



OVG

Project Bradford

**Exterior Lighting Assessment
DRAFT**

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1 INTRODUCTION

1.1 General

This document has been prepared to outline the effects of the proposed permanent external lighting scheme for OVG Manchester on the surrounding environment and neighbouring properties.

A key requisite of any exterior lighting installation is to minimise consequent obtrusive spill light which might adversely affect local residential communities, vehicular traffic routes or surrounding environmental areas.

The proposed works to the project will involve a new exterior amenity lighting system for the public realm as well as façade illumination of the building. The installation of a media façade is also being proposed.

An ambient light level survey has been carried out at the site to ascertain the base-line spill light levels within the immediate surrounding area of the development. The results, are presented in this report.

The lighting scheme presented in this report is to be viewed as a lighting design strategy rather than a detailed design solution. It is recommended that the lighting strategy outlined in this report is adopted including criteria, luminaire types, switching methods, lamp types etc. by the developer's designers when undertaking the full external lighting design of the site.

1.2 Objectives

The general objective of this report is to assess the impact of a suitable lighting scheme for the proposed site on the surrounding area and environment. Also, it includes a record of the existing lighting conditions to allow reference to be made during the planning process. Commentary is also made in areas that are considered key focal points in the success of the redevelopment works.

Specific objectives of the proposed lighting scheme when fully designed include:

- To limit light pollution and sky glow
- To limit obtrusive light, spill light / trespass light and glare to neighbouring land and properties
- To mitigate the effects of the lighting scheme on bats
- To provide an adequate level of illuminance for the proposed exterior areas, in accordance with the CIBSE guidance and Clients requirements
- To provide a suitable lighting control strategy to minimise energy consumption

2 STANDARDS AND GUIDANCE DOCUMENTS

2.1 Referred Units and Terminology

Where referred to in the report, the following units and terminology are used to define the associated lighting phenomena and/or illuminance plane

Candela:	unit used to define the intensity of a light source.
Lumen:	unit used to define luminous flux. 1 lumen is defined as the luminous flux passing through a 1-foot opening in the surface of a sphere with a radius of 1-foot and a 1-candela light source at its centre.
Lux:	unit used to define illumination. 1 lux is equal to 1-lumen falling on an area of 1-square meter.
Horizontal Light Level:	the illumination on a horizontal plane. Readings taken with the light meter in the horizontal position
Vertical Light Level:	the illumination on a vertical plane. Readings taken with the light meter in the vertical position.
Maximum Vertical Light Level:	the illumination measured on the vertical plane with the meter facing the brightest light source.
Line of Sight:	term used to express the condition in which a person's view is directly in line with a light source.
Spill Light:	for the purpose of this report spill light can be defined as the illumination that is produced by a light source or light sources at a point or surface on which the light is not intended or desirable.
Glare:	the discomfort or impairment of vision experienced when the image is excessively bright compared to the general surroundings.

2.2 Assessment Criteria

The light spill study has been completed with reference to the following industry standard guidelines:

- CIE 150:2003 – Guide on the limitation of the effects of obtrusive light from outdoor lighting installations.
- ILP: Guidance Notes for the Reduction of Obtrusive Light GN01:2011
- SLL Code for Lighting
- SLL Lighting Guide LG6: The exterior environment
- BS EN 12464-2
- ILP Guidance note PLG 05 – The Brightness of Illuminated Advertisements

2.2.1 Regulating Light Spill

The following tables are excerpts from the Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers. The tables provide the limits of illuminance to minimise light spill, depending on environmental zones.

Different environmental zones are established within the UK to determine the required limitations for lighting installations depending on the surrounding environment that the development is being placed in. Table 1 below shows the various environmental zones.

Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Environmental Zone	Sky Glow ULR [Max %]	Light Intrusion (into Windows) Ev [lux]		Luminaire Intensity I [candelas]		Building Luminance Pre-curfew
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m ²]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Environmental Zone:

- E0 – Protected surrounding, dark lighting environment
E1 – Natural surroundings, intrinsically dark lighting environment
E2 – Rural surrounding, low district brightness lighting environment
E3 – Suburban surrounding, medium district brightness lighting environment
E4 – Urban surrounding, high district brightness lighting environment

Abbreviations:

- ULR = Upward Light Ratio of the installation
Ev = Vertical illuminance in Lux
I = Light intensity in Candelas (cd)
L = Luminance in candelas per square metre (cd/m²)
Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply.
* = Permitted only from only public road lighting installations

Table 1.2.2a – Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers, table 2

Obtrusive Light Limitations for Exterior Lighting Installations – Road Users		
Road Classification ⁽¹⁾	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaption luminance of 0.1cd/m ²	0.04
ME6 / ME5	15% based on adaption luminance of 1cd/m ²	0.25
ME4 / ME3	15% based on adaption luminance of 2cd/m ²	0.40
ME2 / ME1	15% based on adaption luminance of 5cd/m ²	0.84

⁽¹⁾ Road Classification:

As defined in EN 13201-2(2015) road lighting performance requirements

Abbreviations:

- TI = Threshold increment
Lv = Veiling luminance

Table 1.2.2b – Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers, table 3

For the purpose of comparison with the collated baseline readings, the current environmental zone for the site is considered to be best represented by E3– Suburban surrounding, medium district brightness lighting environment.

Based upon the above, the two main criteria which need to limit obtrusive light for general observers are:

- Light trespass on the vertical plane of any adjacent building should be less than 10 lux and 2 lux during pre and post curfews respectively.
- Source Intensity of the luminaire should be less than 10,000cd and 1,000cd during pre and post curfews respectively.

It shall be noted that these figures are for guidance only and can be supplemented or replaced by the Local Planning Authorities own guidance on sky glow ULR, light intrusion, luminaire intensity and specific pre-curfew and post-curfew limitations defined within planning approval requirements.

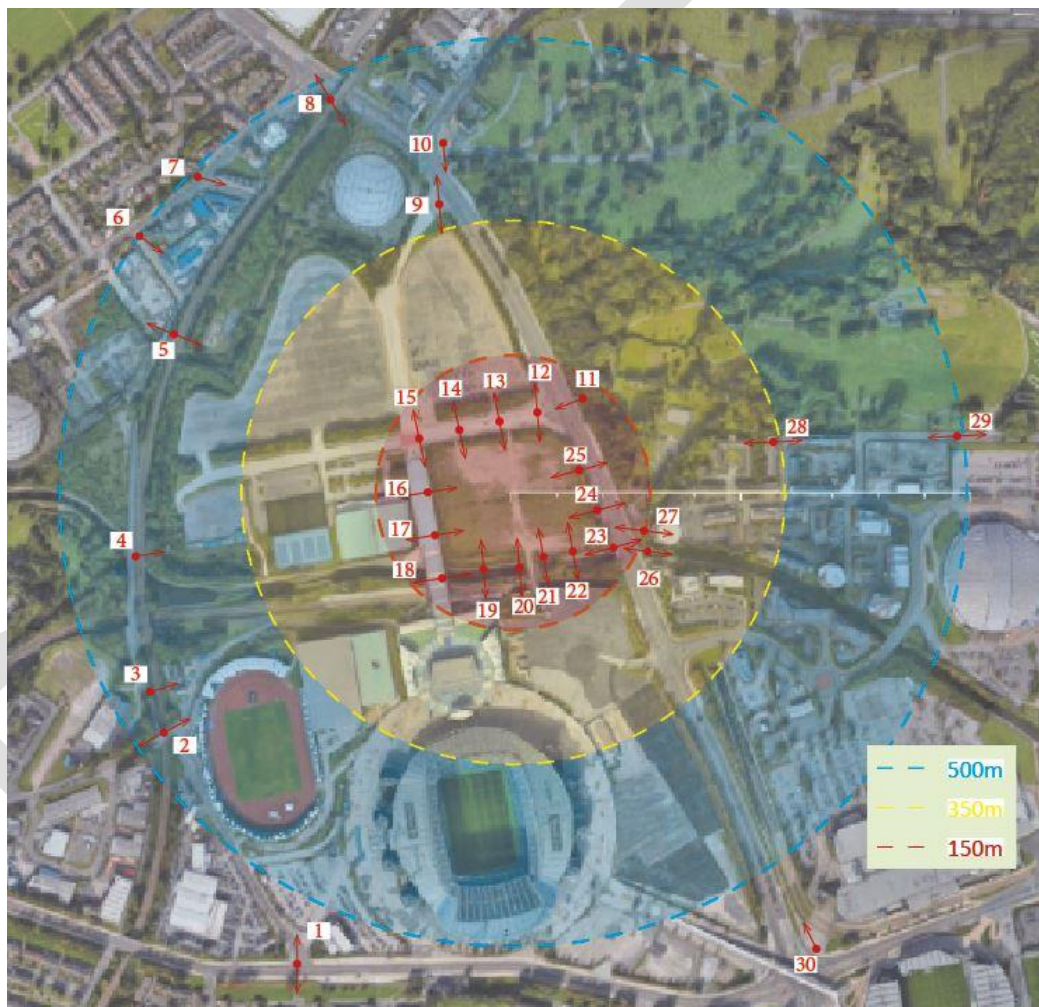
3 BASELINE CONDITIONS

3.1.1 Methodology

At various points within the immediate surrounding of the development, a horizontal illuminance reading is presented which was taken at floor level with the light meter orientated so as aiming straight up. Additional vertical illuminance readings are taken with the light meter orientated directly towards the development and when deemed relevant away from it. These are taken at 2m above ground level.

The illuminance levels presented within the results is the measurement of a single point reading of lux at the relevant location.

Locations of measurement positions are as indicated in the map below, with the associated GPS coordinates and light level being imposed provided within section 3.1.3 of this report.



Measurements were taken at a distance up to 500m from the proposed development. Measurement points are set at circa 40 to 50m intervals in the immediate surrounding- 150m radius- of the site (points 11 to 25). Further measurements were taken at areas where residents are most likely to be affected within a 500m radius of the Stadium. This primarily focuses on the residential buildings North of Viaduct Road (points 5 to 8) and South of Philips Park (points 26 to 29) as indicated above.

Where measurement points are located local to residential properties, the readings are taken as close to the residential boundary as possible whilst keeping within the public realm.

3.1.2 Test Apparatus

Instrument: Konica Minolta illuminance meter

Model: T-10

Serial Number: 61731077-41721019

Calibration Certificated attached in Appendix B

3.1.3 Field Results

The following observations are made for the baseline spill light levels taken at key point areas around the site.

Readings are intended to establish existing conditions for future comparison and are not intended to be a random sampling that would be required in order to determine a statistical average for the given area and street.

It shall be noted that the survey carried out is an initial study to obtain the base-line spill lighting conditions within immediate surrounding of the development. Consequently, any light generated by other external sources e.g. floodlighting during a match day, should also be considered when assessing the contribution of spill lighting by the new development.

To obtain the base-line spill lighting conditions within the immediate surrounding of the proposed works area, a survey was carried out on 12th of September 2019. The survey was carried out during low-light hours (21.30-12.00).

Point	GPS Coordinates	Illuminance		
		Horizontal	Vertical	
			Towards the Site	Away from the Site
1	53°28'54"N 2°12'12"W	30.12	11.71	5.06
2	53°29'02"N 2°12'20"W	4.50	0.32	2.37
3	53°29'04"N 2°12'21"W	14.61	1.61	-
4	53°29'08"N 2°12'22"W	10.43	0.33	-
5	53°29'18"N 2°12'18"W	4.52	7.92	0.31
6	53°29'20"N 2°12'21"W	4.43	6.06	-
7	53°29'22"N 2°12'18"W	4.05	26.05	-
8	53°29'25"N 2°12'11"W	13.72	10.63	6.56
9	53°29'21"N 2°12'03"W	30.21	10.56	11.01
10	53°29'23"N 2°12'03"W	10.08	6.41	-
11	53°29'14"N 2°11'55"W	17.93	3.66	-
12	53°29'13"N 2°11'57"W	2.34	0.38	2.22
13	53°29'13"N 2°12'00"W	12.58	0.51	8.79
14	53°29'13"N 2°12'02"W	36.53	1.21	22.02
15	53°29'12"N 2°12'05"W	51.35	0.90	21.51
16	53°29'11"N 2°12'05"W	12.24	0.32	2.93
17	53°29'10"N 2°12'04"W	32.62	0.85	8.45
18	53°29'08"N 2°12'04"W	11.99	3.42	4.47
19	53°29'08"N 2°12'01"W	4.02	1.00	0.22
20	53°29'08"N 2°11'58"W	4.32	0.98	0.54
21	53°29'08"N 2°11'58"W	9.01	25.41	0.28
22	53°29'08"N 2°11'55"W	3.43	7.23	0.67
23	53°29'09"N 2°11'53"W	5.36	2.51	2.45
24	53°29'11"N 2°11'54"W	1.23	1.61	0.19
25	53°29'12"N 2°11'55"W	2.42	0.07	1.6
26	53°29'09"N 2°11'51"W	3.92	0.26	2.65
27	53°29'09"N 2°11'51"W	3.43	1.17	0.23
28	53°29'13"N 2°11'43"W	10.81	0.28	0.15
29	53°29'13"N 2°11'30"W	11.80	16.04	6.67
30	53°28'54"N 2°11'41"W	13.57	2.73	8.35

4 PROPOSED LIGHTING SCHEME

4.1 Recommended Lighting Values

The lighting levels have been designed in accordance with the site requirements and to mitigate as much as possible the site's impact on its surroundings and on local wildlife.

Amenity lighting aims to provide a safe and secure environment for pedestrian circulation.

Recommended Luminance levels for signs are provided in the ILP Guidance note PLG 05 – The Brightness of Illuminated Advertisements. The luminance limits are expressed in cd/sqm and are dependent on the size of the proposed signage.

Measurements for the external illumination of the signs is provided for both the illumination level and as a measurement of the building Luminance at the signage positions.

4.2 Minimising obtrusive Light, effect on bats and reducing Visual impact

Careful consideration has been given to reduce the visual impact of the lighting installation during the day, whilst maintaining an adequate level of illuminance on the site. The perimeter of the building will be illuminated by luminaires recessed on the underside of the soffit. Amenity lighting will be supplemented by lighting columns. The aim is for the columns to have a simple design that blends with the architecture. Additional illumination will be provided by low level lighting incorporated in landscape elements (handrails and benches).

Particular attention has been paid to minimise any obtrusive light, glare or sky glow produced by the artificial lighting installation. Wherever possible luminaires are orientated towards the site or mounted on the underside of the building soffit. The luminaire types with good light beam control have been chosen to reduce light spillage.

The facade is lit by luminaires located in an enclosed metal perforated panel. Light spill from the architectural lighting will be minimal as the lit effect is a result of the contrast between the dark exterior panel and the illuminated back surface.

Best practice guidance from the Institute of Lighting Professionals, in conjunction with the Bat Conservation Trust, is to avoid lighting on key habitats such as the canal corridor altogether with implementation of buffer zones between the development and the corridor. This means that any increase above existing light levels should be minimal. Therefore, light levels are kept to a minimum adjacent to the canal corridor.

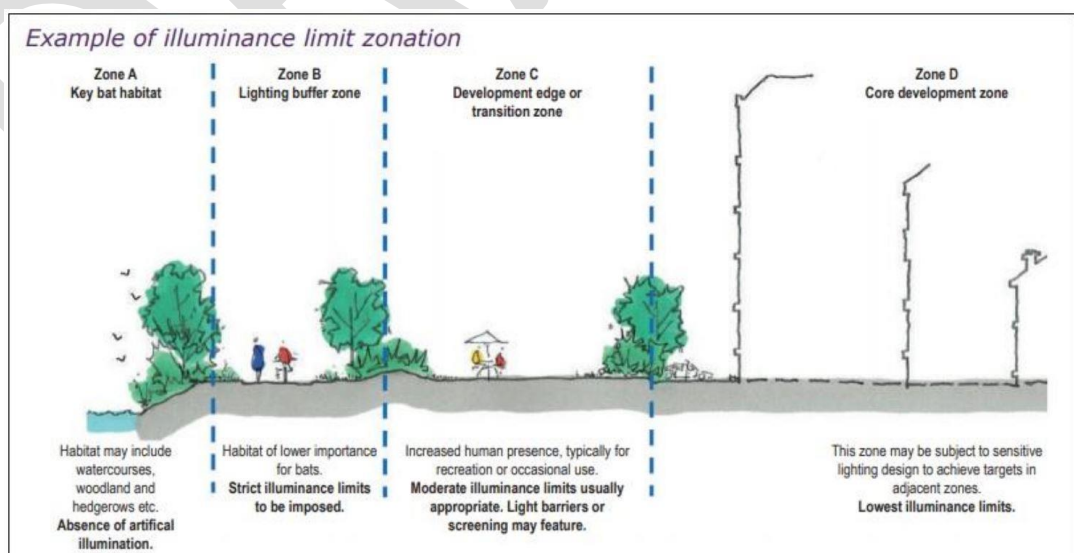


Figure: Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers

4.3 **Luminaire Types**

The recommended lighting columns for this type of amenity lighting are 6m high. This is the lowest level possible to reduce visual impact whilst being high enough so that vehicles can safely access the site. The column mounted luminaires have been chosen to be as inconspicuous as possible. Arm brackets shall have 0° tilt and shall be fitted with flat glass to reduce the visibility of the light source.

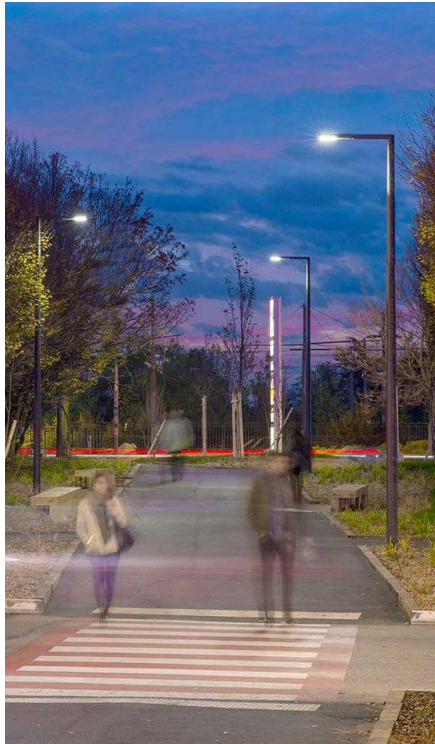


Figure :Example of an installation of the Mikado column

Landscape lighting will be kept to a minimum on the canal side and will aim to create a few destination points for the visitors.



Figure :Example of under bench lighting

All luminaires used for amenity lighting shall have 0% upward light output ratio. Luminaires with good light beam control and Colour Rendering of at least Ra80 shall be utilised throughout the site, to mitigate the impact of the lighting scheme on the surrounding area and the local wildlife. Using this type of lamp provides an energy efficient solution compliant with Part L of the Building Regulations. All the luminaries shall have an appropriate ingress protection and impact resistant rating depending on their installation type and location.

4.4 Lighting Controls

The luminaires will be controlled via a photocell to ensure that they are only switched on when required. The lighting should be switched on for dusk and off for dawn. The controls should be integrated to the BMS system to ensure that lights switch on and off together.

To minimise the light impact on surrounding areas as much as possible a part-lighting strategy will be adopted where only part of the exterior lighting will be switched on at times when the venue is not in use.

The facade illumination and the media screens should be switched off after certain time at night, depending on curfew hours imposed by the council. Further consulting with the council is required for this in the next phase.

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5 ASSESSMENT METHODOLOGY

An appropriate lighting scheme for the site has been assessed using standard industry software Dialux.

Dialux is a computer lighting simulation tool which utilizes 3D modelling to model the output of chosen light fittings. The results from the computer model produce the calculations presented in [Section](#).

All lighting calculations have first been carried out with all the luminaries switched on, representing the 'worst case scenario' From these calculations, output results illustrating the illuminance levels throughout the site and at the boundary have been produced so that the lightings scheme's impact can be assessed. The calculation model does not include the planting, hedgerows or trees however this is accounted for when assessing and making conclusions about the light spill.

Light trespass has been assessed and the line of sight from neighbouring residential properties has also been considered.

Full calculations have been included in [Appendix](#).

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6 **PROPOSED LIGHTING INSTALLATION THE LIGHTING SCHEME**
(In development)

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7 CONCLUSIONS

7.1 Comments

The proposed site is surrounded by areas that could be sensitive to light such as residential blocks, parks and the canal.

The Etihad Campus on the south of the site obstructs direct view from the residencies located south of Ashton New Road and potential light spill to them (points 1 and 2).

Areas within 500m west of the New Viaduct Street are not subject to glare or ambient light spill from the site as they are obstructed by the foliage of trees next to the trainline (points 3 to 7). Also, they are at lower level than the site. The road is lit by street lighting and it slopes down towards the north where views to the site are obstructed by a rail bridge (point 8).

On the west the main contribution of ambient illumination is by the street lights illuminating Alan Turing Way (points 9 to 11, 23 to 25 and 30). The light levels are quite high as this is a traffic route for motorized vehicles of medium to high driving speeds with conflict areas e.g. intersections and pedestrian passages.

The residential area south of Philips park is at lower level than the site. There is a direct line of sight from the buildings adjacent to Alan Turing Way (points 26 and 27) but not from other location in this area. The horizontal light levels next to the park are quite high (points 28 and 29). These streets are well lit by post top luminaires.

In a radius within 150m of the ground the only sensitive area is the canal which is currently lit by LED lighting columns (points 18 to 23 and 26). The vertical light levels are high due to the contribution of light from the street columns. During the site survey we recorded bats flying above the canal.

The part of the canal which is east of Alan Turing Way is lit mainly by bollards.

Areas further than 500m from the site are very unlikely to suffer from light spill (due to distance) or direct glare from a façade installation.

7.2 Summary

Exterior illumination of the building and the façade might have an impact on the surrounding areas.

The areas most likely to be affected by the new development are the buildings adjacent to Alan Turing Way as well as the canal.

The residential buildings have a direct line of sight to the site. If of a media façade is installed on the southeast elevation it would create high contrast with the night time sky and would be visible from all floors of these buildings.

Because the canal is a bat corridor light levels should be kept to a minimum. A new installation of exterior lighting might add to the existing light levels. Although the design could aim to minimise any light spill in the area, it is also possible to alter the current lighting design across the canal keep the illuminance at low levels.

In conclusion the new development could affect some surrounding residencies as well as the bat corridor. Therefore, the design should take into account the lines of direct sight and try to minimize light spill on the canal.

APPENDIX A: SURVEY PHOTOS

	Calculation Point: 1 (View towards the site) Subject: Etihad Stadium and Manchester Regional arena High illuminance levels due to the street lighting. Additional flood lighting during match days
	Calculation Point: 1 (View away from the site) Subject: Properties South of Ashton New Road The Etihad Campus obstructs direct view of the site from these properties
	Calculation Point: 4 Subject: View up New Viaduct Street Subsidiary road lit by LED lighting columns. Foliage next to the rail lines
	Calculation Point: 5 Subject: View down New Viaduct Street Subsidiary road lit by LED lighting columns. Foliage next to the rail lines obstructs direct view of the site



Calculation Point: 3
Subject: View up New Viaduct Street

Subsidiary road lit by LED lighting columns. Foliage next to the rail lines obstructs direct view of the site



Calculation Point: 6
Subject: View up Barking Street

Subsidiary road lit by LED lighting columns



Calculation Point: 7
Subject: View down Broxton Street

Residential road lit by LED lighting columns. Road at lower level than the site. Properties subjected to no light spill or glare from the site as they sit at lower level. Also, the rail bridge provides an obstruction



Calculation Point: 8
Subject: View up Alan Turing Way

Highway illuminated by LED lighting columns

	Calculation Point: 8 Subject: View down Alan Turing Way Highway illuminated by LED lighting columns
	Calculation Point: 10 Subject: View down Alan Turing Way Highway illuminated by LED lighting columns
	Calculation Point: 15 Subject: View down Joe Mercer Way Street illuminated by LED lighting columns
	Calculation Point: 15 Subject: View from Joe Mercer Way to the site Highway illuminated by LED lighting columns



Calculation Point: 18
Subject: View east on the canal

Canal path illuminated by LED lighting columns



Calculation Point: 23
Subject: View west on the canal

Canal path illuminated by LED lighting columns



Calculation Point: 24
Subject: View southeast to residential building

Highway illuminated by LED lighting columns. Building has direct line of sight to the site



Calculation Point: 23
Subject: View southeast to residential building

Highway illuminated by LED lighting columns. Building has direct line of sight to the site



Calculation Point: 25
Subject: View down Alan Turing Way

Highway illuminated by LED lighting columns



Calculation Point: 25
Subject: View up Alan Turing Way

Highway illuminated by LED lighting columns



Calculation Point: 26
Subject: View east to the canal

Canal illuminated by bollards. Illuminance contribution from Alan Turing Street lighting



Calculation Point: 28
Subject: View down Wesham Road

Street illuminated by LED lighting columns



Calculation Point: 28
Subject: View up Wesham Road to the park

Street illuminated by LED lighting columns



Calculation Point: 30
Subject: View up Alan Turing Way

The Etihad Campus obstructs direct view to the site

