City Plan 2040 Examination: Matter 7

Hearing Statement by Rabbi Shalom Morris, Bevis Marks Synagogue

Question 5: Are the Heritage policies clearly defined and unambiguous so that it is evident how a decision maker should react to development proposals?

1. No, in my view the Heritage policies in the draft City Plan are unsound because of their ambiguous nature which does not provide sufficient guidance for decision makers on how to react to development proposals that could have an impact on heritage assets, specifically Bevis Marks Synagogue.

2. Grade 1 listed Bevis Marks Synagogue is the only synagogue in Europe to have maintained regular worship dating back to its opening in 1701. This singular designation is sadly due to the decimation of Jewish life in Europe in the twentieth century, in contrast to the stability, tolerance and safety of Britain over this time. The longevity of Bevis Marks Synagogue is at the heart of what is at risk due to the ambiguity and contradictions of this draft Plan.

Figure 1: Bevis Marks Synagogue, 1891

3. I therefore write this statement in my capacity as the rabbi of Bevis Marks Synagogue, where it is my responsibility to look after the religious welfare of my community. The community at Bevis Marks Synagogue includes those with historic roots in the congregation, those who simply live locally, Jewish city workers, students, and visitors to London. We conduct regular worship during the week, weekends and festivals, in addition to both educational and social activities. We are currently completing the creation of a heritage centre which will welcome school groups from across London and the country to learn more about the Jewish faith. This is supported by the National Lottery Heritage Fund and the patronage of His Majesty King Charles III.

4. Beyond this, the synagogue also serves an ambassadorial role for the Jewish community, regularly welcoming diverse dignitaries, political figures and faith leaders. In its capacity as Cathedral Synagogue, Bevis Marks also hosts events of national importance for the entirety of the diverse British Jewish community.

5. Whilst I do not believe it is the desire of anyone to see Bevis Marks Synagogue reduced from being an active place of Jewish worship to simply being a monument, this plan is formulated in such a manner as to make that a likely outcome. The immense loss this would cause to the British Jewish community, to the Jewish faith, and to the preservation of a unique intangible heritage (of Spanish and Portuguese Judaism) cannot be overstated.

6. Whether the policies set out in this document also cross a line in terms of equality under the law, is beyond my expertise, though I would encourage the inspectors to consider this point carefully. As such I attach an opinion on the matter to my statement (Appendix 1). I would add, however, that it seems incongruous to tightly define the protections for St Paul's Cathedral, whilst willingly leaving the fate of Bevis Marks Synagogue, the Cathedral Synagogue of British Jewry, to the uncertainties of the planning system. Equality should surely demand that Bevis Marks Synagogue, a site the City has rightly recognised as one of its most important heritage sites, is fully protected in the manner it requires, just as is the case with the Cathedral.

7. In the case of Bevis Marks Synagogue, this includes protecting its south-eastern sky-views, for the purpose of preserving its historic setting, its vulnerable light levels, and the ability of its community to worship according to its faith which requires views of this portion of the sky.

8. The necessity to preserve this view in policy is made all the more necessary due to the fact that the Plan includes the synagogue and its setting within its designated Eastern Cluster Tall Building Area. This indicates that it is ostensibly an acceptable place to build a tall building, despite the significant harm it would cause to Bevis Marks Synagogue. This matter has already been rehearsed several times over the past decade through several planning decisions, including the refusal of 31 Bury St on two occasions (the second of which was subject to an Article 31 Direction), the government refusal of the Tulip, and in adopting the Creechurch Conservation Area and establishing its boundary. And yet, after each decision is made, the City finds a way around it, forcing the issue to be debated over and over again, putting the Synagogue constantly at risk. It would therefore seem appropriate to reflect the matter in policy and not leave the issue perpetually ambiguous, likely leading to further planning disagreements, which also have the effect of slowing down growth.

9. It is worth adding, that the Synagogue is located at the very edge of the Eastern Cluster area for Tall Buildings. Therefore, ensuring that the correct protections for the Synagogue are put in place, by protecting its sky-views to the south-east, would have only the most narrow of impacts on the Cluster and the City's growth potential.

10. Historically speaking, Bevis Marks Synagogue has enjoyed an exceptionally positive relationship with the City of London Corporation. It is in the City where Jewish people were first welcomed during the Resettlement of the seventeenth-century, and where Jewish people in Britain first enjoyed civil equality in the nineteenth-century with the elections of Jewish Sheriffs and Lord Mayors, before Jews could sit in Parliament. As such this entire ordeal has been a source of immense grief to our community, as there has been a sharp departure from the City's leading historic role in protecting its Jewish community.

11. We have carried out extensive conversations with Officers to explain our position and help them understand the contours of Bevis Marks Synagogue and the Jewish faith. However, throughout a process that has been ongoing for over five years, they have frustratingly attempted to have it both ways. They have created seeming protections, that in effect don't actually protect but just give that impression. This double talk has only added to the sense of power imbalance and injustice that we have experienced during this ordeal.

12. Most recently, just weeks after designating a conservation area around the synagogue (Creechurch Conservation Area), in which Officers first tried to exclude the contentious site of 31 Bury St, they have attempted in this Local Plan to remove the pre-existing presumption against tall buildings in conservation areas. They have also invented an 'immediate setting' area, but have excluded again the adjacent 31 Bury St, and more egregiously denied the intrinsic importance of the sky-view to the significance of the synagogue. Officers rightfully admit that they are not experts on Judaism, the Jewish community, and the synagogue, and yet ludicrously also claim to know what is, and what is not, relevant to its heritage status and required for its protection.

13. This contradiction became shamefully clear in the 31 Bury St Officer Report which recommended approval (though the Committee rightfully determined to refuse the application). It demonstrated the extent to which the protection of Bevis Marks Synagogue cannot be entrusted to ambiguous and contradictory planning policies, seemingly intentionally crafted to leave the matter open for 'interpretation' during the planning process. Not only does this subject the synagogue to significant financial injury in being forced to repeatedly fight the same issue in harmful planning applications, it ultimately demonstrates that the City is not serious about protecting Bevis Marks Synagogue from this kind of harm. It is analogous to Parliament passing a law, but knowing that civil servants will in practice be instructed to find reasons why it should be set aside.

14. It would therefore seem helpful for me to set out here some of the key religious issues that the sky plays in the significance of the synagogue as a working place of Jewish faith, and as such why it

is crucial that its preservation is incorporated into the City's planning policies for Bevis Marks Synagogue. For further detail and elaboration I welcome you to carefully consider the attached Setting Study that I've prepared (Appendix 2).

15. The synagogue relies on natural light for its illumination. Light is essential for Jewish worship which requires the reading of hundreds of pages of prayers at a given service. We've undertaken a multi-year study of the synagogue's internal light levels (Appendix 3) and have found that at certain times the levels are currently at the bare minimum of acceptability, and cannot withstand further reduction. The reason for this is that despite the synagogue having large windows on all four sides, the growth in neighbouring buildings over the past century has resulted in the almost entire removal of any direct light to the synagogue's main floor, with only a small remnant in its gallery.

16. As such, today, the synagogue relies primarily on indirect light reflected off the neighbouring buildings set tightly around its courtyard. As the sun cuts around the eastern and southern sides, its light is cast against the buildings to the synagogue's north and west, causing the synagogue's interior to illuminate. Our monitoring has demonstrated that if the synagogue's south-east sky-view is restricted, our light levels will plummet. Unfortunately, the BRE guidelines do not take this kind of illumination into account in their models, which has consistently allowed developers to mistakenly downplay the potential impact of their proposals on the synagogue's illumination. If this would occur, the synagogue would cease to be suitable for Jewish worship, which is of course integral to its very significance and purpose.

17. Beyond this, direct views of the sky are necessary for the carrying out of certain elements of Jewish worship. Religiously these are important for determining the conclusion of Shabbat and festivals through the seeing of stars in the night sky (which is currently the case). Beyond this, these views are absolutely necessary for the monthly prayer of renewal which is recited upon seeing the waxing moon in the night sky (kiddush levana).

Figure 2: Stills showing the passage of the moon across the sky as viewed from the courtyard

16. With the view already constrained due to buildings already built and approved, the synagogue cannot absorb further destruction. Doing so would result in our inability to recite this prayer as we currently can most months of the year. Functionally, if we can no longer carry out the fullness of our faith in this location, the synagogue ceases to be an appropriate location for Jewish life, and becomes a relic.

17. Beyond this, the formal historic name of the Bevis Marks Synagogue (inscribed above its door) is 'Gate of Heaven.' The juxtaposition of the synagogue and sky is therefore essential for understanding the poetic meaning of this name, and the meaning that the synagogue had for London's first Jews. The sky view is therefore an important element of the synagogue's setting and heritage significance.

18. The sky-view framing is also necessary from a religious stand-point. Jewish law requires that a synagogue is seen as the tallest building in its surroundings to emphasise the sense of importance of the building and the space around it. In Judaism, this is not accomplished with a steeple, dome or minaret, but with the very height of the building itself in relation to those around it. Regrettably, an element of this visual dominance has been lost, but an important element of it remains - crucially the element that

is visible from the main entrance from the street. For this reason too, it is essential to the synagogue's significance that its framing (once again, the south-eastern sky) remains clear as it largely still does. Infringement on this narrow space would result in the Synagogue feeling small in contrast the buildings set immediately behind it, which would diminish or destroy what remains of this important aspect of significance.

19. Thankfully, all of these elements (light, setting, and worship) can be protected at once by preserving the synagogue's south-eastern backdrop. In light of all of this, and the exceptional importance of Bevis Marks Synagogue locally, nationally and internationally, we are calling for the synagogue's protection to be formalised in the City Plan to protect this important heritage asset with such significance to the Jewish community.

20. The City's refusal to do so cannot be understood as anything other than a wilful disregard of the needs of the Synagogue. In the Plan's current form, the Synagogue is under severe threat from development. As I've explained, the likely implication of this situation is that the Synagogue will go from being an active community and place of Jewish worship to simply being no more than a monument, an outcome that should be seen by all as completely unacceptable, whilst at the same time being completely avoidable with the necessary protections in place.

21. The recent 31 Bury St application highlights the importance of clear policy regarding the Synagogue. The Officers' recommendation for approval demonstrated that they do not have the "do-no-harm" mindset that should be applied to a heritage asset like this. Mercifully, the Planning Committee ultimately rejected the recommendation (for the second time).

22. The display of democratic will on the part of the Committee is admirable, but (a) it should not be left to the vagaries of political fortune to ensure that the right thing happens, and (b) the fact that the politicians decided as they did demonstrates a clear lack of support within the Corporation for elements of the draft Plan that have been forced through by the leadership.

23. We are therefore calling for the inclusion of a policy that would preserve the synagogue's clear sky-view backdrop in keeping with

both the requirements of the synagogue and the City's own planning decisions. Three of the five reasons for refusal of the most recent 31 Bury St application were in fact on account of the harm it would have caused to the (1) setting of the synagogue, (2) its light, and (3) the ability of the community to worship on account of it restricting its southern sky-view and views of the moon.

24. I welcome any questions on any points of my statement, and look forward to further discussions at the Examination Hearings.

Many thanks,

Rabbi Shalom Morris
Bevis Marks Synagogue

Appendix 1 – Opinion by Henrietta Gordon, Solicitor

FAO of Inspectors
J Bridgwater PGDipTP MRTPI
A Phillips BA(Hons), DipTP, MTP, MRTPI.

4 March 2025

Re: Hearing Statements to the City Plan Examination in Public which is taking place from 25 March 2025

I have worked as a solicitor in the City of London for over 25 years.

I am not Jewish and have no links to Bevis Marks or its community or the wider Jewish community other than having a few friends who happen to be Jewish. No one has asked me to involve myself in this.

Planning Application 24/00021/FULEIA & 24/00011/LBC – Hearing 13 December 2025

I registered an objection to this application entirely on my own initiative and not because of any special interest but because it was my honest view that what was being decided was not in reality a mere planning application but rather whether the Jewish people, their faith and their place of worship would continue to be discriminated against and whether the law will continue to be broken within the City of London.

I subsequently submitted an application to speak at the hearing and was one of the individuals who ultimately spoke at the hearing on behalf of the objectors.

On the back of my involvement in this application I am now writing this letter.

Concerns to raise

There is a stark difference in the ways in which St Paul's Cathedral and the Bevis Marks Synagogue have been and continue to be treated and this should be taken into account as part of this City Plan Examination, addressed and rectified.

St Paul's Cathedral opened in 1710 and is afforded a wealth of legal protection by the City of London Corporation and the Mayor of London. No buildings, whether offices or otherwise, encroach upon it. It is justifiably treated with reverence. Bevis Marks synagogue by contrast has little or no planning protections.

The synagogue opened in 1701. It is the oldest synagogue in the UK in continuous use and it is the only synagogue building in Europe that has held continuous services for more than 320 years. It was the main synagogue built after the readmission of Jews to England by Cromwell following the expulsion in 1290 and continues to be an active place of worship. It is also the only non-Christian place of worship within the City of

London. St Paul's Cathedral and Bevis Marks Synagogue are both Grade 1 buildings, built within a few years of each other in the early 18th century with almost identical historic and religious significance. And yet Bevis Marks is not being offered the same protection that is given to St Paul's Cathedral.

The City of London Corporation is subject to the Planning and the Public Sector Equality Duty in section 149 of the Equality Act 2010. The principles in the decision of R (Brown) v Secretary of State for Work and Pensions [2008] EWHC 3158 (Admin) have become defining guidelines for the exercise of this duty and should be taken account of as part of this Examination.

It is important for public bodies to comply with this statutory duty. A failure to comply with it amounts to an unlawful action, and it is one that is commonly raised as grounds for a judicial review claim. In such a case, the court may quash the decision taken by the public body, so that the body cannot proceed with its intended course of action unless it re-runs its full decision-making process in a way that complies with the PSED.

The Human Rights Act Articles 9 and 14 also require Christian and Jewish worshipers to be treated in the same way and their places of worship should not therefore be treated differently. The only way of ensuring that these articles are not being breached is to put Bevis Marks on the same protected footing at St Paul's Cathedral.

Furthermore, the Corporation adopted the International Definition of Antisemitism in full on 5 December 2019 this includes antisemitism directed toward Jewish individuals and/or their property, toward Jewish community institutions and religious facilities.

Failure to provide Bevis Marks with the same protections as St Paul's Cathedral, would in my view be in breach of the Corporation's equality duty, a breach of the human rights of the members of the synagogue and an act of discrimination and antisemitism.

There are only 250,000 Jewish people in the UK. They are a minority group and as such they are worthy of protection but if the Bevis Marks Synagogue and its congregation are not afforded the same protections as granted to St Paul's Cathedral and its congregation, they will instead be the victims of discrimination.

I sincerely hope that due consideration is now given to the purpose for which these statutes were enacted which was to provide legal protections in exactly this type of situation: where those of a different faith, and their related buildings are not being treated equally to those of another faith but rather one is being discriminated against. To now protect the Bevis Marks Synagogue in the same way as St Paul's Cathedral would be to face up to, and accept what amounts to centuries of discrimination, and would ensure that future generations are protected against such future harm.

[redacted]

Henrieta Gordon

Appendix 2 – Setting Study prepared by Rabbi Shalom Morris

the S&P SEPHARDI community Bevis Marks

Planning application ref. 24/00021/FULEIA; proposed 43 storey tower at 31 Bury Street

Bevis Marks Synagogue in Judaism and Heritage: A Setting Study With Perspectives from Jewish Sources

20 November 2024

Rabbi Shalom Morris
Rabbi, Bevis Marks Synagogue
PhD Candidate, King's College London, Dept of History

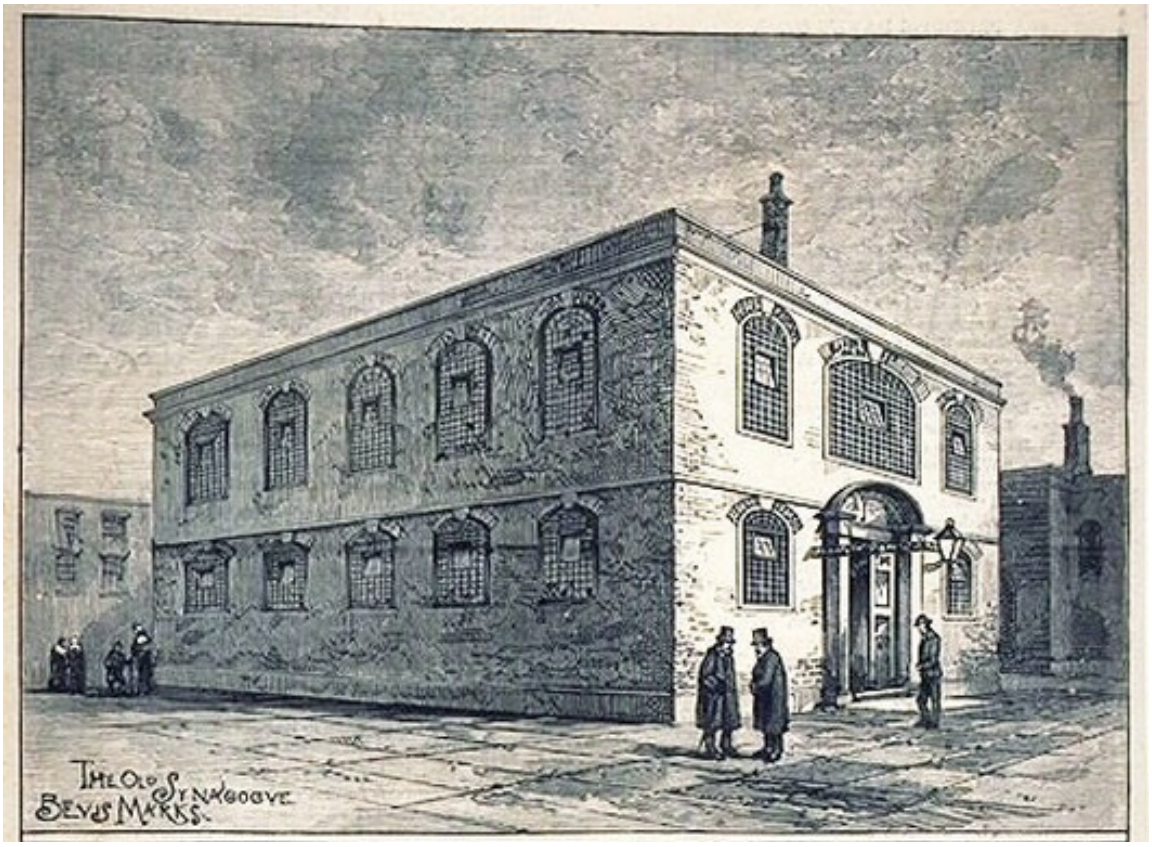


TABLE OF CONTENTS

Chapter 1: Introduction: Harm and Significance……2

Chapter 2: Important Sources……4

Chapter 3: The Bevis Marks Synagogue and Community: An Overview……5

.

Chapter 4: Massing and Scale: The Synagogue's Setting……7

Chapter 5: Importance of the Sky View in the Synagogue's Setting……9

Chapter 6: Synagogue Viability and Courtyard Amenity: At Risk……11

Chapter 7: Light Reduction, Windows, and the Synagogue's Architecture……12

Chapter 8: Conclusion……15

Chapter 1 - Introduction: Harm and Significance

One of the the most important elements of the significance of Bevis Marks Synagogue is the interplay between the historic building, its setting, and the community who have always worshiped there. However, the setting of the synagogue, its architectural purity, and the ability of its community to continue to use it for worship are at risk due to tall development to its south, notably at 31 Bury St.

As the original custodians of Bevis Marks Synagogue, we hope this paper will sufficiently explain elements of the synagogue's significance that are at risk due to developments that infringe on its remaining southern sky-view. It is our contention that this space must be protected at all costs to ensure the continuing significance, including functioning, of Bevis Marks Synagogue. In this sense, this is an existential matter both for the synagogue's future wellbeing, and for the Jewish community's continuing presence in the City of London, a place they have called home since the Resettlement of Anglo-Jewry began in 1656.

A. Significant Harm to Bevis Marks Synagogue

Grade-1 Listed Bevis Marks Synagogue is the UK's most historically-important synagogue. This is rooted in the synagogue's history, architecture, communal value, and religious traditions.

These elements of its significance, however, are at grave risk due to a planning application to construct of 43-story tower at the site of 31 Bury St, just to the synagogue's south.

The proposed tower will cause harm to the synagogue's:

1. Original architectural intent, which is its physical prominence over its setting. This prominence is important architecturally, historically, and religiously.
2. Religiously important sky views.
3. Interior light levels necessary for prayer.
4. The purposeful functioning of the synagogue's architecturally significant windows.
5. The amenity of the communally important courtyard.
6. The meaning of the synagogue's name.
7. The economic viability of the site.

These harms will be explained to in detail in the pages that follow. As Bevis Marks Synagogue is a site of such national and international significance, it is wholly unacceptable to cause this extent of harm to it. It breaches local and national planing policies, and inflicts particular harm to the country's Jewish community who relate to the synagogue much as the Church of England does to St Pauls' Cathedral.

B. The Synagogue's Unparalleled Significance

Bevis Marks Synagogue is the most historically significant synagogue in the United Kingdom. It was the first purpose-built synagogue constructed in England after Jews were readmitted to the country by Oliver Cromwell in 1656. Even until today, it is the only non-Christian house of worship in the City of London, and it existence represents both the City's and the country's history of religious tolerance.

The construction of Bevis Marks Synagogue began in 1699 in the years following the Great Fire of London. It was built in the style of Sir Christopher Wren and blends both Jewish and English architectural motifs. The synagogue was completed in 1701, before St Paul's Cathedral, making it one of the country's most-important houses of worship. It is a Grade-1 Listed building.

Bevis Marks Synagogue is also one of the most important synagogues in the world. Bevis Marks Synagogue is the world's only synagogue to have maintained regular worship dating back to its opening in 1701. Its congregation is comprised of descendants of families who have worship there throughout its centuries of existence. Bevis Marks Synagogue therefore is world Jewry's last remaining unbroken link to the pre-modern era.

This continuity has also allowed the synagogue's congregation to maintain its unique religious heritage and traditions, one of the last vestiges of Spanish & Portuguese Jewry. Furthermore, it's ritual is a blend of ancient Iberian Jewish traditions and English culture, making its intangible heritage of extreme significance to both Judaism and Britain.

C. This Report

A thorough understanding of a heritage-asset's significance is essential for planning authorities to make decisions that might harm said asset. Each heritage site's significance is unique to its particular history, location, function, etc. There are various contributing factors that include heritage, cultural understanding, function, and viability.

This becomes even more crucial when considering potential harm to a listed building, particularly one which is Grade-1 Listed. In such instances substantial harm should be wholly unacceptable, and where less than substantial harm would be caused, it must be outweighed by public benefits of equal significance. These are high bars to overcome.

Of particular concern is 31 Bury St, where a 43-storey tower is proposed. This site sits just twenty-five meters to the synagogue's south. In Historic England's objection letter to this scheme, they consider the harm that would result to the synagogue on account of its: 'intangible associations with its surroundings', 'patterns of use', and 'intentional intervisibility with other historic and natural features'.

This concern has already been confirmed by the City of London's Planning Committee in their decision in 2022 to refuse permission to a scheme on the same site of similar scale. This position is reinforced by the planning inspectors determination to refuse the Tulip proposal (to the synagogue's west) on account of the harm it would cause to the setting of the synagogue.

It is our understanding that Historic England offered to conduct a study in cooperation with the City of London to explore the contributors to the synagogue's significance, but that this offered was not accepted. The following work therefore documents the significant harm that overshadowing from 31 Bury St would cause to the synagogue's significance. This is rooted in an understanding of the unique history, religious meaning, architecture, and use of the site.

This work considers sources that may be unfamiliar to planing officers due to their unfamiliarity with Jewish texts, and records associated with Bevis Marks Synagogue. It is our hope that officers will see this as an opportunity to become better acquainted with wider range of materials than they've previously encountered, and as such will find themselves better acquainted with the significance of Bevis Marks Synagogue, and therefore why infringement to its remaining sky-view is wholly unacceptable in planning terms.

Chapter 2: Important Sources

In order to understand the significance of Bevis Marks Synagogue, it is essential to be familiar with both Jewish religious traditions and sources, as well as the collections of Bevis Marks Synagogue. On account of barriers associated with cultural understanding, language, and accessibility, many of these materials will be largely inaccessible to to those outside of the Jewish community, and indeed outside of the Bevis Marks Synagogue community. The following paragraphs therefore set out a brief introduction to them.

A. Religious Law

The primary text of Jewish law is the Hebrew Bible, though more specifically the Pentateuch (Five Books of Moses). This is often referred to as the Written Law. This distinguished it from what is otherwise called the Oral Law, which are Jewish religious traditions found in later Jewish works, in particular in the massive work called the Talmud (Babylonia, 6th century). The Talmud includes interpretations of the Biblical word, as well as additional rabbinical traditions, that together comprise the form that Judaism takes in its post-Biblical era.

In medieval times, additional Jewish communities took root outside of the Middle East, in particular in Spain and in France. These became known as Sephardi and Ashkenazi, respectively, and while largely the same, each community evolved in somewhat different ways religiously and culturally. For Sephardi Jews, the primary religiously legal work that outlines and directs their traditions is the *Shulhan Arukh* (R Yosef Karo, 16th century).

Beyond these sources, more localised traditions evolved following the Spanish Inquisition, particularly amongst those Sephardi Jews who remained in the West (the Atlantic), and those who settled in the former Ottoman Empire. The Western Sephardi Jews were known for their acculturation and rational Judaism, and those in the east for their religious mysticism.

The Western Sephardi Jews are otherwise known as the Spanish & Portuguese Jews, and are those who re-established London's Jewish community in 1656. They then opened Bevis Marks Synagogue in 1701, England's first purpose-built synagogue since Jews were expelled in 1290 by King Edward I.

B. Communal Records

The community at Bevis Marks Synagogue kept detailed records of their activities. As the only Jewish community, the 'synagogue' oversaw all of the the needs of its community. Their records therefore include minutes from all of this various activities which includes education, health, charity, and worship. These records are housed in the Metropolitan Archives and can be accessed with permission from the Spanish & Portuguese Jewish community.

The archives at large (kept in several other locations) also include historic photographs, prints and paintings, as well as religious objects produced by skilled craftsman, including Huguenot silver and fabric makers, and other archival materials.

Recordings of the synagogue's musical traditions have also been made and are freely available on its website. This is an incredibly important element in the community's intangible heritage, which is preserved and maintained at Bevis Marks Synagogue.

Of course, the most important element of the collection, is Bevis Marks Synagogue itself, which, together with its setting, remains largely as it was when it was opened in 1701.

Taken together, the collection makes up one of the most intact and important community Judaica collections in the world. The collections are vast. Those who study them are always discovering new materials and insights into the history, functioning and nature of this important community.

However, what makes the collection most remarkable is the living nature of it. That is to say, the interplay between the tangible and intangible heritage in a living historic community, that has remained active in its synagogue, in the City of London, for over three centuries. If any one element of this interplay is lost, then the collection in its entirety decreases in its value and significance.

Chapter 3: Brief Introduction to the Bevis Marks Synagogue and Community:

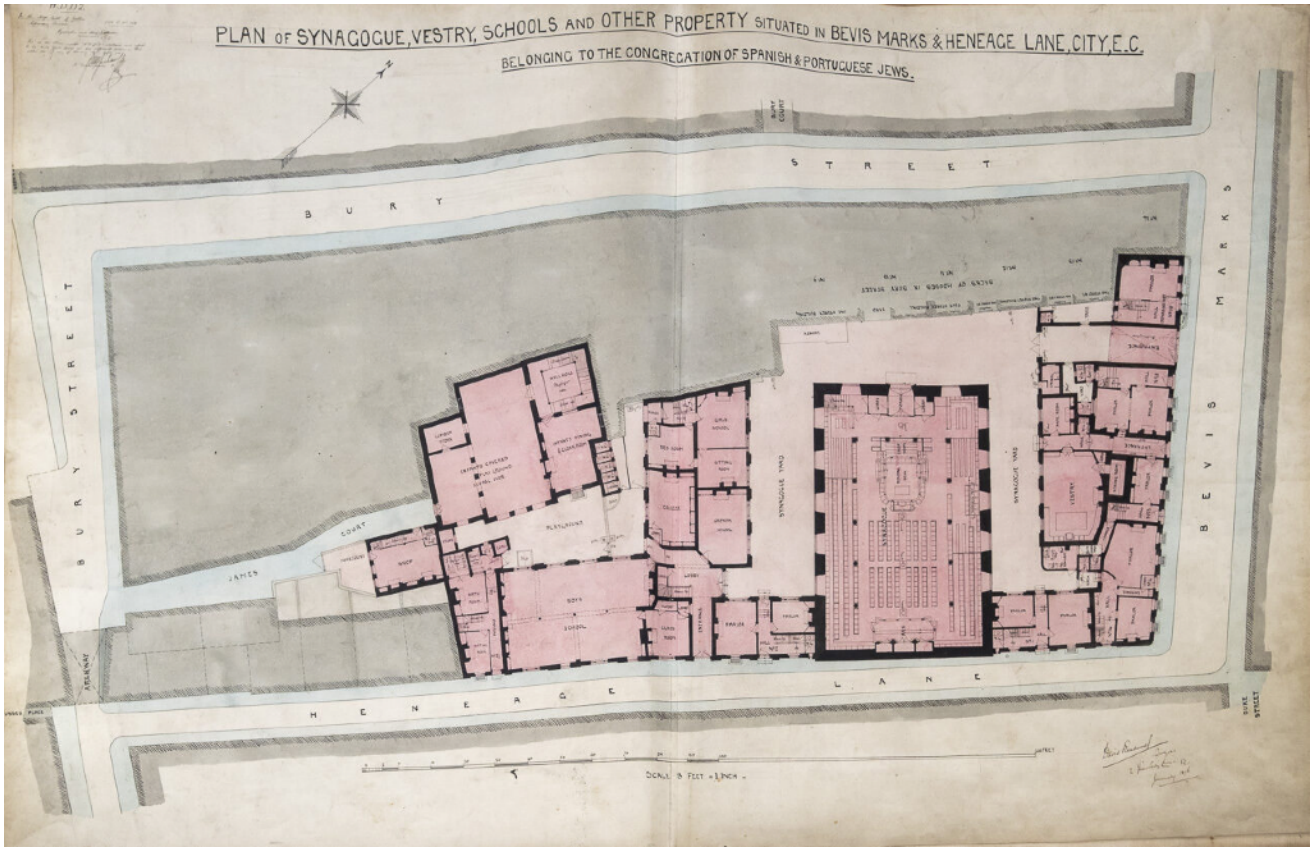
As stated abouve, one of the the most important elements of significance to Bevis Marks Synagogue is the interplay between the historic building, its setting, and the community who has always worshiped there.The setting of the synagogue, its architectural purity, and the ability of its community to continue to use it for worship are therefore key to understanding the synagogue's significance. This sections lays out a brief history of the synagogue itself and its community.

A. The Synagogue Site

Bevis Marks Synagogue was built by Spanish & Portuguese Jews, who first settled in London in the 1650s. The community was fleeing persecution in Spain and Portuguese due to the Inquisitions that had been established there in the preceding centuries. In London they found safety and the freedom to worship openly. They first worshiped in makeshift conditions in a converted synagogue in Creechurch lane, opened in 1657. As the community grew, they sought to construct a purpose-built synagogue on Bevis Marks. To this end they initially leased the land called Plough Yard, and later in the 1700s successfully purchased it outright.

Bevis Marks Synagogue was built from 1699-1701. It is the oldest synagogue in the UK, the only non-Christian house of worship in the City of London, and likely the only synagogue in Europe, or the world, in regular use dating back to its opening in the early eighteenth century. The synagogue was constructed by master builder Joseph Avis, likely according to the design of a Mr. Ransy produced in the years before the synagogue was built.

The synagogue was situated prominently in a courtyard and surrounded by a series of low-rise communal buildings, including schools, housing, offices, ritual baths, and a kosher shop. Through these, the community maintained numerous charitable organisations, including alms houses, medical facilities, and burial facilities on Mile End Road. The community continues to maintain many of these institutions, though their locations have moved across London. Some of the site was redeveloped in the late nineteenth century, though the contours of the site remain largely the same as they were in 1701, with the synagogue dominating its setting.



B. The Community Over Time

Over the centuries many important English Jews have attended Bevis Marks Synagogue, including Prime Minister Benjamin Disraeli, Philanthropist Sir Moses Montefiore, and national boxing champion Daniel Mendoza. Members of the community fought for Britain in the World Wars, including the first Jew to be awarded the Victoria Cross, Frank de Pass. Over sixty members of the community lost their lives fighting for Britain and their names appear on the synagogue's outer wall next to its main doorway. Bevis Marks Synagogue is widely considered the 'Cathedral Synagogue' of British Jewry, akin to St Paul's Cathedral for the Church of England.

The synagogue continues to function as regular place of Jewish worship, in line with its original traditions, and is populated with descendants of those who worshipped there when the synagogue was first opened in 1701. This community is augmented by other Jews living in Central London, City workers, students and visitors to London. The synagogue is also used for weddings, Bar and Bat Mitzvahs, Livery instillation services, national Jewish commemorations, major guest speakers, and other similar events.

Over the past number of years the synagogue has been constructing a new visitor centre with support from the NLHF. Due to this disruption the synagogue has been forced to scale back some of its services that were in place pre-covid. It continues to be open for some weekday services, and for all Sabbaths and Festivals. It is the intent of the community to resume full services with the opening of it centre in May 2025. The visitor centre hopes to welcome over 25k visitors each year, with weekday mornings dedicated to school groups from across the country and local area coming to learn about Judaism.

**Typical Anticipated Week at Bevis Marks Synagogue. Does Not Include Many Additional Festivals.*

*	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8am	Morning Prayers	Morning Prayers	Morning Prayers	Morning Prayers	Morning Prayers	Morning Prayers	Morning Prayers
9am	Morning Prayers						Morning Prayers
10am	Visitors	School Visits	School Visits	School Visits	School Visits	Visitors	Morning Prayers
11am	Visitors	School Visits	School Visits	School Visits	School Visits	Visitors	Morning Prayers
12pm	Visitors	Visitors	Visitors	Visitors	Visitors	Visitors	Morning Prayers
1pm	Visitors/ Prayer	Visitors/Prayer	Visitors/Prayer	Visitors/Prayer	Visitors/Prayer	Visitors/ Prayer	Morning Prayers
2pm		Visitors	Visitors	Visitors	Visitors	Visitors	
3pm	Special Events	Visitors	Visitors	Visitors	Visitors	Visitors	
4pm	Special Events	Visitors	Visitors	Visitors	Visitors		
5pm	Special Events						
6pm	Special Events/ Prayer	Lectures/Prayer	Social Event/ Prayer			Sabbath Prayers	Sabbath Afternoon Prayers
7pm	Special Events	Lectures	Social Event			Sabbath Prayers	Sabbath Afternoon Prayers
8pm		Lectures	Social Event			Sabbath Prayers	
9pm			Social Event				

Chapter 4: Massing and Scale: The Synagogue's Setting

It is clear from a variety of sources that Bevis Marks Synagogue was constructed to dominate its setting. For those coming to it, the scale of the synagogue would have dominated amongst its surrounding. The following section sets out an understanding of the synagogue in relation to the area around it, and why further massing, particularly set behind it from the viewpoint of the courtyard entry area, would undermine this historic and religious setting.

This perspective was confirmed by the last planning decision in 2022 that ruled that a tall building at 31 Bury St was inappropriate on account of its overbearing nature on the Bevis Marks Synagogue. This goes beyond the notion of the juxtaposition of new and old, but particularly the experience of Bevis Marks Synagogue as viewed from within the synagogue courtyard.

Indeed, the Tulip inspection confirmed this notion by stating that every additional visible tall building further erodes the historic character of the courtyard setting. This is surely the case, when considering a tall building that would constitute the backdrop to the 1701 synagogue, and as such its massing would cause a grievous harm to the synagogue's protected setting which is necessary for understanding its historic, architectural and religious value. As such it would cause significant harm to its significance.

A. Historic Setting: Secluded Courtyard

Bevis Marks Synagogue is set in a courtyard. According to historians from the past century, this was for the purpose of secluding it from view on account of persistent anti-Jewish sentiment that had remained despite the Jewish community having already been established in the City of London for over four decades. According to some, there may have even been a regulation that required the synagogue be hidden from view off the main street.

More recently, some have suggested that placing the synagogue in a courtyard may have been reflective of the synagogue's prominence, as a way of giving it breathing room and removing it from the clatter and mess of the thoroughfare. Indeed, originally the synagogue courtyard was likely closed off with a solid wooden door, though since the nineteenth century this was been an iron gate permitting glimpses of the synagogue inside.

Whilst public buildings surround the courtyard, they are largely out of view as one enters the courtyard, thus maintaining this historic sense of seclusion. This historic experience can only be maintained by keeping the synagogue's backdrop clear of any overbearing intrusion, a context that would be lost should 31 Bury St be granted approval. There is an important difference between a secluded and an oppressive setting.

B. Religious Intent

According to Jewish religious tradition, a synagogue is meant to be the tallest building in an area. This is codified in Shulhan Arukh chapter 150 (OH). The chapter heading is 'The Building of a Synagogue and that it Should be Tall'. Below you can see the regulations requiring that the synagogue maintains this prominent position, even to the point of restricting heights of buildings constructed afterwards.

150:2 - The synagogue must be built at the height of the city, and it should be raised until it is taller than the usable parts of all other buildings,

150: 3 - If someone built/raised his house higher than the synagogue, some say that we force him to lower it.

The objective of these rulings are to ensure that the synagogue, and what it represents remains prominent amongst those coming to worship. Erosion to this sense of scale, erodes both the religious values that the synagogue's physical prominence represents, and its historic setting.

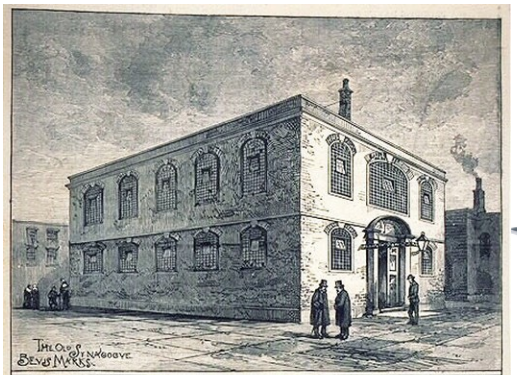
While no renderings have been found of the road Bevis Marks, a drawing from 1890 shows that at least in relation to the buildings next to the synagogue, the synagogue rose in view above them. At the very least, this sense of prominence would have been felt from within the courtyard setting, with no other buildings in view rising around it. It is this sense of scale, that must be preserved to maintain this important religious sense of prominence of Bevis Marks Synagogue mandated by Jewish tradition.

C. Architectural Intent

Beyond this, the synagogue's prominence on the urban landscape, at least from within the courtyard itself, was architecturally part of the original intent of its construction. The plan for Bevis Marks Synagogue was being crafted already in the 1690s. This took place following the Glorious Revolution when William of Orange came to the throne of England in 1688. The led to an increase in migration from the Netherlands and the Sephardi community located there. Amsterdam's Portuguese Jews had themselves completed construction of a new synagogue just a few years before in 1675.

The Amsterdam synagogue largely followed the model constructed by Rabbi Jacob Judah Leon. Leon was more widely known as Templo on account of a plan he drew of Solomon's Temple. It caused a stir and was even exhibited to King Charles II of England.The model placed the ancient Temple in a courtyard surrounded by ancillary buildings, with the Temple sitting prominently in the middle. This model was followed in the Amsterdam synagogue, as the contemporary synagogue in Jewish thought is considered a miniature of of the ancient Temple.

Bevis Marks Synagogue, constructed shortly afterwards, largely followed this paradigm, setting the synagogue in a courtyard, with prominence in relation to the buildings in view all around it. This prominence was not achieved in the manner of church spires, but through the massing of the synagogue itself in contrast to the buildings in view around it. This prominence is only maintained by ensuring its scale continues to dominated its surroundings, by carefully managing visible growth around it.



Bevis Marks Synagogue, 1890

Amsterdam Synagoge

Templo Model With the Temple Situated Atop a Buttressed Temple Mount

Chapter 5: The Sky View in the Synagogue's Setting

The protection of the synagogue's clear sky-view backdrop helps ensure the synagogue retains its historically important prominence as experienced from within the synagogue courtyard. The framing of the synagogue with the sky is what ensures this. However, beyond this, the sky view itself is intrinsic to the understanding of the synagogue and its use.

A. The Synagogue Name

The synagogue is commonly known as Bevis Marks on account of its location on this street. However, the synagogue's actual name is *Sha'ar Hashamayim*. This is Hebrew for 'The Gate of Heaven/Sky'. The origin of this term for a synagogue is in Genesis and the dream of Jacob and the ladder, where he views angels ascending and descending. Upon waking, Jacob exclaimed, 'How awesome is this place! This is none other than the house of God, and this is the gate of heaven' (Gen 28:17). According to Jewish tradition this location was Temple Mount in Jerusalem, hence the connection between House of God and Gate of Heaven.

In Hebrew the word *Shamayim* means both heaven and sky (as in the first verse in Genesis). This is rooted in a religious perspective that relates to heaven as it does to sky, hence the common looking upward to the sky when referring to God or heaven. As such, the sky backdrop is essential to understand the very essence of the synagogue congregation 'The Gate of Heaven/Sky' with its name etched in Hebrew above the synagogue gate and door.

The erosion of this sky view, in such a central location, set immediately behind the synagogue, that would result from 31 Bury St, should therefore be considered a significant harm to the synagogue's significance, and as such should be avoided.

B. *The Synagogue Emblem*

Beginning in the seventeenth century London's Sephardi community annually presented the Lord Mayor with a silver gift. While the exact design of this gift evolved over time, it always included the depiction of a Biblical scene, that of a sentry standing outside the Biblical Tabernacle/Meeting Tent, set in nature. The scene includes clouds and a tree..

The emblem was the official seal of the congregation, and was used on synagogue stamps, and on other communal objects. In these smaller objects the scene was reduced in size, making the original version important for understanding its full meaning.

The Tabernacle traveled with the Israelites as they encamped in the desert for forty years between their exodus from Egypt and eventual arrival in the Holy Land. It continued to serve as the central place of worship until ancient Israel constructed their permeant Temple in Jerusalem. As stated above, the modern-day synagogue is considered a miniature version of these earlier national temples.

That the community chose to illustrate the ancient Tabernacle with a demonstrable sky-setting, and then adopt it as their community's emblem, reinforces the degree to which the sky view is an intrinsic element of the synagogue's significance. Indeed, in the community emblem, the Hebrew name of the congregation 'Gate of Heaven/Sky' is written around it.

C. Religious Worship

The Sky view is also integral to Jewish religious worship. Each month members of the Jewish community go outside during the waxing moon. Upon viewing the moon in the night sky, a prayer is recited (*Kiddush Levana*). It is a prayer for renewal that relates to the moon's renewal during this phase of the moonscape.The prayer is typically said after the evening service, outside of the synagogue, as is both common today and as is depicted in historic drawings of the ritual from the time when the synagogue was constructed.

The synagogue has produced an extensive study of this ritual in the community's history and the negative impact that would be caused by tall buildings to the synagogue's south. These conclusions largely match those of BRE's independent review of GIA's report. However, in brief we will restate several points here.

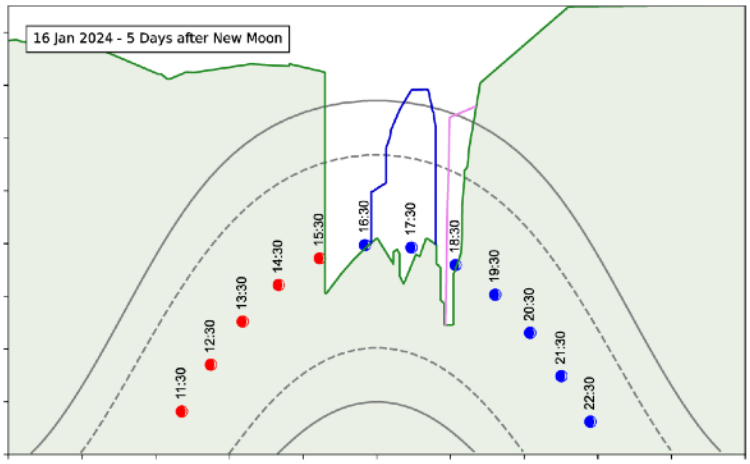
The prayer can only be recited on certain days of the month, and should 31 Bury St be permitted, it would obstruct these views entirely during several months of the year, and significantly reduce them in the remaining months. As such it would cause significant harm to the worship of this ancient Jewish community.

D. Religious Meaning

The use of the synagogue for Jewish worship is intrinsic to its significance. Part of that ritual requires views of the sky, and therefore any obstruction of this view must be considered a significant harm to the synagogue's significance.

Beyond this, views of the sky are important religiously and culturally in Judaism. Traditionally Jews observe the appearance of stars in in the night sky to determine the conclusion of the Sabbath, and the position of the sun in the daytime sky to determine the times for prayer.

Construction of a large tower to the synagogue's south would largely block-out these culturally important views, as the celestial bodies cross the sky along the southern horizon.



1695 Amsterdam
Haggadah

Chapter 6: Courtyard Viability: At Risk

The courtyard at Bevis Marks Synagogue plays an important role in both the community's religious and communal activities, and for the synagogue's new heritage centre and cafe. The community at Bevis Marks Synagogue make regular use of the synagogue's courtyard for celebrations and gatherings. Furthermore, the courtyard will function as an important feature on the synagogue's new NLHF supported Heritage Centre, as both a key point for interpretation, and as a setting for its cafe.

The amenity of this space is therefore of utmost importance for the continued vitality and economic viability of this historic community. While it is difficult to quantify amenity, clearly the courtyard is a more enjoyable space with open sky, and without imposing and oppressive buildings overbearing and overshadowing the site. The degradation of the site that would be caused by the proposed tower is therefore both wholly inappropriate, and against planning policy that protects the viability of heritage assets. This negative impact should therefore be avoided.

A. Communal Use and Value

The courtyard at Bevis Marks Synagogue serves several different functions beyond just an access point for the synagogue and as the key location for appreciating the synagogue in its historic settings. The courtyard is also where the community gathers on regular occasion throughout the year.

The courtyard is often used by the worshiping community as a place to hold outdoor receptions following services, whether on a regular Sabbath, or on occasions when the congregation is celebrating a Bar or Bat Mitzvah. The community also utilises the courtyard for the celebration of Succot, Tabernacles, which is celebrated by enjoying food in the outdoor *succah,* hut. Beyond this, the courtyard is also used for Jewish after-work gatherings such as BBQs and other social events.

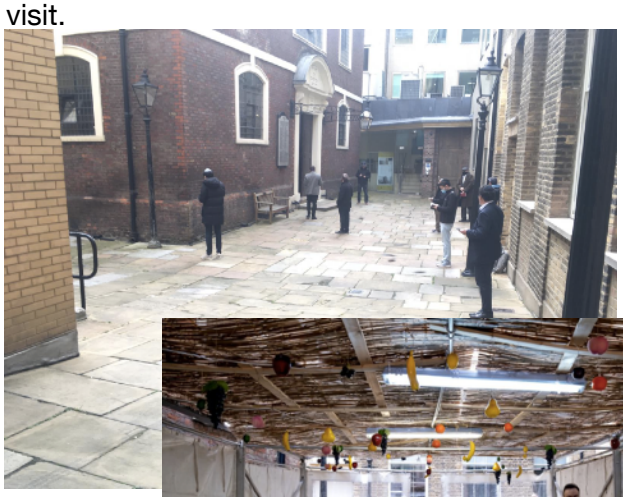
Additionally, the courtyard is utilised as part of wedding celebrations, which are held regularly at the synagogue throughout the year. In this space people take their first photographs as a married couple, attendees cheer as a couple makes their way out of the synagogue and into the vehicle awaiting them in the courtyard, and some even hold their wedding reception in this space.

B. Economic Impact

A core element in the synagogue's future viability, is its ability to generate income through weddings rentals, heritage visitors and new cafe. This will allow the community to maintain its Listed Building status, which would be at risk without this additional support.

The importance of the courtyard for weddings has already been explained. Beyond this, the courtyard will serve as an important function in the community's new heritage centre. It is here that visitors will purchase their entry tickets and collect their audio guides. In the courtyard the site's interpretation will begin with an introduction to the synagogue and an explanation of its setting.

Finally, another key component of the heritage centre's success is its new cafe. This will include outdoor seating, which is expected to be an important feature in encouraging visitors to purchase food and drink and to extend their visit.



Chapter 7: Light, Windows, and the Synagogue's Architecture

While the majority of this study has focused on the exterior of the synagogue as it pertains to setting, setting within the framework of Bevis Marks Synagogue also pertains to its interior. This is because the synagogue was constructed with its relationship to its setting as central to a user's experience of the interior.

According to the Talmud, 'A person should pray only in a house with windows' (Berakhot 34b). Rabbi Yosef Karo in his work *Bet Yosef* quotes a number of explanations for this law. They include reasons that relate to the practical use of windows for light, as well as the religious significance of views to the outside during prayer through the windows.

For these reasons, further obstructing the synagogue's windows would cause a practical, architectural and religious harm to the synagogue, that relates to its very significance as a heritage and communal site of the greatest value. Most importantly, further reduction in synagogue's daylighting will render parts of the synagogue largely unusable for worship, the core function of the synagogue.

It is clear from historic drawing and paintings of the synagogue's interior that the synagogue was once bathed in light, as it was intended, both religiously and architecturally. Further reducing this feature should be considered a substantial harm to the synagogue's significance as the section below explains.

Bevis Marks Synagogue, 1890

A. Lighting Levels

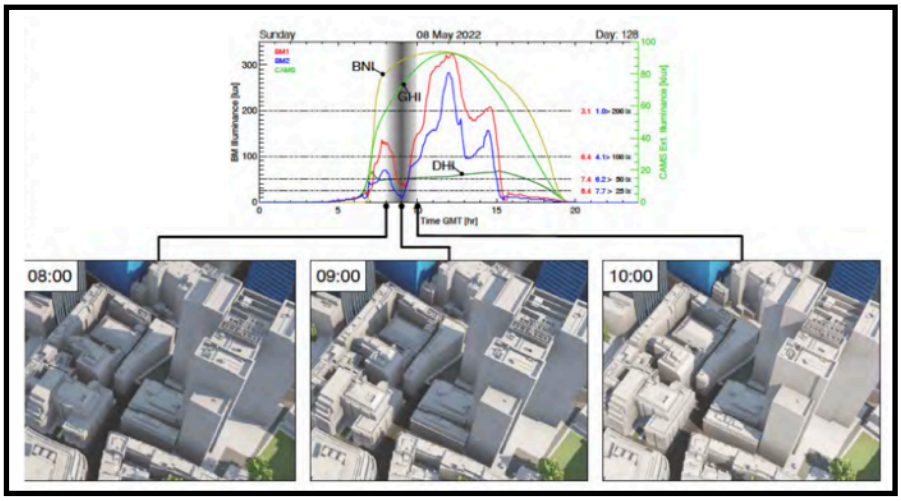
Rabbi Jonah of Gerona (thirteenth-century, Catalonia) explains the reason for requiring windows in a synagogue is that one's (religious and devotional) intention is better when there is light. Indeed, the Shulhan Arukh rules that 'One who builds facing a window of a synagogue, it is not sufficient to leave 4 cubits space, because it (ie. the synagogue) needs a lot of light' (OH 150:4).

Of course, sufficient light is necessary even for the most basic uses of the synagogue, such as the ability to read the prayer book. The synagogue's lighting is reliant on diffused light. Without this, congregants are forced to huddle beneath the limited artificial lighting that was added by the synagogue's columns in the 1920s. This is the case during an after-dark service (aside for special occasions when the synagogue lights its chandeliers, which takes hours to do so, and days to replace). However, during the day, when the congregation's main services are conducted, it is possible to sit anywhere throughout the synagogue and still read the prayers.

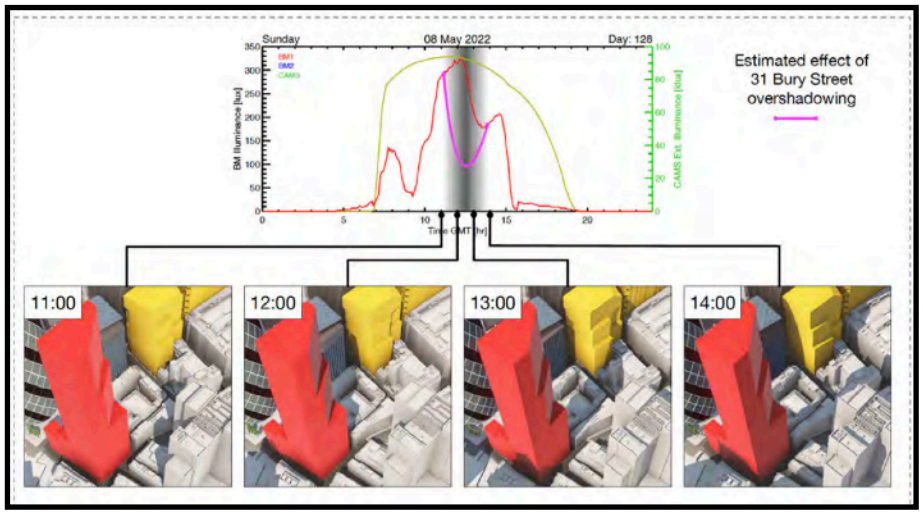
The synagogue has taken interior light-measure readings over the past two years with surprising results. The readers demonstrate that at times interior light levels can reach several hundred lux of light during the morning/midday hours. However, the readers also show a significant drop in light levels in the morning, a phenomenon which is explained by the construction of a tall building (1 Creechurch) twenty-five meters to the synagogue's east less than a decade ago.

It is reasonable to predict a similar impact would be caused by the proposed 31 Bury st as it would be located to the synagogue's south, at a similar distance away, and which will be twice in height as the previously mentioned tower.

Should light levels be further reduced during the daytime, this would render large areas of the synagogue as unusable for worship, the core function of the synagogue. This would constitute a significant harm to the synagogue as it infringes on the synagogue's core significance as a working synagogue, the only one in the world in continual use dating back to 1701.



1 Creechurch Impact



31 Bury St Impact

B. Interior Sky Views and their Religious Value

According to the preeminent Talmudic commentary Rashi (Rabbi Shlomo Yitzhaki, France, 11th century) the purpose in requiring a synagogue to have windows is because it exposes the sky, reminding us of our subordination to Heaven. Direct views of the sky still remain from the synagogue gallery. However, these views would be largely lost should permission be granted to 31 Bury St.

Furthermore, the ability to perceive change in the time of day is also important for the language of Jewish prayer. Indeed, as Jews pray three times a day, in morning, afternoon and evening, the language of Jewish prayers reflect these times of day for meaning. These include optimism at new beginnings (morning), endurance (midday), and protection from danger (night).

The ability to perceive the changing times of day is therefore integral to the Jewish tradition and the original construction of the synagogue as its windows on all four sides enabled this. The construction of taller buildings immediately surrounding the synagogue have historically all been capped at their current heights, with sloped roofs, to help preserve these remaining views. If taller buildings are constructed beyond these, these benefits will be lost.

C. Architectural Heritage

The synagogue's windows are an important architectural feature of the building. Its prominent Wren style windows are common amongst important buildings of this era. Their clear-pane glass was considered an innovation, improving upon the wonky glass of medieval times. It is for this reason that earlier churches often had small windows, and employed stained-glass, as the relatively opaque windows of the time were of little other value.

Strikingly, with the innovations of the era, prominent buildings began to feature large clear windows, that both allowed light to enter, and enabled views through them. This had a noticeable impact on the experience of places of worship, changing them from foreboding places with dark interiors, to light-filled spaces.

However, the increase in massing of the synagogue's surrounding area has led to a degradation of the synagogue's interior lighting and views out. Aside for the religious implications of this change, this eroding condition is rendering the synagogue's windows as increasing pointless, undermining their architecture interest and utility. This is a harm to the very fabric of the synagogue, as the lack of use of the windows in their original manner constitutes a harm to the ability to 'read' the space and its architectural intent and significance.

Chapter 8: Conclusion

The above study has demonstrated the wide-ranging harm that the proposed tower at 31 Bury St would cause to the significance of Grade-1 Listed Bevis Marks Synagogue. On account of its massing to the synagogue's south it would undermine the architectural, cultural, and religious integrity of the site and its continued use as a functioning synagogue.

The proposed tower will cause harm to the synagogue's:

1. Original architectural intent, which is its physical prominence over its setting. This prominence is important architecturally, historically, and religiously.
2. Religiously important sky views.
3. Interior light levels necessary for prayer.
4. The purposeful functioning of the synagogue's architecturally significant windows.
5. The amenity of the communally important courtyard.
6. The meaning of the synagogue's name.
7. The economic viability of the site.

The harms are so far reaching, and relate to the core significance of the synagogue in both architectural, historical and communal terms, that it is difficult to classify these harms as anything but substantial.

For these reasons, it should be clear that a tall building on the site of 31 Bury St is completely inappropriate in planning terms and should be refused just as it was two years ago.

Appendix 3: Daylight Study prepared by Professor John Mardaljevic and Dr Stephen Cannon-Brookes

Bevis Marks
Daylight Report 2024

Prof. John Mardaljevic
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Dr. Stephen Cannon-Brookes
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Prepared for the Sephardi and Portuguese Congregation

FINAL VERSION: 26/10/2024

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Contents

Executive Summary 1

1 Introduction 2

2 Measuring the Daylight Levels in Bevis Marks 2
- 2.1 Daylight Measurement Strategy . . . 3
- 2.2 Determining Daylight Provision from the Measured Illuminance Data . . . 3
- 2.3 Daylight Monitoring Results . . . 5
- 2.4 The Importance of Reflected Sunlight . . . 6

3 Predicting Daylight Levels in Bevis Marks 13
- 3.1 Climate-Based Daylight Modelling . . . 13
- 3.2 Outline CBDM Evaluation of Bevis Marks . . . 14

4 Conclusions 15
- 4.1 Daylight Measurement . . . 15
- 4.2 Daylight Prediction . . . 15

Statement of Compliance and Declaration 16

Appendix 17

A Critique of the Waldram and Daylight Factor Methods 17
- A.1 Waldram, Trotter and the daylight factor . . . 17
- A.2 Absolute and relative values of illumination . . . 18

B Daily Plots of Illuminance Data 19

List of Tables

1 Average daily hours key illuminance values achieved on a monthly basis . . . 5

List of Figures

1 Location of Hanwell loggers BM1 and BM2 . . . 3

2 Illustration showing superposition of bars in Figure 3 . . . 5

3 Typical daily hours lux levels achieved. Monitoring period 26th February 2022 to 2nd April 2024 . . . 6

4 Example data plot for 8th May 2022. The external sun and sky conditions – derived from satellite data – are indicated by the green and yellow lines. The solid green line shows the global horizontal illuminance (GHI), and the dashed green/grey line shows the diffuse horizontal illuminance (DHI). The yellow line shows the beam normal illuminance (BNI). . . . 7

5 Renderings showing the progression of shadow cast by One Creechurch Place on Bevis Marks for a clear sky day (8th May) between the hours 08:00 and 10:00 (GMT). The significant effect of the overshadowing on measured Bevis Marks illuminance levels is readily apparant. 9
6 Renderings showing the progression of shadow cast by 31 Bury Street (red tower) on Bevis Marks for a clear sky day (8th May) between the hours 11:00 and 14:00 (GMT), and estimated likely reduction in measured Bevis Marks daylight levels caused by the overshadowing on such a day. 10
7 Data from Figure 6 focussing on illuminance at BM1. Renderings as before showing the progression of shadow cast by 31 Bury Street (red tower) on Bevis Marks for a clear sky day (8th May) between the hours 11:00 and 14:00 (GMT). 11
8 Data from Figure 6 focussing on illuminance at BM2. Renderings as before showing the progression of shadow cast by 31 Bury Street (red tower) on Bevis Marks for a clear sky day (8th May) between the hours 11:00 and 14:00 (GMT). 12
A1 Distribution of preferred daylight factor values (after Phillips R. O. Phillips. "An historical outline of the concepts and terminology of daylight". In: *Proc. CIE v2, Zurich, Switzerland* (1955)) 19

Executive Summary

Bevis Marks Synagogue, 1884 (John Crowther)

In order to determine if the Bevis Marks Synagogue is at risk from significant loss of daylight due to proposed nearby developments, it is necessary to establish two matters of fact:

1. The current levels of daylight provision in the Synagogue.
2. The expected reduction in daylight provision to the Synagogue caused by the proposed developments.

The first can only be determined reliably by direct measurement of daylight levels in the Synagogue over extended periods. The second can only be estimated using a realistic prediction method which minimises the uncertainty in the outcome.

This report focuses on the findings of a long-term measurement campaign to quantify the daylight provision in the core of the Bevis Marks Synagogue. The measurements, using two conservation grade light meters, were carried out over a two year period from 26th February 2022 to 2nd April 2024. The results attest to the fact that the Synagogue is a functionally daylit building for considerable periods of the year: over winter the daylight levels are barely adequate, but they improve considerably for the other nine months of the year. The data also show that the daylight levels in the Synagogue are at a 'tipping point' – significant additional shadowing by nearby proposed developments could plunge the Synagogue into permanent winter daylight conditions, or worse. The report also provides guidance regarding the selection of a suitable prediction method to estimate the loss of daylight provision to the Synagogue caused by the proposed developments.

1 Introduction

To set the picture, the Synagogue was designed to be well daylit with large windows on all four sides to meet spiritual and functional aspects of worship. That the latter has always involved the congregation reading during services is confirmed by the presence of lockers beneath every seat, some of which predate the Synagogue and that are still in use. Members of the congregation expect to be able to read during services using daylight, which as of tradition plays a role in the timing of services. This helps to explain why the generous number of original chandeliers were not electrified during the 20th century, since, as in early the 18th century, appropriate candles are expensive and their use is reserved for special services. Furthermore, it is the minimal level of material change since then that earned the current Grade 1 listing of the building, its fabric and furnishings.

Whilst the building and its use remain largely unchanged the same cannot be said for its surroundings and this has had a substantial effect on the daylighting of the interior. The narrow surrounding courtyard has maintained a perimeter of space though one increasingly shaded from the sky by the rising height of adjacent buildings. The consequences of this can be read in the interior with redundant boxes above the upper level windows on the SE and SW walls. In the past these housed blinds to diffuse direct sunlight, now largely blocked by adjacent buildings. Change has been incremental, but always in the direction of lower daylight levels as the height of these buildings increased. An earlier report by surveyor GIA presented the current conditions showing how little direct view of the sky remains from the Synagogue's windows.

Site measurements of light levels indicate that the interior is on the cusp of losing workable levels of daylight under most sky conditions. Review of existing conditions and schematic modelling indicates that the daylighting in the Synagogue is now largely dependent on reflected light from the surfaces of the buildings surrounding the courtyard. This is most obvious during periods of sunlight, the absence of which is easily perceived since levels are considerably lower when sky is overcast. At these times, the current and relatively sparse electric lighting on the columns is utilised, but, as reported, even when members of the congregation tend to congregate around the columns, light levels are insufficient for these to be an effective alternative means of illumination.

2 Measuring the Daylight Levels in Bevis Marks

Illuminance is a measure of the amount of light (i.e. the luminous flux per unit area) under normal viewing conditions. Illuminance has units of lux (often shortened to lx). Illuminance is the quantity most commonly used to assess illumination levels in buildings. For example, to specify the artificial lighting in an office, usually something in the range 300 lx to 500 lx. Verification of an artificial lighting system would be carried out using a light meter, e.g. taking measurements at various desks to ensure that the design intent (say, 300 lx across the desks) has been achieved.

In contrast to artificial lighting, verification of daylight levels in a building is far more complex. The quantity and quality of daylight in buildings is continually varying due to the natural changes in sun and sky conditions from one moment to the next. These changes have components that are: random (e.g. individual cloud formations); daily (i.e. progression from day to night); and, seasonal (e.g. changing day length and prevailing weather patterns). Accordingly, to be reliable, any measurement of daylight provision in a building must be taken over a period of at least a full calendar year. Daylight levels measured outside vary enormously.[1] For example, in the Midlands (UK), typical daylight levels at noon vary from ~60,000 lx in summer to around ~10,000 lx in winter. Peak values under the sunniest conditions can reach in excess of ~90,000 lx. Half an hour after sunrise (or half an hour before sunset), daylight levels will be around ~1,000 lx. Thus, any meaningful assessment of daylight provision indoors must describe the degree of occurrence of,

[1] Here we refer to measurements taken on the horizontal plane in an unobstructed outdoor setting, i.e. with a full view of the hemispherical sky vault.

usually, particular daylight levels throughout the year. How this was achieved for Bevis Marks is described in the sections that follow.

2.1 Daylight Measurement Strategy

Two logging illuminance meters (referred to as BM1 and BM2) were used to record the daylight levels in the Synagogue. The meters employed were newly purchased Hanwell ML4701 LUXBUGS, which are widely used to record light levels in museums and heritage buildings. They were placed in the central area of the ground floor (Sanctuary), as can be seen in Figure 1. BM1 was located on the edge of the Bimah and BM2 on the pew closest to the Ark, both at the height normal for holding a prayer book. These locations were selected to capture the range of daylight levels across the core of the ground floor area of the Synagogue. Perimeter areas, under the balconies were not considered as scaffolding was present around the ground floor windows at the start of monitoring. Light levels were recorded at five minute intervals continuously throughout the monitoring period. There were occasional losses of data due to the practicalities of long-term light monitoring in an occupied space. For example, due to internal memory overflow. And one occasion when BM1 was misplaced for a number of weeks following a wedding.

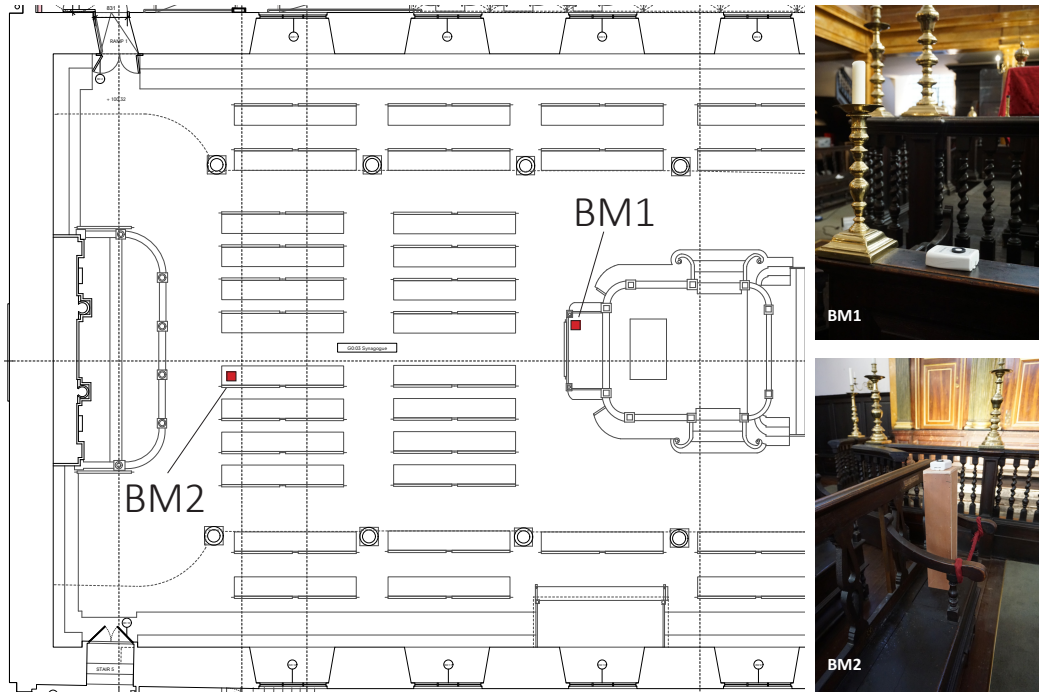

Figure 1: Location of Hanwell loggers BM1 and BM2

2.2 Determining Daylight Provision from the Measured Illuminance Data

The monitored illuminance data used to quantify the long-term daylight provision in the Synagogue were recorded between 26th February 2022 and 2nd April 2024 by logging meters BM1 and BM2. In total, there were 767 full days of measurements where either one or both loggers were recording (equivalent to approximately 2.1 years of data). The rationale for processing the data into metrics that characterises the overall daylight provision in the Synagogue was as follows:

i. All the measured data should be used to avoid bias in the presentation of the results, i.e. no 'cherry-picking' of measurements.

ii. Results should be presented on a monthly basis to reveal how the daylight levels vary across the year.

iii. For each month, the average daily occurrence in hours of key daylight levels should be determined from the measurements.

iv. The key daylight levels used should relate to human visual performance requirements and preferences.

v. Results are normalised to monthly totals, but there should be no interpolation/estimation of missing data.

The key illuminance levels used to characterise the daylight provision are: 25 lx, 50 lx, 100 lx and 200 lx. The minimum key value of 25 lx is approximately the lowest illuminance level advised for use in public spaces when lighting needs to be strictly limited, invariably for conservation purposes in museums and art galleries to protect particularly delicate artworks, fabrics, etc. A more typical illuminance level used for all but the most delicate artefacts is 50 lx. Daylight illuminance levels around 50 to 100 lx are typical in many residential rooms under moderately bright overcast skies. Under daylight illumination levels of 50–100 lx, occupants may often be content to read books/newspapers without additional lighting providing the eye has adapted and there are no contrast issues (e.g. bright window in the field of view). All the same, they might *prefer* illuminances greater than 100 lx, particularly if reading for extended periods. Note that the response of the human eye is such that a doubling of brightness is perceived as a significant change, whereas a smaller incremental edition might be difficult to notice. Accordingly, the final illumination level for consideration is set to 200 lx.

The likely implications for the occupants of the Synagogue experiencing the various illuminance ranges are summarised as follows:

- Below 25 lx many occupants, particularly the elderly, will experience difficulty reading. Those who are not too elderly and with good eyesight may manage to read provided the daylight levels are above 10 lx.[2] The Synagogue is likely to appear drab and gloomy.
- Between 25–50 lx many of the occupants may be able to read printed paper, provided the text is not too small. The Synagogue is likely to appear dim at the lower end of the range (∼25 lux), but noticeably brighter at the upper end (∼50 lux)
- Between 50–100 lx most/all of the occupants are likely to be able to read printed paper without undue discomfort, unless they have marked visual impairment. The Synagogue is likely to begin to appear pleasantly daylit.
- Between 100–200 lx there are likely to be few significant improvements in visual performance for the majority of occupants. However, the synagogue is likely to be perceived as having a markedly more pleasant/daylit appearance.
- Illuminances greater than 200 lx probably not needed for the majority of tasks carried out in the Synagogue. However, the additional brightness imparted would be perceived as further 'enlivening' the Synagogue, and therefore welcomed by the occupants.

[2] Young adults with standard vision can generally read fairly well down to illuminance levels in the range 5–10 lx. However, as visual acuity declines by roughly a factor of three between the ages of 20 and 60, older people invariably need multiples of these light levels to read, often supplemented by eye correction (glasses etc).

2.3 Daylight Monitoring Results

The illuminance levels in the Synagogue recorded at locations BM1 and BM2 in the period between 26th February 2022 and 2nd April 2024 are presented in both tabular and graphical form. The data were processed to show the average daily occurrence in hours that the four key illuminance levels were achieved (i.e. exceeded) on a monthly basis. A summary of the complete analysis is shown in Table 1. For example, for the month of February, an illuminance of 25 lx was achieved (on average) for 5.8 hrs (BM1) and 2.6 hrs (BM2).[3] Whereas an illuminance of 50 lx was achieved (on average) for 2.3 hrs (BM1) and 0.3 hrs (BM2).

	BM1				**BM2**			
	Hours lux value achieved				Hours lux value achieved			
Month	>25 lx	>50 lx	>100 lx	>200 lx	>25 lx	>50 lx	>100 lx	>200 lx
Jan	2.8	0.6	0.0	0.0	1.0	0.0	0.0	0.0
Feb	5.8	2.3	0.9	0.0	2.6	0.3	0.0	0.0
Mar	6.4	3.2	1.4	0.4	4.6	1.7	0.4	0.0
Apr	8.9	6.3	3.1	1.3	7.0	3.7	1.4	0.3
May	10.2	7.4	3.9	1.6	8.8	5.5	2.4	0.5
Jun	10.6	8.2	5.6	2.5	9.3	6.9	3.5	0.7
Jul	10.7	7.9	4.5	1.7	9.1	6.2	2.6	0.6
Aug	9.6	7.2	3.9	1.8	8.3	5.3	2.4	0.7
Sep	8.5	5.4	2.2	0.7	6.8	3.1	1.0	0.1
Oct	6.4	2.7	0.9	0.0	4.1	1.2	0.0	0.0
Nov	3.3	0.8	0.0	0.0	1.3	0.0	0.0	0.0
Dec	1.9	0.2	0.0	0.0	0.7	0.0	0.0	0.0

Table 1: Average daily hours key illuminance values achieved on a monthly basis

The data in Table 1 are presented graphically in Figure 3. Two bars are shown for each month, the left hand is data from BM1 and the right from BM2. Colour coding is employed to show the number of hours achieved for the four threshold light levels (25, 50, 100 and 200 lx). Note the 'bars' are superposed rather than stacked – see illustration in Figure 2. For example, in July, 25 lx is achieved (on average) for 10.7 hrs (BM1) and 9.1 hrs (BM2). Whereas 200 lx is achieved for 1.7 hrs (BM1) and 0.6 hrs (BM2).

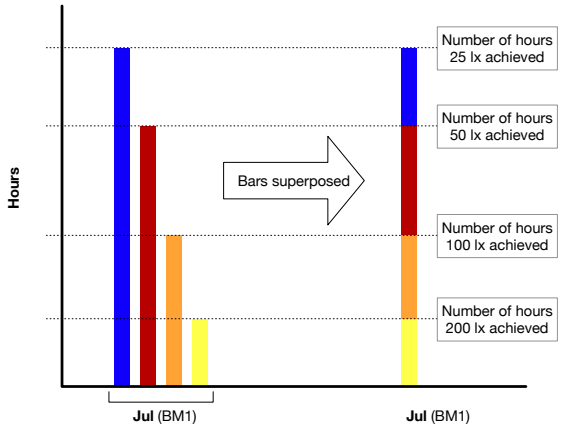

Figure 2: Illustration showing superposition of bars in Figure 3

[3] Decimal hours are shown, e.g. 1.5 hrs equals 1 hr 30 mins.

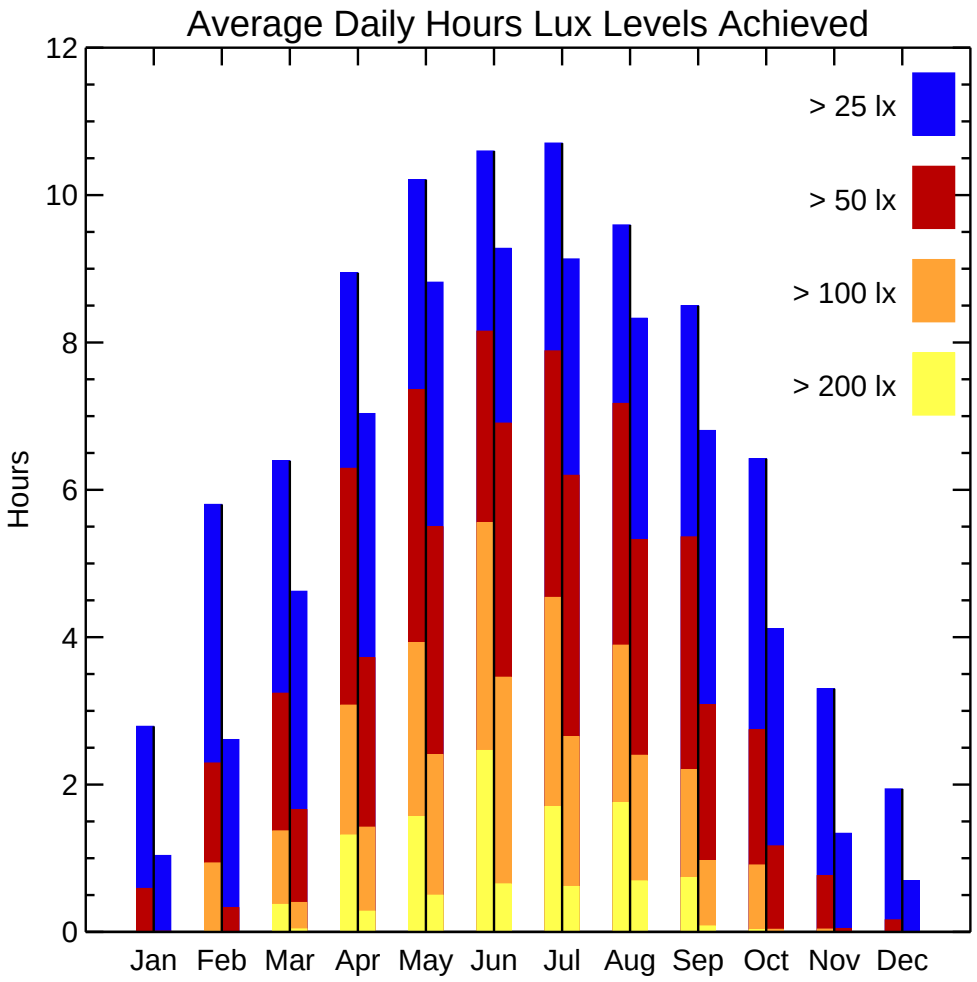

Figure 3: Typical daily hours lux levels achieved. Monitoring period 26th February 2022 to 2nd April 2024

2.4 The Importance of Reflected Sunlight

It was revealing to compare the measured internal illuminance values with simultaneous data for the sun and sky conditions at the same location. The external condition data used were global horizontal irradiation, diffuse horizontal irradiation and beam normal irradiation at 15 minute intervals for the entire monitoring period to date. The global and diffuse horizontal irradiation data were sourced from the Copernicus Atmosphere Monitoring Service (CAMS). This service provides freely available satellite-derived radiation data covering Europe, Africa, the Middle East and parts of South America at various time resolutions. The period of record is February 2004 to the present day (with up to two days delay). CAMS satellite irradiation data has undergone numerous validation studies and shown to be a reliable indicator of conditions on the ground.[4,5]

CAMS irradiation data for the precise latitude/longitude coordinates of the Synagogue were

[4]German Salazar et al. "Solar irradiance time series derived from high-quality measurements, satellite-based models, and reanalyses at a near-equatorial site in Brazil". In: *Renewable and Sustainable Energy Reviews* 117 (2020), p. 109478.

[5]Laurent Vuilleumier et al. "Accuracy of satellite-derived solar direct irradiance in Southern Spain and Switzerland". In: *International Journal of Remote Sensing* 41.22 (2020), pp. 8808–8838.

downloaded from the Solar Radiation And Meteorological Data Services website.[6] The CAMS irradiation data for the duration of the monitoring period (26th February 2022 to 2nd April 2024) were converted to illuminance values using the Perez luminous efficacy models. Global horizontal illuminance (GHI) is a measure of the total light from the sun and sky received by an (unobstructed) horizontal surface. Diffuse horizontal illuminance (DHI) is the same as global horizontal illuminance but excluding the contribution of solar radiation. When the two quantities are plotted, the amount by which GHI is greater than DHI indicates the degree of sunniness. A bell-shaped curve for GHI indicates largely clear sky conditions throughout the day. If however the lines of GHI and DHI overlap (i.e. when GHI equals DHI), this indicates that the sky at that time was largely overcast with no significant solar contribution, i.e. GHI $\simeq$ DHI. The beam normal illuminance (BNI) is a measure of the direct sun intensity measured normal to the direction of the sun. The BNI can often exceed GHI on clear days at times when the sun altitude is low – and thus its contribution to horizontal illuminance is small compared to its intensity measured normal to the beam.

Our use of the CAMS-derived illuminance data is illustrative. However, examination of the correspondence between the internal daylight levels and the (external) illumination levels confirmed our hypothesis that reflected sunlight makes a significant contribution to the daylight inside the Synagogue. And also that the effect is important throughout the year. An example plot of the data collected on 8th May 2022 is used to illustrate the substantial contribution of reflected sunlight to the internal daylight levels in the synagogue, Figure 4. The red and the blue lines show the illuminance measured at points BM1 and BM2, respectively, at 5 minute intervals. The time axis shows GMT.

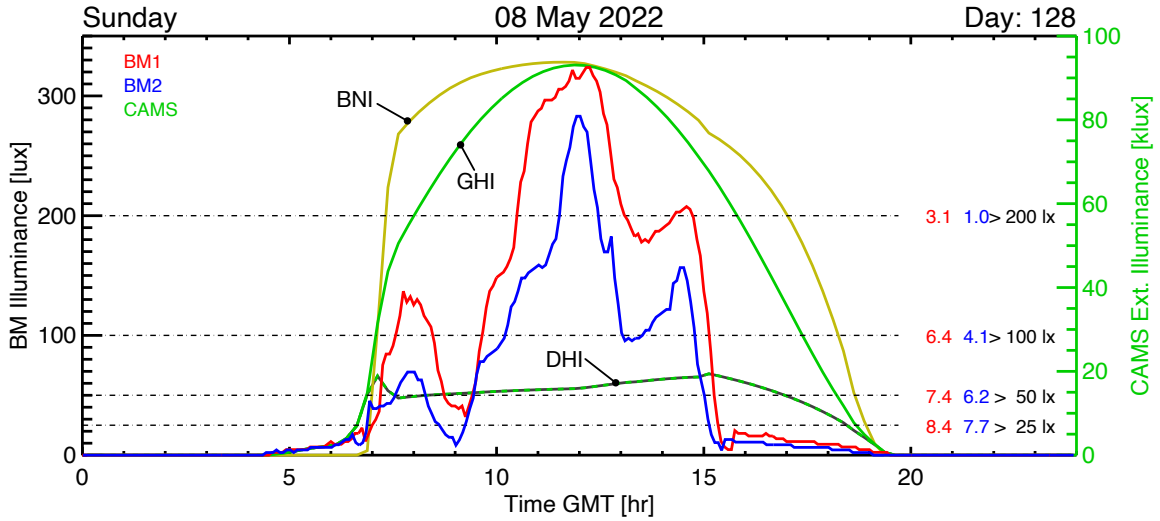

Figure 4: Example data plot for 8th May 2022. The external sun and sky conditions – derived from satellite data – are indicated by the green and yellow lines. The solid green line shows the global horizontal illuminance (GHI), and the dashed green/grey line shows the diffuse horizontal illuminance (DHI). The yellow line shows the beam normal illuminance (BNI).

For this bright day, the maximum recorded illuminances were ~320 lux (BM1) and ~280 lux (BM2), at the same time around 12:00. The key illuminance values are indicated by horizontal dashed lines. The CAMS-derived external illumination data is over-plotted using the same time axis, however the scale used is now the right-hand y-axis in green, with units of klux, i.e. thousands of lux. For this day, The peak GHI (and, coincidently, peak BNI) were both ~95 klux (i.e. ~95,000 lux) around noon. Whereas DHI (the illuminance from the sky only on

[6] https://www.tsv.soda-pro.com

the horizontal) was ∼20,000 lux. The data shows that this was a largely clear, sunny day with just a small degree of cloud around dawn (07:00). All 767 daily plots of illuminance measurements in the Synagogue showing also the satellite-derived external illuminance conditions are presented in Appendix B of the report.[7]

A conspicuous feature evident on many of the sunny days (see Appendix B) is a large dip in both internal light level readings around 08:30 to 10:00, followed by another rise. This distinct dip is quite broad (lasting approximately two hours) and does not result from reduced external irradiation – GHI is steadily increasing until around noon. Instead, it is evident that this feature results from the progression of the path of the sun and its interaction with the surrounding buildings. It appears that, on this day from around 06:00 and until 08:00, the Synagogue receives reflected sunlight from the surrounding buildings. Then, between 08:30 and 09:30, the reflected sunlight decreases to a minimum because the sun is being blocked by a nearby surrounding building – One Creechurch Place (∼80 m tall from ground level). Thereafter, when the sun has progressed past the obstructing building, the reflected sunlight increases as rapidly in the next hour as it declined in the previous hour. Such a persistent feature cannot be explained by random variations such as cloud patterns, etc.

This assertion is confirmed by examining the internal illuminance plot (Figure 4) alongside simulated time-lapse images for that day which show the progression of sunlight and shadow around the immediate vicinity of the Synagogue. The illustration given in Figure 5 shows renderings of the shadow patterns for the hours 08:00, 09:00 and 10:00.[8] These renderings reveal the important contribution of reflected light from the immediate surroundings to the daylight levels in the Synagogue. At 08:00 the shadow cast by One Creechurch Place has begun to encroach on the Synagogue courtyard, and the measured daylight levels begin to decline steeply. At around 09:00 the shadow cast by One Creechurch Place results in the maximum reduction in daylight levels recorded at both locations in the Synagogue: below 50 lux for BM1 and below 25 lux for BM2. At 10:00 the shadow cast by One Creechurch Place begins to recede from the courtyard, and the illuminance levels measured in the Synagogue begin to rise steeply, eventually attaining values around 300 lux each.

The example above showing the overshadowing effect of One Creechurch Place on daylight levels in the Synagogue can be used to illustrate the likely effect that (proposed building) 31 Bury Street would have on Synagogue daylight levels on a similarly clear day during the middle of the year. The illustration is shown in Figure 6 using the same presentation to that employed for One Creechurch Place. For 31 Bury Street, its shadow would begin to encroach on the Synagogue courtyard area around 11:00, and between 12:00–13:00 the courtyard area is heavily shaded. By 14:00 the shadow from 31 Bury Street has largely receded from the Synagogue courtyard area. The illuminance plot used previously is repeated, but now the likely effect on the measured daylight levels at BM1 and BM2 (caused by 31 Bury Street) has been illustrated by superposing on the BM1/BM2 lines 'best guess' estimates indicating how they might change – magenta curve for BM1, cyan curve for BM2. The *actual* degree of light reduction could be less or greater than that shown – but, given the similarities with the example of One Creechurch Place, it is likely to be of that order. The same data for BM1 and BM2 are shown disaggregated (with the less significant details removed) in Figures 7 and 8, respectively.

The contribution of reflected sunlight might appear to be a subtle aspect of the daylight dynamics in the Synagogue. However, it is revealing of a wider reality that the *prevailing* (i.e. yearly) daylight in Bevis Marks depends overwhelmingly on reflected sunlight and skylight from nearby building surfaces. Consequently, any reduction of the daylight provision in the Synagogue that might result from additional overshadowing can therefore only be assessed using a computer simulation technique that accounts adequately for reflected sunlight and skylight.

[7] Note, two versions of the report have been prepared: with and without the 64 pages containing the 767 daily plots.

[8] The shadow pattern images were generated using the VuCity software and supplied with permission for use by HGH Consulting.

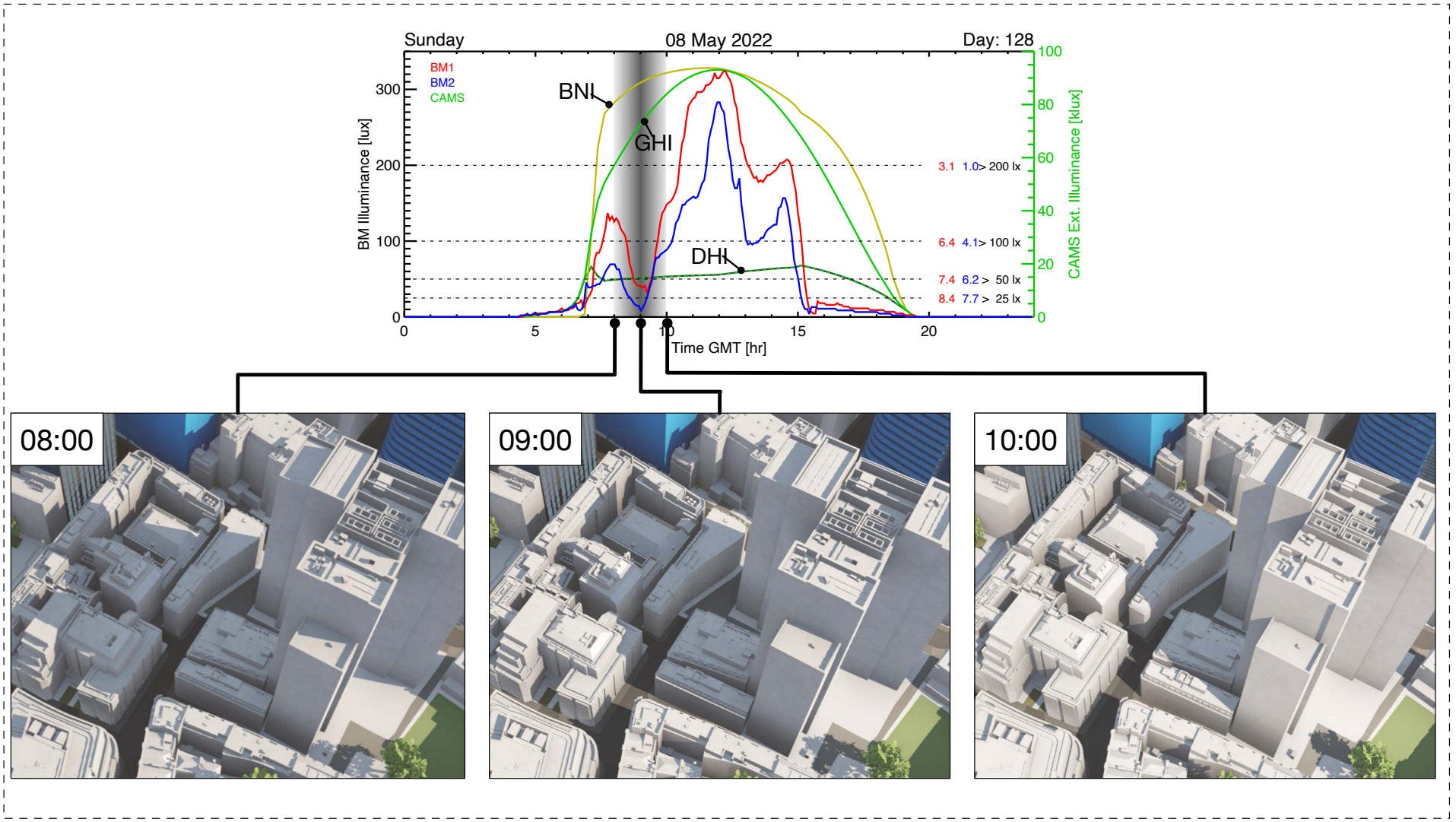

Figure 5: Renderings showing the progression of shadow cast by One Creechurch Place on Bevis Marks for a clear sky day (8th May) between the hours 08:00 and 10:00 (GMT). The significant effect of the overshadowing on measured Bevis Marks illuminance levels is readily apparant.

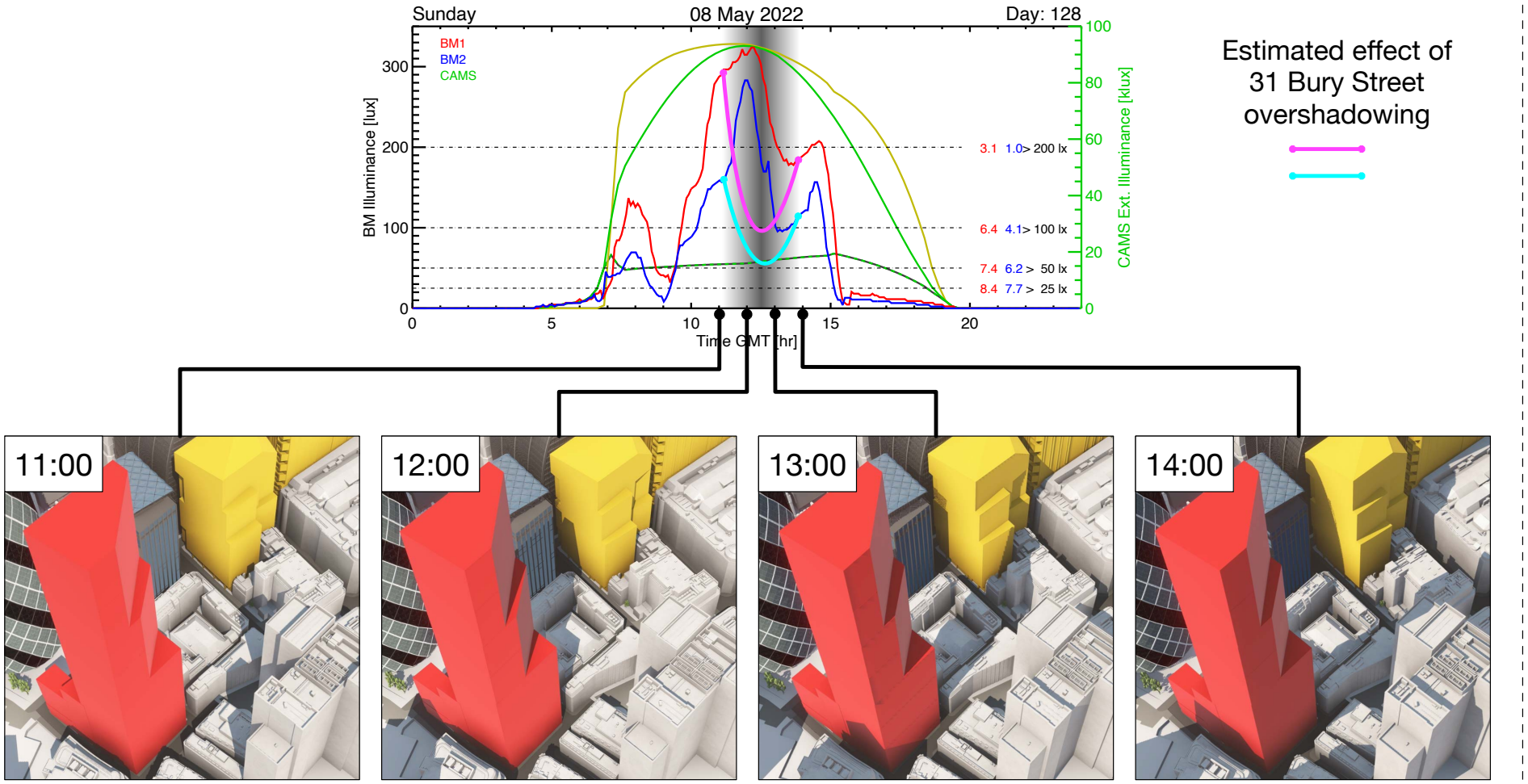

Figure 6: Renderings showing the progression of shadow cast by 31 Bury Street (red tower) on Bevis Marks for a clear sky day (8th May) between the hours 11:00 and 14:00 (GMT), and estimated likely reduction in measured Bevis Marks daylight levels caused by the overshadowing on such a day.

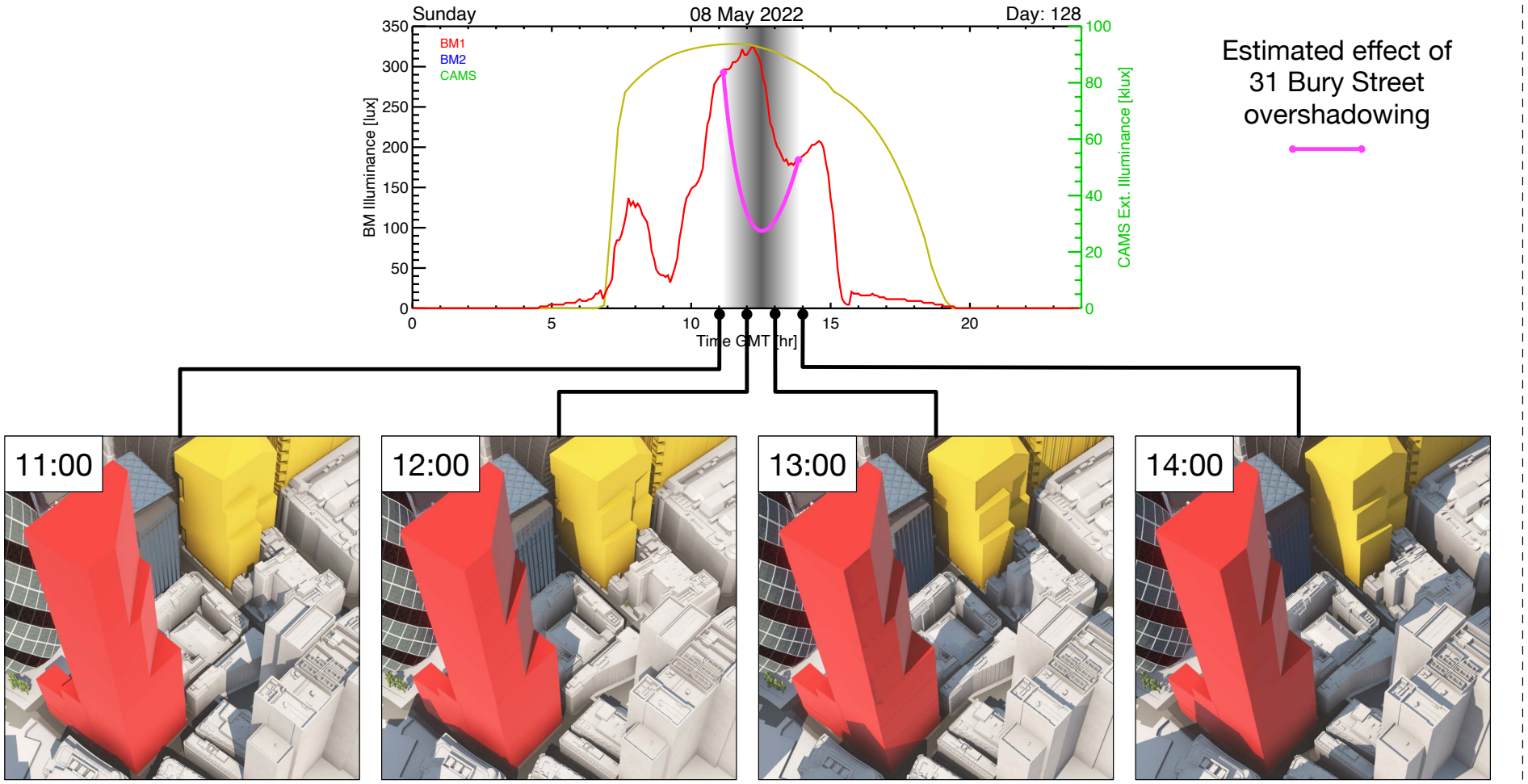

Figure 7: Data from Figure 6 focussing on illuminance at BM1. Renderings as before showing the progression of shadow cast by 31 Bury Street (red tower) on Bevis Marks for a clear sky day (8th May) between the hours 11:00 and 14:00 (GMT).

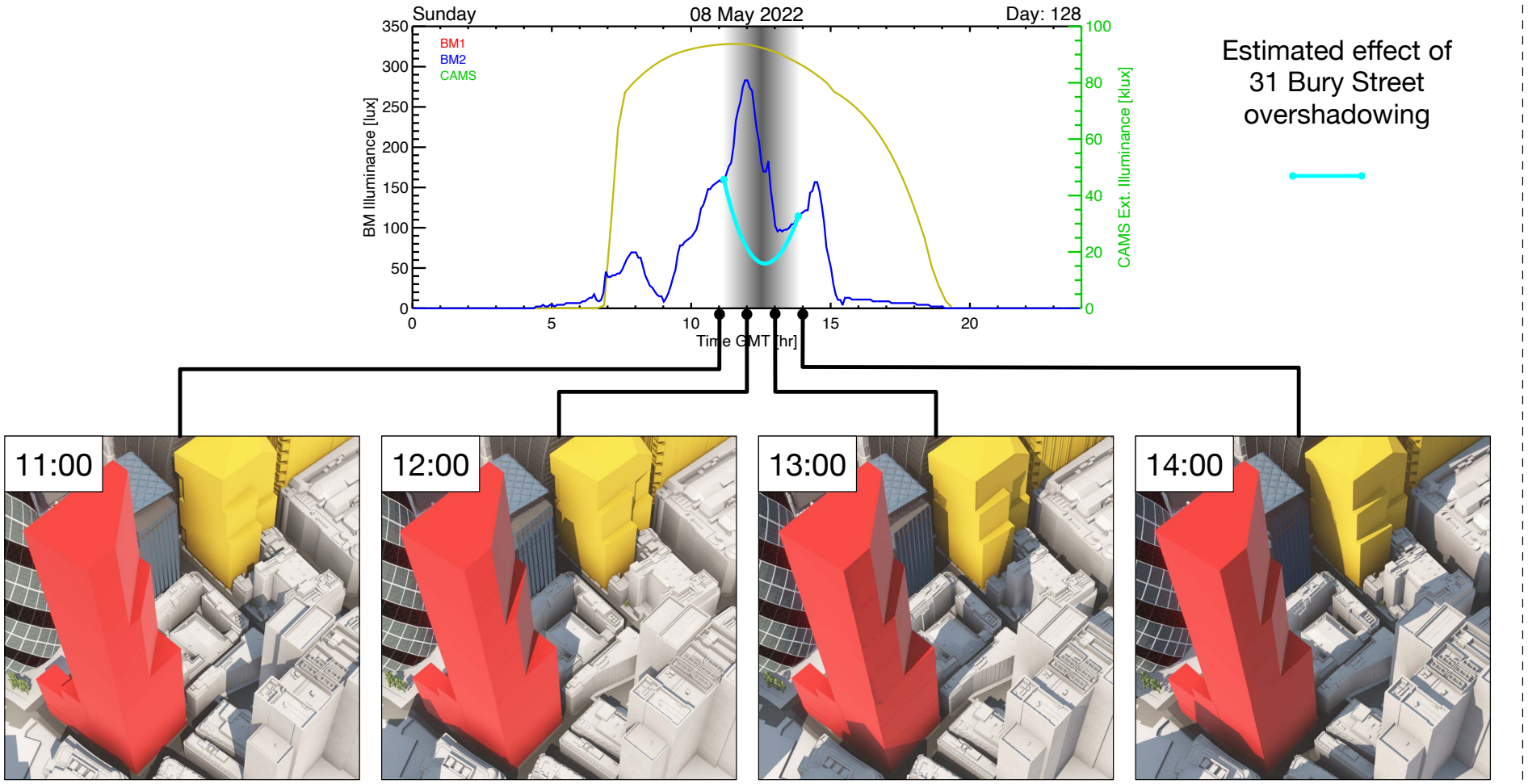

Figure 8: Data from Figure 6 focussing on illuminance at BM2. Renderings as before showing the progression of shadow cast by 31 Bury Street (red tower) on Bevis Marks for a clear sky day (8th May) between the hours 11:00 and 14:00 (GMT).

3 Predicting Daylight Levels in Bevis Marks

As noted in the Executive Summary, the reduction in daylight provision to the Synagogue caused by any proposed development(s) can only be estimated using a realistic prediction method which minimises uncertainty in the outcome. In other words, the prediction method used must be able to faithfully model the prevailing nature of the daylight levels experienced by the occupants of the synagogue – and as proven by direct measurement.

Commonly used prediction methods employed by surveyors at the planning stage do not model actual daylight levels, i.e. illuminance lux levels. Instead, they model various proxies of daylight provision under enormously simplified conditions. For example, a single unchanging sky condition (uniform or standard overcast brightness pattern) with no contribution from sunlight. These methods do not predict absolute levels of illuminance (e.g. as measured in the Synagogue), instead they predict percentage ratios. The basis and intrinsic limitations of these methods are described in Appendix A.

3.1 Climate-Based Daylight Modelling

In the mid to late 1990s, Mardaljevic developed and validated a daylight simulation approach that would later become known as Climate-Based Daylight Modelling, or CBDM.[9,10] The CBDM 'engine' developed by Mardaljevic was founded on the *Radiance* Lighting Simulation System.[11] Although lacking a formal definition, CBDM is widely taken to be the prediction of any luminous quantity (illuminance and/or luminance) using realistic sun and sky conditions derived from standardised climate data, i.e. hourly annual weather files. Thus, CBDM predicts annual profiles of absolute quantities, such as illuminance, which are directly comparable to what can be measured in buildings. For example, with a suitably detailed 3D model, it would be possible to predict daylight levels at points in the Synagogue, and then process the annual simulation data to produce plots of daylight provision similar/identical to that shown in Figure 3.

The widespread adoption of the *Radiance* lighting simulation system[12] and, ultimately, CBDM was due in part to the outcomes from validation studies which demonstrated quite remarkable prediction accuracy, e.g. within ±10% of measured values.[13] Around this time, the accuracy of physical scale models for daylight assessment was called into question, with validation studies showing large discrepancies between illuminances measured in a scale model and the full-size building under the same conditions.[14] CBDM as a tool for practical application steadily gained traction during the first decade of the millennium. Landmark projects such as daylighting the New York Times Building[15] and the Central Park Tower daylight injury evaluation[16] (also in New York) helped to demonstrate the potential of this powerful new technique.

In 2013 the UK Education Funding Agency (EFA) made CBDM a mandatory requirement for the evaluation of designs submitted for the Priority Schools Building Programme (PSBP). School designs submitted to the PSBP must achieve certain 'target' criteria for the useful daylight illuminance metric. This was believed to be the first major upgrade to mandatory daylight

[9] J. Mardaljevic. "Simulation of annual daylighting profiles for internal illuminance". In: *Lighting Research and Technology* 32.3 (2000), pp. 111–118.

[10] Working independently and a little later, Christoph Reinhart also developed a similar technique, but with a different formulation and, arguably, less rigorously validated.

[11] G. Ward Larson et al. *Rendering with Radiance: The Art and Science of Lighting Visualization*. San Francisco: Morgan Kaufmann, 1998.

[12] Ibid.

[13] J. Mardaljevic. "The BRE-IDMP dataset: a new benchmark for the validation of illuminance prediction techniques". In: *Lighting Research and Technology* 33.2 (2001), pp. 117–134.

[14] S. W. A. Cannon-Brookes. "Simple scale models for daylighting design: Analysis of sources of error in illuminance prediction". In: *Lighting Research and Technology* 29.3 (Sept. 1997), pp. 135–142.

[15] J. Mardaljevic, L. Heschong, and E. Lee. "Daylight metrics and energy savings". In: *Lighting Research and Technology* 41.3 (2009), pp. 261–283.

[16] J. Mardaljevic, G. M. Janes, and M. Kwartler. "The 'Nordstrom Tower': A landmark daylight injury study". In: *CIE 28th Session, Manchester, UK* (2015).

requirements since the introduction of the daylight factor more than half a century ago. In the US, a climate-based daylight metric approved by the IESNA has appeared in the latest version of LEED. The 2018 European Standard for Daylight in Buildings (EN 17037) is the first major standard where the basis for daylight assessment is founded on the annual occurrence of absolute measures of illuminance.[17] This marked a step-change from the traditional daylight factor approach. To assess the daylighting performance of a building design against EN 17037 criteria, the evaluated spaces are rated in terms of the spatial extent and the (CBDM predicted) degree of occurrence of target illuminance values as a fraction of the daylit year.

3.2 Outline CBDM Evaluation of Bevis Marks

In September 2021 we carried out climate-based daylight modelling (CBDM) simulations of an approximate scenario based on the Synagogue and its current surroundings. A 3D model of the Synagogue was created based on detailed drawings, and the nearby buildings estimated to create a simple 'massing' model for the surroundings. The 3D model therefore should be considered to be an approximation until a 3D laser scan of the Synagogue is carried out and a detailed massing model acquired. Accordingly, the CBDM results generated using this 3D model should be considered as illustrative until more accurate building geometry is available. Nevertheless, we believe the 3D model is sufficient to reveal 'broad brush' characteristics of the daylight illumination in the Synagogue. More importantly, the findings support our assertion that the methods commonly used to assess daylight provision in buildings – both for rights of light and planning – are not applicable for the particular case of Bevis Marks because they cannot adequately reveal the *actual* degree of daylight loss resulting from the proposed developments. The rationale for our assertion – given below – necessitates an appreciation of the distinction between directly received light (from the sun or sky) and indirectly received light, i.e. that which arrives from the sun or sky following multiple reflections.

The quantity referred to here as the total annual illumination (TAI) is a measure of all the daylight illumination received at a point in a building for a period of a full year. It is a useful summary metric since it reveals the totality of daylight illumination – from the sun and sky – over a representative period of a full year. Total annual illumination is one of the many metrics that can be predicted using CBDM to indicate the daylighting performance of a space. The CBDM formulation used here is a research-grade daylight simulation tool developed by Mardaljevic and known as the 4 Component Method (4CM). This tool is widely regarded to be the most rigorously validated of all daylight simulation tools, and so serves as a benchmark to assess the accuracy of other CBDM formulations. The 4 Component Method is called so because it predicts, at a point in a space, the total daylight in terms of its four components:

i. Direct sun – light that arrives directly from the sun (usually through a window).
ii. Indirect sun – light from the sun that arrives following one or more reflections, usually from both external (e.g. surrounding buildings, ground, etc.) and internal surfaces (e.g. walls, ceilings, etc.).
iii. Direct sky – light that arrives directly from the sky (usually through a window).
iv. Indirect sky – light from the sky that arrives following one or more reflections, usually from both external (e.g. surrounding buildings, ground, etc.) and internal surfaces (e.g. walls, ceilings, etc.).

Analysing the CBDM predictions for TAI in terms of the four components can, depending on the scenario, greatly enhance the understanding the importance of the various light transfer mechanisms, and how they contribute to the light experienced by the occupants of a building.

The TAI predictions for the core of the Synagogue revealed that around ∼1% of the daylight received over a full year was that arriving directly from the sky, no direct sunlight at all was received. Thus, ∼99% of the daylight illuminating the core of the synagogue is light from the sun

[17] European Committee for Standardization. *EN 17037:2018 - Daylight in Buildings*. 2018.

and the sky reflected off adjacent buildings. Of the reflected light illuminating the core of the Synagogue, about 3/5 is comprised of reflected skylight and the remaining 2/5 by reflected sunlight. We would expect a fully detailed 3D model to give some variation in the relative amounts of the illumination components. However, even if the total of the direct components were predicted to be several times greater, say, 5%, it would not alter the key finding that daylight illumination is dominated by *reflected* light – originating from the sun and the sky in roughly equal proportions. Note, walking around the core of the Synagogue, at best only tiny slivers of sky are directly visible through the windows. Thus, the potential for direct illumination by skylight is very small indeed, and for direct sunlight it must be negligible/zero. And since the estimated massing model of the surroundings was partial, it is not improbable that the direct components of total daylight in the core of the Synagogue could amount to even less than the ∼1% predicted by the illustrative model.

4 Conclusions

4.1 Daylight Measurement

The following assertions can be made from the daylight monitoring evidence collected between 26th February 2022 and 2nd April 2024:

a) The measured daylight levels support the claim made by the users of the Synagogue that it is experienced as functionally daylit space for the majority of the months of the year.

b) The daylight levels during the winter months, however, are often only barely exceeding the threshold needed to perform visual tasks, e.g. reading, appreciation of the space, etc.

c) The measured data supports our observations from site visits that daylight in the core of the Synagogue is comprised almost entirely of reflected light. Reflected sunlight makes a significant contribution to the prevailing daylight levels in the Synagogue, even on partially sunny days which occur much more often than entirely clear-sky days.

It is reasonable therefore to describe the prevailing daylight provision in the Synagogue at present as being at or very close to a 'tipping point'. Consequently, any additional reduction in daylight provision caused by the proposed developments carries the significant risk that the prevailing daylight levels inside the Synagogue could be pushed beyond this 'tipping point', with the Synagogue ceasing to be a *functionally daylit* space. Were that to happen, it could profoundly affect the character, perception and use of the space – bringing into question the continued survival of the only Synagogue in Europe to have held regular services continuously for more than 300 years.

4.2 Daylight Prediction

The evidence collected during the monitoring campaign clearly demonstrates that the only way to reliably predict the daylight loss due to proposed developments is to use Climate Based Daylight Modelling (CBDM). In contrast to the traditionally used methods (see Appendix A), CBDM has the potential to reliably predict the totality of daylight illumination – including the important reflected sun and sky contributions – over representative periods of at least a full year.

Statement of Compliance and Declaration

The authors of this report have prepared it in compliance with norms expected for an expert witness, including possible use of the material in court:

I. We confirm that our report includes all facts which we regard as being relevant to the opinions which we have expressed, and that attention has been drawn to any matter which would affect the validity of those opinions.

II. We confirm that our duty to the Court (should it become a legal matter) as expert witness overrides any duty to those instructing or paying us, that we have understood this duty and complied with it in giving my evidence impartially and objectively, and that we will continue to comply with that duty as required.

III. We confirm that we are not instructed under any conditional fee arrangement.

IV. We confirm that we have no conflicts of interest of any kind other than those already disclosed in my report.

V. We confirm that our report complies with the expected norms for academic practice with regard to acting as Expert Witness.

VI. We confirm that, insofar as the facts stated in our report are within our knowledge, we have made clear which they are and we believe them to be true, and that the opinions we have expressed represent our true and complete professional opinion.

VII. We aware of the requirements of CPR Part 35, practice direction 35 and the Guidance for the Instruction of Experts in Civil Claims 2014.

Prof. John Mardaljevic

Dr. Stephen Cannon-Brookes

24th October 2024

Appendix

A Critique of the Waldram and Daylight Factor Methods

The following contains material from two peer reviewed articles:

- P Tregenza and J Mardaljevic. "Daylighting buildings: Standards and the needs of the designer". In: *Lighting Research & Technology* 50.1 (2018), pp. 63–79
- J. Mardaljevic and J. Christoffersen. "'Climate connectivity' in the daylight factor basis of building standards". In: *Building and Environment* 113 (2017), pp. 200–209

A.1 Waldram, Trotter and the daylight factor

Quantitative measures of daylighting provision evolved from the methods devised in the 19th century to determine some objective basis for the degree of daylight injury (that is, reduced daylight illumination) caused to an existing space by the introduction of some obstruction, e.g. a new building. The Prescription Act 1832 provides for the creation of a right to light where light has been enjoyed for the period of 20 years before a claim to the easement is made.[18] Once a right to light (with regard to a particular window) is determined to exist, the owner of the right is entitled to *"sufficient light according to the ordinary notions of mankind"*. Whilst the 1832 Act essentially enshrined in Common Law the notion of a 'right to light', the determination of what constitutes an *"ordinary notion"* of sufficiency was, initially, largely a matter of judgement supplemented by rough rules of thumb such as the 45° rule, i.e. the vertical angle of sky visible at the centre of the window. The attempts to systematise the assessment of daylight injury date back to at least 1865.[19]

In the 1920s, Percy Waldram determined what was intended to be a precise and objective measure of an *"ordinary notion"* of sufficiency for daylight illumination. This was based on measurements of daylight illumination in buildings combined with subjective determination of sufficiency by a jury of experts. From this study, Waldram determined the so-called "grumble point", i.e. the point in a space at the boundary between sufficient and insufficient daylight from a window. The "grumble point" was defined in terms of the illumination received at that boundary as a percentage of the unobstructed horizontal illumination from a notional average (assumed uniform luminance) sky. The percentage value at the "grumble point" was determined by Waldram's jury to be 0.2%. For practical application of Waldram's "grumble point" in 'rights of light' disputes, surveyors commonly apply the "50/50 rule" to determine if a space is adequately daylit, i.e. no more than half of the space at table-top height should receive less than 0.2% of the sky illumination. Additionally, the percentage value is referred to as the sky factor since, for evaluation purposes, it is a measure of the illumination on a horizontal surface resulting from any direct view of a uniform luminance sky, expressed as a percentage of the horizontal illumination from an unobstructed view of the sky. Neither reflected light nor attenuation from any glazing are accounted for in the 'rights to light' schema.

Whilst Waldram's work is widely credited as providing the basis for the daylight factor, it appears that the idea of using a ratio between inside and outside was first proposed in 1895 by Alexander Pelham Trotter (1857–1947).[20] The origins of the daylight factor (DF) are actually somewhat hazy since there does not appear to have been a seminal paper introducing the approach. The reference to its introduction in 1895 appears to be anecdotal and recalled a number of years later. The daylight factor was conceived as a means of rating daylighting performance

[18] The Prescription Act 1832. "(Regnal. 2 and 3 Will 4)". In: *The Stationery Office, London* (1832).

[19] R.M. Kerr. *On Ancient Lights: And the Evidence of Surveyors Thereon : with Tables for the Measurement of Obstructions*. J. Murray, London, 1865.

[20] J. A. Love. "The evolution of performance indicators for the evaluation of daylighting systems". In: *Industry Applications Society Annual Meeting, 1992., Conference Record of the 1992 IEEE* (1992), 1830–1836 vol.2.

independently of the actually occurring, instantaneous sky conditions. Hence the daylight factor DF was defined as the ratio of the internal horizontal illuminance E_{in} to the unobstructed (external) horizontal illuminance E_{out}, usually expressed as a percentage:

$$DF = \frac{E_{in}}{E_{out}} 100\% \tag{1}$$

However, the external conditions still need to be defined since the luminance distribution of the sky will influence the value of the ratio. At the time that the daylight factor was first proposed it was assumed that heavily overcast skies exhibited only moderate variation in brightness across the sky dome, and so they could be considered to be of constant (that is, uniform) luminance. The assumption of a uniform sky is, of course, in keeping with the notion of rating the performance independently of sky conditions. In the second half of the 20$^{\text{th}}$ Century the daylight factor formulation switched from using the uniform sky to the CIE Standard Overcast Sky.

A.2 Absolute and relative values of illumination

In a 1937 paper P. J. Waldram claimed that: *"The eye is affected by ratio only, and is scarcely aware of huge variations in amount."*.[21] The evidence for this was based on an assessment of the daylight adequacy of 20 spaces carried on both a "bright day" and a "dull day" by a 'jury' of six members (i.e. the data used previously to determine the "grumble point"). Waldram's claim appears to have become the foundation for what is now an 'article of faith' amongst a number of practitioners, i.e. that there is no need to make any consideration of absolute values – the daylight factor ratio is all that is required. Waldram's assertion and the evidence in support of it were examined in a 1955 CIE paper by R.O. Phillips.[22] Phillips notes that:

> *If this investigation did, in fact, support the view that the daylight factor is more important than the actual illumination in determining the adequacy of the lighting, then the values of the daylight factor determined would be substantially the same on both types of day. If on the other hand, it is the illumination which is the more important, a higher value of the daylight factor would be required on a dull day that on a bright one.*

The original report of the 'jury' findings presented by Waldram included the curve shown in Figure A1. This was intended to*"summarise the results concisely and to deduce a figure of daylight factor which may fairly be said to represent the average opinion of the observers"*.[23] Phillips decomposes this curve into the data taken on the bright and dull days respectively. They clearly show different distributions, with a marked preference for a higher daylight factor value on a dull day compared to a bright one: the means were 0.20% (dull day) and 0.09% (bright day). Applying a paired t-test on the data, Phillips notes that: *"Since such a value could only arise by chance once in several millions of cases, the hypothesis that there is no difference must logically be rejected"*. In short, Phillips' analysis of the data makes the convincing case that, contrary to Waldram's assertion, the subjects were in fact expressing a preference for adequate absolute daylight levels rather than relative ones (i.e. daylight factors).

Phillips' paper is potentially of great significance since it offers a robust challenge to a rarely unquestioned assertion that has long been held as a fundamental tenet of daylighting design/evaluation. That is being so, a question presents itself: why has this paper been consigned to near-obscurity? This finding from the Phillip's paper is included here because Waldram's assertion has been so influential that it has framed much of the development of methodologies for the evaluation and testing of daylight performance in spaces. In particular for the case of

[21] P. J. Waldram. "Measuring and predetermining daylight illumination". In: *The Builder* (1937), p. 598.

[22] R. O. Phillips. "An historical outline of the concepts and terminology of daylight". In: *Proc. CIE v2, Zurich, Switzerland* (1955).

[23] Ibid.

Bevis Marks, the preference for *higher* levels of absolute illumination (say, 100 lx rather than 25 lx) would appear to be in accord with what was *actually* determined by Waldram's 'jury'.

It needs to be recalled that, at the time that Waldram's jury carried the assessments, notions of illumination adequacy were very different from what they are today. However, that consideration does not alter the significance of Phillips' re-evaluation of the Waldram study. This and related studies by Waldram also serve as the basis for the "rights to light" schema devised for the determination of daylight injury. In recent years the methodology employed by Waldram has been severely critiqued in a number of papers.[24,25,26,27]

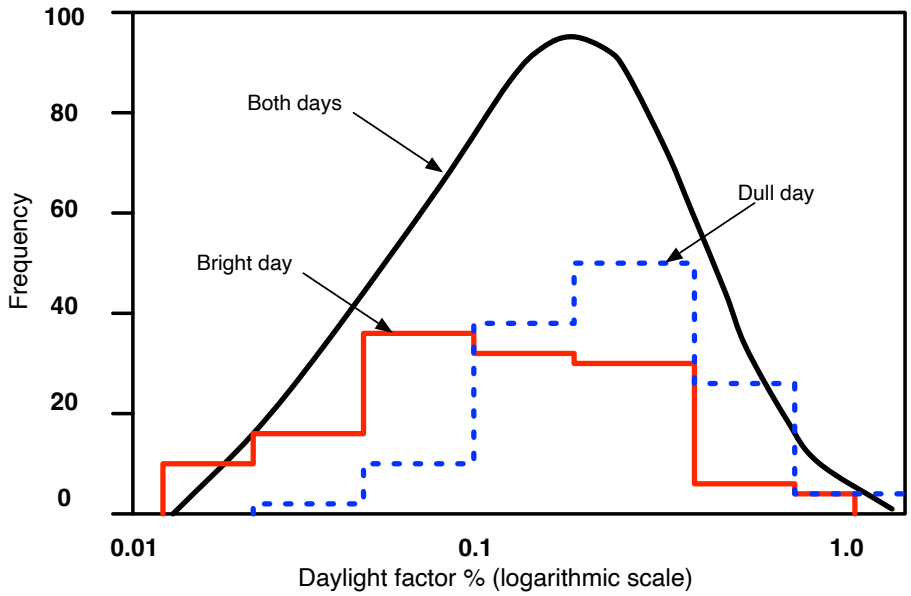

Figure A1: Distribution of preferred daylight factor values (after Phillips R. O. Phillips. "An historical outline of the concepts and terminology of daylight". In: *Proc. CIE v2, Zurich, Switzerland* (1955))

B Daily Plots of Illuminance Data

DESCRIPTION ONLY – SEE COMPLETE REPORT FOR THE DAILY PLOTS

Appendix B presents all 767 complete days of monitoring data recorded between 26th February 2022 and 2nd April 2024 by logging meters BM1 and BM2. Data are presented where there is a complete day for either one or both of the meters. For the first period of monitoring, 26th February 2022 to 7th June 2022, the contribution of electric lighting used by contractors during maintenance work was subtracted from the values recorded by BM1 and BM2. For the remaining period, it can be seen that a number of days show the small contribution (~10 lux) of electric lighting at various times. This will have a small effect (i.e. slight 'uplift') on the results presented in Section 2.

As described in Section 2.4, the plots also contain illustrative external illuminance conditions (GHI, DHI and BNI) derived from satellite remote sensing.

[24] P. Chynoweth. "Progressing the rights to light debate – Part 1: a review of current practice". In: *Structural Survey* 22.3 (2004), pp. 131–137.

[25] P. Chynoweth. "Progressing the rights to light debate: Part 2: the grumble point revisited". In: *Structural Survey* 23.4 (2005), pp. 251–264.

[26] Paul Chynoweth. "Progressing the rights to light debate: Part 3: judicial attitudes to current practice". In: *Structural Survey* 27.1 (2009), pp. 7–19.

[27] P. Defoe and I. Frame. "Was Waldram wrong?" In: *Structural Survey* 25.2 (2007), pp. 98–116.