

LIGHTING STRATEGY (draft)

PROJECT: PROPOSED OXFORDSHIRE STRATEGIC RAIL
FREIGHT INTERCHANGE

PREPARED FOR: OXFORDSHIRE RAILFREIGHT LIMITED

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1. Introduction

1.1 General

- 1.1.1 This lighting strategy is provided to outline lighting approaches to be taken within the Proposed Development of the Proposed Oxfordshire Strategic Rail Freight Interchange, for the purposes of minimising the impacts of lighting on potentially sensitive receptors.
- 1.1.2 This strategy serves as an Appendix to Chapter 11 of the Environmental Statement (ES), which concerns lighting.
- 1.1.3 This lighting strategy is provided by Designs for Lighting Ltd, a specialist lighting design consultancy with experience and knowledge in lighting impact assessments, mitigation and lighting design in relation to bats.
- 1.1.4 The purpose of this lighting strategy is to outline lighting approaches to provide a basis for assessment within the Lighting Chapter of the Environmental Statement for the Proposed Development.
- 1.1.5 The Proposed Development requires artificial lighting for safety, security and amenity. Lighting can be applied sensitively to ensure that the potential for obtrusive light is suitably minimised in compliance with the predetermined obtrusive light limits within the Environmental Zone in which the Application Site is located. This can be achieved through the implementation of a carefully planned and implemented lighting design strategy informed by relevant industry guidance, such as ILP GN01:2021 and ILP GN08/18.
- 1.1.6 The lighting strategy proposes good practice and outlines a suitable approach to apply to the installation of the proposed lighting. The aim of the strategy is to outline a minimally obtrusive approach to lighting, which is functional as well as ensuring sensitivity to the environment and sensitive ecology.
- 1.1.7 Lighting associated with the Proposed Development will comply with GN01:2021 - Guidance Notes for the Reduction of Obtrusive Light outlined by the Institution of Lighting Professionals (ILP).
- 1.1.8 The lighting strategy has been developed in line with recommendations outlined in industry standard guidance for sensitive ecology receptors. This seeks to ensure the lighting associated with the Proposed Development is minimally obtrusive.

2. Standards and Policies

2.1 Relevant National Policies

- National Policy Statement for National Networks (NN NPS); and
- Overarching National Policy Statement for Energy (EN-1).

2.2 Relevant local policies

2.2.1 There are relevant local policies to the Proposed Development that have informed the lighting strategy as far as is reasonably practicable, however, the NN NPS takes precedent as the key source of national policy and guidance for this SRFI application.

2.2.2 The most relevant Local Authority policies that inform the lighting strategy are outlined within the Cherwell Local Plan 2011 - 2031 (Adopted July 2015). The most relevant elements to lighting within the plan are policy ESD 15 (The Character of the Built and Historic Environment) and Strategic Objective SO 15.

2.2.3 Policy ESD 15 states:

“Successful design is founded upon an understanding and respect for an area’s unique built, natural, and cultural context. New development will be expected to complement and enhance the character of its context through sensitive siting, layout and high quality design. All new development will be required to meet high design standards. Where development is in the vicinity of any of the District’s distinctive natural or historic assets, delivering high quality design that complements the asset will be essential.

New development proposals should: ...

... Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation...”

2.2.4 Strategic Policy SO 15 states:

*“To protect and enhance the historic and natural environment and Cherwell’s core assets, including protecting and enhancing cultural heritage assets and archaeology, maximising opportunities for improving biodiversity and minimising **pollution** in urban rural areas.”*

2.3 Guidance

Guidance Notes for the Reduction of Obtrusive Light (GN01:2021)

2.3.1 The lighting strategy shall be informed by industry guidance notes which aim to reduce the potential for obtrusive light to occur, caused by poorly designed and installed exterior artificial lighting. The lighting strategy is informed by the most relevant sections of GN01/21 to reduce the potential for obtrusive light from a wide range of exterior lighting applications.

2.3.2 The environmental zone criteria detailed within **Tables 1** and **2** will form the basis for the lighting strategy. Due to the scale of the site, Environment Zones may vary from area to area.

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

Notes:

1. 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.
2. Rural zones under protected designations should use a higher standard of policy.
3. Zone E0 must always be surrounded by an E1 Zone.
4. Zoning should be agreed with the local planning authority and due to local requirements a more stringent zone classification may be applied to protect special/specific areas.
5. SQM (Sky Quality Measurements) referenced by the International Dark-Sky Association (IDA), the criteria for E0 being revised in mid-2019 but not retrospective.
6. Astronomical observable dark skies will offer clearer views of the Milky Way and of other objects such as the Andromeda galaxy and the Orion Nebula.
7. Although values of SQM 20 to 20.5 may not offer clear views of astronomical dark sky objects such as the Milky Way, these skies will have their own relative intrinsic value in the UK.

Environmental Zones	Sky Glow ULR (Max %)	Light Trespass (into Windows) E_v (lux)		Building Luminance Average, Pre-curfew
		Pre-Curfew	Post-Curfew	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 relating to each Environmental Zone

Notes to table:

- **ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky;**
- **E_v is Vertical Illuminance in Lux;**
- **I is viewed Light source Intensity in Candelas;**
- **L is Luminance in Candelas per square metre; and**
- **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.**
- **(*) Permitted only from Public road lighting installations.**

Light Technical Parameter	Application Conditions	Luminaire group (projected area A_p in m ²)					
		0 < A_p ≤ 0.002	0.002 < A_p ≤ 0.01	0.01 < A_p ≤ 0.03	0.03 < A_p ≤ 0.13	0.13 < A_p ≤ 0.50	A_p > 0.5
Maximum luminous intensity emitted by luminaire (I in cd)	E0						
	Pre-Curfew	0	0	0	0	0	0
	Post-Curfew	0	0	0	0	0	0
	E1						
	Pre-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2500
	Post-Curfew	0	0	0	0	0	0
	E2						
	Pre-Curfew	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7500
Post-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500	

	E3						
	Pre-Curfew	0.86 d	1.9 d	2.8 d	7.5 d	15 d	10000
	Post-Curfew	0.29 d	.63 d	1.3 d	2.5 d	5.1 d	1000
	E4						
	Pre-Curfew	1.4 d	3.1 d	6.3 d	13 d	26 d	25000
	Post-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2500

Table 3 Obtrusive Light criteria relating to each Environmental Zone

- 2.3.3 The Application Site is described as 'Intrinsically Dark' in the majority of places but is bounded in part to the west by illuminated roadways and the built-up area of Heyford Park. There are examples of lighting throughout the Order Limits in areas such as the existing Ardley Household Waste Recycling Centre and at farmhouses within the Application Site boundary. Lighting is also presented to the east of the Main Site at the nearby Ardley Viridor ERF, and to the south in the village of Middleton Stoney. Therefore, the Application Site and surroundings are categorised predominantly as an E2 Environmental Zone in accordance with the ILP Guidance Notes for the Reduction of Obtrusive Light (GN01:2021).

GN08/18 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals.

- 2.3.4 Guidance for artificial lighting and bats was updated in Autumn 2018, the guidance 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 averse behaviour (Stone, 2012).”

“Dark buffers, illuminance limits and zonation dark buffer zones can be used as a good way to separate habitats or features from lighting by forming a dark perimeter around them. Buffer zones rely on ensuring light levels (levels of illuminance measured in lux) within a certain distance of a feature do not exceed certain defined limits. The buffer zone can be further subdivided in- to zones of increasing illuminance limits radiating away from the feature” (see Figure 2).

Example of illuminance limit zonation

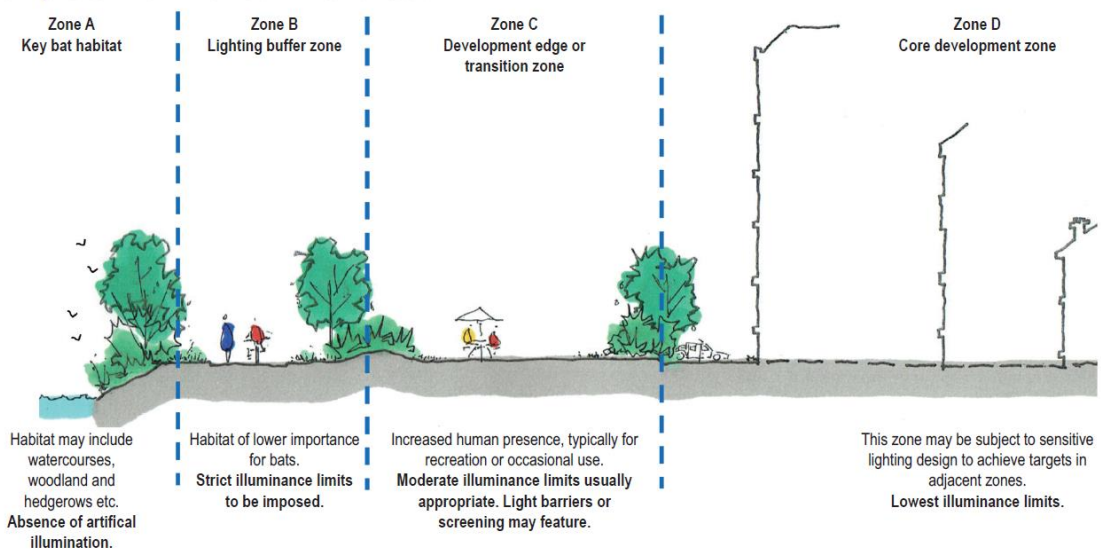


Figure 1 Example of lighting zonation near sensitive boundaries and known ecological habitats

2.4 Relevant British Standards

- 2.4.1 Lighting design criteria outlined within *BS 5489-1:2020 – Code of Practice for the Design of Road Lighting – Lighting of Roads and Public Amenity Areas* is applicable to the proposed highways associated with the Proposed Development which are to be retained under private management and is applicable to highways works within the Order Limits which are intended to be adopted by the local highways authority through the S38 / S278 processes.
- 2.4.2 Lighting design criteria outlined within *BS EN 12464-2:2014 - Lighting of workplaces (Outdoor Workplaces)* is applicable to the lighting of car parking, lorry loading bays, and buildings within the Application Site.

3. Lighting Strategy

3.1 Brief

- 3.1.1 The Proposed Development will require lighting for safety, amenity and security during the hours of darkness. This section outlines the requirements for the lighting design, ensuring that it is fit for purpose and sensitive to the sensitive boundaries.
- 3.1.2 The lighting strategy has been developed to ensure that lighting associated with the Proposed Development is compliant with British Standards and lighting industry guidance produced for the protection and preservation of the environment surrounding where lighting is required.
- 3.1.3 Whilst this lighting strategy seeks to outline the most sensitive approaches to lighting with the key aim of maintaining dark corridors for commuting and foraging bats, it is not intended to supersede pre-existing Local Authority specifications where these are applicable.

3.2 Key Areas Requiring Lighting

- 3.2.1 Lighting will be required in the following areas:
- Site Roads, Accesses and Adoptable Highways;
 - Car Parking Areas;
 - Loading and Unloading Bays;
 - Amenity Lighting to Site buildings;
 - Yard Areas; and
 - Rail Freight Loading / Unloading Areas.

3.3 Site Roads, Accesses and Adoptable Highways

- 3.3.1 The Site Roads, Accesses and Adoptable Highways will require lighting in accordance with *BS EN 13201-2:2015 and BS EN 12464-2:2014*. Light spill onto boundary features from the road lighting will be restricted by focusing light into the site.
- 3.3.2 Luminaires are to emit a warm white colour temperature light (2700 Kelvin or less, unless otherwise specified by the adopting authority, where any of the infrastructure is to be adopted by the local highway authority) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 3.3.3 Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 3.3.4 Luminaire performance parameters for the Site roads and accesses are outlined in **Table 4**.

Equipment Specification	Description
Location	Site Roads and Accesses
Light Source	LED [Light Emitting Diode]
Luminaire Type	Urbis Ampera (or similar approved)
CCT of Light Source (Kelvin)	2700K (maximum)
Luminous Intensity Class	G1 (minimum)
Luminaire Tilt	0 degrees from horizontal
Dimming and switching requirements	Luminaires are to be controlled by photocell and timeclock to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 50% Output 04:00am to Dawn: 100% Output
Design Guidance	
Lighting Standard	BS EN 12464-2:2014 – Part 2: Outdoor Work places BS EN 13201-2:2015 – Part 2: Performance Requirements
Lighting Class	BS EN 12464-2:2014 - 5.1.3 – Regular Vehicle Traffic (20 lux average, 0.40 uniformity) (Site Roads and Accesses) BS EN 13201-2:2015 – Table 1 (M lighting classes), Table 2 (C lighting classes) and Table 3 (P lighting classes). Lighting classes to be assessed by a competent designer as part of the detailed design process.
Mounting Arrangement	Post Top
Restrictions	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 8.0 metre maximum column height Where possible columns to be setback at the rear of the carriageway at a distance no less than as stated in BS 5489-1:2020.

Table 4 Site Roads, Accesses and Adoptable Highways - Luminaire Performance Requirements

3.4 Car Parking Areas

- 3.4.1 Site car parks will require lighting in accordance with BS 5489-1:2020. Light spill onto boundary features from car park lighting will be restricted by focusing light into the site.
- 3.4.2 Luminaires are to emit a warm white colour temperature light (2700 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 3.4.3 Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 3.4.4 Luminaire performance parameters for the Car Parking Areas are outlined in **Table 5**.

Equipment Specification	Description
Location	Car Parking Areas
Light Source	LED [Light Emitting Diode]
Luminaire Type	Urbis Ampera (or similar approved)
CCT of Light Source (Kelvin)	2700K (maximum)
Luminous Intensity Class	G1 (minimum)
Luminaire Tilt	0 degrees from horizontal
Dimming and switching requirements	Luminaires are to be controlled by photocell and timeclock to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 50% Output 04:00am to Dawn: 100% Output
Design Guidance	
Lighting Standard	BS 5489-1:2020 – Lighting of roads and public amenity areas
Lighting Class	Maintained lighting levels for outdoor car parks, Medium traffic (10 lux average, 0.25 uniformity)
Mounting Arrangement	Post Top
Restrictions	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 8.0 metre maximum column height Where possible columns to be setback at the rear of the carriageway at a distance no less than as stated in BS 5489-1:2020.

Table 5 Car Parking - Luminaire Performance Requirements

3.5 Loading and Unloading Bays

- 3.5.1 Loading and unloading bays will require lighting in accordance with BS EN 12464-2:2014 to enable safe use during the hours of darkness. Light spill onto boundary features from loading bay lighting will be restricted by focusing light into the site and controlling the hours of operation.
- 3.5.2 Luminaires are to emit a warm white colour temperature light (2700 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 3.5.3 Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 3.5.4 Where level access loading / unloading takes place, lorry parking bays shall be lit in accordance with the lighting levels for the associated service yard.
- 3.5.5 Luminaire performance parameters for the Loading and Unloading bays are outlined in **Table 6**.

Equipment Specification	Description
Location	Loading and Unloading Bays
Light Source	LED [Light Emitting Diode]
Luminaire Type	Urbis INDU Flood GEN2 (or similar approved)
CCT of Light Source (Kelvin)	2700K (maximum)
Luminous Intensity Class	G1 (minimum)
Luminaire Tilt	0 degrees from horizontal
Dimming and switching requirements	Luminaires are to be controlled via switch, dimming luminaires to their 'off' state when not in use.
Design Guidance	
Lighting Standard	BS EN 12464-2:2014 - Table 5.7
Lighting Class	Loading and unloading – 50 lux average, 0.40 uniformity
Mounting Arrangement	Wall Mounted
Restrictions	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 8.0 metre maximum mounting height

Table 6 Loading Bays - Luminaire Performance Requirements

3.6 Amenity Lighting to Site Buildings

- 3.6.1 Wall mounted amenity lighting will be required to site buildings for the purposes of wayfinding, safety and amenity during the hours of darkness. Light spill onto boundary features from wall mounted amenity lighting will be restricted by focussing light into the site, maintaining light at a relatively low level, and ensuring that the output of the proposed luminaires is suitable for the application.
- 3.6.2 Luminaires are to emit a warm white colour temperature light (2700 Kelvin) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 3.6.3 Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 3.6.4 Luminaire performance parameters for the Amenity Lighting to Site Buildings are outlined in **Table 7**.

Equipment Specification	Description
Location	Amenity Lighting to site buildings
Light Source	LED [Light Emitting Diode]
Luminaire Type	DW Windsor Kirium Wall (or similar approved)
CCT of Light Source (Kelvin)	2700K (maximum)
Luminous Intensity Class	G1 (minimum)
Luminaire Tilt	0 degrees from horizontal
Dimming and switching requirements	Luminaires are to be controlled by photocell and timeclock to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 20% Output 04:00am to Dawn: 100% Output
Design Guidance	
Lighting Standard	BS 5489-1:2020 – Lighting of roads and public amenity areas
Lighting Class	P4 – (5 lux average, 1 lux minimum)
Mounting Arrangement	Wall Mounted
Restrictions	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 3.0 metre maximum mounting height

Table 7 Building Amenity Lighting - Luminaire Performance Requirements

3.7 Yard Areas

- 3.7.1 The yard areas will require lighting in accordance with *BS EN 12464-2:2014*. Light spill onto boundary features from the yard lighting will be restricted by focusing light into the site.
- 3.7.2 Luminaires are to emit a warm white colour temperature light (2700 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 3.7.3 Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 3.7.4 Luminaire performance parameters for the yard areas are outlined in **Table 8**.

Equipment Specification	Description
Location	Yard Areas
Light Source	LED [Light Emitting Diode]
Luminaire Type	Urbis Ampera (or similar approved)
CCT of Light Source (Kelvin)	2700K (maximum)
Luminous Intensity Class	G1 (minimum)
Luminaire Tilt	0 degrees from horizontal
Dimming and switching requirements	Luminaires are to be controlled by photocell and timeclock to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 50% Output 04:00am to Dawn: 100% Output
Design Guidance	
Lighting Standard	BS EN 12464-2:2014 – <i>Part 2: Outdoor Work places</i>
Lighting Class	5.1.3 – Regular Vehicle Traffic (20 lux average, 0.40 uniformity) (Site Road)
Mounting Arrangement	Post Top
Restrictions	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 8.0 metre maximum column height Where possible columns to be setback at the rear of the carriageway at a distance no less than as stated in BS 5489-1:2020.

Table 8 Yard Areas - Luminaire Performance Requirements

3.8 Rail Freight Loading / Unloading Areas

- 3.8.1 Loading and unloading areas associated with the rail freight terminal to the north of the Application Site will require lighting in accordance with BS EN 12464-2:2014 to enable safe use during the hours of darkness. Light spill onto boundary features from rail freight lighting will be restricted by focusing light into the site and controlling the hours of operation.
- 3.8.2 Luminaires are to emit a warm white colour temperature light (2700 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 3.8.3 Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 3.8.4 Luminaire performance parameters for the Rail freight loading / unloading areas are outlined in **Table 9**.

Equipment Specification	Description
Location	Rail freight loading / unloading areas
Light Source	LED [Light Emitting Diode]
Luminaire Type	Urbis INDU Flood GEN2 (or similar approved)
CCT of Light Source (Kelvin)	2700K (maximum)
Luminous Intensity Class	G1 (minimum)
Luminaire Tilt	0 degrees from horizontal
Dimming and switching requirements	Luminaires are to be controlled via switch, dimming luminaires when not in use.
Design Guidance	
Lighting Standard	BS EN 12464-2:2014 - Table 5.12
Lighting Class	Railway yards handling areas (30 lux average, 0.40 uniformity)
Mounting Arrangement	Column Mounted / Affixed to Loading Cranes
Restrictions	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 18.0 metre maximum mounting height

Table 9 Rail Freight Loading / Unloading Areas - Luminaire Performance Requirements

4. Conclusion

4.1 General

- 4.1.1 The lighting strategy outlines the criteria for the lighting design of the Proposed Development to ensure that the lighting is fit for purpose, whilst maintaining sensitivity towards the environment through compliance with relevant British Standards and Guidance.
- 4.1.2 To ensure that the potential for obtrusive light is minimised, it is necessary to restrict the mounting heights of the luminaires, tilt angle, colour temperature and lumen output of exterior light sources to those specified in **Section 3**.
- 4.1.3 The exterior lighting outlined in the lighting strategy shall comply with the requirements for an E2 Environmental Zone (as relevant) as per **Table 1**.
- 4.1.4 Compliance with the lighting strategy will allow a safe and sensitive level of light for way finding and guidance at night, whilst limiting obtrusive light to a negligible level and in compliance with ILP GN01:2021 and GN08/18, which seeks to reduce light spill onto sensitive boundaries.
- 4.1.5 It is anticipated that monitoring of the light levels would be completed post installation to verify that the light levels and technical parameters are compliant with the lighting strategy, British Standards and Guidance, especially near ecologically sensitive features of the site.