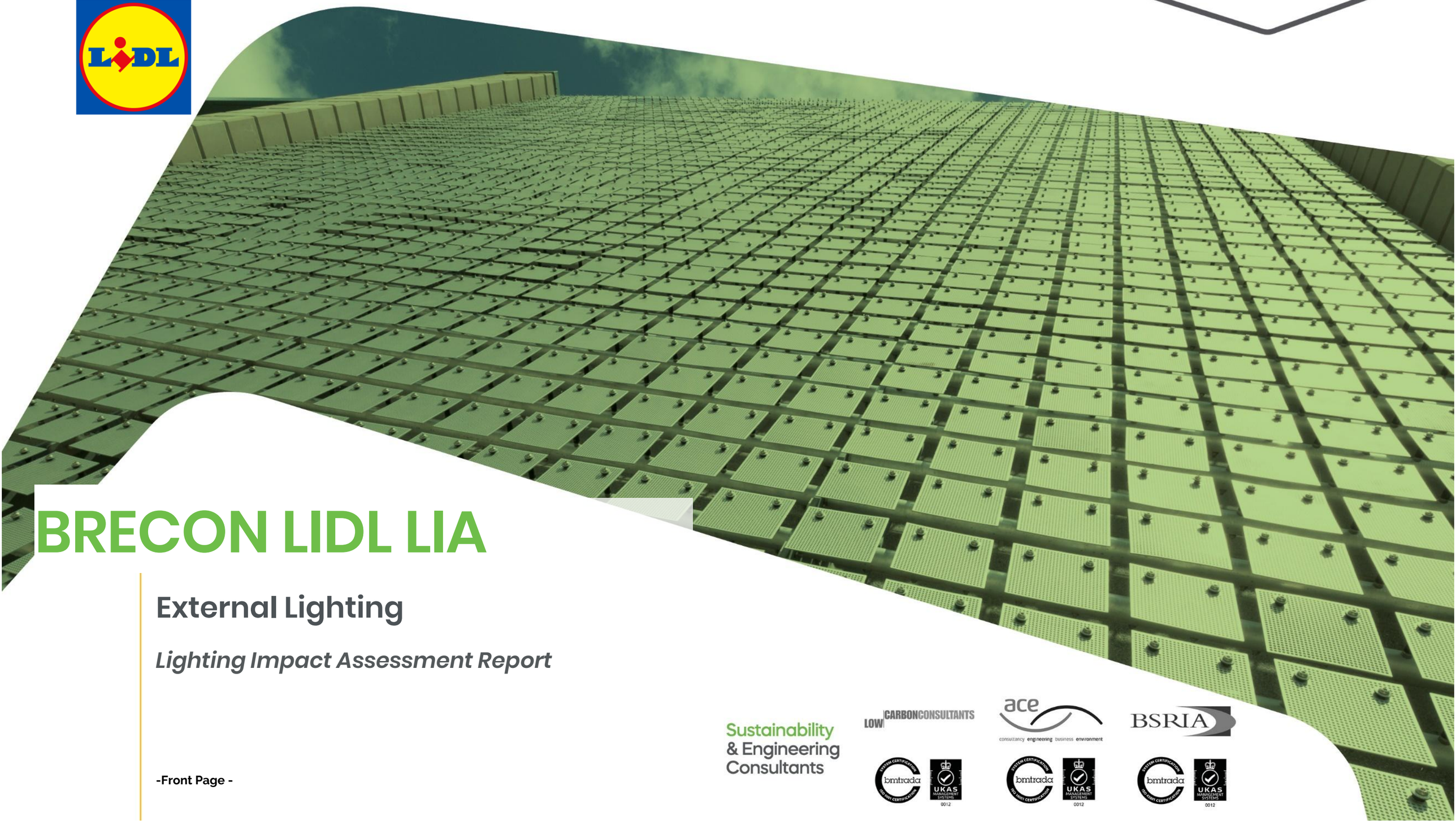
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BRECON LIDL LIA

External Lighting

Lighting Impact Assessment Report

-Front Page -

Sustainability & Engineering Consultants

Document Information

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1 Introduction

1.1 Scope of the Report

Services Design Solution Limited (SDS) have been commissioned by LIDL Great Britain to undertake a Baseline Survey, External Lighting Design and Lighting Impact Assessment (LIA) for the site at Land off A470, Brecon, Powys, LD3 8LA (Grid Reference – SO 03175 28275).

The Lighting Impact Assessment aims to provide an assessment of the impact of the Internal & External Lighting Design by considering light spill, impacts on ecology, visual impacts, and dark sky requirements. The primary concern to light spill onto the dark zones to the south of the site as highlighted by the project ecologist.

Within this report, the proposed land take area will be referred to as the 'site'.

1.2 Structure of the Report

This report has been broken down into the following sections:

Section 2: Outlines the relevant legislation, planning policy and guidance

Section 3: Summarises the guidance for environmental zone classification and limiting parameters

Section 4: Describes the Baseline conditions of the site

Section 5: Describes the methodology of the lighting assessment

Section 6: Outlines the proposed external lighting for the development during the construction phase

Section 7: Considers mitigation proposals for the site

Section 8: Considers the residual effects

Section 9: Concludes the lighting impact assessment

1.3 Site Location

The site address is:

Land off A470

Brecon, Powys

LD3 8LA

1.4 Key Sensitive Receptors

The site boundaries for the site at Kings Meadow have taken from "3223 P413B Proposed GA Site Plan" supplied by HTC Architects.

The primary objective of this lighting impact assessment is to provide a considered external lighting scheme that reduces the impacts of the external lighting as far as practicable, whilst preserving a safe and secure external nighttime environment for customers and staff at the proposed Lidl store.

The external lighting scheme has been developed in accordance with the following guidance documents to limit the potential impacts of the external lighting scheme:

- ILP Guidance Note 01/26 for the Avoidance of Obtrusive Light
- ILP Guidance Note 08/23 Bats and Artificial Lighting at Night
- Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales

For SDS layouts of the dark zones, refer to Drawing No. 08998L-SDS-ZZ-EX-D-E-7082003 – Site Key Plan and References with Vertical Calculation Planes.

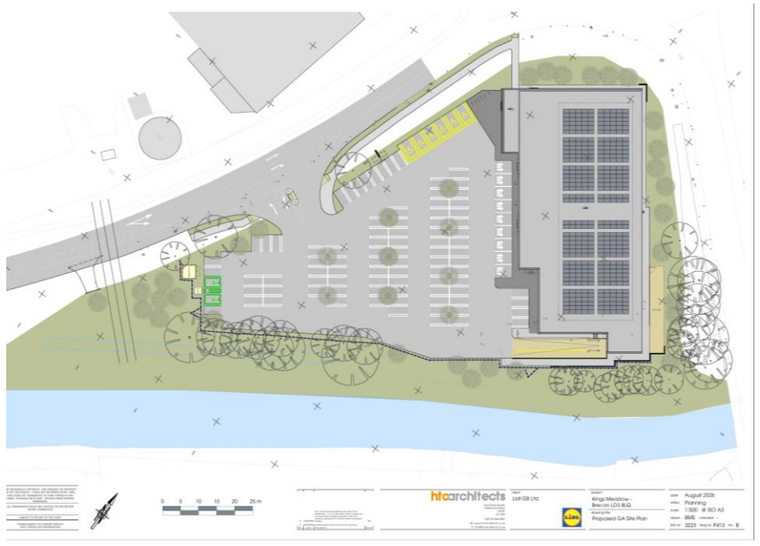


Figure 1 | Proposed Site Plan

1.5 Site Location Plan



Figure 2 | Shows a Wide Location Plan of the Site from Google Maps

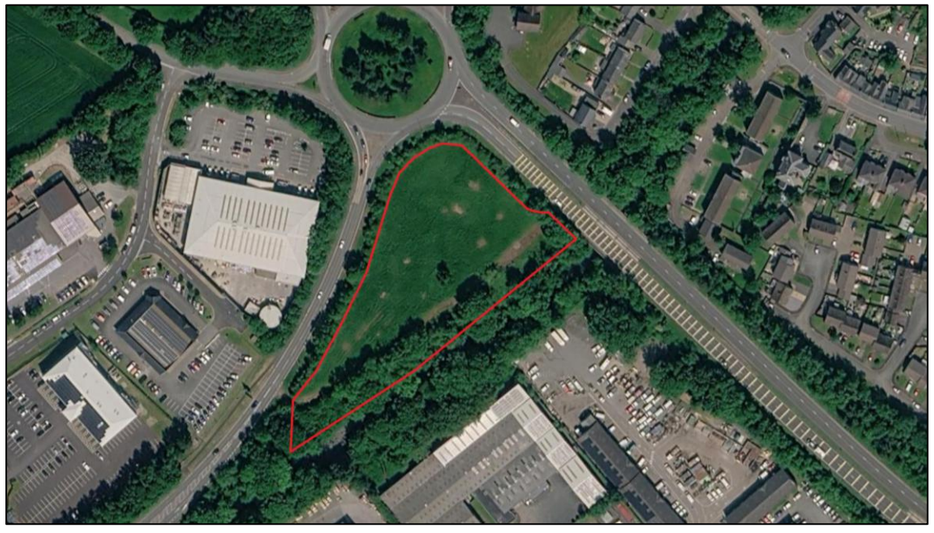


Figure 3 | Shows a Site Plan of Brecon from Google Maps

2 Legislation, Planning and Policy Guidance

2.1 Legislative Background

Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of statutory nuisance under the Environmental Protection Act (the 'EPA', 1990), which was amended in 2006 to include the following nuisance definition:

"(fb) artificial light emitted from premises so as to be prejudicial to health or nuisance."

Although light was described as having the potential to cause statutory nuisance, no prescriptive limits or rules were set for impact assessment purposes. Guidance Notes for the Avoidance of Obtrusive Light produced by the Institute of Lighting Professionals (ILP) has, therefore, been referred to for the purposes of this assessment.

Guidance produced by Defra, Statutory Nuisance from Insects & Artificial Light (2006) on S101 to S103 of the Clean Neighbourhoods and Environment Act (2005) has also been referred to which places a duty on local authorities to ensure that their areas are checked periodically for existing and potential sources of statutory nuisances - including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with S80(2) of the EPA 1990), requiring that the nuisance cease or be abated within a set timescale.

2.2 Planning Policy Context

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which, together with the PPW, provide the national planning policy framework for Wales.

Technical Advice 12 (TAN 12): Design supplements PPW by providing guidance on achieving good and sustainable design.

At the local level, Brecon Beacons national park local development plan policy 12, Lighting should be appropriate to its intended purpose and must not result, either individually or cumulatively, in significant adverse effects upon the character of the area, residents, vehicle users, pedestrians, biodiversity, the visibility of the night sky or dark corridors used by bats and other light-sensitive species.

National Park Authority's *Obtrusive Lighting and Light Pollution Supplementary Planning Guidance* (2015). The SPG seeks to ensure that external lighting is designed to minimise obtrusive light and protect the National Park's intrinsically dark environment and International Dark Sky Reserve.

2.3 International Guidance

2.3.1 Commission Internationale De L'Eclairage (CIE) 150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (the 'CIE 150', 2017)

The purpose of CIE 150 is to aid in formulating guidelines for assessing the environmental effects of exterior lighting and to provide limits for relevant lighting parameters to control the obtrusive effects of exterior lighting to tolerable levels. CIE 150 also refers to the potentially adverse effects of exterior lighting on both natural and man-made environments.

2.3.2 CIE 126: Guideline for Minimising Sky Glow (1997)

This document gives general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for exterior lighting installations. These values are regarded as limiting values. Lighting designers should strive to meet the lowest criteria for the design. Practical implementation of the general guidance is left to national regulations.

2.4 National Guidance

2.4.1 Institute of Lighting Professionals (ILP) (2026) Guidance Notes for the Avoidance of Obtrusive Light (the 'ILP Guidance Notes')

The ILP has proposed lighting guidance and criteria for local authorities with a recommendation that these are incorporated at the local plan level. The ILP Guidance Notes define various forms of light pollution and describe a series of environmental zones. The ILP Guidance Notes provide suitable criteria against which the effects of artificial lighting can be assessed. This assessment has been based upon these criteria.

2.4.2 Institute of Lighting Professionals (ILP) (2013) PLG 04 Guidance on Undertaking Environmental Lighting Impact Assessments

The aim of this guidance is to outline good practice in lighting design and provide practical guidance on the production and assessment of lighting impacts within new developments.

2.4.3 Institute of Lighting Professionals (ILP) and Bat Conservation Trust (BCT) (2023) Bats and Artificial Lighting at Night (Guidance Note 08/23)

This guidance is intended to raise awareness of the impacts of artificial lighting on bats, and mitigation is suggested for various scenarios. There are suggested methods for the avoidance of disturbing bats when considering lighting design.

2.4.4 Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales

This document provides guidance to planners, developers, and designers to support proposals requiring the alteration of lighting schemes across Wales. The recommendations within the document include lighting design principles that aim to provide more sensitively designed and appropriate lighting schemes across Wales.

3 Environmental Zone Classification and Parameters

All standards consulted in section 2 are nationally recognised documents (some internationally, also), which deal with the relevant design issues associated with external lighting.

3.1 Environmental Zoning

The CIE Standards, CIBSE and the Society of Light & Lighting guidance documents all apply a common Environmental Zoning system, which is summarised in Table 1 below.

Table 1 | Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low District brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/City centres with high levels of night-time activity

3.2 Obtrusive Lighting Limitation for Exterior Lighting Installations

The ILP Guidance Note for the Avoidance of Obtrusive Light (GN 01/26) provide guidelines and threshold values applicable to each Environmental Zone, which are reproduced in tables 2 – 7 with associated notes.

Table 2 aims to address light intrusion by providing maximum values of vertical illuminance on properties. Limits apply to nearby dwellings, or potential dwellings, more specifically to their relevant surfaces or parts of surfaces, especially where windows are located. This parameter can also be considered for the management of spill light.

Table 3 aims to limit the luminous intensity of bright luminaires. It shows the maximum values for the luminous intensity of luminaires in designated directions where views of bright surfaces of luminaires are likely to be a nuisance to occupants of premises or from positions where such views are likely to be maintained, that is, not momentary or short-term.

Table 4 aims to limit the effects on transport systems, applying limits where users of road networks are subject to a reduction in the ability to see essential information.

Tables 5 and 6 aim to limit the effects of sky glow. The limits in table 5 represent the primary approach. The limits in table 6 should only be considered in certain scenarios as described.

Table 7 aims to limit the effect of over-lit building facades and signs. For illuminated advertising signs the aim should be to achieve the limits advised in PLG05.

Table 2 | Maximum Values of Vertical Illuminance on Properties

Light technical parameter	Application conditions	Environmental Zones				
		E0	E1	E2	E3	E4
Illuminance in vertical plane (Ev)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx
Note: * If the installation is for public (road) lighting then this may be up to 1 lx.						

Table 3 | Limits of the Luminous Intensity of Luminaires

Light technical parameter	Application conditions	Luminaire group (projected area Ap in m2)					
		0<AP ≤0.002	0.002<AP ≤0.01	0.01<AP ≤0.03	0.03<AP ≤0.13	0.13<AP ≤0.50	AP>0.5
Maximum luminous intensity emitted by luminaire (I in cd)	E0 Pre-curfew Post-curfew	0 0	0 0	0 0	0 0	0 0	0 0
	E1 Pre-curfew Post-curfew	0.29 d 0	0.63 d 0	1.3 d 0	2.5 d 0	5.1 d 0	2,500 0
	E2 Pre-curfew Post-curfew	0.57 d 0.29 d	1.3 d 0.63 d	2.5 d 1.3 d	5.0 d 2.5 d	10 d 5.1 d	7,500 500
	E3 Pre-curfew Post-curfew	0.86 d 0.29 d	1.9 d 0.63 d	3.8 d 1.3 d	7.5 d 2.5 d	15 d 5.1 d	10,000 1,000
	E4 Pre-curfew Post-curfew	1.4 d 0.29 d	3.1 d 0.63 d	6.3 d 1.3 d	13 d 2.5 d	26 d 5.1 d	25,000 2,500
Aid to gauging AP		2 to 5cm	5 to 10cm	10 to 20cm	20 to 40cm	40 to 80cm	>80cm
Geometric mean of diameter (cm)		3.2	7.1	14.1	26.3	56.6	>80
Corresponding AP representative area (m2)		0.0008	0.004	0.016	0.063	0.251	>0.5

Notes:

1. d is the distance between the observer and the glare source in metres.
2. A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut-off in the designated directions.
3. AP is the apparent surface of the light source seen from the observer position
4. For further information refer to Annex C of CIE 150
5. Upper limits for each zone shall be taken as those with column Ap>0.5

Table 4 | Maximum Values of Threshold Increment and Viewing Direction

Light technical parameter	Road classification*			
	No road lighting	M6/M5	M4/M3	M2/M1
Veiling luminance‡ (Lv)	0.037 cd/m2	0.23 cd/m2	0.40 cd/m2	0.84 cd/m2
Threshold increment	15% based on adaption luminance of 0.1 cd/m2	15% based on adaption luminance of 1.0 cd/m2	15% based on adaption luminance of 2.0 cd/m2	15% based on adaption luminance of 5 cd/m2

Notes:

* Road classifications as given in CIE 115:2010

‡ The veiling luminance values specified in this table are based upon on a permissible TI value of 15%

Definitions:

TI - The measure of disability glare (the reduction in visibility caused by intense light sources in the field of view) expressed as the percentage increase in contrast required between an object and its background for it to be seen equally well with a source of glare present. Note: Higher values of TI correspond to greater disability glare.

Lv - The luminance that would need to be superimposed on a scene in object space to reduce the scene's contrast by an amount equal to the added retinal illuminance from scattered light on the scene's retinal image. It is most commonly used to describe the contrast-reducing effect of a glare source in the field of view.

Table 5 | Maximum Values of Upward Light Ratio (ULR) of Luminaires

Light technical parameter	Environmental Zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR)/%	0	0	2.5	5	15

Notes:

1. This is the primary approach to limit skyglow and is suitable to compare different single luminaires and mitigate the contribution of each luminaire within an installation.
2. This does not consider the effect of light reflected upwards from ground that also contributes to sky glow.
3. Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights and 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

Table 6 | Maximum Values of Upward Flux Ratio (UFR) of Installation (of four or more luminaires)

Light technical parameter	Type of installation	Environmental Zones				
		E0	E1	E2	E3	E4
Upward flux ratio (UFR)/%	Road	0	2	5	8	12
	Amenity	0	0	6	12	35
	Sports	0	0	2	6	15

Notes:

- The table allows the effect of both direct and reflected upward components of a whole installation to be considered. The factor being the upward flux ratio (UFR).
- n/a within the table denotes that lighting of this type is not usually expected within these zones.
- This should only be considered where an installation consists of four or more luminaires that form an installation with a defined performance requirement or specialised fauna growth lighting systems (such as those use to promote grass growth in sports stadia) and is in proximity to:
  - Optical observations
  - Lies within dark (E1) zones which abuts a protected (E0) dark sky zone
- The effect of distance must be considered which is a factor of the artificial lighting installation size. A small lighting installation will have an effect on an optical observatory 30km away whereas a large lighting installation of many luminaires will have an effect from a greater distance up to 100km. Specific guidance is given in CIE126 and CIE150.
- All external surfaces will have varying reflectance's depending upon their condition and climatic conditions (wet, dry, frost etc,) as well as their varying angles, therefore the level of uncertainty in any assessment may be considerable.
- Clauses 6.4.2 and 6.4.3 of CIE 150:2017 describe the calculation methods for both ULP and UFR.
- Light emitted just above the horizontal in a zone between 90˚ and 110˚ is extra critical for sky glow in large open areas around observatories. An additional measure in these areas limits the luminous intensities (I90 – I110) as follows:
  - between 90˚ and 100˚ < 0.5 cd/1000lm.
  - between 100˚ and 110˚ 0 cd.
- All proposed luminaires must have been photometrically measured so that results can be verified for Gamma angles 0 to 180˚.

Table 7 | Maximum Permitted Values of Average Surface Luminance (cd/m²)

Light technical parameter	Application conditions	Environmental Zones				
		E0	E1	E2	E3	E4
Building façade luminance (Lb)	Taken as the product of the design average illuminance and reflectance divided by π	< 0.1	< 0.1	5	10	25
Sign luminance (Ls)	Taken as the product of the design average illuminance and reflectance divided by π, or for self-luminous signs, its average luminance	< 0.1	50	400	800	1000

Notes:

1. The values apply to both pre- and post-curfew, except that in zones 0 and 1 the values shall be zero post curfew. The values for signs do not apply to signs for traffic control purposes.
2. For illuminated advertising signs the aim should be to achieve the limits advised in PLG05.

4 Baseline Conditions

4.1 Environmental Zoning and Surrounding Environment

The environmental zone used for this assessment is an "Intrinsically dark" E1 environmental zone, this is because the site is situated within the Brecon Beacons national park which determines the environmental classification for the site.

Any light spill emanating from the proposed site to this area would need to adhere to the requirements imposed by the E1 environmental zone.

4.2 Existing Lighting Environment of the Site

The site currently comprises of an open greenfield site with established vegetation. Based on the survey of the existing site, the surrounding night environment was established to be intrinsically dark with no light sources present on the site.

There is existing road lighting along the A470 and the A40 North of the site. The road lighting appears to be utilising 8m post top column mounted luminaires with 0-degree tilt positioned on both sides of the road

South and Southwest of the site is the Ffrwdgrech industrial Estate, containing several commercial and industrial premises. These uses sources of artificial light that are unlikely to effect light spill into the site premises.

5 Assessment Methodology and Significance Criteria

5.1 Method for Assessing Proposed Lighting

5.1.1 General

The site has been modelled and calculations provided, using industry standard software DIALux Evo. DIALux Evo is a computer calculation package which utilises 3D modelling to model the real-world output of chosen light fittings. From these calculations, drawings illustrating the illuminance levels throughout the site and at the boundaries have been produced so that the lighting scheme's impact can be assessed.

Results have also been produced to show the levels of illuminance and uniformity across the various work areas across the site. Refer to the External lighting drawings for levels of design illuminance, uniformity and horizontal light spill. Refer to the calculation summary for a detailed breakdown of the external lighting performance and work planes used for the calculations.

Topography for the site has not been built into the calculation model. The calculation model does include the proposed or existing planting/ hedgerows/ trees on site, as indicated on "3223 P413 GA Proposed Site Plan, Rev. H" issued by HTC Architects, or in the surrounding area, as it is not possible to model these accurately in the lighting software.

The drawings used in the development of the model were:

Table 8 | Drawings Received

Drawing Number	Drawing Title	Rev	Date
3223 P413B Proposed Site Plan GA	Proposed Site Plan GA	B	September 2026

5.1.2 Internal Lighting

The proposed development has been modelled in 3D, including all glazed elements within the building elevations.

All glazed apertures within the proposed building have been modelled accurately, in terms of position, dimensions, transmittance and sill height. The standard glazing transmittance has been set at 70% which represents typical double glazing.

Internal lighting has been designed in accordance with BS EN 12464-1:2021, 'Light and Lighting of Indoor Workplaces', with the following levels of design illuminance applied throughout the store.

- Table 35.1 General Sales Area – 300 lux Em, 0.4 Uniformity (Uo).

The lighting has not been modelled to include display lighting. The inclusion of display lighting is not expected to have any impact on the results of the impact assessment.

Calculations have used generic luminaires of a similar style to those within the standard specification provided by Lidl. Internal lighting results are not expected to impact the overall light spill emanating from the site adversely.

5.1.3 External Lighting

The external lighting has been designed in line with BS EN 12464-2:2024 Light and Lighting of outdoor workplaces.

The external lighting design has also been designed to minimise light spill in line with the recommendations of ILP Guidance Note 01/26 Avoidance of Obtrusive Light, ILP GN08/23 Bats and Artificial Lighting at Night and the recommendations of "Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales".

The model is intended to represent the worst-case scenario with all lighting switched on.

The luminaires that are proposed to be utilised within the development have been used in the external lighting calculation. Refer to "08998L-SDS-ZZ-ZZ-SH-E-7082007 – Luminaire Schedule" for full fitting information.

5.1.4 Impact Assessment and Significance Criteria

The threshold values stated in the obtrusive light standards and guidance (refer to section 3.2) aim to control obtrusive light by limiting:

- The illumination on surrounding properties, referred to as light intrusion, is limited by the vertical illuminance measured typically at the window of a neighbouring property.
- Bright luminaires in the field of view, referred to as glare, are limited by the luminous intensity in designated directions.
- Sky glow, limited by upwards light output ratio (ULOR) and upward flux ratio (UFR); and
- The effects of over-lit building facades and signs, limited by the average luminance on the surface

These parameters form the primary basis for considering potential effects from artificial lighting and defining the effect criteria (refer to Table 9). However, this assessment also considers light spill, 'over' lighting, energy consumption and the effect on flora and fauna, as these are also identified as being of environmental concern regarding lighting installations.

The distant view of light across the landscape, particularly in rural or dark landscapes (Light Presence), is another consideration; however, this aspect is covered in the Landscape Visual Appraisal for the project.

These factors are described in more detail below.

Light Intrusion (into windows)

Light intrusion is light that impacts on to a surface outside of the area designed to be lit by the installation concerned. It is somewhat subjective because it is difficult to define when, where and how much light is unwanted. An example of light intrusion is when spill light from external lighting enters a window and illuminates an indoor area.

The ILP guidance specifies limits for light intrusion entering windows in terms of environmental zones. The values in the table are the suggested maximum, and also need to consider the existing light intrusion at the point of measurement. Light intrusion is measured in illuminance on the vertical plane. Other forms of light intrusion are not specifically limited in the guidance; however, it is becoming increasingly common to assess light spill at the boundary of a development, especially in ecologically sensitive areas.

Light Spill

Light spill, sometimes referred to as stray light, is light emitted by a lighting installation which falls outside the boundary of the property on which the

installation is sited. This is usually measured in illuminance on a horizontal plane.

Glare

Glare is the uncomfortable brightness of a light source against a darker background. It can cause discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or to extreme contrasts.

The ILP guidance sets limits for the luminous intensity of each luminaire in a potentially obtrusive direction, outside of the site being lit, in an attempt to control glare. It should only be applied to viewing directions that are likely to cause discomfort or disability glare. The guidance suggests that glare should be minimised by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70 degrees.

Sky Glow

Sky glow is the brightening of the night sky caused by outdoor lighting and natural atmospheric and celestial factors. Outdoor lighting contributes to sky glow by producing light that is either emitted directly upward by luminaires or reflected from the ground. This light is then scattered by dust and gas molecules in the atmosphere, producing a luminous background. The part of the sky glow which is attributed to man-made sources of luminous radiation is called Artificial Sky Glow. (Note: this assessment considers the impact of artificial sky glow only.)

A major effect of sky glow at night is to reduce contrast in the sky. It has the effect of reducing one's ability to view the stars. This is the most pervasive form of light pollution and can affect areas many miles from the original light source.

Sky glow is highly variable depending on immediate weather conditions, quantity of dust and gas in the atmosphere, amount of light directed skyward, and the direction from which it is viewed.

Measuring and predicting sky glow from artificial lighting is a very challenging task due to the number of factors involved. Sky glow caused by artificial light can be minimised by limiting the upward light output of luminaires used in a lighting installation.

Building and Signage Luminance

Building and signage luminance should be limited to avoid 'over' lighting and to relate to the general district brightness. Building luminance applies to buildings directly illuminated as a night-time feature, as opposed to 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.

'Over' Lighting

'Over-lighting' is when an area is lit to a higher level of illuminance than the task/use requires. It is identified by the ILP guidance as being a major cause of obtrusive light and for wasting energy. Good design practice and adherence to the published lighting standards prevent 'over' lighting areas, which in turn helps to minimise upward reflected light.

Energy Consumption

Consideration should be given to the energy efficiency of the existing lighting installed on site and to minimising the energy consumption of any proposed lighting. Energy-efficient luminaires, light sources and lighting controls should be selected.

The Effect on Flora and Fauna

A liaison with the project ecologist is to be undertaken to identify any light-sensitive receptors in terms of flora and fauna, so an assessment of the effect can be established.

The Distant View of Light Across the Landscape, Particularly in a Rural or Dark Landscape (Light Presence)

This report considers where light emitted from a light source, or light that is projected onto an area or building, can be viewed from outside the area it was provided for. This is light that does not reach an intrusive level, but can be seen, and has been termed "light presence". This light presence may draw attention to the existence of a lighting installation or structure. This light cannot be accurately quantified and is considered to be subjective.

Table 9 | Significance Criteria

Nature	Level of significance	Descriptions	Remedial Needs
Positive	Major / substantial beneficial effects (Significant)	Significant improvement in night environment and/or a major decrease in the level of sky glow, light spill and glare on to surrounding areas and illuminance levels at the windows of healthcare premises (light intrusion), resulting in a noticeable or major improvement in baseline conditions and is well within the recommended CIE guidance levels.	None
	Moderate beneficial effects (Significant)	Noticeable improvement in the night environment and/or a moderate decrease in the level of sky glow, light spill and glare on to surrounding areas and illuminance levels at the windows of healthcare premises (light intrusion), resulting in a moderate improvement in the current baseline conditions and recommended CIE guidance levels.	
	Minor beneficial effects (Not Significant)	Slight improvement in night environment and/or a minor decrease in the level of sky glow, light spill and glare on to surrounding areas and illuminance levels at the windows of healthcare premises (light intrusion), resulting in a perceptible improvement in baseline conditions and is within the recommended CIE guidance levels.	
Neutral	None / negligible (Not Significant)	No significant effect or overall effects balancing out with a barely perceptible change in the level of sky glow, light spill and glare onto surrounding areas and illuminance levels at the windows of surrounding premises (light intrusion) and would cause a negligible or barely discernible change to current baseline conditions and is within the recommended CIE guidance levels.	None
Negative	Minor adverse effects (Not Significant)	Minor increase in the level of sky glow, light spill and glare on to surrounding areas an illuminance levels at the windows of surrounding premises (light intrusion), would cause a minor perceptible change in baseline conditions, which are slightly above recommended CIE guidance levels but where current uses could still be maintained.	Develop appropriate levels and type of mitigation
	Moderate adverse effects (Significant)	Noticeable increase in visibility of site, moderate increase in the level of sky glow, light spill and glare on to surrounding areas and illuminance levels at the windows of surrounding premises (light intrusion) and would result in a noticeable effect on baseline conditions moderately in excess of the recommended CIE guidance levels.	
	Major adverse effects (Significant)	Significant problems with increase in visibility of site, major increase in the level of sky glow, light spill and glare on to surrounding areas and illuminance levels at the windows of surrounding premises (light intrusion) and would result in a major effect on baseline conditions significantly in excess of the recommended CIE guidance levels.	

6 Construction and Operational Phase Lighting

6.1 Construction Phase Lighting

The primary reasons for lighting provision within the construction site will be for health and safety and security requirements.

The sources of artificial light that have been assumed to be present during the construction phase are:

- Temporary floodlighting, particularly during the winter months.
- Floodlighting and security lighting associated with site access, on-going work areas, temporary car parking areas and on the exterior of construction compounds.
- Lighting at height associated with the construction of structures.
- Interior lighting within any temporary office units within any construction compounds.
- Crane warning lights.

The working hours for construction are anticipated to be typical industry hours (i.e. 08:00 to 18:00 Monday to Friday and 09:00 to 13:00 on Saturday). It is assumed there will be no work on Sundays or Bank Holidays. Lighting associated with the construction works is assumed to be temporary and intermittent in nature. It is assumed that some level of security lighting will be required at all times during the hours of darkness.

6.2 Operational Phase Lighting

Lighting during the operational phase is provided to enhance safety, visual comfort and visual performance for customers and workers using the proposed development site.

The sources of artificial light that have been assumed to be present during the operational phase are:

- Internal general and display lighting within the store.
- Column-mounted luminaires to serve the proposed car park and access road
- Wall-mounted luminaires to serve the proposed delivery and HGV turning area.

The working hours for the operation of the site are 08:00 to 22:00, Monday to Sunday, inclusive of Bank Holidays. The intention is that the external lighting will operate between 07:30 to 22:00 Monday to Sunday and for lighting to drop to 30% for one hour after close (22:00)

7 Mitigation Measures

7.1 Construction Phase

Mitigation of the effects of the lighting installation during the construction phase will include:

- Specifying working hours, uses of lighting, location of temporary floodlights and construction compound and agreeing these with the local council.
- Lighting to be switched off when not required, specifically for construction activities or required for health and safety or security.
- Glare will be minimised by ensuring that the main beam angle of all luminaires is directed away from any potential observer into the centre of the site, wherever possible and angled at less than 70 degrees from the horizontal.
- Light spill will be minimised by avoiding poorly sited luminaires located at the boundary of the development.
- Sky glow will be minimised by using modern floodlights with good photometric control, angled at less than 70 degrees from the horizontal and by using additional shields as appropriate.
- The selection of luminaires, including those required for night-time security, that are designed to minimise any obtrusive light.
- During construction, all site lighting should be situated and angled away from any linear vegetation, i.e. hedgerows and nearby treelines, etc., that may be used as flight paths.
- During construction, all contractor compounds and facilities shall be located as far as practicable from retained trees and hedgerows around the perimeter of the site, and away from the proposed dark zones, dark corridors, and foraging routes to minimise potential impacts on bats on the site.

These measures will form part of a Construction Environmental Management Plan.

7.2 Operational Phase

Mitigation measures applied to the operational lighting will be as follows –

- Over-lighting has been avoided through the careful selection of lighting design criteria.
- All external lighting has been specified as 'Warm White' with a correlated colour temperature (CCT) of 2700K.
- All external lighting columns have been specified at 5m mounting height
- All external lighting has been specified with LED lamps with negligible UV component and a peak wavelength higher than 550nm.
- All external luminaires specified for use within the project are DarkSky Approved.
- All external luminaires are to be fitted with controls to enable automatic switching to prevent luminaires from being left on outside of the proposed operating hours.
- Presence detectors to be utilised to dim luminaires to reduce potential impacts from the external lighting and reduce energy consumption during low-traffic periods.
- Lighting columns have been specified with louvres to reduce to back spill of light.
- The Sign(s) hereby approved shall not be illuminated more than one hour before the store opens and shall always be turned off within one hour after the store's closing time.

8 Predicted Impacts from Artificial Lighting

8.1 Construction Phase

Construction impacts are temporary in their nature; however, prior to mitigation, there is potential for the development to result in adverse effects. Mitigation and residual effects are further discussed in Sections 6 and 7.

8.2 Operational Phase

The results show that light spill from the external and car park lighting is calculated horizontally at ground level from the proposed site. Refer to 08998L-SDS-ZZ-EX-D-E-7082005 for isolines and horizontal light spill from the proposed installation.

The results show that light spill from the external lighting calculated horizontally at ground level from the proposed site is predicted to be less than 0.5 lux across the site boundaries, as indicated in Table 10 and Drawing No. 08998L-SDS-ZZ-EX-D-E-7082003.

Overall impacts of the artificial lighting have been discussed in Section 9 Conclusion.



Figure 4 | False Colour Scale – Levels of Illuminance Measured in Lux

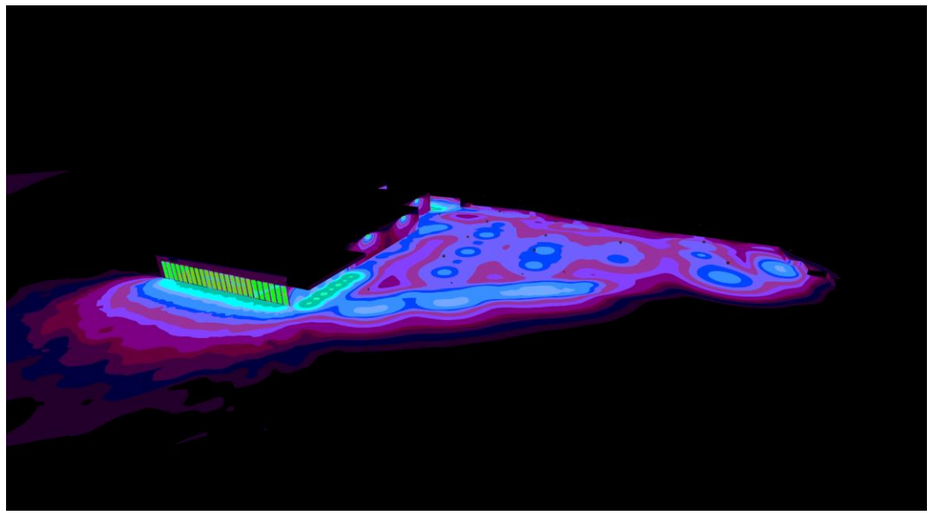


Figure 5 | 3D Calculated View of the Site – View from the North

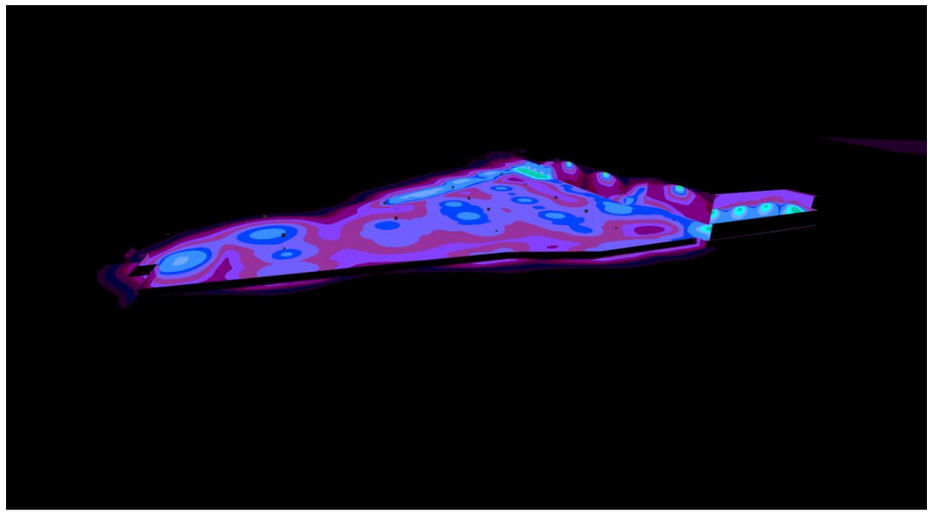


Figure 6 | 3D Calculated View of the Site – View from the South

9 Conclusion

9.1 General

The Lighting Impact Assessment aims to provide an assessment of the impact of the combined internal and external lighting from the proposals in terms of ecology, obtrusive light, dark sky by considering light spill emanating from the proposed development site.

The lighting impact assessment covers the development of the existing site with newly proposed buildings, access roads and car park to be constructed.

This Lighting Impact Assessment is based on the adoption of the external lighting strategy and mitigation measures outlined in this report. The site has been modelled and calculations provided, using industry-standard software. The impact of light spill from external lighting has been calculated using DIALux Evo Lighting Software.

All specified external lighting has a 0% upward light output ratio and is certified as 'Dark Sky' compliant. All external lighting is to be installed at the mounting heights shown on the external lighting layout drawings and is to be installed with no tilt.

The lighting across the site has been designed in accordance with the requirements of 'Bats and artificial lighting in the UK' (ILP 2023), 'The Avoidance of Obtrusive Light' (ILP 2026) and 'Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales' (Natural Resources Wales 2025)

External lighting has been provided for visual comfort, visual performance of tasks, and safety in accordance with the recommendations of BS EN 12464-2:2024. The following illuminance levels have been applied for the task areas across the site –

- 7.1 Walkways exclusively for pedestrians – 5 Lux E_m, 0.25 U_o
- 7.4 Mixed traffic areas, vehicles turning, stationary loading and unloading – 50 Lux E_m, 0.4 U_o
- 8.1 Light traffic parking – 5 Lux E_m, 0.25 U_o
- 9.2 Building entrance with canopy – 30 Lux E_m, 0.4 U_o

All external lighting shall be controlled via a photocell and/or PIR sensor to mitigate any potential light spill emanating from the site.

9.2 Ecology

All external lighting has been designed in line with the requirements of ILP GN08 Bats and Artificial Lighting at Night to avoid detrimental impacts on foraging or commuting bat species using the site.

As identified in the sHRA report, the adjacent Afon Tarell is a key ecological receptor, noticeable due to otter and migratory fish presence. The outcome of the lighting impact assessment predicts no light spill onto the surface on Afon Tarell; this is deemed acceptable.

The scheme represents an increase in baseline conditions recorded across the site due to the lack of existing internal and external lighting. This increase in lighting from baseline levels has the potential to adversely impact commuting and foraging bat species using the site.

It should be noted that the calculation model represents the worst-case scenario, with all lights switched on simultaneously, and the screening effect of any shields or louvres not considered. Actual light spill from and across the site could differ from the values calculated. Proposed trees have not been included within the model for visual impact purposes; this is due to limitations with the modelling software's processing capability for complex 3D objects.

Given the calculated horizontal and vertical light spill emanating from and within the site, it is presumed that the proposed scheme is compliant with the ecological requirements proposed, ensuring that the sensitive boundaries to the south located adjacent to the loading areas remains below 0.5 lux to preserve this sensitive area in line with the ecology report. External lighting has been provided for task illuminance in accordance with BS EN 12464-2:2024.

The calculation results are detailed in Table 10 and in Drawing No. 08998L-SDS-ZZ-EX-D-E-7082003. The project/LPA ecologist shall confirm whether the proposed strategy and calculated light spill are acceptable.

Table 10 | Vertical Calculation Planes Maximum Levels of Illuminance

References	Target E_{max} (lux)	E_{max} (lux)	Meets Target
Vertical Plane 1	0.50	0.49	✓
Vertical Plane 2	0.50	0.41	✓
Vertical Plane 3	0.50	0.34	✓
Vertical Plane 4	0.50	0.46	✓
Vertical Plane 5	0.50	0.31	✓
Vertical Plane 6	0.50	0.41	✓
Vertical Plane 7	0.50	0.48	✓

Table 11 | Baseline Survey Assessment Results

References	Horizontal Illuminance (lux)	Height Measurement (m)
Survey Reference 1	0.000	0.00 (Ground Level)
Survey Reference 2	0.000	0.00 (Ground Level)
Survey Reference 3	0.011	0.00 (Ground Level)
Survey Reference 4	0.000	0.00 (Ground Level)
Survey Reference 5	0.022	0.00 (Ground Level)
Survey Reference 6	0.097	0.00 (Ground Level)
Survey Reference 7	0.000	0.00 (Ground Level)
Survey Reference 8	0.032	0.00 (Ground Level)
Survey Reference 9	0.000	0.00 (Ground Level)
Survey Reference 10	0.032	0.00 (Ground Level)
Survey Reference 11	0.000	0.00 (Ground Level)
Survey Reference 12	0.000	0.00 (Ground Level)
Survey Reference 13	0.000	0.00 (Ground Level)
Survey Reference 14	0.022	0.00 (Ground Level)
Survey Reference 15	0.022	0.00 (Ground Level)
Survey Reference 16	0.043	0.00 (Ground Level)
Survey Reference 17	0.075	0.00 (Ground Level)
Survey Reference 18	0.150	0.00 (Ground Level)
Survey Reference 19	0.150	0.00 (Ground Level)
Survey Reference 20	0.290	0.00 (Ground Level)
Survey Reference 21	0.200	0.00 (Ground Level)
Survey Reference 22	0.110	0.00 (Ground Level)
References	**Horizontal Illuminance (lux)**	**Height Measurement (m)**
Survey Reference 23	0.310	0.00 (Ground Level)
Survey Reference 24	0.050	0.00 (Ground Level)
Survey Reference 25	0.620	0.00 (Ground Level)
Survey Reference 26	0.980	0.00 (Ground Level)
Survey Reference 27	1.310	0.00 (Ground Level)
Survey Reference 28	1.330	0.00 (Ground Level)
Survey Reference 29	4.410	0.00 (Ground Level)
Survey Reference 30	0.410	0.00 (Ground Level)
Survey Reference 31	0.410	0.00 (Ground Level)
Survey Reference 32	0.011	0.00 (Ground Level)
Survey Reference 33	0.000	0.00 (Ground Level)
Survey Reference 34	0.032	0.00 (Ground Level)
Survey Reference 35	0.032	0.00 (Ground Level)
Survey Reference 36	0.011	0.00 (Ground Level)
Survey Reference 37	0.000	0.00 (Ground Level)
Survey Reference 38	0.011	0.00 (Ground Level)
Survey Reference 39	0.000	0.00 (Ground Level)
Survey Reference 40	0.000	0.00 (Ground Level)
Survey Reference 41	0.110	0.00 (Ground Level)
Survey Reference 42	0.000	0.00 (Ground Level)
Survey Reference 43	0.022	0.00 (Ground Level)
Survey Reference 44	0.043	0.00 (Ground Level)
Survey Reference 45	0.043	0.00 (Ground Level)
Survey Reference 46	0.065	0.00 (Ground Level)
Survey Reference 47	0.000	0.00 (Ground Level)
Survey Reference 48	0.032	0.00 (Ground Level)

9.3 Obtrusive Light

The proposed external lighting scheme has been designed in accordance with ILP Guidance Note 01/26 for the Avoidance of Obtrusive Light. All specified luminaires to be utilised within the proposed development are LED with a sharp cut-off, 0% upward light output ratio (ULOR) and are Dark Skies compliant when installed as specified.

The undertaking of the lighting design has taken into account commentary provided by NRW and aims to minimise impacts on the sense of remoteness and tranquillity to the local area. This has been achieved through limited mounting heights (5m maximum) to newly proposed lighting, which will sit below existing street lighting. This has been done in conjunction with the careful selection of lighting classes to avoid over lighting and associated light spill and scatter from the installation.

9.4 Dark Skies

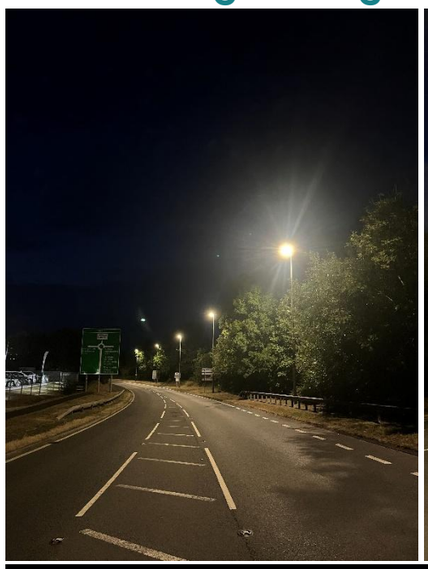
To reduce the impacts on dark skies, the following documents have been used to inform the external lighting design –

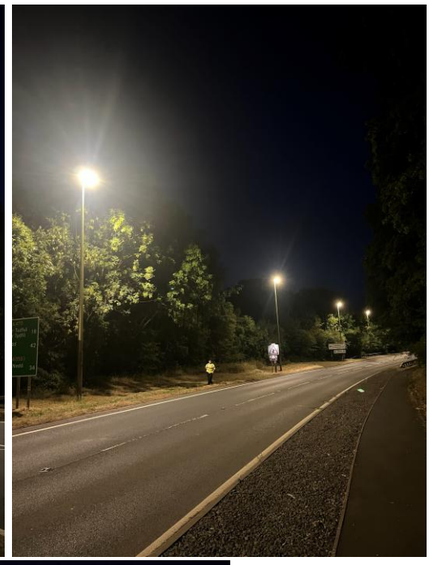
- Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales
- ILP Guidance Note 01/2026 for the Avoidance of Obtrusive Light

All specified external luminaires have been specified as dark skies compliant luminaires with 0% ULOR and selected to be installed with no tilt to reduce, as far as practicable, the effects of localised sky glow from the installation.

Adaptations from the previous scheme include the reduction in illuminance levels across the car parking and access roads to reduce the potential for light scatter from the installation, along with a reduced column height and luminaire outputs to reduce visual impacts.

9.4.1 Existing Site Lighting






Brecon LIDL LIA











Appendix A

Lighting Terminology

Lighting Terminology

For the purpose of this report, the definitions given below apply:

CIBSE: Chartered Institute of Building Services Engineers

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 Ra, where 100 Ra represents the colour rendering of natural daylight i.e. perfect colour.

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/m^2).

Light Pollution: The spillage of light into areas where it is not required.

Light Trespass (Nuisance): Light that impacts on a surface outside of the area designed to be lit by a lighting installation.

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.

Photocell: A unit which senses light to control luminaires.

Curfew: The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by a government controlling authority, usually the local government (CIE, 2003).

Environmental Zones: Area where specific activities take place or are planned and where specific requirements for the restriction of obtrusive light are recommended. Zones are indicated by the zone rating (E1… E4) (CIE, 2003).

Obtrusive Light: Spill light which because of quantitative, directional, or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information (CIE, 2003).

Residential Property: Land upon which a dwelling exists (CIE, 2003).

Sky Glow: The brightening of the night sky caused by artificial lighting resulting from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols, and particulate matter), in the direction of observation. It comprises two separate components as follows:

(a) **Natural sky glow** - That part of the sky glow which is attributable to radiation from celestial sources and luminescent processes in the Earth's upper atmosphere.

(b) **Man-made sky glow** - That part of the sky glow which is attributable to man-made sources of radiation (e.g. outdoor electric lighting), including radiation that is emitted directly upwards and radiation that is reflected from the surface of the Earth (CIE, 2003).

Spill Light (Stray Light): Light emitted by a lighting installation which falls outside the boundaries of the property for which the lighting installation is designed (CIE, 2003).

Upward Light Ratio: The maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

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