Proximity

Solar Glare Report

Birley Fields, Manchester

Project Particulars

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1.0 Introduction

1.1 Background and Instructions

1.1.1 Manchester Metropolitan University ("MMU") propose the installation of photovoltaic ("PV") panels on the roofs of several buildings forming part of the Birley Fields Campus in Manchester.

1.1.2 Proximity is appointed to evaluate the likely solar glare amenity impact of the Proposed Developments on those key parts of the surrounding built environment. This Report confirms our opinions.

1.2 What Is Solar Glare

1.2.1 In simple terms, solar glare is reflected sunlight.

1.2.2 In the context of this Report, it is the sunlight reflected from the PV panels once installed.

1.2.3 Reflected sunlight in the built environment is not necessarily or inherently a problem – most materials have a reflective quality and will reflect sunlight to some degree. However, if solar glare is experienced in a certain context / parameter, it can lead to discomfort or disorientation (known as "disability glare").

1.2.4 There are a number of factors that influence whether disability glare will be experienced:

- Receptor sensitivity in a direction of view;
- The suns position in the sky, which changes throughout both the course of the day and the seasons. For example, in the winter, sunlight hours are reduced and the sun is lower in the sky. In the summer, sunlight hours are increased and the sun is higher in the sky. Both will give rise to different solar glare patterns;
- The location and orientation of the Proposed Development; and
- The reflective quality / characteristics of the Proposed Development. For example, in the context of buildings, a predominantly brick elevation / façade will reflect less sunlight than a heavily glazed façade.

1.2.5 These factors have all been considered in the preparation of this Report.

1.3 Scope of this Report

1.3.1 This appraisal is based on the provisions of the Building Research Establishment ("BRE") *Site Layout Planning for Daylight & Sunlight: A Guide to Good Practice,* The BRE's information paper *IP3/87 – Solar Dazzle from Sloping Surfaces*, and the Commission on Illumination's *CIE146:2002 Equations for Disability Glare.*

1.3.2 No glare measurements have been undertaken in the preparation of this Report. This is a qualitative impact assessment based on a considered and experienced professional judgement.

1.4 The Site

1.4.1 The roofs of certain buildings forming part of MMU's Birley Fields Campus in Manchester. The Site also includes the MMU Students Union building located on Higher Cambridge Street.

1.5 The Proposed Development

1.5.1 The erection / mounting of PV panels on the roofs of Dale Halls, The Vine Halls, Naylor Halls, Wardle Halls (all forming part of the Birley Fields Campus) and the Students Union building located on Higher Cambridge Street.

1.5.2 The location / orientation of the PV panels is as per the Helioscope images contained at Appendix 1.

1.6 Glare Receptors

1.6.1 The following are identified as the most likely glare receptors that exist around that part of the Site known as the Birley Fields Campus, located to the south of Princess Road:

- Princess Road (A5103);
- Archway Hall, Bonsall Street, Manchester
- Archway (public highway);
- Crossroads between Rolls Crescent / George Parr Road / Old Birley Street;
- 4-26 Old Birley Street, Manchester, M15 5RG;
- 1-26, 2b Old Birley Street, Manchester, M15 5RG;
- 1-6, 2a Old Birley Street, Manchester, M15 5RG;

- 1-6, 2 Old Birley Street, Manchester, M15 5RG;
- Bishops Corner, 321 Stretford Road, Manchester, M15 4UY;
- Crossroads between Stretford Road / Joyce Road;
- Stretford Road (public highway);
- 54-164 Stretford Road, Manchester, M15 5JH; and
- 52 Stretford Road, Manchester, M15 5JH.

1.6.2 The following are identified as the most likely glare receptors that exist in the vicinity of the Students Union building, located on Higher Cambridge Street:

- Higher Cambridge Street (public highway);
- Rosamond Street West (public highway);
- Boundary Street West (public highway);
- Sir Charles Groves Hall, 4 Booth Street West, Manchester, M15 6PY;
- Unit 2, Victoria Hall, Higher Cambridge Street, Manchester, M15 6AD;
- Victoria Hall, Higher Cambridge Street, Manchester, M15 6AD;
- University Barracks, Boundary Lane, Manchester, M15 6BL; and
- Cambridge Street Hall of Residence, Cambridge Street, Manchester, M15 6TT.

1.6.3 The external receptors identified thus far typically comprise public highways in the vicinity of the Site and neighbouring buildings of residential / student accommodation use.

1.7 Information Relied Upon

1.7.1 We have inspected the Site and its surroundings from Birley Fields Campus and adjacent public highways.

1.7.2 Our understanding of the Proposed Development is based on information supplied by MMU's agents, Castle Owen. The Helioscope images contained at Appendix 1 being the most visual representation of the works.

1.8 Site Specific Limitations

1.8.1 This Report is prepared in accordance with a scope agreed with MMU's agents, Deloitte and Castle Owen.

1.8.2 No technical glare measurements have been undertaken in the preparation of this Report.

1.8.3 This is a qualitative / professional judgement Report.

2.0 Technical Standards

2.1 BRE Digest 209

2.1.1 This is titled *BRE Digest 209 Site Layout Planning for Daylight & Sunlight; A Guide to Good Practice.*

2.1.2 The BRE Guidance was produced following extensive consultation with architects, planning officers, consultants, professional institutions and Government officials.

2.1.3 The Guidance was first published in 1991 and superseded the Department of the Environment Guidance "Sunlight and Daylight Planning Criteria and Design of Buildings".

2.1.4 The current edition (Third Edition) of the BRE Guidance was published in 2022.

2.1.5 The BRE Guidance is technically robust and has become the industry standard methodology for assessing daylight and sunlight amenity in the built environment.

2.1.6 The provisions of the BRE Guidance are not mandatory and the BRE have taken steps to confirm that it should not be read as an instrument of planning policy:

"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and this document should not be seen as an instrument of planning policy. Its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly because natural daylight is only one of many factors in site layout design".

2.1.7 The BRE Guidance notes that

"if it is likely that a building may cause solar dazzle, the exact scale of the problem should be evaluated".

2.1.8 The BRE Guidance suggests that key locations that could be sensitive to the consequences of glare should be identified and goes on to note that this includes road junctions and windows of nearby buildings.

2.1.9 The BRE Guidance specifically identifies that *"glare to motorists"* approaching the building can be an issue.

2.1.10 The BRE Guidance notes that the methodology for appraising or assessing solar glare is to include the working out of the number of hours per year that sunlight can be reflected to these points, and goes on to reference BRE Information Paper IP3/87 as a source of further information on the assessment of impacts of solar glare.

2.2 BRE IP3/87

2.2.1 This is titled *BRE IP3/87 – Solar Dazzle Reflected from Sloping Glazed Facades.*

2.2.2 This Information Paper confirms a methodology for calculating when solar glare might be seen from a particular vantage point or receptor. This Information Paper does not confirm any aspirational targets or whether a certain amount of glare is or is not acceptable. It does, however, provide general commentary as follows:

- Solar dazzle is reflected sunlight from a glazed façade, or metal cladding.
- Solar dazzle will only be a long-term problem for some heavily glazed or mirror clad buildings.
- Solar dazzle can become a problem where there are large areas of reflective glass or cladding, or where glass or cladding slopes back, so that high altitude sunlight can be reflected along the ground.
- That vertical mirror glazed facades tend only to create solar dazzle difficulties when the sun is low in the sky, near dawn or sunset, unless the façade is sloping back.
- That solar dazzle can be remedied by reducing the area of glazing. Using clear or absorbing glass (rather than reflective) can also help prevent or minimise the issue.
- The worst solar dazzle problems to motorists occur when driving directly towards a building and sunlight can reflect in the driver's direct line of sight.

2.2.3 Some general commentary is provided on what can be done to remedy any glare that is experienced.

2.3 The CIE Collection of Glare

2.3.1 This is a collection of Technical Reports prepared by the International Commission on Illumination ("CIE") including Report 146:2002 CIE Equations for Disability Glare.

2.3.2 As confirmed earlier in this Report, solar glare is not ordinarily a problem, but if it is experienced in a certain context or parameter then it can lead to discomfort or disorientation, referred to in practice as “disability glare”.

2.3.3 The CIE 146:2002 confirms:

“Disability glare is glare that impairs vision … It is caused by scattering of light inside the eye …. The veiling luminance of scattered light will have a significant affect on visibility when intense light sources are present in the peripheral visual field and the contrast of objects to be seen is low”.

and

“Disability glare is most often of importance at night when contrast sensitivity is low and there may well be one or more bright light sources near to the line of sight, such as car headlights, street lights or floodlights.

But even in daylight conditions, disability glare may be of practical significance: think of traffic lights when the sun is close to them, or the difficulty viewing paintings hanging next to windows”.

2.3.4 On this basis, it is clear that a glare source close to the object being looked at has a much more severe impact upon the visibility of that object than a glare source at the periphery of the observer’s visual field.

2.3.5 On this basis, it is clear that as to whether solar glare results in disability glare is based on where in the field of vision it is experienced. The field of vision is explored further in this Report. The CIE 146:2002 does, however, confirm that occurrences of solar glare at angles beyond 30° in the field of vision would be of little significance.

3.0 The Site and Its Surroundings

Hulme Arch

Located to the north east of the Site. Spanning Stretford Road (where that public highway bridges over Princess Road dual carriageway). Photograph taken facing west (with the Birley Fields Campus on the left hand side).

Vine House

Located to the north east of the Birley Fields Campus. The Stretford Road fronting elevation of this building is north facing.

Dale Halls

A cluster of three four storey student accommodation buildings located at the north western end of the Birley Fields Campus.

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A cluster of three four storey student accommodation buildings located at the north western end of the Birley Fields Campus.

Crossroads

The crossroads intersecting the Stretford Road (A5067) and Royce Road public highways. Located to the north west of the Birley Fields Campus (located closest to Dale Halls).

Naylor Halls

A cluster of three four storey student accommodation buildings. Located to the west of the Birley Fields Campus and fronting Old Birley Street (and to the north of George Parr Road).

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A cluster of three four storey student accommodation buildings. Located to the west of the Birley Fields Campus and fronting Old Birley Street (and to the north of George Parr Road).

Old Birley Street

Old Birley Street facing north (one block forming part of Naylor Halls, on the right-hand side).

Crossroads

The crossroads located to the immediate south of Naylor Halls between Old Birley Street, Rolls Crescent, and George Parr Road.

George Parr Road

Facing east (with Naylor Halls on the left hand side, but out of shot).

Wardle Halls

A cluster of three blocks of four storey student accommodation buildings, located centrally within the Birley Fields Campus and constructed to the immediate north of George Parr Steet.

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A cluster of three blocks of four storey student accommodation buildings, located centrally within the Birley Fields Campus and constructed to the immediate north of George Parr Steet.

Wardle Halls

A cluster of three blocks of four storey student accommodation buildings, located centrally within the Birley Fields Campus and constructed to the immediate north of George Parr Steet.

Ormsgill Street

Facing north (Wardle Halls on the right-hand side).

Archway

Facing south to the immediate east of Wardle Halls. The pedestrian crossing is across the slip road between Archway and MSCP.

Princess Road (A5103)

Located to the east of the Site at a reduced / sunken level. North facing carriageway.

Princess Road (A5103)

Located to the east of the Site at a reduced / sunken level. South facing carriageway.

Stretford Road

A pedestrian crossing located to the north of the Site in close proximity to Vine House.

4.0 Commentary

4.1.1 Solar glare is reflected sunlight. All building materials reflect sunlight to some degree (and some more than others). Reflected sunlight is not, therefore, per se a problem. Glare only becomes a problem if experienced in a particular field of vision having a disabling or disorienting effect (referred to as “disability glare”).

4.1.2 The Proposed Development comprises the erection / mounting of PV panels on the roofs of certain neighbouring buildings forming part of the Birley Fields Campus and the Students Union building located on Higher Cambridge Street.

4.1.3 In the United Kingdom the sun rises in the east, setting in the west, passing through south. Because of this, the orientation of the PV panels is an influence on the extent / duration of any reflected sunlight.

4.1.4 As confirmed earlier in this Report, our understanding of the location and orientation of the proposed PV panels is based on the HelioScope images set out at Appendix 1, and summarised below:

Vine House	The PV panels will face south (facing inwards towards the Birley Fields Campus).
Dale Halls	The majority of the PV panels will be oriented south. Where the roof is duo pitched, the panels will be oriented east and west.
Naylor Halls	The majority of the PV panels will be oriented south. Where the roof is duo pitched, the panels will be oriented east and west.
Wardle Halls	The majority of the PV panels will be oriented south. Where the roof is duo pitched, the panels will be oriented east and west.
MNU Students Union, Higher Cambridge Street	The PV panels will be oriented east and west.

4.1.5 Princess Road is located to the east of the Site and the Proposed Development at a reduced / sunken level. It is a major and busy highway between Manchester City Centre and the South.

4.1.6 Motorists driving in either direction (north or south) will not be subject to any disability glare. This because the motorists will not be driving towards the Site / Proposed Development directly. Further, because this highway is at a reduced / sunken level, the proposed PV panels will not be visible to the drivers.

4.1.7 Similarly, it is not anticipated that any of the PV panels will be visible to motorists and pedestrians using the highway infrastructure in and around the Site (including Stretford Road, Old Birley Road, and Archway). If the PV panels cannot be seen from the ground, then glare will not be experienced at any ground level receptor.

4.1.8 Archway Hall is located to the east of the Site. It is a tall building and inevitably, the PV panels on the roof of Vine House will be seen through the windows of some of the upper floors. Notwithstanding this point, we do not anticipate a material or significant solar glare impact. Any glare to be experienced here will be limited to the mornings in the summer months and therefore a short-term experience.

4.1.9 There are residential use properties located to the north of the Site on the opposite side of Stretford Road. However, all proposed PV panels are oriented east, south or west. On that basis, any reflected sunlight / glare will not be experienced by the occupants of those neighbouring buildings.

4.1.10 There are neighbouring buildings of residential use on the opposite side of Old Birley Street to the west of the Site that are taller (to varying degrees) than the buildings (Dale and Naylor Halls being the closest) upon which the PV panels will be erected. These neighbouring buildings include 4-26 Old Birley Street, 2, 2a and 2b Old Birley Street and Bishops Corner. It is only the upper floors of these neighbouring buildings that would possibly have a view of the PV panels. We do not anticipate a material or significant solar glare impact. Any glare to be experienced here will be limited to the afternoons in the summer months and therefore a short-term experience.

4.1.11 The Students Union building on Higher Cambridge Street is a four storey flat roofed building (where it fronts the Higher Cambridge Street public highway). This building is taller than most of the neighbouring buildings in its immediate surroundings. On this basis, the PV panels won't be seen through the windows of the majority of neighbouring buildings and on that basis no material or significant adverse solar glare impact is contemplated.

4.1.12 The only neighbouring building in the vicinity of the Students Union building that is taller is the Sir Charles Groves Hall building on the opposite side of Rosamond Street West to the south. The proposed PV panels will be seen through the north-facing windows to the uppermost floors of this neighbouring building. However, because the proposed PV panels are oriented east and west no material or significantly adverse solar glare impact is contemplated.

4.1.13 There are several road junctions in the vicinity of the Students Union building including where Boundary Street West and Rosamond Street West independently interface with Higher Cambridge Street. The proposed PV panels will not, however, be seen at these road junctions and on that basis, no material or significantly adverse solar glare impact will be experienced by road users (or pedestrians using the associated footpaths).

Appendix 1:
Proposed PV Panel Locations

Components

Component	Name	Count
Inverters	S5-GR3P20K (400V) (Solis)	1 (20.0 kW)
Strings	4 mm2 (Copper)	3 (139.7 m)
Module	Longi, LR4-60HIH-375M (375W)	60 (22.5 kW)

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	5-24	Up and Down Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	10°	161.9204°	0.5 m	1x1	47	31	11.6 kW
Field Segment 3	Fixed Tilt	Landscape (Horizontal)	10°	162.5228°	0.5 m	1x1	27	14	5.25 kW
Field Segment 4	Fixed Tilt	Landscape (Horizontal)	10°	162.48982°	0.5 m	1x1	18	15	5.63 kW

Detailed Layout

Detailed Layout

Detailed Layout

Detailed Layout

Components

Component	Name	Count
Inverters	S5-GR3P10K (400V) (Solis)	1 (10.00 kW)
Strings	4 mm2 (Copper)	3 (73.9 m)
Module	Longi, LR4-60HIH-375M (375W)	38 (14.3 kW)

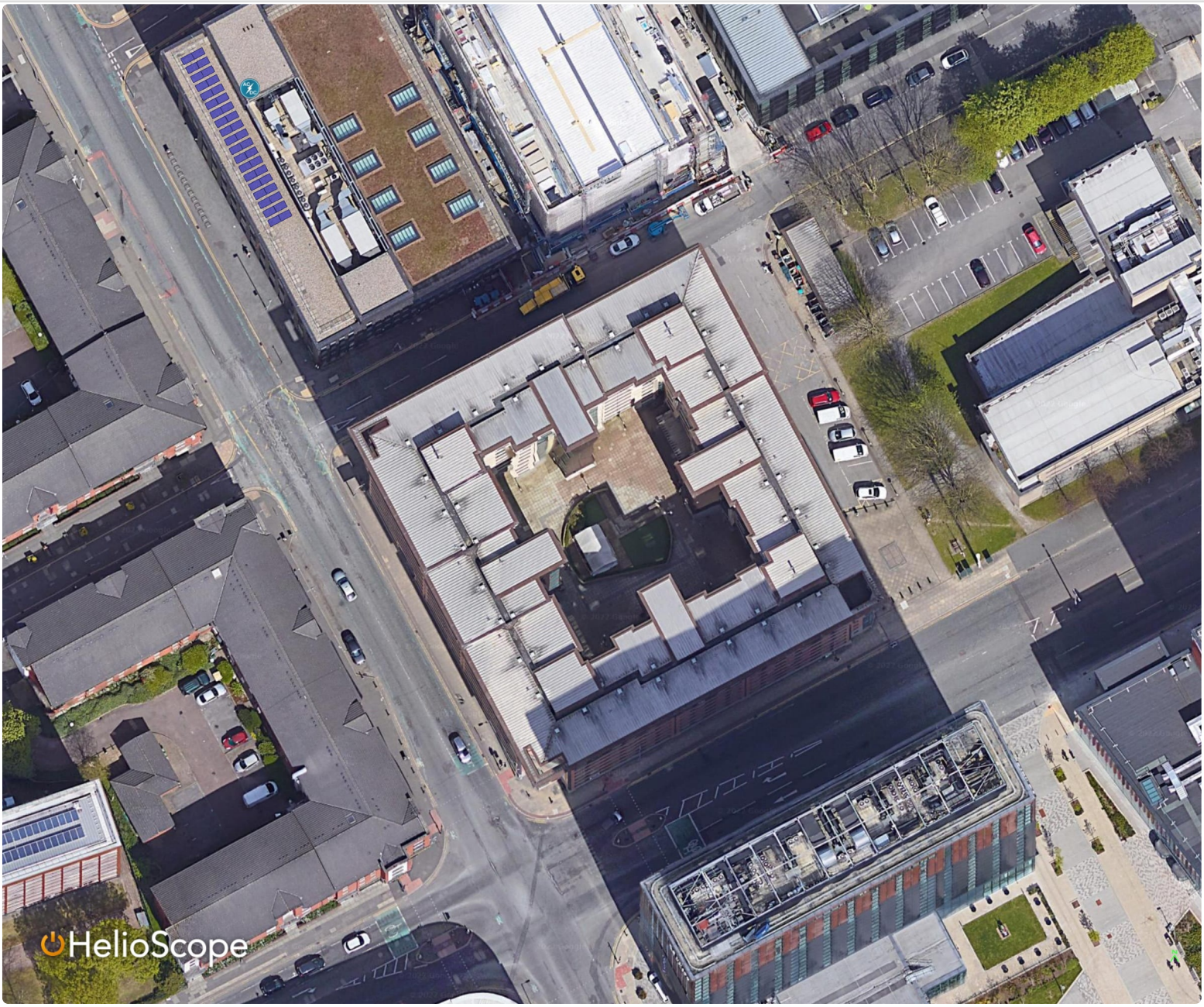
Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	3-13	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	10°	152.34628°	0.5 m	1x1	38	38	14.3 kW

Detailed Layout



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