

15 APPENDICES: Lighting

APPENDIX 15.1: ILE GUIDANCE



The Institution of Lighting Engineers

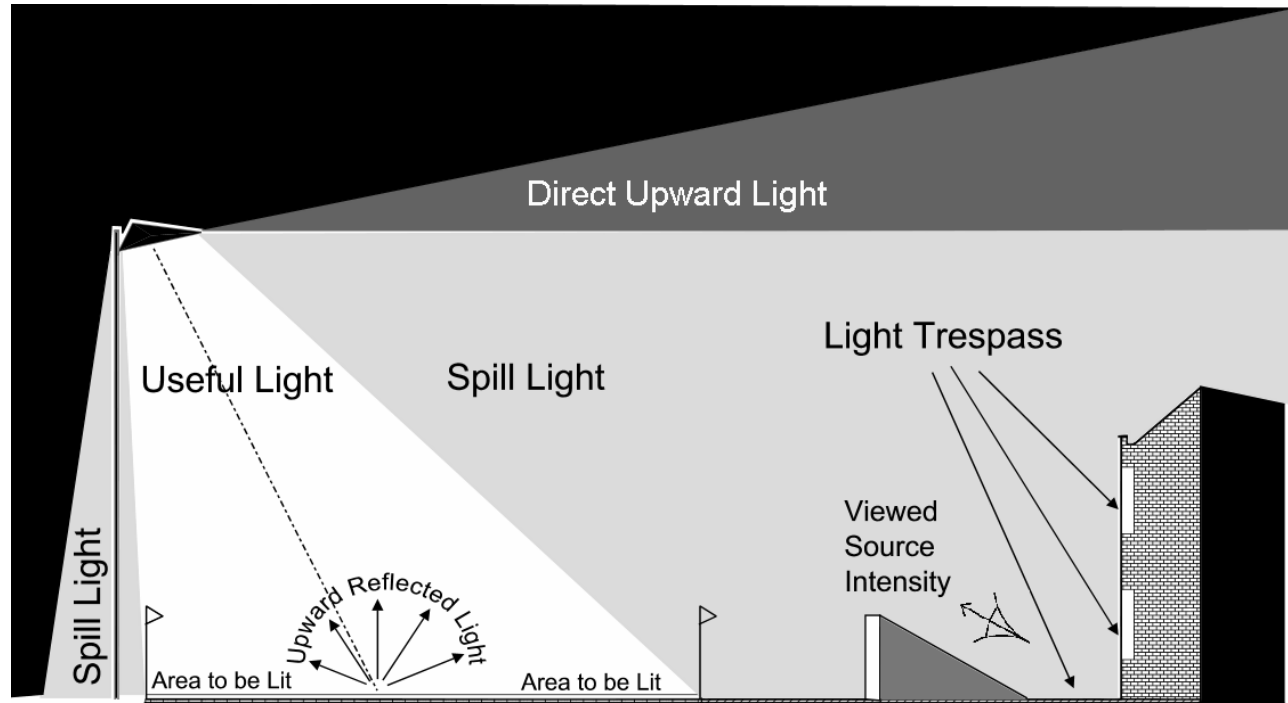
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GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

ALL LIVING THINGS adjust their behaviour according to natural light. Man's invention of artificial light has done much to enhance our night-time environment but, if not properly controlled, **obtrusive light** (commonly referred to as light pollution) can present serious physiological and ecological problems.

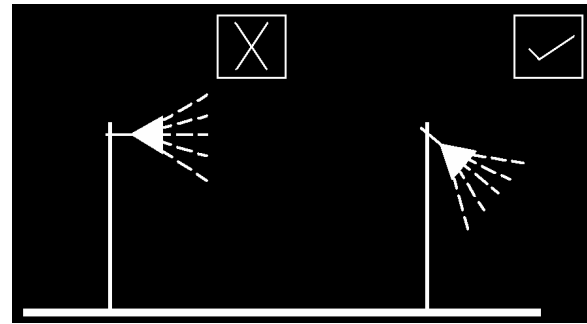
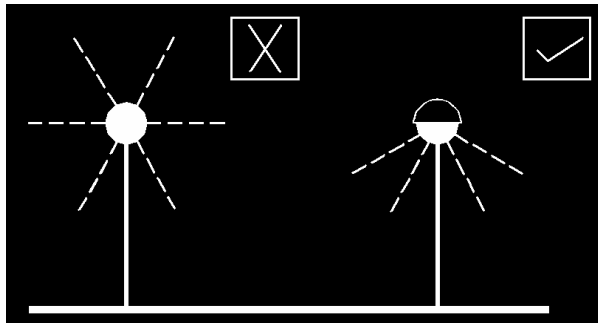
Obtrusive Light, whether it keeps you awake through a bedroom window or impedes your view of the night sky, is a form of pollution and can be substantially reduced without detriment to the lighting task.

Sky glow, the brightening of the night sky above our towns, cities and countryside, **Glare** the uncomfortable brightness of a light source when viewed against a dark background, and **Light Trespass**, the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive light which may cause nuisance to others, waste money and electricity and result in the unnecessary emissions of greenhouse gases. Think before you light. Is it necessary? What effect will it have on others? Will it cause a nuisance? How can I minimise the problem?



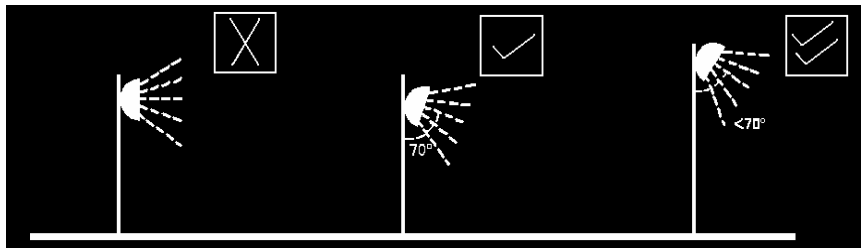
Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light. Organisations from which full details of these standards can be obtained are given on the last page of this leaflet.

Dim or switch off lights when the task is finished. Generally a lower level of lighting will suffice to enhance the night time scene than that required for safety and security.



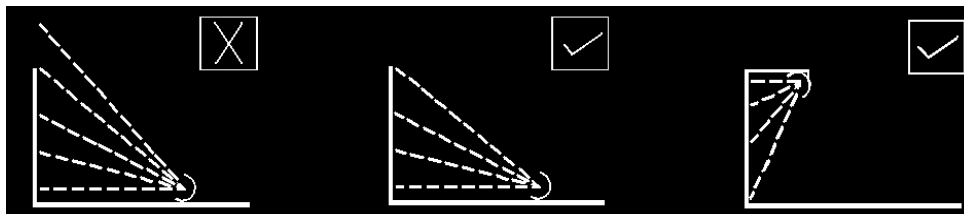
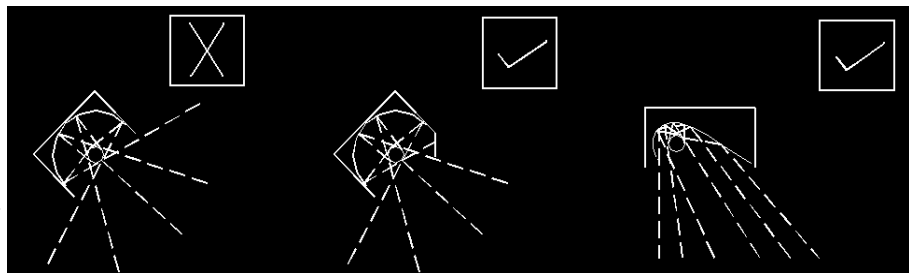
Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Care should be taken when selecting luminaires to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Remember that lamp light output in LUMENS is not the same as lamp wattage and that it is the former that is important in combating the problems of obtrusive light

Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment. With regard to domestic security lighting the ILE produces an information leaflet GN02 that is freely available from its web site.



The UK Government will be providing an annex to PPS23 Planning and Pollution Control, specifically on obtrusive light. However many Local Planning Authorities (LPA's) have already produced, or are producing, policies that within the new planning system will become part of the local development framework. For new developments there is an opportunity for LPA's to impose planning conditions related to external lighting, including curfew hours.

For sports lighting installations (see also design standards listed on Page 4) the use of luminaires with double-asymmetric beams designed so that the front glazing is kept at or near parallel to the surface being lit should, if correctly aimed, ensure minimum obtrusive light. In most cases it will also be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation. The requirements to control glare for the safety of road users are given in Table 2.



When lighting vertical structures such as advertising signs direct light downwards, wherever possible. If there is no alternative to up-lighting, as with much decorative

lighting of buildings, then the use of shields, baffles and louvres will help reduce spill light around and over the structure to a minimum.

For road and amenity lighting installations, (see also design standards listed on Page 4) light near to and above the horizontal should normally be minimised to reduce glare and sky glow (Note ULRs in Table 1). In sensitive rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, also help to minimise visual intrusion within the open landscape. However in many urban locations, luminaires fitted with a more decorative bowl and good optical control of light should be acceptable and may be more appropriate.

ENVIRONMENTAL ZONES:

It is recommended that Local Planning Authorities specify the following environmental zones for exterior lighting control within their Development Plans.

Category	Examples
E1:	Intrinsically dark landscapes National Parks, Areas of Outstanding Natural Beauty, etc
E2:	Low district brightness areas Rural, small village, or relatively dark urban locations
E3:	Medium district brightness areas Small town centres or urban locations
E4:	High district brightness areas Town/city centres with high levels of night-time activity

Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

DESIGN GUIDANCE

The following limitations may be supplemented or replaced by a LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a professional lighting designer before installing any exterior lighting.

Table 1 – Obtrusive Light Limitations for Exterior Lighting Installations						
Environmental Zone	Sky Glow ULR [Max %] (1)	Light Trespass (into Windows) Ev [Lux] (2)		Source Intensity I [kcd] (3)		Building Luminance Pre-curfew (4)
		Pre- curfew	Post- curfew	Pre- curfew	Post- curfew	Average, L [cd/m2]
E1	0	2	1*	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5.0	10	2	10	1.0	10
E4	15.0	25	5	25	2.5	25

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

Ev = Vertical Illuminance in Lux and is measured flat on the glazing at the centre of the window

I = Light Intensity in Cd

L = Luminance in Cd/m2

Curfew = The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated – 23.00hrs is suggested.

* = From Public road lighting installations only

- (1) **Upward Light Ratio** – Some lighting schemes will require the deliberate and careful use of upward light – e.g. ground recessed luminaires, ground mounted floodlights, festive lighting – to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.
- (2) **Light Trespass (into Windows)** – These values are suggested maxima and need to take account of existing light trespass at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light trespass into the window down to the after curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
- (3) **Source Intensity** – This applies to each source in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.
- (4) **Building Luminance** – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

Table 2 – Maximum Values of Threshold Increment from Non-Road Lighting Installations				
Light Technical Parameter TI	Road Classification ⁽⁵⁾			
	No road lighting	ME5	ME4/ ME3	ME2 / ME1
	15% based on adaptation luminance of 0.1cd/m ²	15% based on adaptation luminance of 1cd/m ²	15% based on adaptation luminance of 2 cd/m ²	15% based on adaptation luminance of 5 cd/m ²

TI = Threshold Increment is a measure of the loss of visibility caused by the disability glare from the obtrusive light installation

- (5) Road Classifications as given in BS EN 13201 – 2: 2003 Road lighting Performance requirements
Limits apply where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and for viewing directions in path of travel. See CIE Publication 150:2003, Section 5.4 for methods of determination. For a more detailed description and methods for calculating and measuring the above parameters see CIE Publication 150:2003.

RELEVANT PUBLICATIONS AND STANDARDS:

British Standards: www.bsi.org.uk	BS 5489-1: 2003 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas BS EN 13201-2:2003 Road lighting – Part 2: Performance requirements BS EN 13201-3:2003 Road lighting – Part 3: Calculation of performance BS EN 13201-4:2003 Road lighting – Part 4: Methods of measuring lighting performance. BS EN 12193: 2003 Light and lighting – Sports lighting
Countryside Commission/DOE www.odpm.gov.uk	Lighting in the Countryside: Towards good practice (1997) <i>(Out of Print)</i>
CIBSE/SLL Publications: www.cibse.org	CoL Code for Lighting (2002) LG1 The Industrial Environment (1989) LG4 Sports (1990+Addendum 2000) LG6 The Exterior Environment (1992) FF7 Environmental Considerations for Exterior Lighting (2003)
CIE Publications: www.cie.co.at	01 Guide lines for minimizing Urban Sky Glow near Astronomical Observatories (1980) 83 Guide for the lighting of sports events for colour television and film systems (1989) 92 Guide for floodlighting (1992) 115 Recommendations for the lighting of roads for motor and pedestrian traffic (1995) 126 Guidelines for minimizing Sky glow (1997) 129 Guide for lighting exterior work areas (1998) 136 Guide to the lighting of urban areas (2000) 150 Guide on the limitations of the effect of obtrusive light from outdoor lighting installations (2003) 154 The Maintenance of outdoor lighting systems (2003)
Department of Transport www.defra.gov.uk	Road Lighting and the Environment (1993) <i>(Out of Print)</i>
ILE Publications: www.ile.org	TR 5 Brightness of Illuminated Advertisements (2001) TR24 A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999) GN02 Domestic Security Lighting, Friend or Foe
ILE/CIBSE Joint Publications ILE/CSS Joint Publications	Lighting the Environment – A guide to good urban lighting (1995) Seasonal Decorations – Code of Practice (2005)
Campaign for Dark Skies (CfDS) www.dark-skies.org	

NB: These notes are intended as guidance only and the application of the values given in Tables 1 & 2 should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

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APPENDIX 15.2: LIGHTING CONSULTATION

Old Mill Lane, Barnsley

Telephone Conversation Record

Lighting Consultation

Consultation with Barnsley Metropolitan Borough Council

BETWEEN: Alan Pearson **AND** Lucy Allen (Regulatory Services)

DATE: 21/09/2011 **Time:** 10.00

JOB NO. 20470 **PROJECT:** Old Mill Lane

SUBJECT: Lighting Effects Assessment **Tel** 01226 772 455

COPIES TO:

Details:

AP contacted LA to discuss the scope of the lighting assessment and baseline lighting conditions survey. It was ascertained that the methodology and scope of the assessment were comprehensive and acceptable for this Site. LA confirmed the location of sensitive receptors that need to be assessed along Burton Road and Twibell Street. LA outlined that there were also residential properties along Old Mill Lane but they did not need to be considered in the lighting assessment due to the large distance to the Site and there were no direct views of the Site to these properties.

AP outlined the effect of lighting on sensitive ecological species (in particular bats) would be assessed by WSP ecologist in the ecological chapter of the Environmental Statement.

APPENDIX 15.3: GLOSSARY OF TERMINOLOGY

Appendix 15.3 – Glossary of Lighting Terminology

- **BALLAST** – A device used to operate discharge lamps by regulating the lamp current during operation.
- **BUILDING LUMINANCE** – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.
- **CANDELA** – The intensity of a light source in a specific direction. Unit of luminous intensity.
- **COLOUR RENDERING INDEX (CRI)** – A scale of the colour appearance of an object under a particular light source compared to its colour appearance under a reference light source. Expressed on a scale of 1 to 100 where 100 represents the colour rendering of daylight.
- **COLOUR TEMPERATURE** – A specification of the colour appearance of a light source, relating the colour to a reference source heated to a particular temperature, measured in Kelvin.
- **CONTRAST** – The relationship between the luminance of an object and its background. The higher the contrast, the more likely it is an object can be seen.
- **CONVENTIONAL CONTROL GEAR** – Control gear used to run a lamp, typically consisting of a ballast, ignitor and capacitor.
- **DIFFUSE** – Term describing dispersed light distribution referring to the scattering of light.
- **DISABILITY GLARE** – Glare which impairs the vision of objects but may not cause discomfort.
- **DISCOMFORT GLARE** – Glare causing discomfort which may not impair the ability to see objects.
- **EFFICACY** – A measure of light output against energy consumption measured in lumens per watt.
- **ELECTRONIC CONTROL GEAR** – A device that uses semi-conductor components to operate a discharge lamp.
- **FLUORESCENT LAMP** – A lamp consisting of a tube filled with argon, along with krypton or other inert gas.
- **HIGH INTENSITY DISCHARGE (HID)** – Describes mercury vapour, metal halide and high pressure sodium lamps.
- **HIGH PRESSURE SODIUM LAMP** – A HID lamp whose light is produced by radiation from high pressure sodium vapour (and usually a small amount of mercury).
- **ILLUMINANCE** – Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m²).
- **LED** – Light emitting diode.
- **LIGHT POLLUTION** – The spillage of light into areas where it is not required.
- **LIGHT SPILL** – This is the unwanted spillage of light onto adjacent areas and may affect sensitive receptors particularly residential properties and ecological sites.
- **LIGHT TRESPASS** – Light that impacts on a surface outside of the area designed to be lit by a lighting installation.
- **LONGITUDINAL UNIFORMITY** – Ratio of the lowest to highest road surface luminance on a set of grid points in a line along the centre of a driving lane.

- **LOUVRE** – Assembly used to control light distribution from a luminaire.
- **LOW-PRESSURE SODIUM** – A discharge lamp in which light is produced by radiation from low-pressure sodium vapour.
- **LUMEN** – Calculations have shown that one watt of radiant power with a wavelength of 555 nm equals 683 lumens. (This is an arbitrary value which has been selected for definition purposes.) This figure is known as the "maximum spectral luminous efficacy"
- **LUMINAIRE** – A lighting unit designed to distribute the light from a lamp or lamps.
- **LUMINANCE** – Luminance is the concept for the luminous intensity emitted per unit of area of a surface in a specific direction. The unit is the candela per square metre (cd/m²).
- **LUX (LX)** – Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m²).
- **METAL HALIDE** – A type of HID lamp in which most of the light is produced by radiation of metal halide and mercury vapours in the arc tube. Metal halide lamps generally produce high colour rendering.
- **MERCURY VAPOUR LAMP** – ultraviolet lamp that emits a strong bluish light (rich in ultraviolet radiation) as electric current passes through mercury vapour
- **OPTIC** – The components of a luminaire such as reflectors, refractors, protectors which make up the light emitting section.
- **OVERALL UNIFORMITY** – Ratio of the lowest to highest road surface luminance on a set of grid points.
- **PHOTOCELL** – A unit which senses light to control luminaires.
- **PHOTOPERIOD** – Response of plants and animals to the period of daylight
- **REFLECTANCE** – The ratio of light reflected from a surface to the light incident on the surface.
- **REFLECTOR** – A device used to reflect light onto a surface.
- **REFRACTOR** – A device used to redirect the light output from a lamp when the light passes through it.
- **SKY GLOW** – The brightening of the night sky caused by artificial lighting.
- **SOURCE INTENSITY** – This applies to each source in the potentially obtrusive direction, outside of the area being lit.
- **ULTRA VIOLET (UV)** – Radiation that is shorter in wavelength and higher in frequency than visible violet light.
- **UPWARD LIGHT RATIO** – Some lighting schemes will require the deliberate and careful use of upward light – e.g. ground recessed luminaires, ground mounted floodlights, festive lighting – to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.
- **VOLTAGE** – The difference in electrical potential between two points of an electrical circuit.
- **WATT (W)** – The unit for measuring electrical power.

APPENDIX 15.4: DETAILED BASELINE LIGHTING RESULTS

Appendix Table 15.4: Detailed Baseline Lighting Survey Results

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
NV1	1.58	4.23	0.31	1.58	0.97	E3	The current night-time scene, viewed in all directions (360 degrees) from NV1 Located on raised ground in the A61 Link Rod construction site, north-west of the Site, is illustrated in Figure X.2. This is situated approximately 120m from the north-eastern boundary of the Site. The predominant lighting at this location comprises of highways lighting fitted with low pressure sodium (LPS) lamps mounted in shallow bowl lanterns on columns approximately 12m in height. Such installations are typical along Burton Road adjacent to this viewpoint. In an easterly direction of the viewpoint the first highways lighting comprises a refractor optic with bowl fitted with a LPS lamp mounted on a 12m high column. This LPS light source generated high levels of glare with luminance levels of 7816cd/m² recorded at a distance of approximately 20m. The highways lighting comprise refractor optics with bowls fitted with LPS lamps and are situated on alternative sides of the road. Moving east along Burton Road values of 3369cd/m² and 789.8cd/m² were recorded respectively. Moving west along Burton Road the lighting is dominated by highways lighting in the form of LPS lamps mounted on 12m high columns located on alternating sides of the road. The recorded luminance levels are recorded, moving away from NV1 along Burton Road, as 2158cd/m², 466cd/m², 92.11cd/m², 251cd/m², 146.5cd/m², and 29.83cd/m². In a southerly direction, the horizon is dominated by asymmetric floodlighting mounted on 40m columns associated with the Peel Retail Park. The luminance levels were recorded moving from east to west as: 44.28cd/m², 57cd/m², 23cd/m², 3.5cd/m², 5.8cd/m², 3.64cd/m², and 416cd/m². Further west, the lighting is dominated by LPS lamps associated with highways lighting with luminance values working from east to west recorded as: 2.12cd/m², 9.8cd/m², 9.6cd/m², 6.22cd/m², and 20.68cd/m². There are three high pressure sodium (HPS) lamps associated with the Asda retail store which recorded luminance values of 3.3cd/m², 2.8cd/m² and 1.7cd/m². Along Old Mill Lane to the west of the Site, there are a number of LPS lamps mounted on 12-14m columns approximately 30m apart associated with highways lighting and these were recorded as 7.5cd/m², 3.3cd/m², 9.5cd/m², 7.13cd/m², 2.23cd/m², and 2.84cd/m². NV1 shows that the Site is situated in a brightly lit urban environment with lighting to the north, west and south. The post-curfew operation of the lighting at this location, the illuminance levels can be considered representative of the obtrusive light limitations for an E3 Environmental Zone. This is considered generally typical of the obtrusive light limitations for an area of “medium district brightness” under current ILE Guidance (2005). The vertical illuminance levels, which are representative of the light spill experienced at this location, are due to the surrounding townscape and are affected predominantly by modern highways lighting adjacent to Burton Road.
NV2	21.34	8.05	26.45	23.88	25.47	E4	The current night-time scene, viewed in all directions (360 degrees) from NV2 located on the junction between Twibell Street and Harborough Hill Road adjacent to the south-western boundary of the Site. This viewpoint has views into the southern section of the Site, along Twibell Street, along Old Mill Lane, and along Harborough Hill Road. The views from NV2 are illustrated in Figure X.3. From NV2 looking north along Old Mill Lane, there are highways lighting comprise reflector optics with bowls fitted with HPS lamps mounted on approximately 12-14m columns close to the junction with Harborough Hill Road with the closest moving north along Old Mill Lane recording luminance values of 48,950cd/m², 1823cd/m², 141.7cd/m², and 145.3cd/m².

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
							The illuminance reading associated with the Asda signage is 63.44cd/m², and the highways lighting fitted with HPS lamps mounted on 12-14m columns located between Asda and the Site were recorded as 7717cd/m² (approximately 10m), 223.4cd/m² and 84.22 cd/m² (approximately 100m). Looking south, moving away from the Site along Harborough Hill Road, there are highways lighting fitted with HPS lamps mounted on 12-14m columns moving uphill with the closest approximately 100m away and the furthest extending to 300m. The luminance readings 100m to 300m are 168.4cd/m², 91.61cd/m², 297.4cd/m² and 16.11cd/m². Looking east along Twibell Street, there are highways lighting fitted with LPS lamps mounted on 6m columns with the closest LPS located next to NV2. The luminance readings moving further east along Twibell Street were 14,946cd/m², 372.3cd/m² and 32.64cd/m². The post-curfew operation of the lighting at this location, the illuminance levels can be considered representative of the obtrusive light limitations for an E4 Environmental Zone. This is considered generally typical of the obtrusive light limitations for an area of "high district brightness" under current ILE Guidance (2005). The vertical illuminance levels, which are representative of the light spill experienced at this location, are due to the surrounding townscape and are affected predominantly by modern highways lighting adjacent to Burton Road.
A	0.41	0.05	0.02	0.13	0.12	E2	Monitoring location A is situated on Site next to the culvert located on the River Dearne approximately 10-15m western perimeter. The ambient lighting conditions at this location are primarily influenced by highways lighting comprising reflector optics with bowls fitted with LPS and HPS lamps mounted on columns approximately 12-14m in height along Old Mill Lane. Other lighting sources are the floodlighting associated with the construction compound located on the northern section of the Site and highways LPS lamps located along Burton Road. There is a large amount of screening associated with the trees and vegetation along the banks of the River Dearne, which effectively screen the south section of the Site from the north. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an E2 Environmental Zone. This is considered generally representative of the obtrusive light limitations for an area of 'low distinct brightness'.
B	0.03	0.00	0.01	0.02	0.02	E2	Monitoring location B is situated in the centre of the Site on the northern bank of the River Dearne and is representative of the ambient lighting conditions within the northern section of the Site. The ambient lighting conditions at this location are influenced by highways lighting fitted with LPS lamps along Burton Road. Otherwise there are no other apparent sources of lighting in the immediate vicinity. This monitoring location is in the northern section of the Site adjacent to the River Dearne which runs west to east through the centre of the Site. The Site's topography slopes on either side of the River down towards the River Dearne in the centre of Site. There is a large amount of screening associated with the trees and vegetation along the banks of the River Dearne, which effectively screen the south section of the Site from the north. The illuminance levels are low in the centre of the Site and in accordance with post-curfew values stipulated under current ILE Guidance (2005) are considered representative of an E2 Environmental Zone. This is considered generally representative of the obtrusive light limitations for an area of 'low distinct brightness'.

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
C	0.11	0.07	0.16	0.03	0.06	E2	Monitoring location C is situated on the northern bank of the River Dearne approximately 40m from the eastern boundary of the Site. The ambient lighting levels are representative of the River Dearne corridor. The ambient lighting conditions at this location are influenced by highways lighting fitted with LPS lamps along Burton Road, and the asymmetric floodlighting associated with Booker's Cash and Carry Warehouse located on the southern bank of the River Dearne. The warehouse has a number of floodlightings attached to the building which provide security lighting at night. There are intermittent views of the warehouse on the southern bank of the River Dearne resulting from trees and vegetation acting as screening on the banks of the River. Otherwise there are no other apparent sources of lighting in the immediate vicinity. The topography slopes down to this monitoring location due to its location at the bottom of the valley next to the river. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance values are considered representative of an E2 Environmental Zone. This is considered generally representative obtrusive light limitations for an area of 'low district brightness'.
D	0.23	0.20	0.05	0.08	0.15	E2	Monitoring location C is situated on the northern bank of the River Dearne adjacent to the eastern boundary of the Site. The ambient lighting at this location is primarily influenced by highways lighting comprising refractor optics with bowls fitted with LPS lamps situated on Burton Road to the north. The land to the east of the Site boundary is occupied by the Dearne Valley Country Park and Local Nature Reserve which is an unlit and undeveloped environment. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance values are considered generally representative of an E2 Environmental Zone. This is considered representative obtrusive light limitations for an area of 'low distinct brightness'.
E	9.27	6.49	0.37	1.63	1.14	E3	Monitoring location E is situated in the car park of the construction compound located in the northern section of the Site. The ambient lighting conditions are dominated by three asymmetric beam floodlights raised to a height of 10m which are associated with the security of the construction compound. Other influences on the ambient lighting levels are modern highways lighting fitted with HPS and LPS lamps mounted on 12-14m columns located on Old Mill Lane to the west, and highways lighting fitted with LPS lamps located on Burton Road to the north. This location is screened from the southern section of the Site by trees and vegetation along the banks of the River Dearne. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an E4 Environmental Zone however because this reading was taken directly underneath a direct light source in a dark area this has been factored down to an E3 Environmental Zone. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium distinct brightness' under current ILE 2005 Guidance.
F	9.26	1.73	3.79	8.69	5.48	E3/E4	Monitoring location F is situated outside residential properties at 6 Burton Road approximately 120m north of the Site. The ambient lighting is dominated by highways lighting comprising refractor optics with bowls fitted with LPS lamps mounted on 12m columns along Burton Road and Old Mill Lane. The lighting conditions are also subject to fugitive

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
							lighting from residential properties along Burton Road. At this monitoring location there are a number of 2 storey houses with direct and intermittent views into the Site. The Wickes retail store provides a level of screening for a number of houses along Burton Road, and along with trees planted along Burton Road provides intermittent views of the Site. The southern section of the Site is screened from view by the trees and vegetation associated with the River Dearne. This monitoring location is representative of a sensitive residential receptor with direct/intermittent views of the Site. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) is considered representative of an E3/E4 Environmental Zone because whilst readings exceeded the E4 threshold the level of light varied considerably due to inconsistent lighting along Burton Road. It is considered such values are generally representative of the obtrusive light limitations for an area of 'medium distinct brightness'.
G	1.49	0.30	0.12	0.32	0.42	E3	Monitoring location G is situated in the car park of flats located between Burton Road and the Site. This location is approximately 50m from the northern Site boundary. The ambient lighting conditions at this location is predominantly influenced by security floodlighting along the 3 storey flats and fugitive lighting from residential flats. The longer distance views are influenced by light from highways lighting fitted with LPS lamps and asymmetric floodlighting on the horizon. From this monitoring location there are direct views into the north-western section of the Site, and restricted/intermittent views into the north-eastern section of the site due to sparse trees and vegetation acting as screening. From higher windows none of the views are restricted resulting in direct views into the entire northern section of the Site. The southern section of the Site is screened by the trees and vegetation running adjacent to the River Dearne. In accordance with the pre and post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an E3 Environmental Zone. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium distinct brightness' under current guidance.
H	1.83	13.14	9.48	4.95	8.81	E3/E4	Monitoring location H is situated further to the east along Burton road outside residents located at 86 Burton Road. This monitoring location is approximately 140m north-east of the Site and is representative of a sensitive residential receptor with direct views into the Site. The ambient lighting conditions are dominated by highways lighting comprising refractor optics with bowls fitted with LPS lamps mounted on 12m columns on alternative sides of Burton Road. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an E3/E4 Environmental Zone because whilst readings exceeded the E4 threshold, the levels of light varied considerably with inconsistent levels of lighting along Burton Road. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high distinct brightness'.
I	7.57	1.48	19.41	6.74	12.29	E4	Monitoring location I is situated on Old Mill Lane adjacent to the western boundary of the Site. The ambient lighting is predominantly influenced by a mixture of highways lighting comprising reflector optics with bowls fitted with HPS lamps mounted on 12-14m columns situated at 30m intervals on both sides of Old Mill Lane. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
							considered representative of an E4 Environmental Zone . It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'high distinct brightness'.
J	1.58	0.25	6.76	9.99	1.44	E3/E4	Monitoring location J is located in the car park of Howdens and Plumb Center retail warehouses situated in the southern section of the Site. The ambient lighting conditions are predominantly affected by one asymmetric beam floodlight mounted upon the Plumb Center warehouse building, and also the highways lighting fitted with HPS lamps mounted on 12-14m columns along Old Mill Lane. The northern section of Site is screened by trees and vegetation associated with the River Dearne in the centre of the Site. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an E3/E4 Environmental Zone because although certain readings exceed the E4 threshold, these were over-elevated as a result of bulkhead security floodlighting associated with the adjacent warehouses. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high distinct brightness'.
K	0.49	8.89	4.92	0.87	12.19	E3/E4	Monitoring location K is located outside of a block of residential properties situated at 39 Twibell Street. This location is approximately 12m from the southern boundary of the Site. Twibell Street is predominantly lit by modern highways lighting comprising reflector optics with bowls fitted with of a mixture of LPS and HPS lamps mounted on approximately 6m tall columns positioned 20m intervals. Ambient lighting conditions are also influenced by minimal levels of fugitive lighting associated with residential properties. The southern section of the Site is screened by a 2m wall for the ground floor of the 2 storey houses with views on the second floor being unobstructed into the Site. This monitoring location was selected as a representative of a sensitive residential receptor located to the south of the Site. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an E3/E4 Environmental Zone because readings exceed the E4 threshold; however the light varied considerably with inconsistent levels of lighting along Twibell Street. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high district brightness'.
L	2.40	0.76	0.48	3.27	1.86	E3	Monitoring location L is situated outside of the existing entrance to the retail units on the southern section of Site on Twibell Street. The lighting conditions at this monitoring location are the same sources of lighting visible in monitoring location K. In addition, the ambient lighting is influenced by highways lighting comprising reflector optics with bowls fitted with HPS lamps associated with Harborough Hill Road. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an E3 Environmental Zone. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness'.

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
M	7.88	16.78	7.49	8.68	6.99	E4	Monitoring location M is situated in the centre of the Asda retail store's car park approximately 100m west of the Site. The ambient lighting conditions are predominantly affected by the 6 HPS asymmetric beam floodlights located across the car park, which are indicative of modern car park lighting for supermarket developments. The HPS lamps are mounted on columns of approximately 40m with full horizontal cut off. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an E4 Environmental Zone. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'high district brightness'.
N	3.39	28.85	12.46	14.16	10.8	E3/E4	Monitoring location N is situated outside residential properties located at 7 Twibell Street approximately 12m from the southern boundary of Site. The lighting conditions at this monitoring location are similar to monitoring location L with the predominant sources of lighting coming from modern highways lighting consisting of reflector optics with bowls fitted with a mixture of LPS and HPS lamps mounted on approximately 6m tall columns positioned 20m intervals and levels of lighting associated with residential properties. In addition ambient lighting is influenced by modern highways lighting fitted with HPS located along Harborough Hill Road and Old Mill Lane. This monitoring location is representative of a sensitive residential receptor with direct views into the southern section of the Site. The topography at Twibell Street slopes down towards the River Dearne in the centre of the Site; therefore Twibell Street is raised with direct and unobstructed views into the southern section of the Site. The vegetation running along the River Dearne screens the north of the Site. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an E3/E4 Environmental Zone because although readings exceed the E4 threshold, these readings were taken directly beneath a light source and not representative of the lighting conditions. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high district brightness'.

