



· LIGHTING DESIGN · ELECTRICAL · SMART CITIES ·
ENERGY REDUCTION · LIGHTING IMPACT

MITCHELDEAN

LIGHTING STRATEGY

DFL-UK

17 City Business Centre, Hyde Street, Winchester, SO23 7TA
+44(0)1962 855080 | info@dfi-uk.com | www.dfi-uk.com



PROJECT NUMBER: 3541		DOCUMENT REF: 3541-DFL-ELG-XX-RP-EO-13001			
P05	Fifth Issue	AJB	AL	AL	19/02/2025
P04	Fourth issue	AJB	AL	AL	12/12/2024
P03	Third issue	AJB	AL	AL	19/11/2024
P02	Second issue	AJB	AJB	AL	03/07/2024
P01	First issue	SP	AJB	AL	26/06/2024
Revision	Purpose Description	Originated	Checked	Approved	Date

Designs for Lighting (DFL) is a business built on successfully collaborating with our clients. We have over 20 years proven experience in our industry, listening to the challenges our clients face, developing the best solutions and being innovators in our specialism. Our role is to find the most effective and sustainable outcome to enhance and support your projects. We proudly work with recognised industry bodies to promote and shape the future of the industry and ensure our staff are trained to exceed the required competency levels of our industries. Above all, we ensure each project delivers against our values.



Quality



Knowledgeable



Dependable



Clear Advice

Table of Contents

1. Introduction	5
1.1. Executive Summary	5
2. Legislative Frameworks and National Policies	6
2.1. Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005..	6
2.2. National Planning Policy Framework 2023.....	6
2.3. Planning Practice Guidance	7
3. Local policies.....	8
3.1. Forest of Dean District Council, Forest of Dean Draft Local Plan 2021-2041.	8
3.2. Manual for Gloucestershire Streets Section 10, Street Lighting Rev 1	8
4. British Standards.....	9
4.1. BS 5489-1:2020 - Lighting of Roads and Public Amenity Areas - Code of practice.	9
4.2. BS EN 13201-2:2015 - Road lighting. Performance requirements.	9
5. Guidance	10
5.1. Guidance Notes for the Reduction of Obtrusive Light (Institution of Lighting Professionals GN01/2021).....	10
5.2. GN08/2023 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals.	11
6. Desktop Study.....	12
6.1. Site Description and Context.....	12
6.2. Designations.....	13
6.3. Baseline lighting.....	13
6.4. CPRE Night Blight Mapping	14
6.5. Environmental Zone Classification	15
7. Identified Receptors.....	16
7.1. Ecological	16
7.2. Human Amenity	16
8. Lighting strategy.....	17
8.1. Summary.....	17
8.2. Roadways.....	18
8.3. Property Frontages and Rears	18
9. Summary of Results.....	19
9.1. Overview	19
9.2. Summary of Results	19
9.3. Mitigation	21
10. Conclusion	21
10.1. General	21
Appendix 1 – Light Spill Diagram.....	22
Appendix 2 – Vertical Light Spill Diagram	22
Appendix 3 – Sensitive Receptors	22

Appendix 4 – Equipment Specification.....	23
1.1. Luminaire and control specification.....	23
Technical Descriptions, Definitions & Abbreviations	27

Table of Figures

Figure 1: Example of lighting zonation near sensitive boundaries and known ecological habitat	11
Figure 2: The Application Site location and boundary	12
Figure 3: Proposed Development Site layout plan	13
Figure 4: Surrounding areas/roads.....	14
Figure 5: Performance requirements	18
Figure 6: Sensitive receptors.....	22

Table of Tables

Table 1: Environmental Zone Descriptions.....	10
Table 2: Obtrusive Light Criteria.....	10
Table 3: Limitations of identified environmental zone.	15
Table 4: Potentially Sensitive Ecological Receptors (PSER)	16
Table 5: Potential Human Amenity Receptors (PHAR)	16
Table 6: PSER results table, maximum illuminance.....	19
Table 7: PHAR results table, maximum illuminance.....	20
Table 1.1: Luminaire performance requirements.....	23
Table 1.2: Luminaire performance requirements.....	24
Table 1.3: Luminaire performance requirements.....	25
Table 1.4: Luminaire performance requirements.....	26

1. INTRODUCTION

1.1. Executive Summary

- 1.1.1. This Lighting Strategy has been written by DFL (Designs for Lighting Ltd¹), a lighting design consultancy specialising in Lighting Impact Assessments, obtrusive light mitigation, and detailed lighting design.
- 1.1.2. The Lighting Strategy proposes good practice and outlines a suitable approach for the proposed lighting at Carisbrook Road, Mitcheldean, for the purpose of safety, security, wayfinding and amenity. The lighting strategy is intended to set out a minimally obtrusive approach to the lighting, whilst ensuring it is necessary and considers the sensitivity of nearby human, environmental and ecological receptors.
- 1.1.3. Lighting associated with the Proposed Development will comply with relevant British Standards and Institution of Lighting Professionals (ILP) guidance to ensure obtrusive light is minimised in accordance with best practice.
- 1.1.4. This report outlines the following:
 - Relevant obtrusive light policies in direct relation to the Proposed Development;
 - Relevant National and Local Policies;
 - Why the Proposed Development requires artificial lighting; and
 - Details as to how lighting will be implemented for the Proposed Development.
- 1.1.5. It has been identified that the Application Site is set within a sparsely inhabited rural area (E2).
- 1.1.6. Through careful design and mitigation, this Lighting Strategy ensures the lighting installation at the proposed development will be in accordance with British Standards, Guidance and Local Policy.
- 1.1.7. Whilst the Application Site is for outline planning purposes, this report offers an ongoing strategy, and indicative approach that will ensure that any artificial lighting designed during the detailed stage will be done so in a sensitive manner. This will ensure that existing residents to the surrounding area and the ecological diversities within the surroundings are not negatively affected by artificial lighting installed within the extent of the Application Site.
- 1.1.8. Local Policies LP.9 and LP.15 implemented by the Forest of Dean Council have been accounted for through the restriction of luminaire types, mounting height, mounting type and maximum lumen packages as outlined within **Section 8** and **Appendix 4**.

¹ <https://www.dfl-uk.com/about/>

2. LEGISLATIVE FRAMEWORKS AND NATIONAL POLICIES

2.1. Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

- 2.1.1. Since 2005, artificial light has been incorporated as a potential statutory nuisance. An amendment to section 79 of the Environmental Protection Act 1990, contained within the Clean Neighbourhoods and Environment Act 2005 states:

“The following matters constitute “statutory nuisances” for the purposes of this Part, that is to say— [...]

[...] artificial light emitted from premises so as to be prejudicial to health or a nuisance;

[...]and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint”.

2.2. National Planning Policy Framework 2025

- 2.2.1. The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how they are expected to be applied and provides a framework for local plans. With regard to light pollution, the NPPF was updated in February 2025 and states that the following elements are to be considered:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- > mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- > identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- > limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”*

2.3. Planning Practice Guidance

2.3.1. Guidance for assessing the effects of proposed artificial lighting is outlined in the planning practice guidance (PPG). The guidance states:

“Does an existing lighting installation make the proposed location for a development unsuitable, or suitable only with appropriate mitigation? For example, this might be because:

- *the artificial light has a significant effect on the locality; and/or*
- *users of the Proposed Development (e.g., a hospital) may be particularly sensitive to light intrusion from the existing light source.*

Where necessary, development proposed in the vicinity of existing activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme, reflecting the agent of change principle. Additional guidance on applying this principle is set out in the planning practice guidance on noise.

- *Will a new development, or a proposed change to an existing site, be likely to materially alter light levels in the environment around the site and/or have the potential to adversely affect the use or enjoyment of nearby buildings or open spaces?*
- *Will the impact of new lighting conflict with the needs of specialist facilities requiring low levels of surrounding light (such as observatories, airports and general aviation facilities)? Impacts on other activities that rely on low levels of light such as astronomy may also be a consideration but will need to be considered in terms of both their severity and alongside the wider benefits of the development.*
- *Is the development in or near a protected area of dark sky or an intrinsically dark landscape where new lighting would be conspicuously out of keeping with local nocturnal light levels, making it desirable to minimise or avoid new lighting?*
- *Would new lighting have any safety impacts, for example in creating a hazard for road users?*
- *Is a proposal likely to have a significant impact on a protected site or species? This could be a particular concern where forms of artificial light with a potentially high impact on wildlife and ecosystems (e.g. white or ultraviolet light) are being proposed close to protected sites, sensitive wildlife receptors or areas, including where the light is likely to shine on water where bats feed.*
- *Does the Proposed Development include smooth, reflective building materials, including large horizontal expanses of glass, particularly near water bodies? (As it may change natural light, creating polarised light pollution that can affect wildlife behaviour.)”*

3. LOCAL POLICIES

3.1. Forest of Dean District Council, Forest of Dean Draft Local Plan 2021-2041.

- 3.1.1. The relevant Local Planning Authority (LPA) for the Proposed Development is Forest of Dean District Council, with policies detailed within the Forest of Dean Draft Local Plan 2021-2041, version May 2024 applying to the lighting associated with the Proposed Development.

The applicable policies are:

Policy LP.9 Habitats and Species Protection

“Mitigation of Potential Adverse Impacts

Development should avoid adverse impact on existing biodiversity and geodiversity as a first principle, in line with the mitigation hierarchy. Where adverse impacts are unavoidable they must be adequately and proportionately mitigated. If full mitigation cannot be provided, compensation will be required as a last resort where there is no alternative.”

Policy LP.15 Design Principles

“6.10 It is important that environments are safe with well-designed lighting but equally that excessive scatter or intensity is avoided. Overall the areas within the FoDD where the CPRE designation ‘darker’ applies should be retained as such. Sites will often require regulation of lighting in order to protect and enable wildlife to continue to use them and meeting considerations should help the overall need to avoid excessive lighting and scatter.”

3.2. Manual for Gloucestershire Streets Section 10, Street Lighting Rev 1

- 3.2.1. Adoptable Lighting associated with the Proposed Development will be designed and installed in accordance with Gloucestershire County Council’s adoptable specification for Street Lighting, as per policy document:

Manual for Gloucestershire Streets Section 10, Street Lighting Rev 1

4. BRITISH STANDARDS

4.1. **BS 5489-1:2020 - Lighting of Roads and Public Amenity Areas - Code of practice.**

- 4.1.1. This standard gives recommendations on the general principles of road lighting, its aesthetics and technical aspects and provides guidance on operational maintenance. It also provides guidance on means of minimizing energy consumption and limiting the impacts on the environment and adjacent properties.

4.2. **BS EN 13201-2:2015 - Road lighting. Performance requirements.**

- 4.2.1. This British and European standard defines the performance requirements specified as lighting classes for road lighting aiming at the visual needs of the road users, as well as the consideration of the environmental aspects of the road lighting to be applied.

5. GUIDANCE

5.1. Guidance Notes for the Reduction of Obtrusive Light (Institution of Lighting Professionals GN01/2021)

5.1.1. The Lighting Strategy is informed by industry guidance notes which aim to reduce the potential for obtrusive light to occur, which is typically caused by poorly designed and installed exterior artificial lighting. The Lighting Strategy is informed by the most relevant sections of GN01/2021 that has recently been published to reduce the potential for obtrusive light from a wide range of exterior lighting applications.

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA Dark Sky Parks.
E1	Natural	Intrinsically dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, etc.
E2	Rural	Low district brightness (SQM ~ 15 to 20)	Sparsely inhabited rural areas, Village or relatively dark outer suburban locations.
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres or suburban locations.
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity.

Table 1: Environmental Zone Descriptions

Environmental Zones	Sky Glow ULR ² (Max %)	Light Trespass (Into Windows) E _v (lux)		Building Luminance Average, Pre-curfew
		Pre-Curfew	Post-Curfew ³	Average L (cd/m ²)
E0	0	0	0	0
E1	0	2	0 (1*)	0
E2	2.5	5	1	5
E3	5	10	2	10
E4	15	25	5	25

Table 2: Obtrusive Light Criteria

² ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky.

³ Curfew refers to a time when the local planning authority has agreed that the lighting installation should be switched off; this typically refers to 23h00 – 07h00

5.2. GN08/2023 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals.

5.2.1. This document is aimed at lighting professionals, lighting designers, planning officers, developers, bat workers/ecologists and anyone specifying lighting. It is intended to raise awareness of the impacts of artificial lighting on bats, and mitigation is suggested for various scenarios. However, it is not meant to replace site-specific ecological and lighting assessments, which states the following.

"It is acknowledged that, especially for vertical calculation planes, very low levels of light (<0.5 lux) may occur even at considerable distances from the source if there is little intervening attenuation. It is therefore very difficult to demonstrate 'complete darkness' or a 'complete absence of illumination' on vertical planes where some form of lighting is proposed on site despite efforts to reduce them as far as possible and where horizontal plane illuminance levels are zero. Consequently, where 'complete darkness' on a feature or buffer is required, it may be appropriate to consider this to be where illuminance is below 0.2 lux on the horizontal plane and below 0.4 lux on the vertical plane. These figures are still lower than what may be expected on a moonlit night and are in line with research findings for the illuminance found at hedgerows used by lesser horseshoe bats, a species well known for its light adverse behaviour (Stone, 2012)."

"A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component."

*"A buffer zone subdivided to into smaller zones of increasing illuminance limit further away from the Supporting Habitat would ensure light levels (illuminance - measured in lux) do not exceed certain defined limits. This has the effect of a gradual decrease in lighting from the developed zone, rather than a distinct cut-off, which may provide useable area for the project which also limits lighting impacts on less sensitive species, or less well-used habitat." (see **Figure 1**)."*

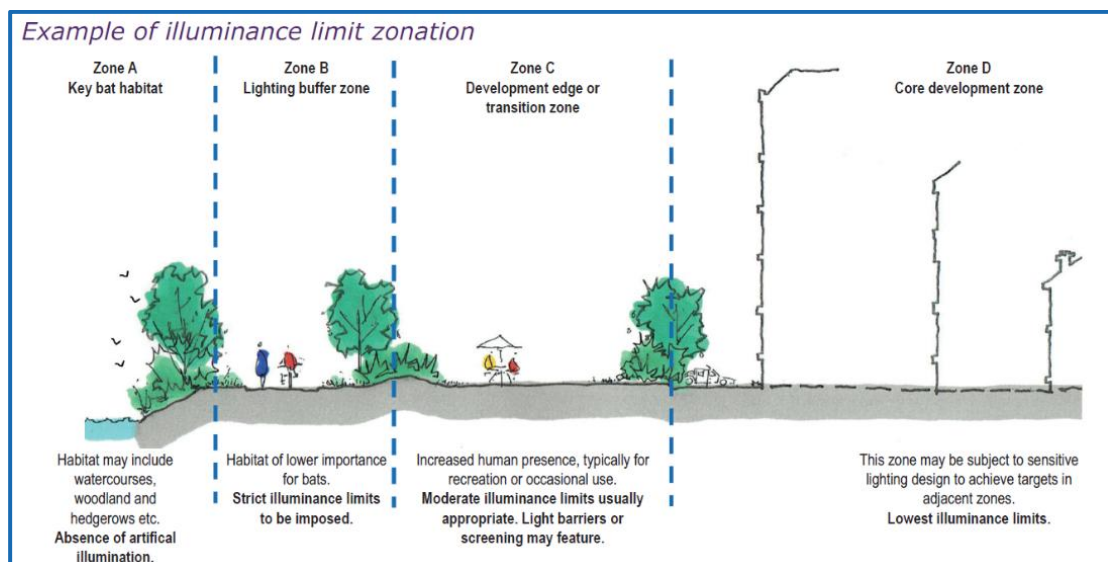


Figure 1: Example of lighting zonation near sensitive boundaries and known ecological habitat

6. DESKTOP STUDY

6.1. Site Description and Context

- 6.1.1. The Application Site is off Carisbrook Road to the north, Mitcheldean. The Application Site is a 9.72 hectare field currently in agricultural use. The site is bounded by an intermittent hedgerow and treeline, with shrubs and fences in areas. The Application Site boundary can be seen in **Figure 2**.
- 6.1.2. The Proposed Development comprises 180 residential dwellings, parking and associated infrastructure. The Outline Plan is shown in **Figure 3**.
- 6.1.3. A desktop assessment was completed to understand its position within the current lit environment.

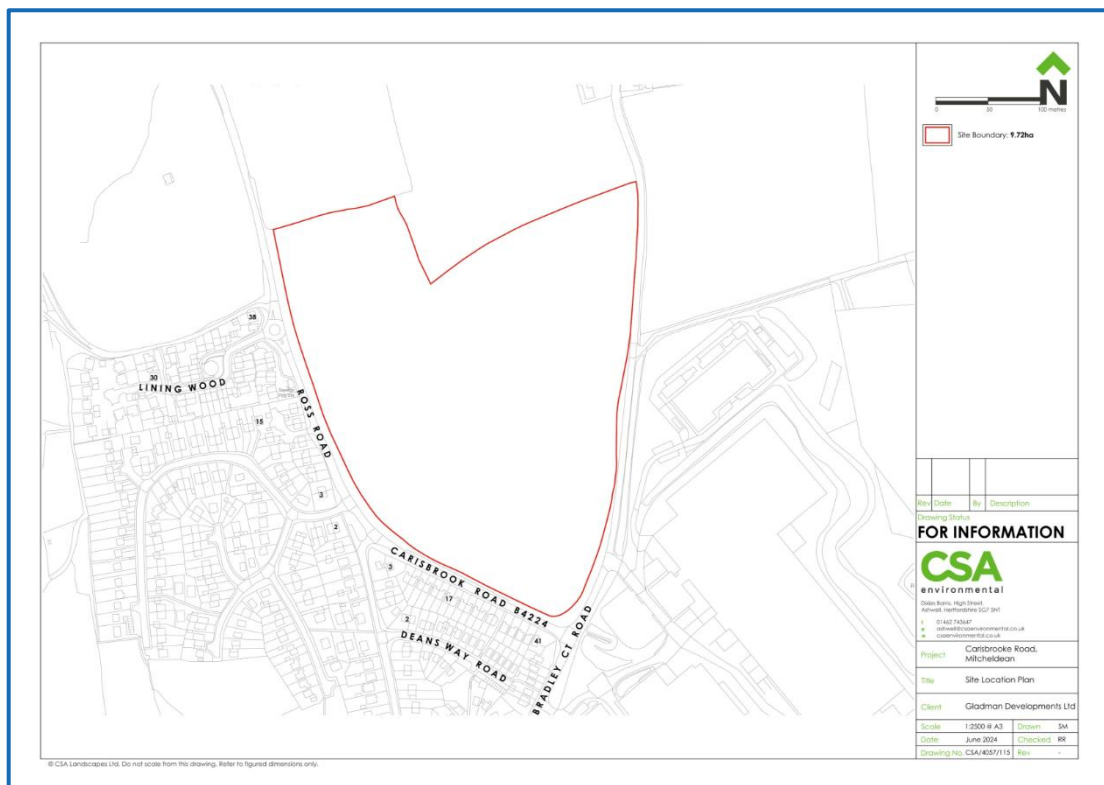


Figure 2: The Application Site location and boundary



Figure 3: Proposed Development Site layout plan

6.2. Designations

- 6.2.1. The Site is in proximity to the Wye Valley and Forest of Dean Bat Sites Special Area of Conservation (SAC) which is designated for its international importance. The SAC is comprised of multiple sites, the closest being Wigpool Ironstone Mine SSSI, located approximately 510m west of the Site.

6.3. Baseline lighting

- 6.3.1. All the roads in the vicinity of the application site; Bradley Close Road to the east, Bradley Court Road, Carisbrook Road, Old Dean Road to the south and Ross Road (B4224), Hollywell Road and Lining Wood to the west, are lit by LED luminaires mounted post top at a height of between 5 & 6 metres. Bradley Close Road becomes unlit to the east when the road changes to national speed limit.

6.4. CPRE Night Blight Mapping⁴

- 6.4.1. To inform our understanding of the nighttime environment, we look to use the CPRE Nightblight map to better appreciate the current baseline light levels. The CPRE Night Blight Mapping confirms the skyward radiance within the vicinity of the Application Site is between 8 - 16 Nano Watts/cm²/sr. As shown in Figure 5, the likely levels of skyglow within the vicinity of the Application Site are similar to those expected within an E3 zone, however due the description of the surrounding environment and location of the Application Site extent, the area would be defined as an E2 environmental zone.

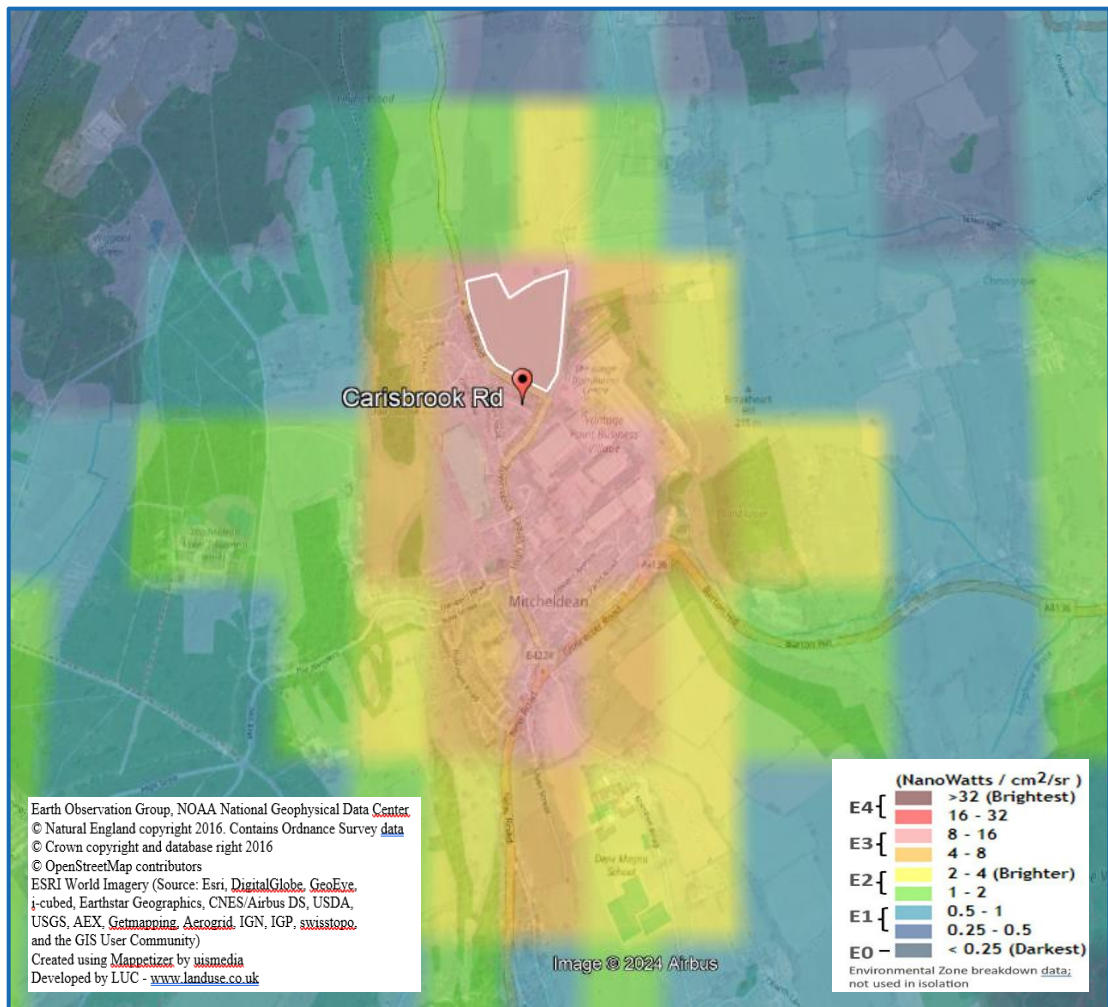


Figure 4: Surrounding areas/roads

⁴ NightBlight Map is a visual representation of light pollution as a view from above the earth's atmosphere and indicates upward light spill based on sky glow.

6.5. Environmental Zone Classification

6.5.1. The Environmental Zone criteria detailed within **Table 1** and **Table 2** informs the basis of the Lighting Strategy. The Application Site is considered to be located within an E2 Environmental Zone, because it is situated in an outer suburban location with open countryside and woodland to the north, north-west and north-east of the site.

Zone	Surrounding	Examples	Limitations		Sky Glow ULR (Max)
			Pre-curfew	Post-curfew	
E2	Rural	Sparsely inhabited rural areas, Village or relatively dark outer suburban locations	5	1	2.5%

Table 3: Limitations of identified environmental zone.

7. IDENTIFIED RECEPTORS

7.1. Ecological

- 7.1.1. The north, northwestern and northeastern boundaries of the Application Site have been identified in the Interim Ecological Impact Assessment, Report No: CSA/4057/06 as areas where potentially sensitive ecological receptors may be present, as shown in Appendix 3. Therefore, this lighting strategy has been written in accordance with GN08/2023.

Receptor Type	Receptor No. (Appendix 3)	Description	Sensitivity
Ecology	PSER 001	Northern hedgerow of site to have a dark corridor for commuting and foraging bats.	High
Ecology	PSER 002	Treeline/ Hedgerow to north-west of site adjacent to B4224 Ross Road	High
Ecology	PSER 003	Hedgerow in north-eastern corner adjacent to Bradley Close Road for commuting bats	High

Table 4: Potentially Sensitive Ecological Receptors (PSER)

7.2. Human Amenity

To the west of the Application Site, Potential Human Amenity Receptors (PHAR) have been identified as shown in **Appendix 3**. Therefore, this lighting strategy has been written in accordance with GN01/2021, **Table 2** - Obtrusive Light Criteria.

Receptor Type	Receptor No. (Appendix 3)	Description	Sensitivity
Human Amenity	PHAR 001	Residential dwellings located along B4224 (Carisbrook Road/Ross Road) to the west/ south-west of the site.	Low

Table 5: Potential Human Amenity Receptors (PHAR)

- 7.2.1. Potential Human receptors were noted further afield to the north and west of the Application Site. Due their proximity (greater than 200 metres) to the nearest source of artificial lighting (in accordance with the strategy), and location in relation to the ecologically enhanced green land which will form a natural light blocking element, they are assessed not to receive any lighting effects and have therefore not been included in the results summary.

8. LIGHTING STRATEGY

8.1. Summary

- 8.1.1. The Proposed Development will require lighting for safety and amenity at limited times during the hours of darkness. Lighting will be fit for purpose and sensitive to nearby human and ecological receptors.
- 8.1.2. Lighting will be of an appropriate specification and designed in accordance with British Standards.
- 8.1.3. Amenity lighting for the Proposed Development will be applied sensitively to account for the receptors identified bounding the Application Site and within the Proposed Development.
- 8.1.4. Luminaires will be used with integral LEDs and only where the luminaire photometry is available from the manufacturer. This is to ensure the photometric footprint of the luminaires can be modelled to ensure the potential effects of light spill are minimised or mitigated.
- 8.1.5. The following criteria seeks to ensure that the lighting is not outside of the obtrusive light limits for the Environmental Zone in which the Application Site is located, is sensitive to the area, and provides a recognised standard level of lighting for all adoptable areas requiring illumination. Luminaires will distribute light downwards only to reduce the potential for light spill onto the boundaries surrounding the buildings and upwards towards the sky.
- 8.1.6. All lighting unless otherwise stated is to emit a warm white colour temperature light (3000 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 8.1.7. As additional mitigation to account for the sensitivity of the surrounding environment a buffer zone where no lights are to be installed has been proposed in the mitigation section (further outlined in **Appendix 1**).
- 8.1.8. Private roads identified in **Appendix 1** by a yellow line, are to be left unlit.
- 8.1.9. Pathways identified in **Appendix 1** by a red line are to remain unilluminated, however, reflective bollards should be used where a change in direction or ground level is to be highlighted for users of the Application Site traveling by bicycle.
- 8.1.10. Lighting in adopted areas will be required in the following application areas:
 - > Roadways
 - > Property Frontages and Rears

8.2. Roadways

- 8.2.1. The Roadways will be illuminated in accordance with BS 5489-1:2020 & BS EN 13201-2:2015 for amenity and safety purposes. The lowest possible lighting levels are proposed within this Lighting Strategy.
- 8.2.2. Performance requirements for the Roadways are outlined in **Figure 5**
- 8.2.3. Following a risk assessment, the lighting class will remain as recommended in BS 5489-1:2020.

Table A.5 — Lighting classes for subsidiary roads

Traffic flow	Lighting class		
	E1 to E4 ^{A)}	E1 to E2 ^{A)}	E3 to E4 ^{A)}
	Pedestrian and cyclists only	Speed limit $v \leq 30$ mph	Speed limit $v \leq 30$ mph
Busy ^{B)}	P5	P4	P3
Normal ^{C)}	P5	P5	P4
Quiet ^{D)}	P6	P5	P4

NOTE 1 Table A.5 assumes no parked vehicles; see risk assessment in [A.3.3.2](#).

NOTE 2 An EV lighting class using vertical illuminance, from BS EN 13201-2:2015, Table 6, can be specified in addition to the general lighting class when there are particular concerns about crime and personal safety. EV is calculated at the typical height of a human face (1.5 m) and in relevant viewing orientations.

NOTE 3 To ensure adequate uniformity, the actual value of the maintained average illuminance is not to exceed 1.5 times the value indicated for the class.

NOTE 4 The actual overall uniformity of illuminance, U_o , needs to be as high as reasonably practicable (see [7.2.6](#)).

NOTE 5 The ambient luminance descriptions E1 to E4 refer to the environmental zone as defined in ILP GN01 [N2].

NOTE 6 The illuminance classes are suggested minimum levels. A risk assessment needs to be carried out to ensure that the light levels are adequate, particularly for pedestrians and cyclists.

Figure 5: Performance requirements

8.3. Property Frontages and Rears

- 8.3.1. The property frontages and rears will need illuminating for safety, wayfinding and amenity.
- 8.3.2. As the lighting will be used for limited tasks and more recreational purposes, no specific standard or guidance will apply. Restrictions to the luminaire type and mounting positions are outlined within the equipment specification.
- 8.3.3. Luminaire performance requirements are outlined in **Appendix 4**.

9. SUMMARY OF RESULTS

9.1. Overview

- 9.1.1. The Light Spill Diagram shown in **Appendix 1 & 2** demonstrates that the Light Spill Levels associated with the proposed lighting would comply with the obtrusive light guidance set out in ILP GN01/2021, at sensitive receptors.
- 9.1.2. To ensure the worst-case scenario has been modelled, the highest potential light levels have been modelled / presented in the light spill diagram, with the project maintenance factors set at MF = 1.0⁵. This demonstrates the light levels at their highest (initial light levels at the start of luminaire life).

9.2. Summary of Results

- 9.2.1. The proposed lighting within the task area(s) is compliant to the relevant policies, standards and guidance.
- 9.2.2. Horizontal light spill to the ecological boundaries has been kept below 0.20 Lux in accordance with the limitations outlined in GN08/2023.
- 9.2.3. Where ecological receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in **Appendix 2**. The light levels based on the modelling do not exceed 0.40 Lux, keeping the light levels within the guidance given within GN08/2023.
- 9.2.4. In line with section 4.56 of GN08/2023, the vertical grids will be mounted at a height of 1.5 metres above the ground level to simulate the likely flight path of a light sensitive bat.

Receptor No	GN08/2023 requirements	Maximum vertical Illuminance (Lux)	Pass/fail
PSER 001	0.40	0.00	Pass
		0.00	Pass
		0.01	Pass
PSER 002	0.40	0.01	Pass
PSER 003	0.40	0.01	Pass

Table 6: PSER results table, maximum illuminance.

⁵ <https://www.dfl-uk.com/knowledge-hub/faqs/>

- 9.2.5. Where human receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in **Appendix 2**. The light levels based on the modelling do not exceed 1 Lux, keeping the light levels within the guidance given within GN01/2021 for an area identified as an E2 environment.

Receptor No	GN01/2021 requirements		Maximum vertical Illuminance (Lux)	Pass/fail
	Pre-curfew	Post Curfew		
PHAR 001	5 Lux	1 Lux	0.00	Pass
	5 Lux	1 Lux	0.00	Pass
	5 Lux	1 Lux	0.14	Pass
	5 Lux	1 Lux	0.00	Pass

Table 7: PHAR results table, maximum illuminance

9.3. Mitigation

- 9.3.1. Careful design ensures the lighting has been minimised onto sensitive receptors in accordance with standards and guidance.
- 9.3.2. Where applicable, shields are proposed in particularly sensitive areas to further minimise spill.
- 9.3.3. Through the use of the control methods detailed in **Appendix 4**, it limits the amount of light in the affected Application Area to minimum amount of time for amenity and safety purposes.
- 9.3.4. The detailed design is to be completed by a competent person or persons in accordance with the details within this Lighting strategy.
- 9.3.5. Where indicated by a purple hatched area in **Appendix 1**, a buffer zone has been implemented where no luminaire is to be mounted, this will ensure that the light levels on the boundary of the Application Site will not exceed the limitations outlined within GN08/2023.

10. CONCLUSION

10.1. General

- 10.1.1. Lighting associated with the Proposed Development shall be designed in accordance with the Lighting Strategy for the Application Site outlined in **Section 8**.
- 10.1.2. This lighting strategy has been written in accordance with the relevant British Standards, industry guidance and local policies to ensure it is unlikely to give rise to obtrusive light with the potential to affect human, environmental and ecological receptors.
- 10.1.3. Through the application of this lighting strategy sensitive receptors will not be adversely affected by obtrusive light, as shown in **Appendix 1** and **2**.
- 10.1.4. Whilst the Preferred luminaire in accordance with the Gloucestershire specification is the Urbis Schröder Ampera Midi, due to the obsolescence of the product range an alternative equivalent has been selected from the same manufacturer to keep somewhat in line with the preferred specification and suit the sensitivities of the Application Site.
- 10.1.5. The street lanterns have been designed to the specification of the Gloucestershire County Council which uses 3000K CCT luminaires, however further consultation is advised to change this to 2700K to fall in line with the GN08/2023 guidance.
- 10.1.6. Through careful design and mitigation, this Lighting Strategy ensures the lighting installation at the proposed development will be in accordance with British Standards, Guidance and Local Policy.

APPENDIX 1 – LIGHT SPILL DIAGRAM

See accompanying document 3541-DFL-ELG-XX-LD-EO-13001-S3

APPENDIX 2 – VERTICAL LIGHT SPILL DIAGRAM

See accompanying document 3541-DFL-ELG-XX-LD-EO-13002-S3

APPENDIX 3 – SENSITIVE RECEPTORS



Figure 6: Sensitive receptors

APPENDIX 4 – EQUIPMENT SPECIFICATION

1.1. Luminaire and control specification

1.1.1. Performance requirements are outlined in **Table 1.1,1.2,1.3** and **1.4**.

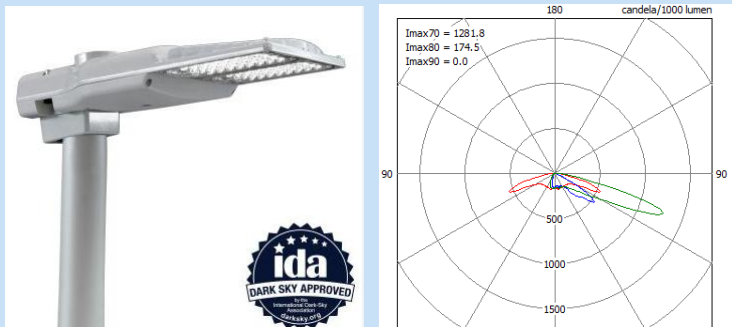
Equipment Specification	
Application Area	Roadways
Correlated Colour Temperature (Kelvin)	≤3000k (2700k advised)
Luminaire Manufacturer	Urbis Schröder (Or Similar Approved)
Luminaire Model	Axia 3 (Or Similar Approved)
Light Source	LED ≤ 2300 lumens
Reference	Type A
Height	≤6 mtrs
Mounting Arrangement	Post top
Luminaire Tilt	0°
Upward Light Output Ratio E2 < 2.5%	0%
Example Luminaire Image	
Controls ⁶	Photocell, On and off in accordance with the Gloucestershire County Council specification.

Table 1.1: Luminaire performance requirements

⁶ Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

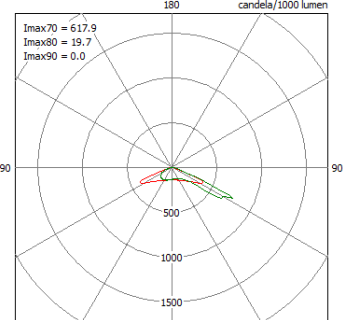
Equipment Specification	
Application Area	Roadways
Correlated Colour Temperature (Kelvin)	≤3000k (2700k advised)
Luminaire Manufacturer	Urbis Schröder (Or Similar Approved)
Luminaire Model	Axia 3 (Or Similar Approved)
Light Source	LED ≤ 1520 lumens
Reference	Type C
Height	≤6 mtrs
Mounting Arrangement	Post top
Luminaire Tilt	0°
Upward Light Output Ratio E2 < 2.5%	0%
Example Luminaire Image	 
Controls ⁷	Photocell, On and off in accordance with the Gloucestershire County Council specification.

Table 1.2: Luminaire performance requirements

⁷ Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

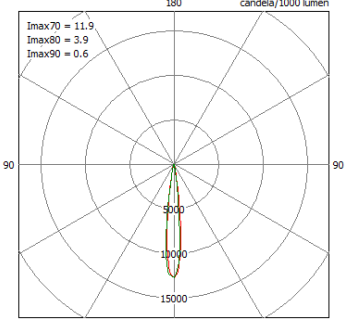
Equipment Specification	
Application Area	Property Frontages
Correlated Colour Temperature (Kelvin)	≤2700k ⁸
Luminaire Manufacturer	Ligman (Or Similar Approved)
Luminaire Model	Jet downlight narrow beam (Or Similar Approved)
Light Source	LED ≤ 500 lumens
Reference	Type N/A
Height	≤2 mtrs
Mounting Arrangement	Wall mounted
Luminaire Tilt	0°
Upward Light Output Ratio E2 < 2.5%	0%
Example Luminaire Image	 
Controls ⁹	Remotely mounted PIR on for no longer than 1 minute when motion is detected.

Table 1.3: Luminaire performance requirements

⁸ Special order

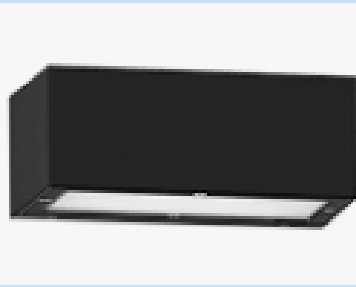
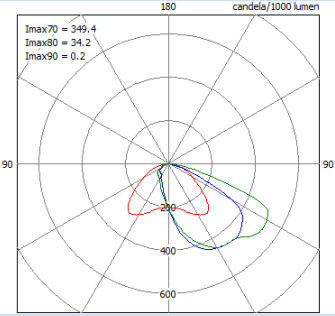
Equipment Specification	
Application Area	Property Rears
Correlated Colour Temperature (Kelvin)	$\leq 2700k^{10}$
Luminaire Manufacturer	Ligman (Or Similar Approved)
Luminaire Model	Gino downlight T4 optic (Or Similar Approved)
Light Source	LED ≤ 1100 lumens
Reference	Type N/A
Height	≤ 2 mtrs
Mounting Arrangement	Wall mounted
Luminaire Tilt	0°
Upward Light Output Ratio E2 < 2.5%	0%
Example Luminaire Image	 
Control	Remotely mounted PIR active when motion is detected.

Table 1.4: Luminaire performance requirements

¹⁰ Special order

TECHNICAL DESCRIPTIONS, DEFINITIONS & ABBREVIATIONS

PHAR: is an abbreviation for a potential human amenity receptor, a location where an observer could have the potential to be affected by the proposed lighting to be installed [Abbreviation used by DFL LI&P.](#)

PSER: is an abbreviation for an area identified as or treated as a location that may host a potentially sensitive ecological receptor. This is generally used where light sensitive bats have the potential to live, forage or use as a flight path, other ecologically sensitive receptors such as (but not limited to) the Great Crested Newt may also be identified by this term. [Abbreviation used by DFL LI&P.](#)

PSR: is an abbreviation for an area where an individual maybe susceptible to light brightness (Light intensity) which may have the potential to cause a hazardous situation. [Abbreviation used by DFL LI&P.](#)

Obtrusive Light: refers to excessive or bothersome artificial light that goes where it shouldn't, causing discomfort and disruption. *Spill light which because of quantitative, directional or spectral attributes in a given context gives rise to annoyance, discomfort, distraction or reduction in the ability to see essential information.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Sky glow: When lights are directed upwards or light is scattered by particles in the air, like dust or water droplets, it creates a glow that makes it hard to see stars. *The increase in diffuse illuminance of the night sky above that produced by natural sources such as the moon and visible star.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Vertical Illuminance: is how much light lands on upright surfaces like walls. It's measured in lux or footcandles and matters for places where the view from a vertical angle is important. *Lighting of vertical surfaces such as walls, windows, statues, sculptures and people's faces.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Correlated colour temperature (CCT): the appearance of light emitted by a light source measured in Kelvin (K), Lower CCT values such as 2700K represent warmer, more yellowish light, *similar to the light from older incandescent lamps. (Tcp)The temperature of the Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions, measured in absolute temperature on the kelvin (K) scale.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Lux: measures the brightness of light as perceived by the human eye at a specific point on a surface. *The SI derived unit of illuminance, measuring luminous flux per unit area (1 lux = 1 lumen/m²).* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Lumens: measure how bright a light appears to our eyes. *The SI derived unit of luminous flux; a measure of the total quantity of visible light emitted by a source or received by a surface (unit: lumen).* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Glare: refers to an excess of bright light that makes you uncomfortable or hinders your vision. It happens when there's a big difference between a bright light and the rest of the surroundings. *Glare: condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or by extreme contrasts.* [BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.1.8](#)

Luminous intensity: is light brightness or how intense the light source is. light intensity is how intense a light source is emitted or received in a particular direction, this is measured candelas and is termed as luminous intensity I_v <of a source, in a given direction> quotient of the luminous flux, $d\Phi_v$, leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle (unit: $cd = lm \cdot sr^{-1}$). BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

Candela: is a measurement for the brightness of a light source, taking into account the direction in which the light is emitted. Base unit of luminous intensity in the International System of Units (SI); the luminous power per unit solid angle emitted by a point light source in a particular direction. CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Uniformity (Uo): is an explanation for the even distribution of light across an area or surface. The overall uniformity shall be calculated as the ratio of the lowest luminance, occurring at any grid point in the field of calculation, to the average luminance. BS EN 13201-3-2015, Calculation of Performance Section 8.3.

Luminance: is how bright a surface appears to our eyes. It considers the light coming from or reflected by an object. L_v <in a given direction, at a given point of a real or imaginary surface> quantity defined by the formula (unit: $cd \cdot m^{-2} = lm \cdot m^{-2} \cdot sr^{-1}$) BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.3.

Illuminance is how much light lands on a surface per square meter. It's measured in lux. More lux means a brighter area. E_v (unit: $lx = lm \cdot m^{-2}$) 1. <at a point of a surface> quotient of the luminous flux $d\Phi_v$ incident on an element of the surface containing the point, by the area dA of that element 2. <at a point of a surface> equivalent definition: integral, taken over the hemisphere visible from the given point, of the expression. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.10.

Luminaire: a light fixture, this is also sometimes referred to as a lantern or a light fitting, is a product that produces artificial light. apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.3

ULOR: upward light output ratio or ULOR refers to the amount of light the light fixture will produce upwards as a percentage of its total light output. $RULO$ <of a luminaire> ratio of the upward luminous flux of the luminaire, measured under specified practical conditions with its own lamp(s) and equipment, to the sum of the individual luminous fluxes of the same lamp(s) when operated outside the luminaire with the same equipment, under specified conditions BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.12.

Maintenance factor (MF): is an allowance for how well the lights keep working overtime. It considers things like dirt on the light fittings and "wear and tear". DEPRECATED: light loss factor ratio of illuminance produced by the lighting installation after a certain period to the illuminance produced by the installation when new Note 1 to entry: The term depreciation factor has been formerly used to designate the reciprocal of the above ratio. Note 2 to entry: The maintenance factor takes into account light losses caused by dirt accumulation on luminaires and room surfaces (in interiors) or other relevant surfaces (in exteriors, where appropriate), and the decrease of the luminous flux of lamps. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.5.18.

Tilt: is how much the luminaire is lifted based on the fitting facing flat to the ground.

Outreach: how far away the fitting is from the column/wall its mounted on to the light source.

This isn't the end...

We don't just have the solution for what you need today. We also have the solutions you might need for the future. We have dedicated teams that deliver.

- **Lighting Impact and Planning** teams that focus on delivering the most effective and sensitive lighting solutions to support planning.
- **Residential** teams that cover all aspects of new development and redevelopment spanning private, section 38 and section 278 design packages.
- **Public Realm** teams that are experts in enhancing night-time public spaces to create inviting spaces and opportunity for local economies to thrive during the hours of darkness.
- **Electrical** teams – we don't just put a light in the ground, we can help you get power to it as well! Additionally, we also offer design services for EV charging. As this market rapidly expands, make sure you have the experts managing the load, otherwise your EV charging solutions might not live up to expectations.
- **Strategic Infrastructure** teams that offer Lighting and Electrical expertise for complex transport networks and interchanges.
- **Consultancy Services** teams that help when you know what you want but you need someone to help you turn the idea into a project.

Finally, as innovators, you might be facing something bespoke or niche. Don't worry – we might have the answer you need. Feel free to get in touch!

THE POWER TO MAKE LIGHT WORK



Alexander Brown

Senior Consultant



+44 (0)1962 855080



Alex.brown@dfi-uk.com



www.dfi-uk.com/



17/18 City Business Centre, Hyde
Street, Winchester, Hampshire,
SO23 7TA