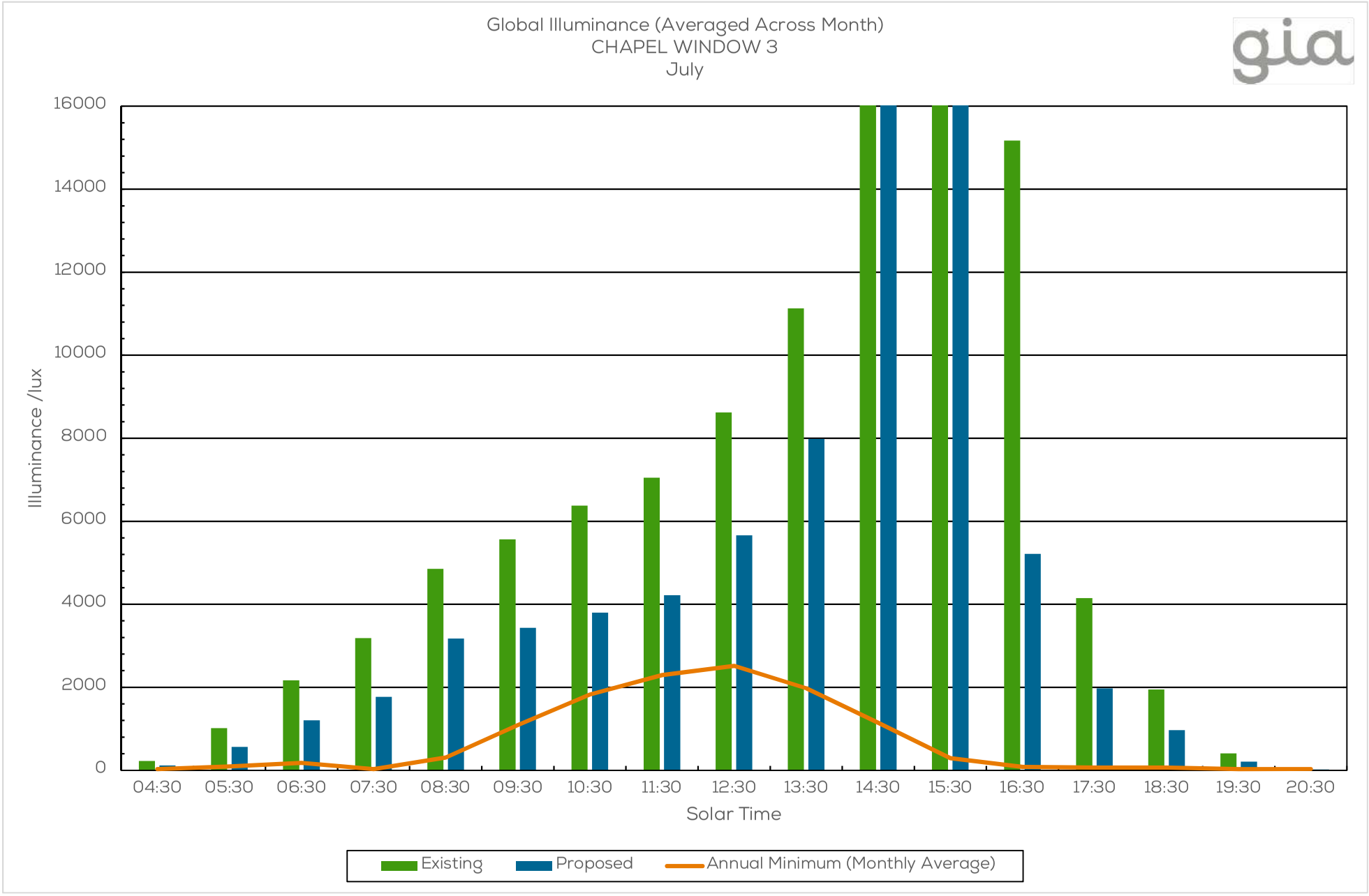

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
February
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

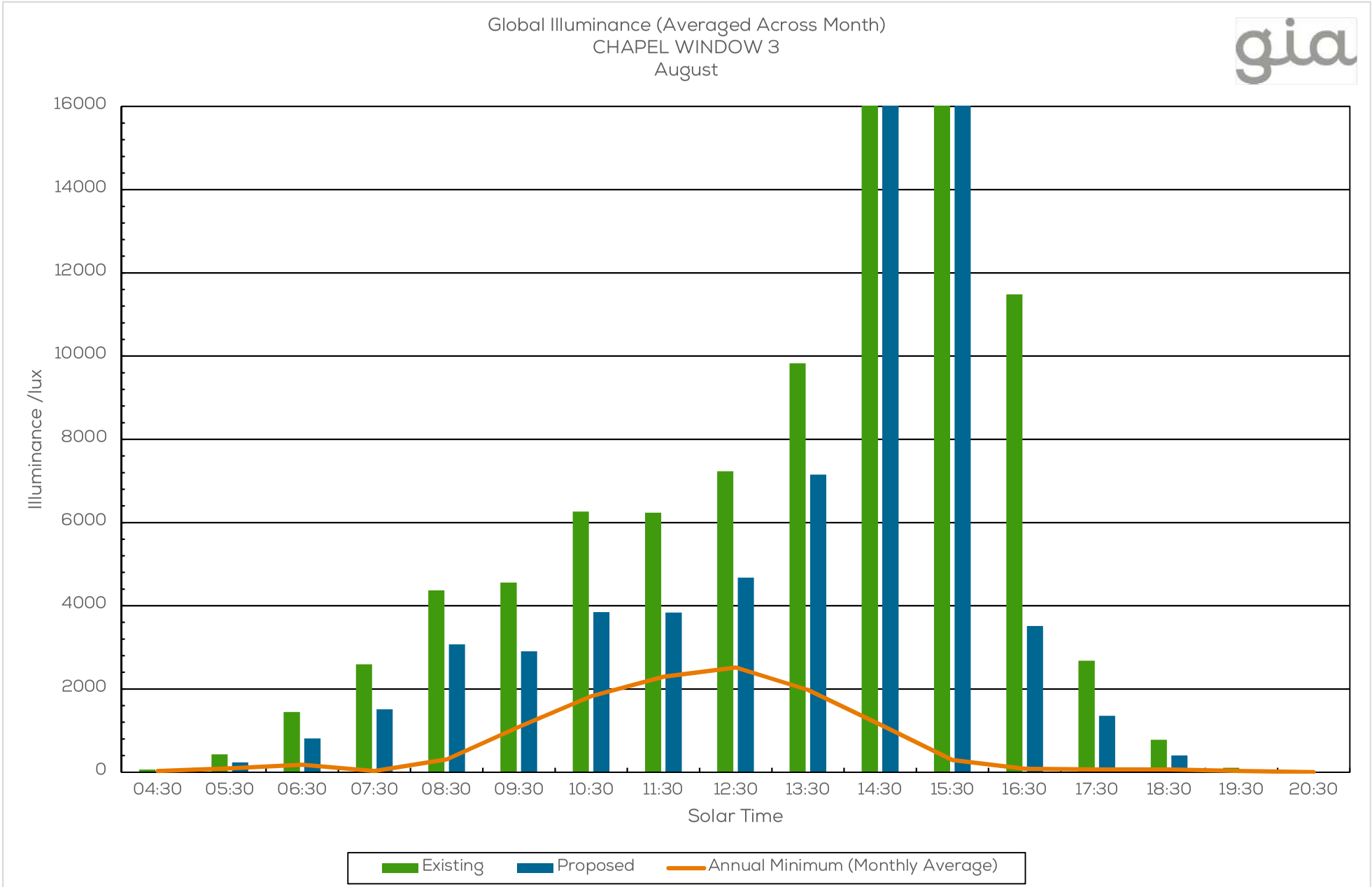

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
March
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

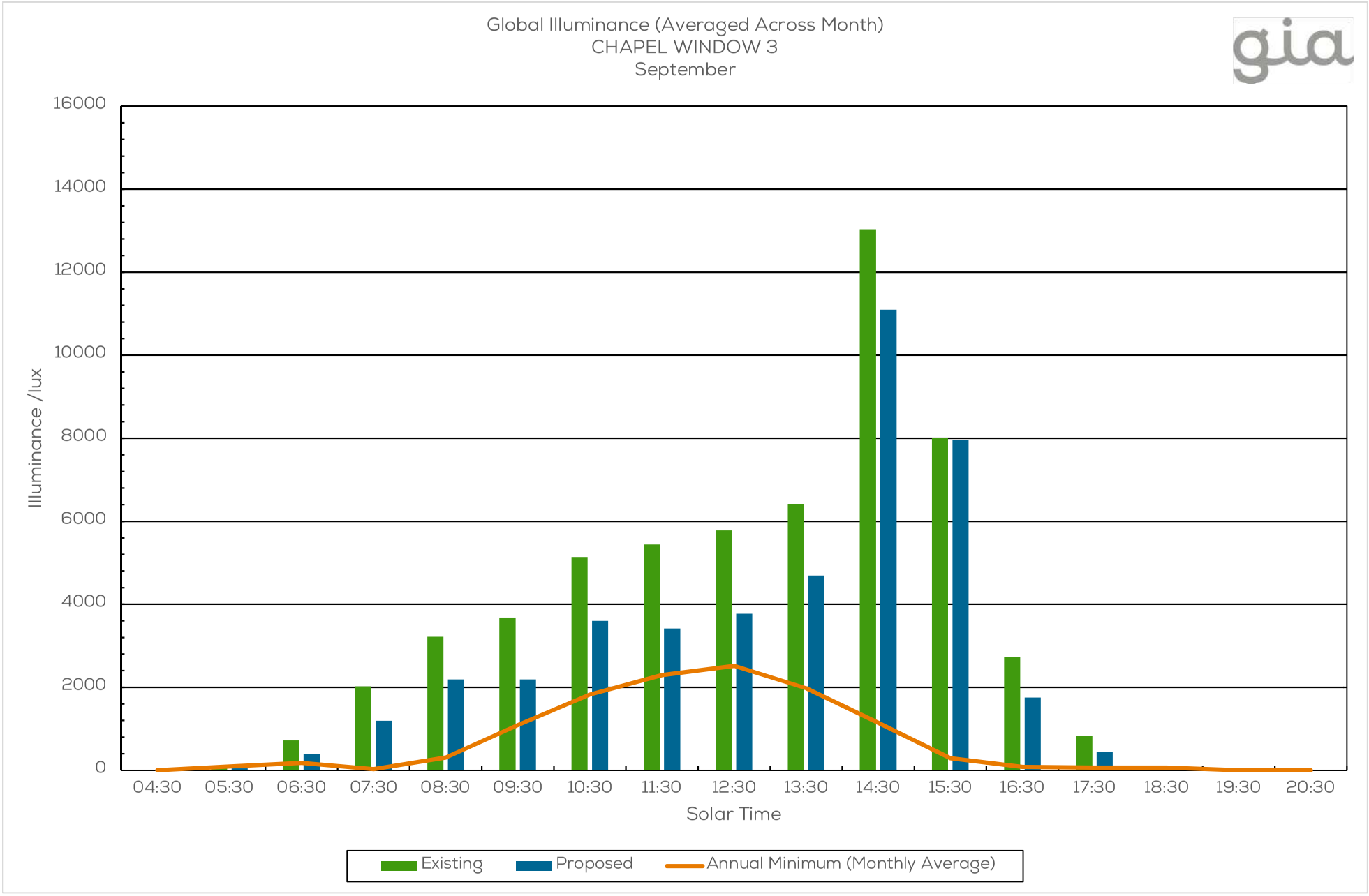

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
April
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

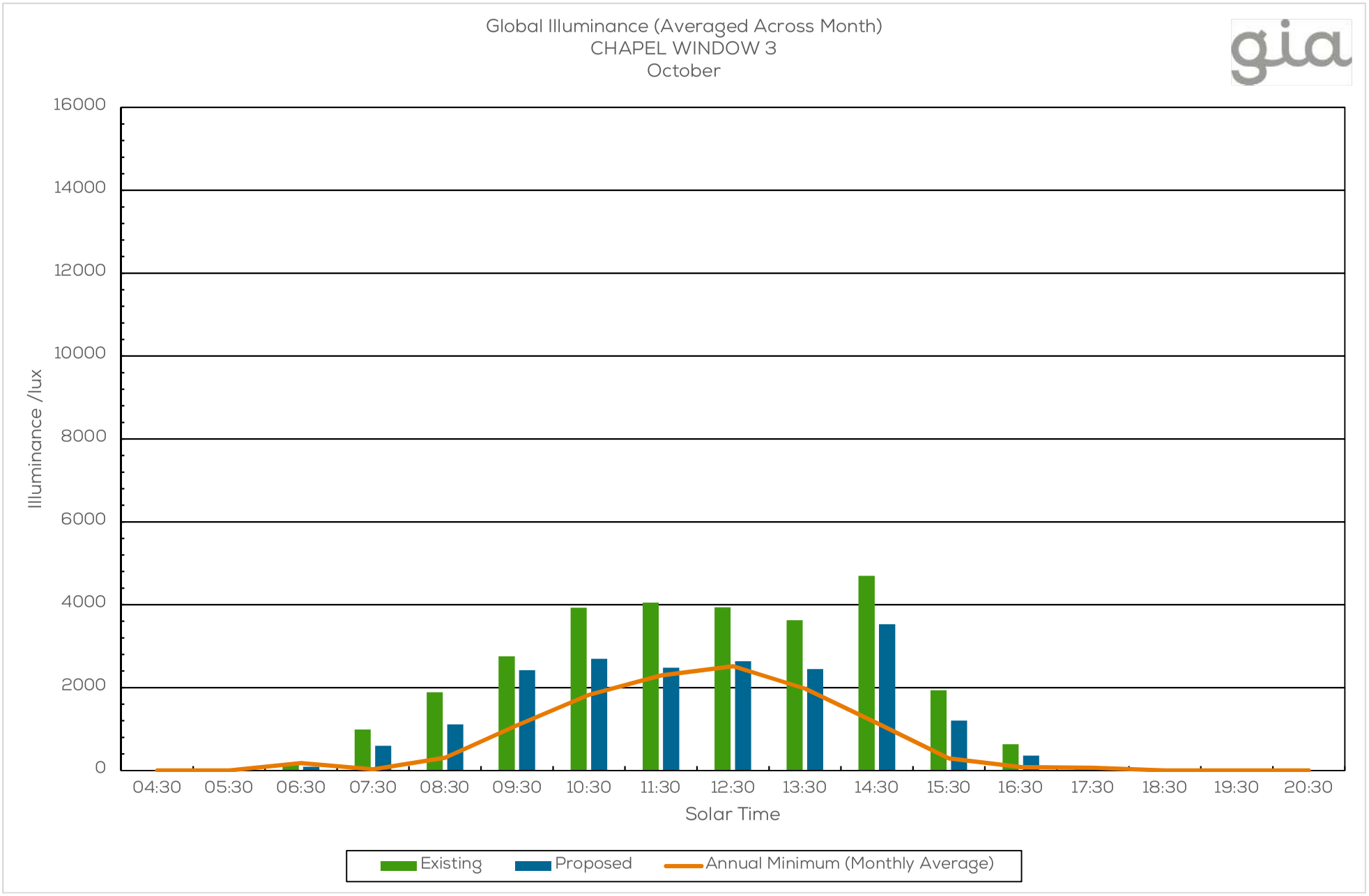

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
May
gia
Illuminance /lux
16000
14000
12000
10000
8000
6000
4000
2000
0
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

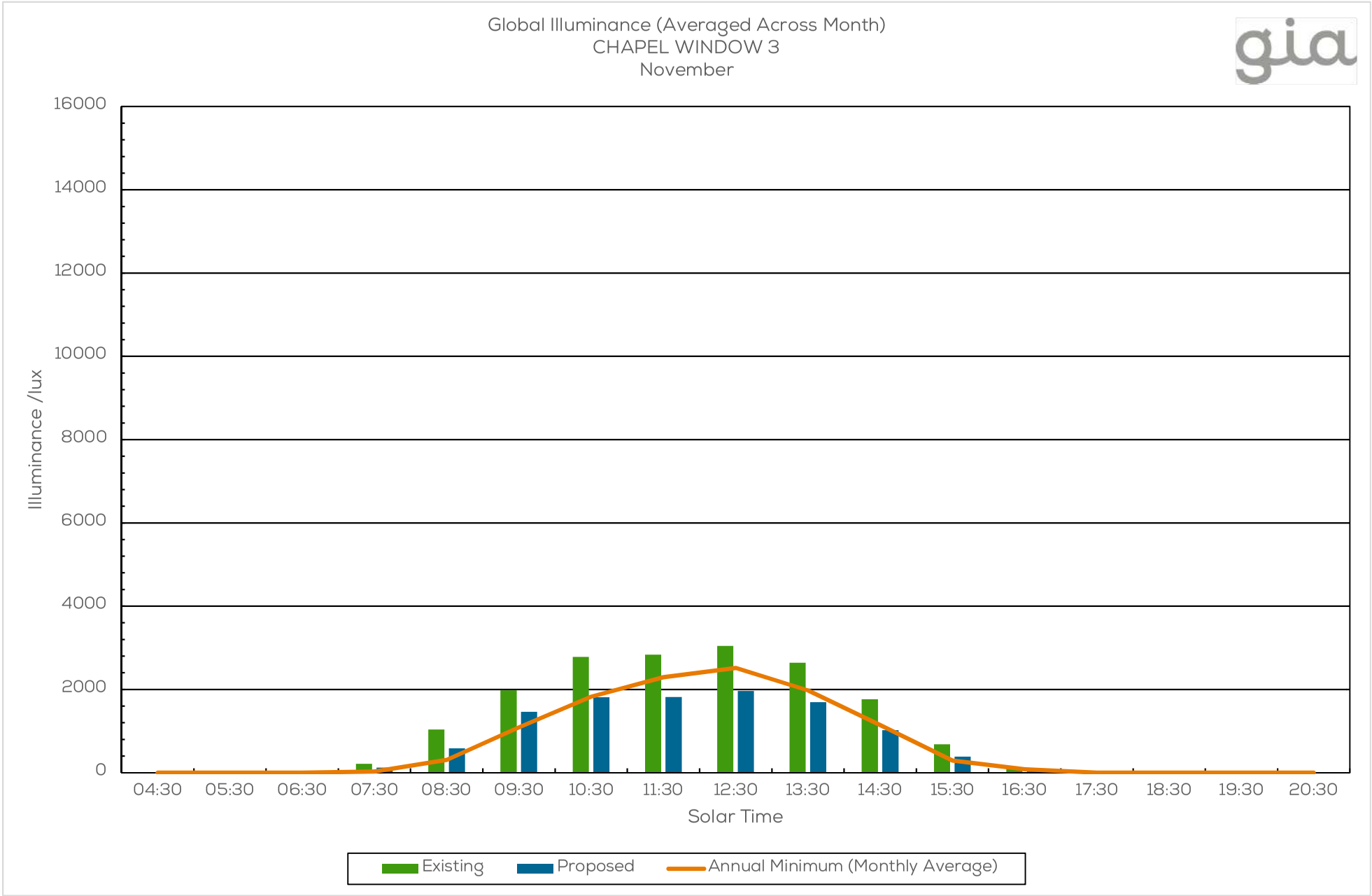

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
June
gia
Illuminance /lux
16000
14000
12000
10000
8000
6000
4000
2000
0
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

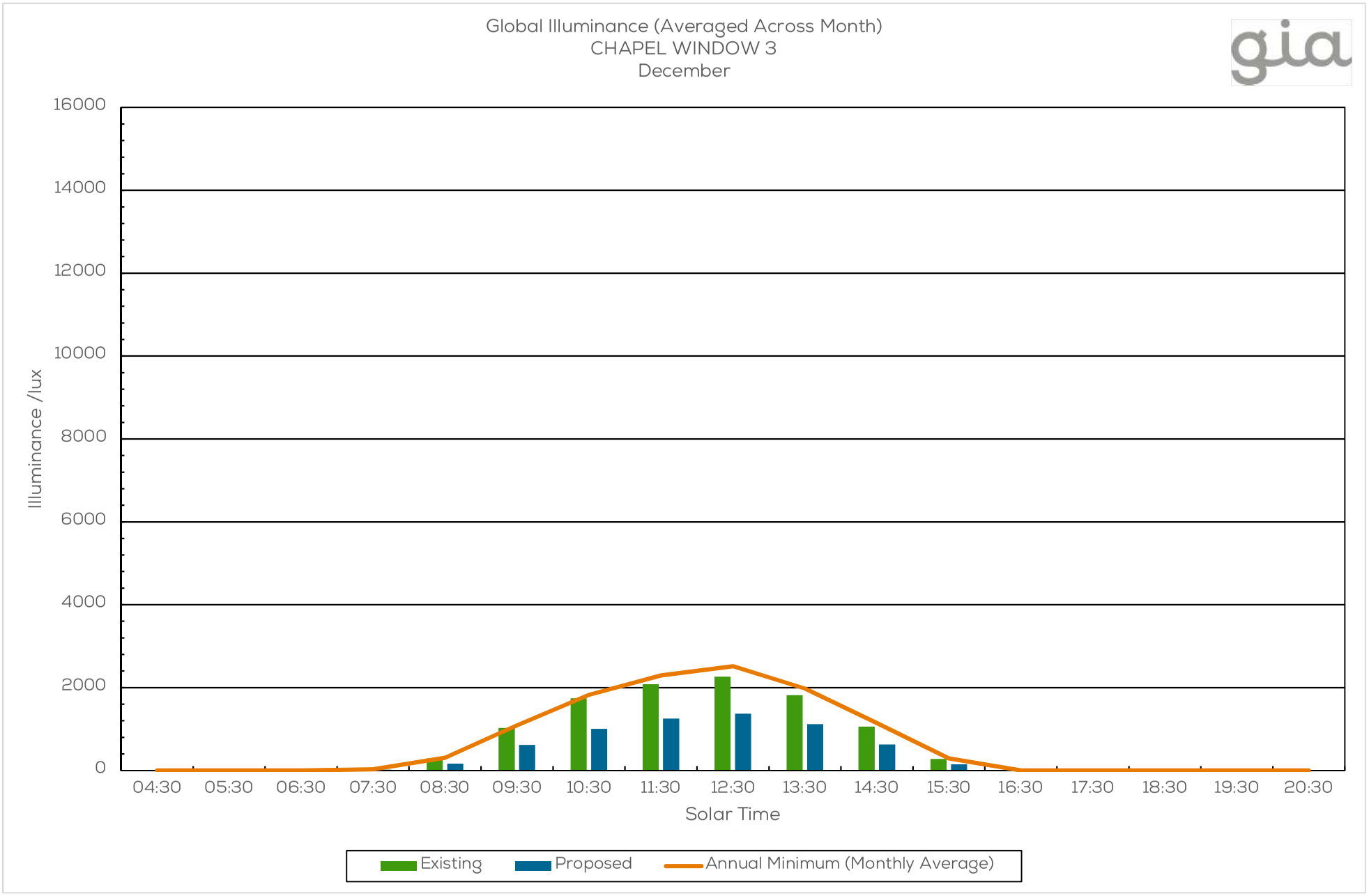

Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
July
gia
Illuminance /lux
16000
14000
12000
10000
8000
6000
4000
2000
0
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
August
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
September
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
October
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
November
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)


Global Illuminance (Averaged Across Month)
CHAPEL WINDOW 3
December
gia
16000
14000
12000
10000
8000
6000
4000
2000
0
Illuminance /lux
04:30
05:30
06:30
07:30
08:30
09:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
Solar Time
Existing
Proposed
Annual Minimum (Monthly Average)

APPENDIX D

COURTYARD TO WINDOW PREDICTION CHARTS

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