

# LIGHTING DESIGN GUIDE

Dedham Vale National Landscape

&

Coast & Heaths National Landscape

Guidance to reduce light pollution  
and protect our dark skies.



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and protect our dark skies.

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### A note on terminology

This document uses:

- The name Coast & Heaths National Landscape (CHNL) for the area designated as the Suffolk Coast & Heaths Area of Outstanding Natural Beauty.
- The name Dedham Vale National Landscape (DVNL) for the area designated as the Dedham Vale AONB.

‘AONB’ is still the legal designation and is used within this plan when referring to AONB’s outside of both the Suffolk Coast & Heaths, Dedham Vale and the designation nationally.

At times they are both abbreviated to ‘National Landscapes’.

# 1. Introduction

Both the Dedham Vale and Coast & Heaths National Landscapes are renowned for their tranquil landscapes and scenic beauty, but it is not just the daytime views which are an attraction. Visitors to the area can also enjoy the beauty of the night sky and a dark landscape. With few towns and areas of open and relatively uninhabited countryside the landscapes offer opportunities to see stars and experience nature in a way which is not possible in more brightly lit areas.

However, inappropriate lighting, bad design and incremental development increases light pollution and reduces our ability to appreciate and benefit from our dark skies. Lighting on rural roads, village streets, houses and other developments have the potential to increase light pollution. It also impacts on our experience of the landscape by altering the naturally changing light levels that occur at dusk and before dawn. Furthermore, artificial light can have a subtle, cumulative effect on the special character of rural landscapes, since brightly lit skies blur the distinction between urban and rural areas.

## The Purpose of this Guidance

The purpose of this guidance is to protect our night sky by promoting good practice in external lighting and internal light spill. Its aim is to foster behavioural change and reduce light pollution by effective design using industry standard best practice – it does not call for an outright ban on lighting but rather the right light in the right place at the right time. Effective design for dark skies will enable us to see the stars more clearly whilst also saving energy, reducing nuisance and minimising the impact of lighting on wildlife, people and on our National Landscapes. It will also contribute to protecting the landscapes wider special qualities, defined character and tranquillity.

More fundamentally, this guidance aims to support behaviour that does not negatively impact dark skies within the Dedham Vale and Coast & Heaths landscapes by establishing a proactive dark sky 'mind-set'. This means looking at the impacts beyond the immediate areas to be lit and ensuring that relevant standards, landscape assessments and other professional guides are followed. As Figure 1 shows, to protect our dark skies properly we need to expand our 'mind-set' from the local need to the wider landscape impact using appropriate guidance and standards that should be referenced at different spatial levels. The documents listed in Figure 1 are more applicable to non-domestic installations where

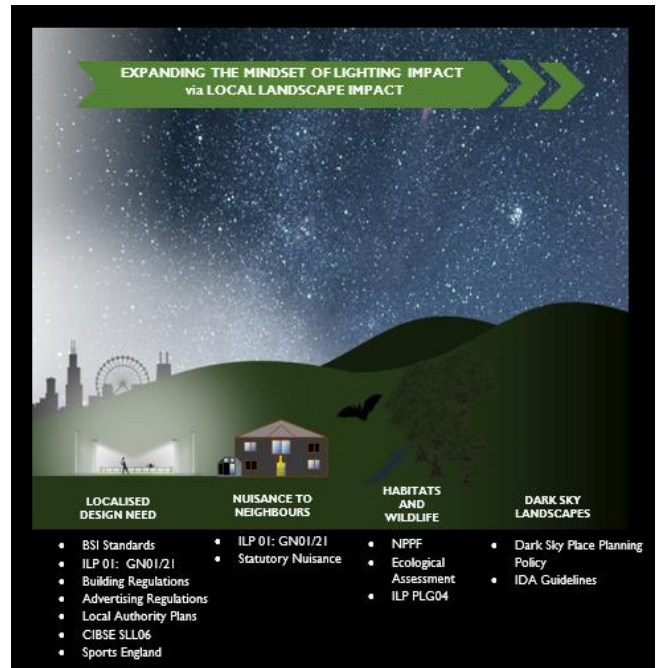


Figure 1 - The relation of standards and guidance to local and landscape needs. From Towards a Dark Sky Standard.

public, employee or other user safety is an essential safety.

Public bodies under section 85 of the Countryside and Rights of Way Act 2000 who have a duty to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty, should ensure that appropriate regard has been given to lighting design and its impacts.

## Who is this guidance for?

This document provides guidance for anyone who is using, replacing, or installing new external lighting in or around the Dedham Vale and Coast & Heaths National Landscapes; this includes householders, businesses and developers who may or may not require planning permission. It also is for those installing new glazing and windows. Achieving good lighting and glazing design is essential for protecting the rural character of the landscape.

Due to the contrast against a darker landscape setting, the impact of lighting at night will have a larger relative visual impact than daytime views. As such, development that may be many miles from the landscape boundaries can have a significant visual impact on the landscape.

This guidance is primarily aimed at;

1. Those seeking to install minor lights or glazing for mainly domestic purposes who need general advice.
2. Non-domestic schemes that may need planning permission and a more thorough design led by professional principles.
3. Planning officers who need guidance on assessing lighting and glazing designs.
4. National Landscape partners and stakeholders providing advice.

For all users, the basic external lighting principles are the same; they differ only in complexity and the users who need the light.

This guidance is also targeted at those with responsibility for setting the framework for development and for making decisions about individual planning applications; this includes planning staff and their colleagues in local authorities. As such, this guidance provides planners with the necessary information to assess most small lighting designs.

Everyone can help reduce light pollution, reduce energy use and save money by improving the type of outdoor lighting they use. There are many simple and cost-effective solutions which can reduce the impact of outdoor lighting on the environment whilst still providing a feeling of safety and comfort, by delivering the right amount of light only when and where it is needed. Sometimes all it needs is turning the light off. By increasing our awareness and following some simple principles, we can all help to minimise light pollution and protect dark skies.

### **Do I need Planning Permission?**

A common question with lighting is whether you need planning permission. Using the guidance within the [UK Planning Portal](#), in general, light itself and minor domestic fittings are **NOT** subject to planning controls. This means that if you need to light your garden path, doorway or driveway and purchase appropriate low level off-the-shelf luminaires, you do not need planning permission. You can use the

advice in this guidance to help you do this and avoid impact on the National Landscapes.

However, when your lighting is part of a new development or requires additional structures or has a sufficient visual intrusion, you may need planning permission. **If in doubt – consult your Local Planning Authority**

Many commercial, industrial, sports and roads will need planning permission due to the use of column mounted lights and the level of material intrusion. External lights require planning permission in some circumstances;

- Existing domestic buildings which have a condition removing permitted development rights included on a decision notice relating to the building.
- Listed buildings – these require planning permission and listed building consent.
- New residential developments
- Non-domestic buildings if the installation of a lighting design requires a material change in the appearance of a structure or engineering operations.
- Advertisements illuminated or otherwise which are subject to the [Town and Country Planning \(control of Advertisements\) regulations 2007](#).

### **Do I need a Lighting Designer?**

You do not normally need a lighting designer for most minor and single use external luminaires for your homes or small business - the information in this guidance should be sufficient. A dark sky consultant could also provide assessment if needed.

A qualified lighting designer is generally needed when lighting needs are more complex, and where there is a need to achieve a specified level of illuminance. Designers will ensure that the luminaires achieve all the necessary requirements to satisfy both lighting needs and dark sky compliance. Large scale lighting should employ the services of a competent designer.

In any circumstance, you will probably need some form of lighting design if your development is new and needs planning permission.

## 2. Dark Skies over our National Landscapes

### What Is a Dark Sky?

A dark sky is a place where the night sky is relatively free of interference from artificial light. Under these conditions you should be able to see the Milky Way overhead and other astronomical features such as the Andromeda Galaxy with the naked eye. Light domes from sky glow are small and confined to the horizon and the landscape is continuous in darkness with few light sources.

Sky quality is usually expressed on the 'Bortle Scale', which shows the level of stellar visibility measured using naked-eye limiting magnitude (NELM). Under better skies the Milky Way will be clearly visible, whereas a suburban sky in the UK will just be dark enough to see the Milky Way.

As everyone's eyes are a little different and as we get older our sight fades, we cannot depend on our own perception of sky quality. To improve the

consistency of experience between all places worldwide, sky quality is normally measured using a hand-held Sky Quality Meter (SQM) which is a standardised requirement of an [International Dark-sky Association](#) place application.

The SQM will return a value of the brightness (magnitudes) of an area (arcsecond<sup>2</sup>) of the sky expressed as a number from 0 to 22 – the higher the number, the darker the sky. To see the Milky Way, a sky measuring 20.5 and above is needed. 21 and above is rare in the UK. Volunteers within The Dedham Vale have measured 21+ in some places. Only one measurement of 20.65 has been recorded within the Coast & Heaths landscape at the Westelton Common Dark Sky Discovery site. However, comparison with satellite data between the two landscapes show that similar 21+ measurements would be expected in the Coast & Heaths National Landscape.

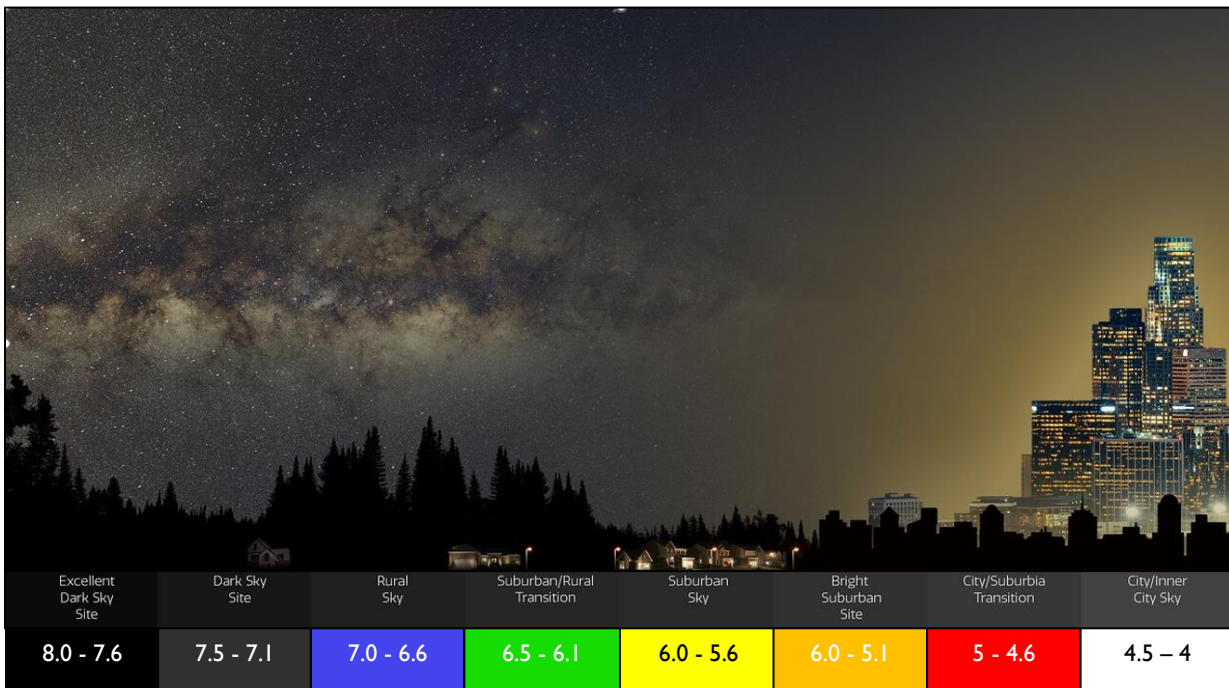


Figure 2 Credit: NOIRLab/NSF/AURA, P. Marenfeld. Global sky conditions from city to the best dark sky sites. Bortle scale expressed in naked eye limiting magnitude has been added. Note that the Milky Way will start to become visible in the suburban sky, 20.5+

### **Dark night Conditions and threats**

Both the Dedham Vale and Coast & Heaths National Landscapes are designated for their distinct landscapes which are rich in biodiversity and cultural heritage. As typically rural landscapes the skies above will be of regional importance to residents within and surrounding the landscape. While neither National Landscapes have yet secured an International Dark-Sky Association (IDA) place status like other UK protected landscapes that have achieved designation, it is still important to protect skies that could qualify for this accreditation at a later date.

The Countryside Charity (CPRE) campaigns to raise awareness about light pollution. In 2015 they worked with Land Use Consultants (LUC) to create a [Night Blight map](#) showing the relative darkness of the night sky across England (Figure 4). The mapping is based on remote satellite sensing and shows light emanating from the ground and upward facing lights that unnecessarily pollute.

As the map shows, the Dedham Vale suffers with light pollution from some rural villages such as Nayland, the A134 corridor and the Stoke by Nayland Resort Hotel. The landscape also suffers the effect of light pollution from Manningtree and the larger city of Colchester in the South. The area between the A134 and the A12 is a continuous area of darkness showing higher areas of relative quality.

The Coast & Heaths shows a greater difference in conditions between the larger unit to the north and the smaller units that reside between Ipswich, Manningtree and Felixstowe. These smaller units show higher levels of light pollution and lower sky quality compared to the larger unit.

The northern unit shows much higher levels of darkness but in addition to more common influences of small towns such as Thorpeness and Southwold, it is influenced by some major sources. Prominent sources include the MoD Woodbridge and Airfield and Sizewell Nuclear Power Station. The landscape also suffers from the surrounding towns and cities including Lowestoft in the North and Ipswich and Felixstowe in the South. There are also two Dark Sky Discovery sites within the boundary, Walberswick NNR and Westleton Common.

As the maps show both landscapes are at risk from the spread of urban development and the introduction of major lighting installations along their boundaries. The National Landscapes has specific threats from the spread of lighting from existing major development sites particularly the construction of energy projects and from offshore wind turbines.

It is important therefore, that development both inside and outside the boundaries properly considers good lighting practice to limit the impact of light pollution and protect good intrinsic areas of darkness within each landscape boundary.

### *The CPRE Scale*

The scale used in the CPRE mapping is dependent upon the resolution of the satellites being used. The VIIRS satellite has a minimum detectable radiance of  $3nW\text{ cm}^{-2}$  with a resolution of 750m and is unable to detect the impactful blue light peak of LED light. Comparing the maps to sky quality measurements, the highest scales (1 to 2) roughly approximate to 20.5 and above. Areas under these categories are likely to provide good astronomical opportunities and dark skies.



Figure 3 - All Sky Image from Nayland. Mike Barrett

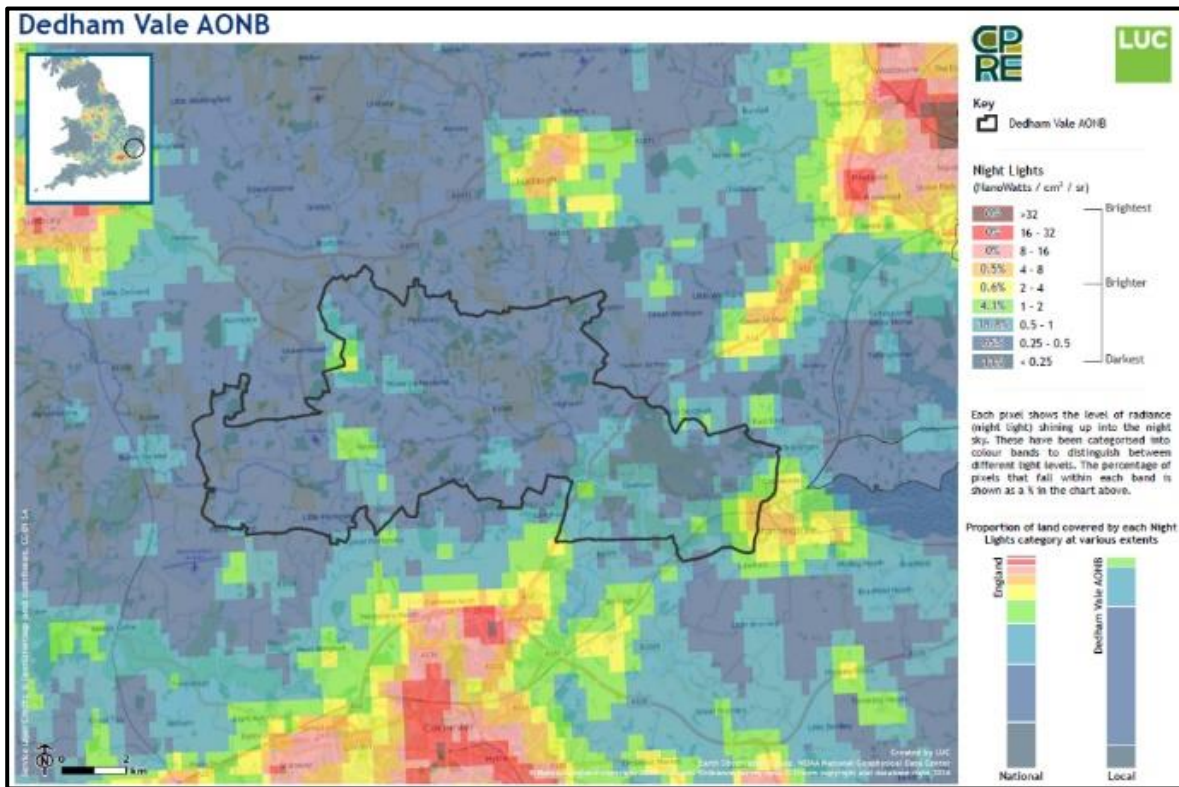


Figure 4 - Dedham Vale National Landscape Sky Quality. (Earth Observation Group, NOAA National Geophysical Data Center. Data processed by LUC on behalf of CPRE)

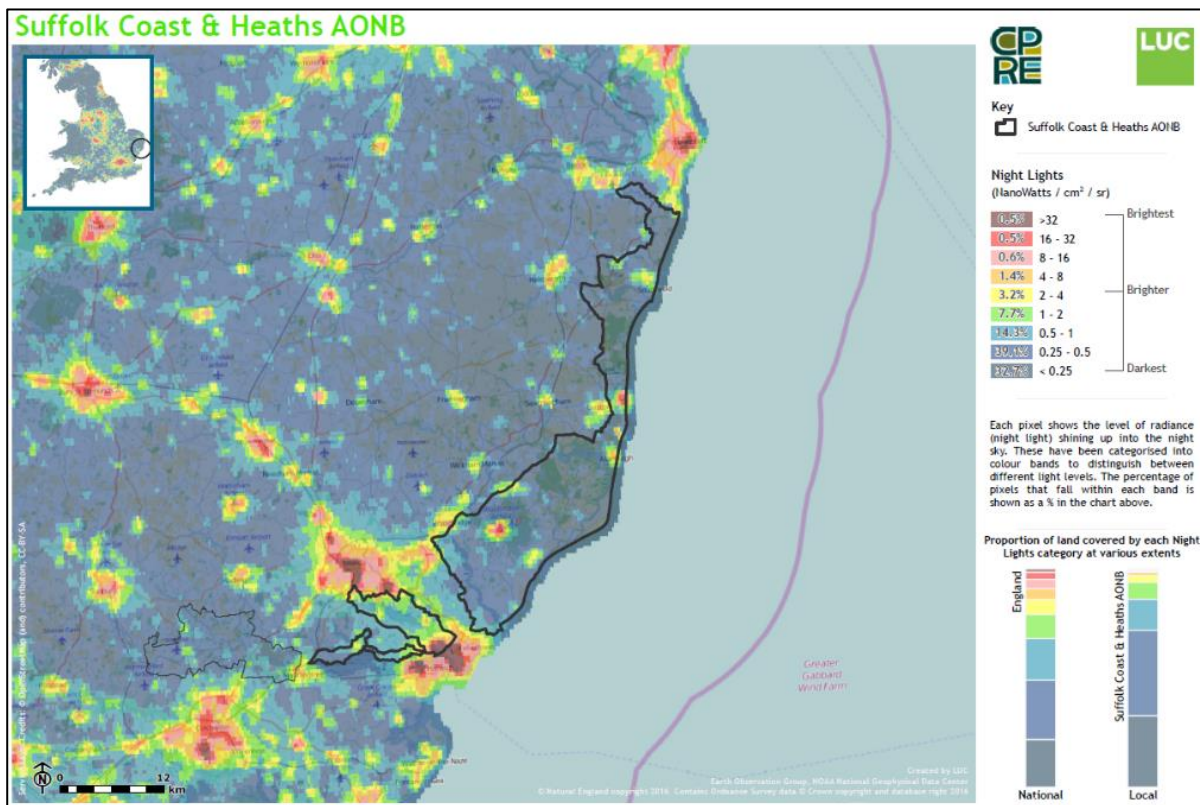


Figure 5 – Coast and Heaths National Landscape Sky Quality (Earth Observation Group, NOAA National Geophysical Data Center. Data processed by LUC on behalf of CPRE)



**Dedham Vale National Landscape Sky Quality**

The CPRE maps show the Dedham Vale National Landscape has 76% of its landscape classified as 'dark' (<0.5 nWcm<sup>-2</sup> sr<sup>-1</sup>) with 11% categorised as pristine (<0.25 nWcm<sup>-2</sup> sr<sup>-1</sup>). It ranks 20<sup>th</sup> of the 34 National Landscapes in England.

Boundary	Night light 1 (<0.25)	Night light 2 (0.25-0.5)	Night light 3 (0.5-1)	Rank
Dedham Vale Landscape	11%	65%	18.8%	20
Colchester District	2.1%	32.9%	31.4%	117
Babergh	13.4%	53.1%	19%	38
Tending	0.8%	30.2%	33.6%	97

**Coast & Heaths National Landscape Sky Quality**

The CPRE maps show that Coast & Heaths National Landscape has 73% of its landscape classified as 'dark' (<0.5 nWcm<sup>-2</sup> sr<sup>-1</sup>) with 32% categorised as pristine (<0.25 nWcm<sup>-2</sup> sr<sup>-1</sup>). It ranks 29<sup>th</sup> of the 34 National Landscapes in England.

Boundary	Night light 1 (<0.25)	Night light 2 (0.25-0.5)	Night light 3 (0.5-1)	Rank
Coast & Heath Landscape	32.7%	39.1%	14.3%	29
Suffolk Coast	2.1%	32.9%	31.4%	117
Waveney	24%	41.3%	13.9%	75

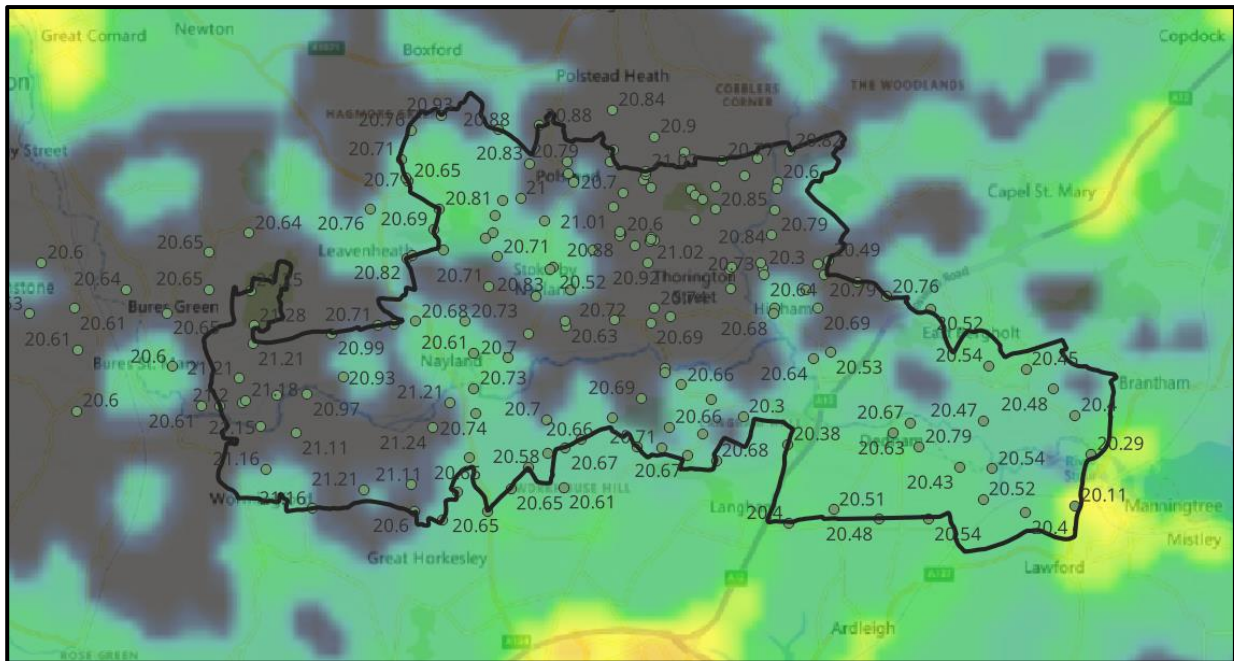


Figure 6 - Sky Quality Measurements in the Dedham Vale National Landscape

**On the Ground Measurements**

Sky quality measurements have been taken within the Dedham Vale. Figure 5 shows above where these values were taken overlaid over VIIRS 2022 satellite data and figure 6 shows an interpolation of the data showing areas between 20-20.5, 20.5-21 and 21 and above.

They show good levels of darkness with some areas measuring above 21 magnitudes per second<sup>2</sup>. They show reasonable agreement with VIIRS 2022 datasets and show that favourable dark sky conditions of 20.5 magnitudes per arcsecond<sup>2</sup> throughout the rural landscape. Given these values, it is fair to assume that Coast & Heath National Landscape will have similar levels of consistency.

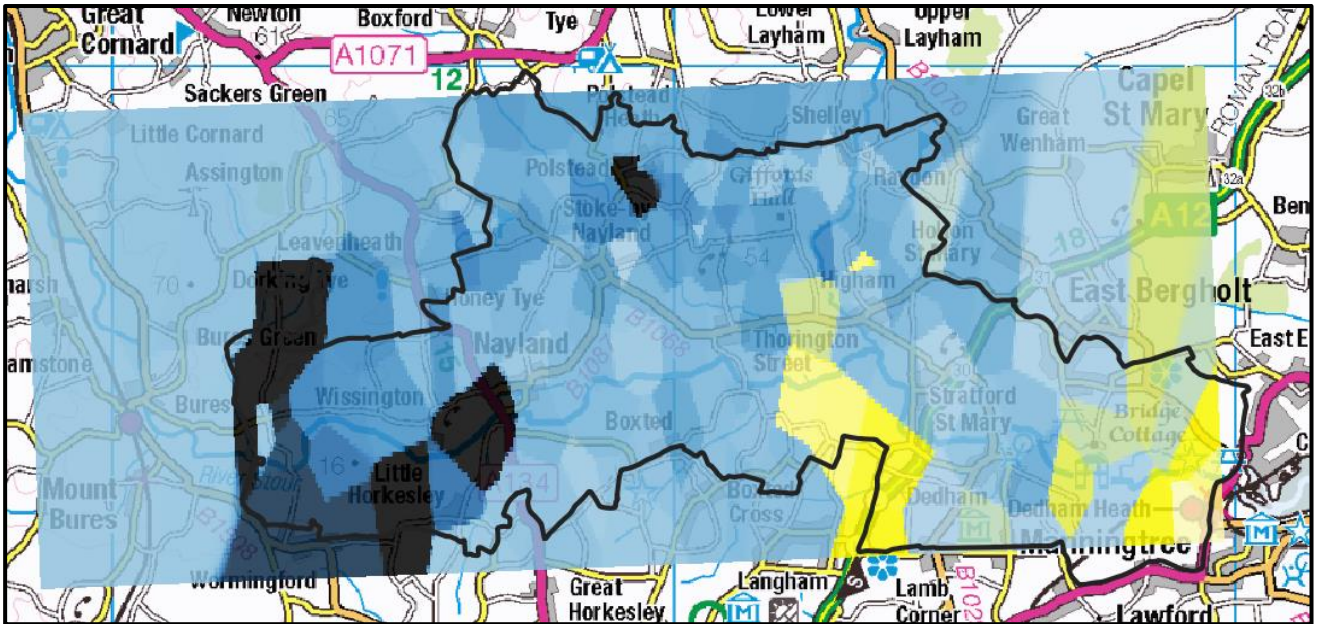


Figure 6 - Inverse Distance Weighting interpolation of Sky quality data. Dark blue to black (21+), blues (20.5 to 21) and yellow (20.5 and less).

Computed histogram shows a peak at 20.6 with consistent values between 20-5 and 21.

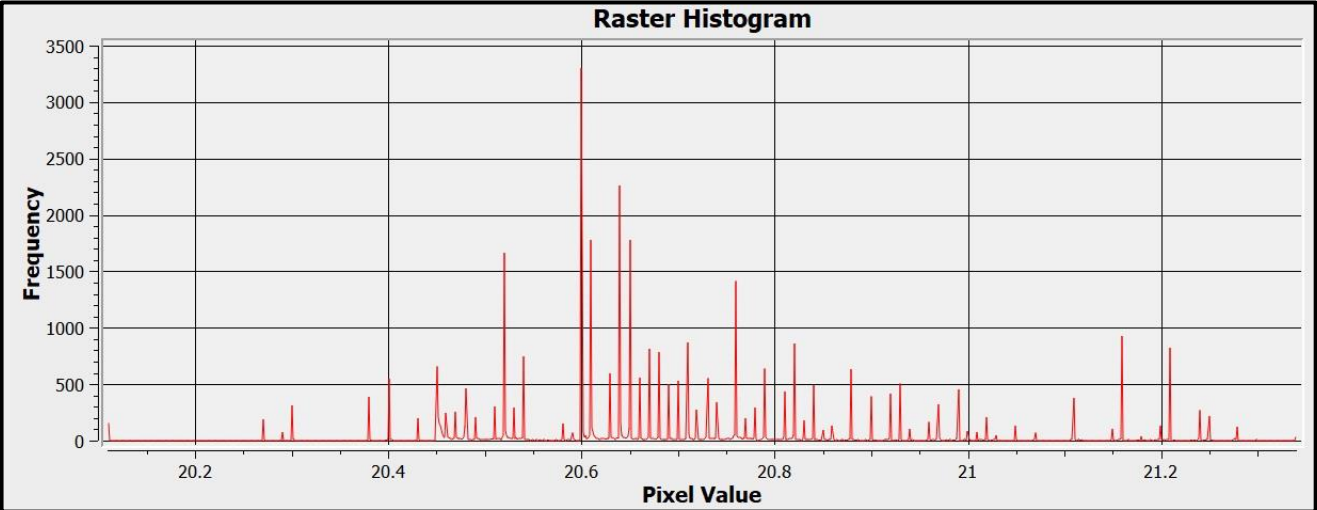


Figure 7 - Histogram of Sky Quality Measurements. Shows peak at 20.6 magnitudes per arc second<sup>2</sup>

**Ambient lighting zones**

The standard practice in external lighting design is to apply ambient lighting environment zones (E-zones) to set different lighting requirements under different sky conditions. Due to the difference in ambient lighting between urban and rural settings, different levels of obtrusive light are allowed although zero upward light is preferred in all zones.

[The Institution of Lighting Professionals guidance on the reduction of obtrusive light \(GN01 ILP: 2021\)](#)

recommends lighting specifications based on these ambient zones. They state different levels of upward light, intensity, glare and building luminance for these zones which should be followed in any lighting design. The landscapes will either be E1 or E3/4 with an additional caveat on upward light. If in doubt, consult with officers to determine zone compliance requirements.

Using sky quality data, the Dedham Vale and Coast & Heaths National Landscape has been categorised into two main rural and urban zones based upon the use of Council or National Highways Authority owned road column street lighting in urban areas. Urban street lighting has a clear and measurable impact on sky quality and is a useful demarcation between ambient lighting environments. The environment zones are set as;

A rural zone which includes areas of the landscape that has sky quality measurements satisfying.

- E1 – Rural landscape, small villages, very little street lighting

An urban zone to include,

- E3 – Urban/Suburban settlements, towns, villages using street lighting.

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
<b>E1</b>	<b>Natural</b>	<b>Dark</b>	<b>Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.</b>
E2	Rural	Low District Brightness	Sparsely inhabited rural areas, villages or relatively dark outer suburban locations
E3	Suburban	Medium District Brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High District Brightness	Town / City centres with high levels of night-time activity

*Table 1 - Environment Zones. GN01 ILP The Reduction of Obtrusive Light. The rural landscape will be E1. Refer to the guidance note for recommended limitations of lighting parameters in each zone for, property illuminance (spill), intensity, sky glow and upward light, and building luminance.*

**IMPORTANT: DESIGN COMPLIANCE**

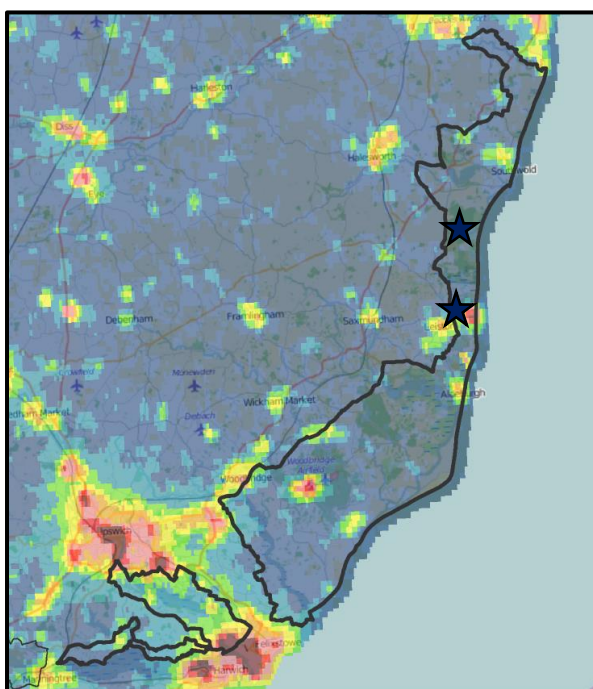
For all lighting development within the rural setting (not within urban areas using Local Authority streetlighting) it is expected that plans will aim to achieve E0 compliance under ILP GN01 2021 as a matter of principle. Use of E1 criteria instead of E0 should be clear in the design justification.

- The need for E1 compliance is particularly relevant to road, amenity, and sports lighting where residual effects are likely to cause significant adverse landscape impacts (refer to Table 7 in GN01 2021). Installations of amenity and sports lighting schemes using more than four luminaires are not expected in E1 zones due to the residual impacts.
- E1 areas are expected to reside between the urban fringe boundaries and the darker rural setting. Measurements above 20.5+ are likely to begin within 2km of the edge of the street-lit urban fringe (E3) boundary.
- Illuminated main roads and highways, such as the A143 or the A12, should not be considered as 'urban' development. They should reflect the wider surrounding ambient lighting levels and in rural areas, would be classified as E1 as a minimum.
- Note that E2 zone is not used, as both landscapes prefer to give the landscape the maximum protection under the ILP GN01 guidance in relation to the protected status and its sky quality.

**IMPORTANT: UPWARD LIGHT RATIO (ULR)**

In all zones an installed upward light level of **ZERO** is sought in all cases, irrespective of ambient lighting zone. This is in contrast to the ILP GN 01 guidance which allows positive values of ULR in E3/4. The Dedham Vale and Coast & Heaths National Landscapes seek zero upward lighting in all cases and supersedes the ILP guidance in this technical respect.

### Dark Sky Discovery Sites



In 2019 two Dark Sky Discovery sites within the Coast & Heaths National Landscape were approved by the [UK Dark Sky Discovery](#) Network. These sites, at Walberswick National Nature Reserve and Westleton Common, have been recognised for the opportunities they offer to observe the night skies and are further proof of the importance of dark skies above the landscape. Special attention should be given to these sites to ensure that light pollution is avoided for both visitors and wildlife. This should be achieved with an appropriate environmental lighting impact assessment methodology that ensures that the ecology surrounding these sites is given due regard.

Figure 8 - Dark Sky Discovery Sites in Coast & Heaths National Landscape. Earth Observation Group, NOAA National Geophysical Data Center. Data processed by LUC on behalf of CPRE

### 3. What is Light Pollution

#### Light Pollution Definition and its effects

Light pollution is the presence of unwanted, inappropriate, or excessive artificial lighting. While protecting dark skies is important, light pollution affects many different aspects of society. Poorly designed, badly installed, inappropriate and waste light can affect nature and wildlife, increase energy costs, and impair health and wellbeing especially if a nuisance to neighbours. It also affects the way we interact and live within our spaces by making us feel safe, connected and part of a community. Viewed as a wider society issue it is important to ensure that lighting meets the needs of people but does not create inappropriate and unnecessary pollution.

As recent evidence in *Nature Ecology and Evolution* (Nov 2020) has shown, artificial lighting pollution is impacting the hormone levels, breeding cycles, activity patterns and predator-prey interactions of a broad range of species. A study by University of Exeter which combined 126 previous papers to assess the impact, concluded that light spill should be treated as another form of pollution. Combined

with the effect on humans, light impacts in many ways:

- Songbirds, amphibians, bats, insects and trees have all been shown to suffer under artificial light. Breeding patterns, foraging routes and pollinators are disrupted, with evidence showing a third of insects attracted to lights will die because of the encounter.
- The human cycle is disrupted by negatively affecting the production of Melatonin in the brain which helps regulate sleep, enhances the immune system, reduces cholesterol levels and the endocrine system.
- Glare can be highly dangerous to road users. It can cause accidents when motorists are distracted or blinded by lights.
- Lighting costs money and can create CO2. Unnecessary light pollution wastes power and money to householders, businesses, and the public sector.



### **Three main types of light pollution**

Light pollution has three main sources: Sky glow, glare and light trespass. The strength and direction of any light source can exacerbate pollution and blue-white light is particularly damaging as it is able to penetrate the atmosphere at greater distances.

It is also important to consider a 'fourth' source of pollution, which is due to the presence of lighting itself within dark areas and the residual impact.

#### ***Sky glow***

This is the brightening of the night sky which can be seen emanating from the horizon, originating mostly in built-up areas. It is caused by badly directed light sent above the horizontal and scattered by aerosols and particles in the air. It can also be reflected from surfaces. Light that travels near the horizontal is the most damaging as it travels furthest through the lower, denser atmosphere. This can be avoided by ensuring that lights are directed downwards where the light is

needed. Sky glow is made worse by blue-white light which penetrates the air more than warmer colours.

#### ***Glare***

This is the uncomfortable brightness of a light source when viewed against a contrasting darker background. In less densely populated rural areas, glare will seem relatively more intense than in urban areas. This is particularly noticeable when looking from raised viewpoints into the darker landscape below.

#### ***Light trespass***

Sometimes called 'light intrusion', this involves external light spilling beyond the property or area being lit. Although this pollution definition generally relates to windows and intrusion into private property, the term 'light intrusion' also applies to natural habitats and areas of high species interest. Light trespass can also occur from internal light that spills into darker places.

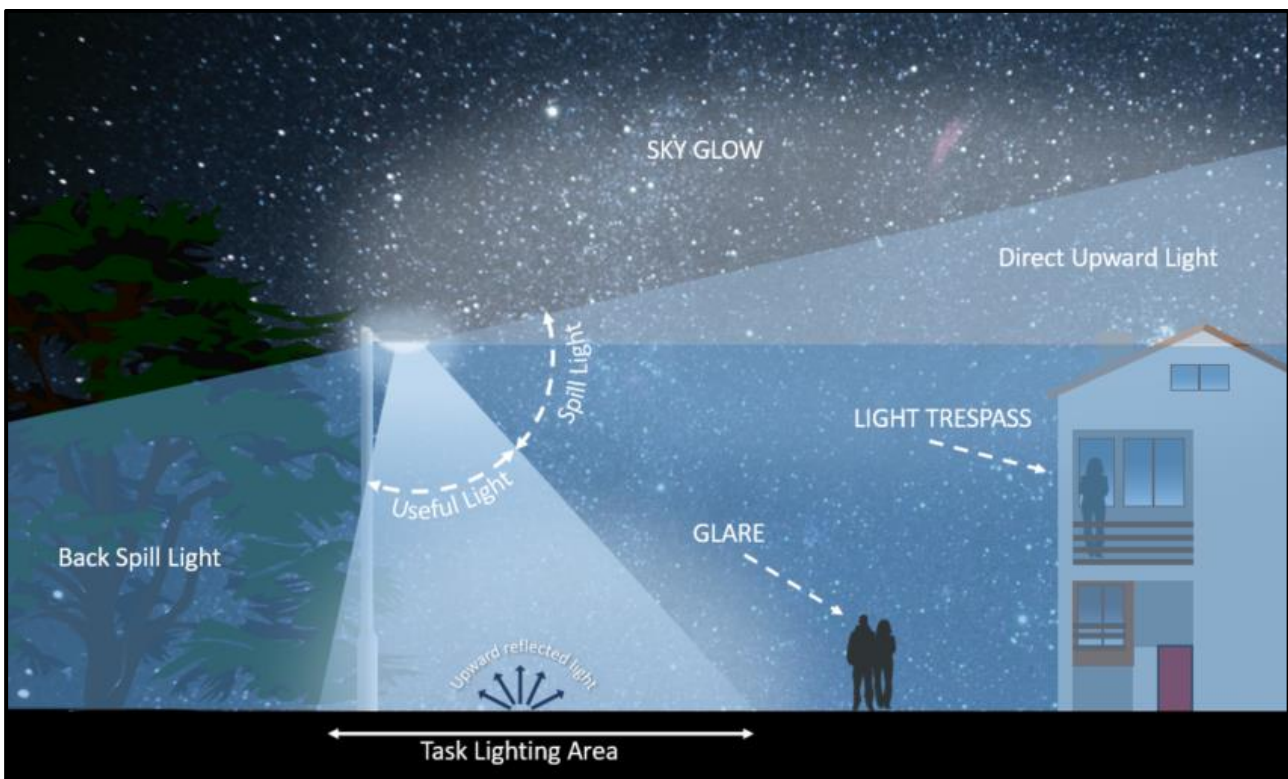


Figure 10 - Light Pollution. Sky Glow, Light Trespass and Glare.

**Presence – a fourth consideration**

Even if a lighting scheme were designed that avoided sky glow, trespass and glare, there still exists the possibility of significant **residual impacts** on dark and sensitive landscapes and wildlife due to the presence of the lights and the illuminance it provides. This applies to impacts from both exterior and interior lighting. When the residual impacts of lighting itself creates negative impacts, alternatives and re-siting should be considered or avoiding the proposed development. This is relevant for more brightly lit places, such as sports pitches or greenhouses that pose a greater threat.

Light pollution is made worse by blue-white light which can be found in many (Light Emitting Diode) LED lamps. The blue-white light can penetrate the

atmosphere much further than yellow and orange lights.

Residual impacts are difficult to avoid as they cannot be mitigated unless the light is completely removed from use. As a minimum amount of light will be required for illuminating surfaces, it will always be visible to some extent. While some acceptability of residual impacts must be given in providing light, even the best lighting plans cannot completely avoid some level of impact.

Residual impacts can be assessed using the methodology in ILP GN04 Lighting Assessments. Significant levels of negative residual impact may not be appropriate in a dark landscape regardless of the efficiency of the design.

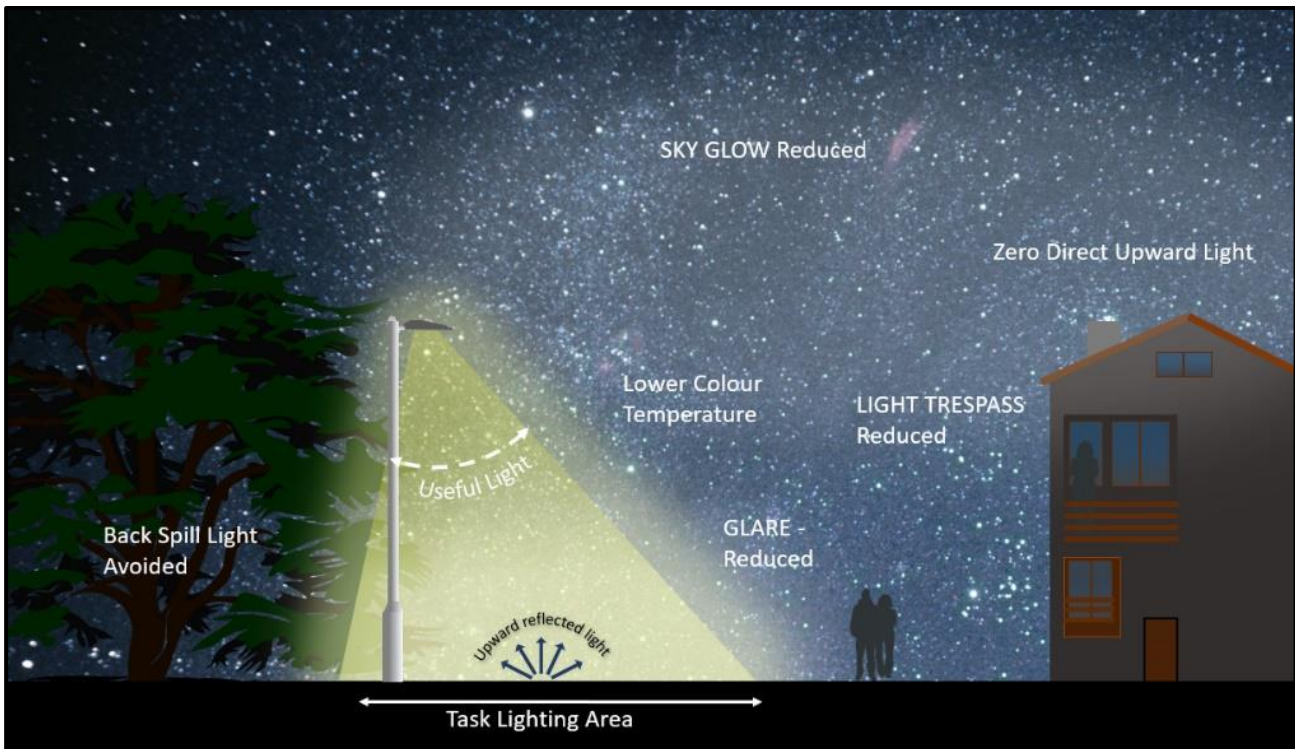


Figure 11 - Reduced sources of Light Pollution. The residual impacts of the lighting - the presence - remains.

## Light Pollution Control in the UK

### *Light Pollution and the Law*

In 2005, [Clean Neighbourhoods and Environment Act 2005 – Statutory Nuisance](#) (para 79-fb) was extended to include light nuisance,

“fb – artificial light emitted from premises so as to be prejudicial to health or a nuisance”

Local authorities must take reasonable steps to investigate complaints of artificial light nuisances. If a nuisance exists or may occur, an abatement notice to cease will be issued within a set timescale. For any resident, it is important not to be a nuisance by reducing pollution and following good lighting practice.

It is important to note that the threshold and process for nuisance lighting is different from planning. A nuisance requires a ‘victim’ who can show that they are being negatively impacted by lighting that has probably not received any obtrusive light reduction design. The harm is quantified by directly measuring obtrusive light spill metrics that fall into internal spaces by Environmental Health Officers. In contrast, planning control requires that light spill is reduced, ideally before the lights are installed, and to comply with obtrusive light requirements.

### *Light Pollution and National Planning Policy Framework (NPPF)*

[The National Planning Policy Framework NPPF \(2021\)](#) provides local authorities with a baseline when developing planning policy; paragraph 185

185 – 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: c) limit the impact of light pollution in local amenity, intrinsically dark landscapes and nature conservation.”

The NPPF references the importance of conserving and enhancing landscape and scenic beauty (Section 5), which would include darkness. Para 176 requires that ‘great weight should be given to conserving and enhancing’ protected landscapes which have the

highest status of protection. Para 176 also requires that development is limited and sensitively designed to ‘avoid or minimise adverse effects’ on designated area. This would include well designed lighting and understanding the full impact on darkness.

Para 177 also note that permission for major development be refused other than in exceptional circumstances.

*Duty of Regard of Section 85 CROW 2000 bodies, Section 85 of the Countryside Rights of Way Act 2000* places a requirement of a general duty of public bodies, which should include the impact of light pollution as regard,

- (1) In exercising or performing any functions in relation to, or so as to affect, land in an area of outstanding natural beauty, a relevant authority shall have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty.

### *Light Pollution and Wildlife sites and species*

The [Wildlife and Countryside Act 1981](#) is the principal mechanism for the protection of wildlife in Great Britain. Under the Act, it is illegal to disturb certain species, including bats, and artificial light can constitute an offence. While some species are particularly sensitive to artificial light, all wildlife and their habitats can be disrupted by artificial light. When developing or assessing a planning application that includes lighting, it is important to be aware of any designated (statutory and non-statutory) wildlife sites and protected species nearby. An assessment of any potential impacts should be undertaken, and a plan made to remove or mitigate these. The Institution of Lighting Professionals and the Bat Conservation Trust created [Guidance note 8/18 Bats and artificial lighting in the UK](#) to help guide lighting assessments of bat species.



## How Light is Measured

Light is composed of individual wavelengths across the electromagnetic spectrum that give lamps their colour and strength. To ensure lighting designs are effective in reducing light pollution it is useful to

understand the different measurements of light – Lumens, Lux, Candela and Colour (Kelvins and spectral wavelength) and how they impact on light pollution.

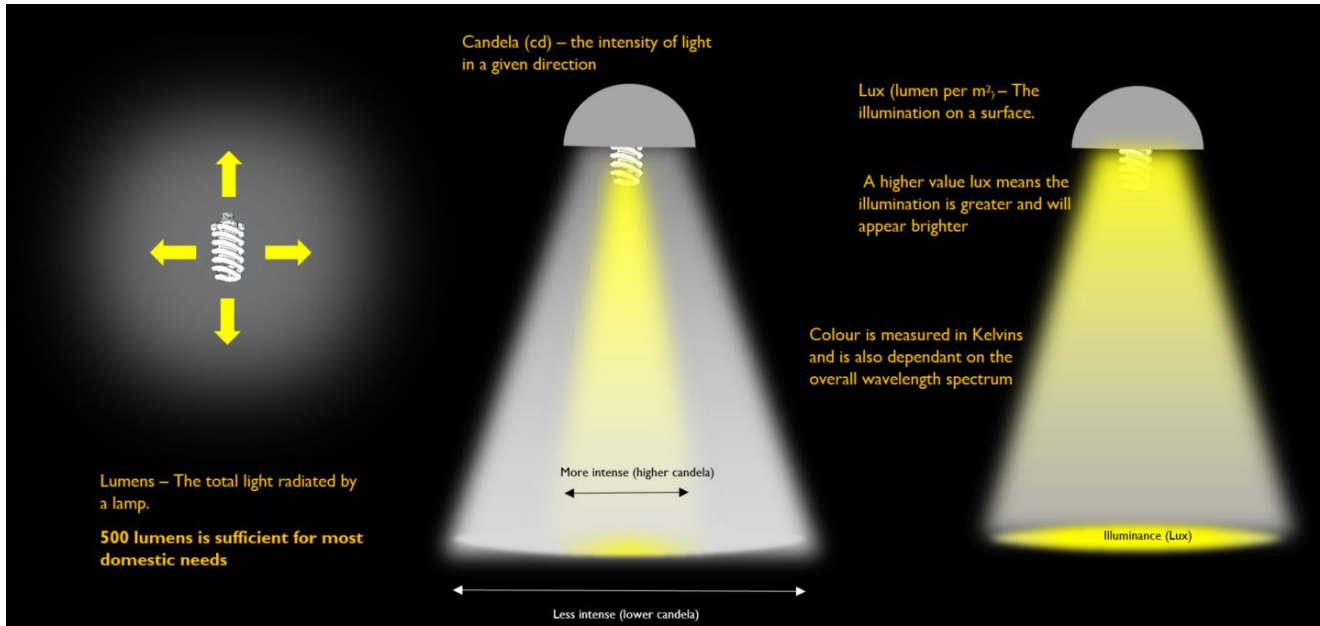


Figure 12 The properties of light. Credit Darkscape/South Downs National Park Authority Technical Advice Note

**Lumens** is how much light is emitted in all directions. Bulbs – or **lamps** - used to be sold according to the watts which is the amount of energy the lamp used, but now as LEDs are much more energy efficient than older incandescent bulbs most retail options list the lumen output. Hardware or electrical retailers will often stock off-the-shelf lamps from 200 to 1,500 lumens. As it is important to avoid over-light by using higher lumen levels, **500 lumens** and less is appropriate for most domestic purposes – you should not need more than 1500.

**Lux** is the amount of light that falls on a surface and represents the illuminance (E) on the ground. Illuminance is the right amount of light needed to do certain tasks and activities. For most non-domestic purposes or where a developer has a 'duty-of-care' to users, illuminance levels should comply with existing standards for illuminance. Using the right average illuminance ( $E_m$ ) is key to user safety and not over lighting.

**Candela** is the intensity of light in a given direction and describes luminous intensity. It shows how bright the light source is and how far away the object can be seen. High levels of intensity in any direction could contribute to neighbour's obstruction and glare issues. The Internal optics and lenses of the whole

light – the **luminaire** - will direct lamp light into a beam direction. Luminaire is the general term for a complete electric light unit.

**Colour Correlated Temperature (CCT)** which is measured in Kelvins (K) describes the colour appearance of light. The higher the colour temperature the bluer the light will appear. It is blue-white light that is particularly damaging to dark skies and should be avoided. Many lamps will state their colour temperature with some abbreviating as 'cool' (5000K or more) or 'warm' white (3000-4000K). 3000K and less is important for dark skies, ideally achieving 2,700K.

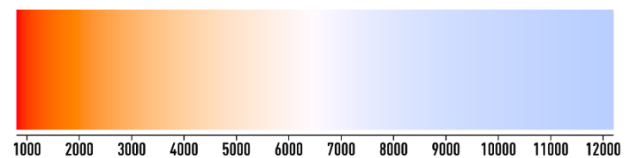


Figure 13 - The Kelvin Scale (K)

The colour of light will also change the way we perceive objects under its light – the colour rendition. Some lighting applications, such as sports or rail platforms, require a certain colour rendition quality which precludes the use of lower colour temperatures. It is important to ensure that the colour temperature (CCT) and the colour rendition index (CRI) are compatible.



Figure 14 - Different colour temperature lamp types

**Colour Spectrum** represents the distribution of wavelengths across the electromagnetic spectrum in the visible, ultraviolet and infra-red range. White light will be composed of many underlying wavelengths of different colour. It is the blue wavelengths <500nm, within LED lighting that can cause greater impact. The first LED lights tended to have spectrums with a high degree of blue light, which increases the impact of light pollution. However, newer LEDs now filter out damaging blue light without changing the overall colour temperature (CCT) or the Colour Rendition Index (CRI). Some manufacturers show the spectrum, but this is not common.

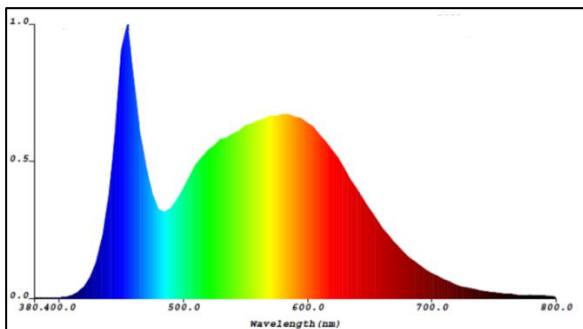


Figure 15 - The colour spectrum from a 5000K lamp with a prominent blue peak which exacerbates light pollution.

**Colour Rendition Index (CRI)** is a measurement of how natural colours render under an artificial white light source when compared with sunlight. The index is measured from 0-100, with a perfect 100 indicating that colours of objects under the light source appear the same as they would under natural sunlight. Some lighting uses, such as sports pitches will need specific colour rendition levels to achieve safe and natural play.

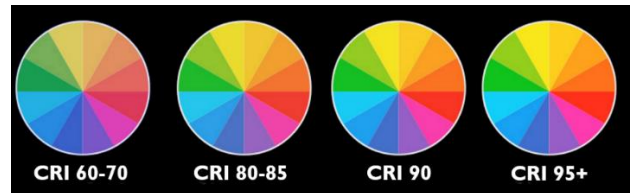


Figure 16 - Colour Rendition Index (CRI).

**Uniformity:**

Uniformity (U) is the ratio of the minimum light level to the average in a specified task area. It relates to the evenness of light across a surface and is the appearance of light to dark 'blotches'. Lighting with good uniformity has less blotchy light-to-dark areas and a fairly consistent level of light, whereas less uniformity is where there are greater differences between light and dark patches. Often, better uniformity can lower the overall illuminance needs. Different places have different uniformity needs and may not be required in design. Standards will define the uniformity level need, such as sports lighting guides where high levels of uniformity across a playing surface are needed.

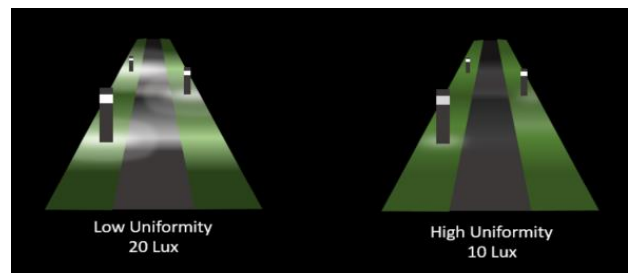


Figure 17 - Uniformity and illuminance

### Measuring Sky Quality

Sky Quality can be measured either by looking down at the Earth from above and measuring the upward light or by measuring the brightness of the sky from the ground. Most ground measurements use a Sky Quality meter either with a [Unihedron meter](#), or a [TESS photometer](#) which cost around £150. More complicated options are available, such as data loggers or all-sky units, but for quick measurements, the simple hand-held button operated units are acceptable.

You can also get a rough estimation of sky quality by counting the number of stars in the constellation of Orion which can be seen in the winter months. Observers can count the number of stars within the rectangle formed by the shoulders and feet. The number of stars you can see will give you the indication. The CPRE, the countryside charity, used

this method for their star count. In a city centre you will be lucky to make out 10 stars whereas under a good Milky Way dark sky in the UK you should be able to see around 25-30. Theoretically, there are 40 stars visible to the naked eye within Orion, but you need to be in a very dark place and have very good eyes to see them all.



Figure 18 - CPRE Star Count



Figure 19 - Light pollution in Boxted, Essex. Nik Szymanek

## 4. Dark Sky Design Lighting Principles

The following best practice design principles should be followed to ensure good lighting that reduces light pollution and its impact on dark skies. They are the corner stone of good lighting for dark skies and can be found in many of the referenced guidance's. With any installation, domestic or otherwise the aim should be,

*the right light, in the right place at the right time*

### Useful



Any light should be justified with a clear purpose and benefit. The overall lighting impact should be appropriate for the task and the local setting, regardless of the design.

### Targeted



Light should be directed to where it is needed and not spill into neighbouring spaces. All light above the horizontal should be avoided. **Zero upward light is essential.**

Asymmetric lights should be used where possible to reduce light spill, lower mounting heights, improve efficiency and eliminate upward light.

### Low light



Lights should provide the right illuminance referenced against design standards where appropriate. Do not use needlessly over-bright lights as there will be more pollution and unnecessary glare. Use **500 lumens** and less for domestic lighting. Lights should be installed at their lowest practical height.

### Controlled



Turn off when not needed with manual switches, timers or proximity (PIR) sensors. Ensure lights are dimmed or selectively activated when activity is low, to reduce light and energy use.

### Designed

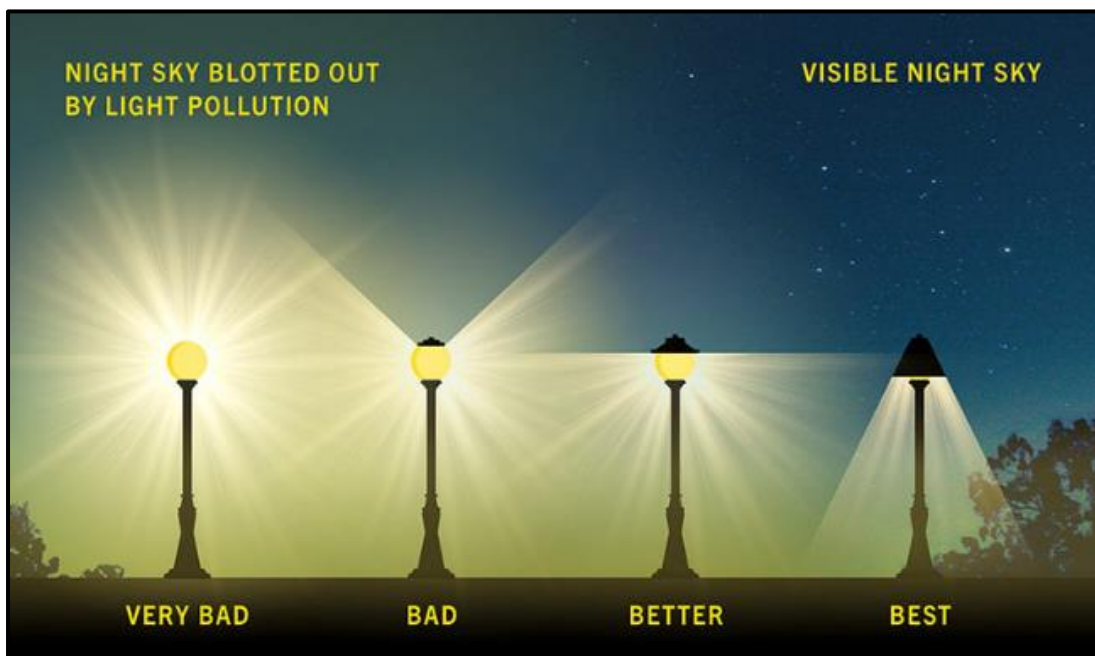


For larger non-domestic installations, professional designers should be consulted to ensure that illuminance, and control of spill light and glare, are appropriate for the task. Use the minimum possible number of lights and adhere to relevant standards.

### Colour



Lamps should be **3000K** or less and ideally **2700K**. These are sometimes described as 'warm white'. Lamps above 4000K described as 'neutral' and 'cool' should be avoided as they generally have more blue light within the spectrum. Spectral emission should avoid blue-wavelengths of **<500nm**.



## 5. Advice for Minor and Domestic Development

The following section provides advice for domestic residences which will typically include:

- Minor and Domestic Lights
- Internal light spill through glazing

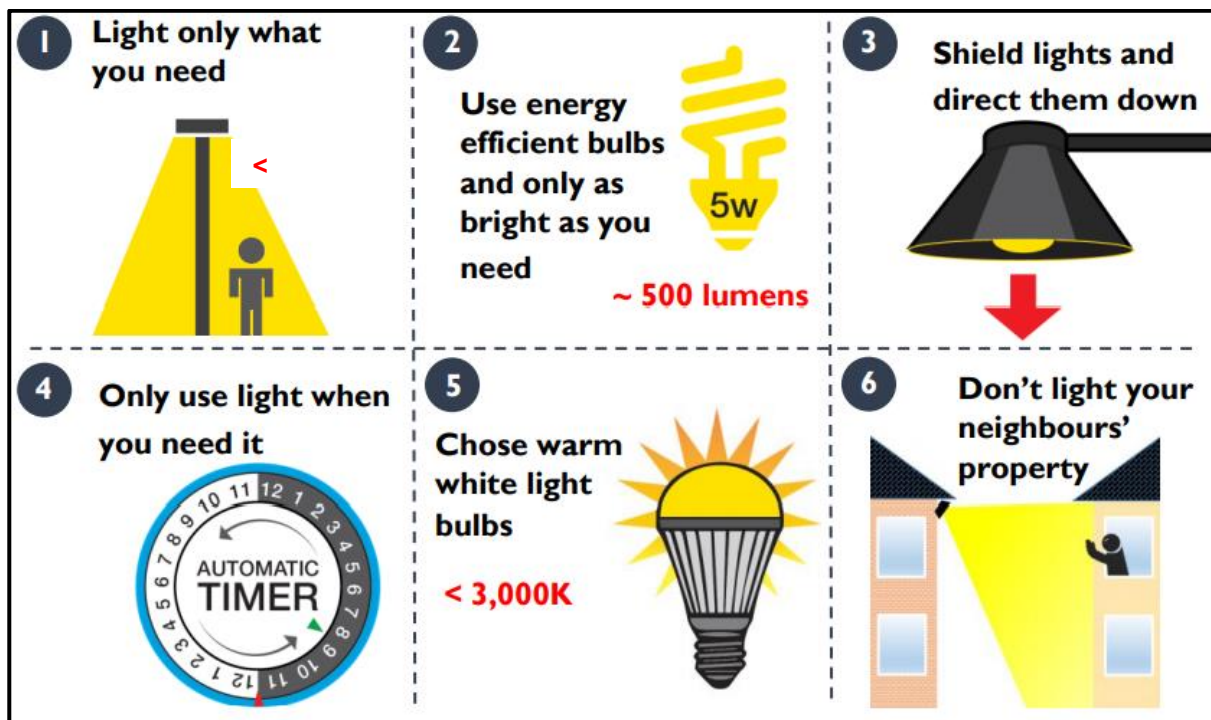
### Minor and Domestic Lights

The first consideration is whether lighting is needed at all. As minor fittings (see accompanying specification) are not generally subject to planning control or need a lighting designer, it is important that users and homeowners installing domestic lights understand the difference between good and bad lighting. What can seem an enticing deal at the retailers can turn out to be inappropriate and a nuisance to neighbours and overly polluting. Moreover, it may negatively affect the night sky and the near environment. Residents often buy and install lighting that is more powerful than a streetlight which can have a significant negative impact.

Follow these simple steps from the [International Dark-Sky Association](#) to ensure good-neighbourly lighting that protects dark skies.

### Minor Lights Specifications

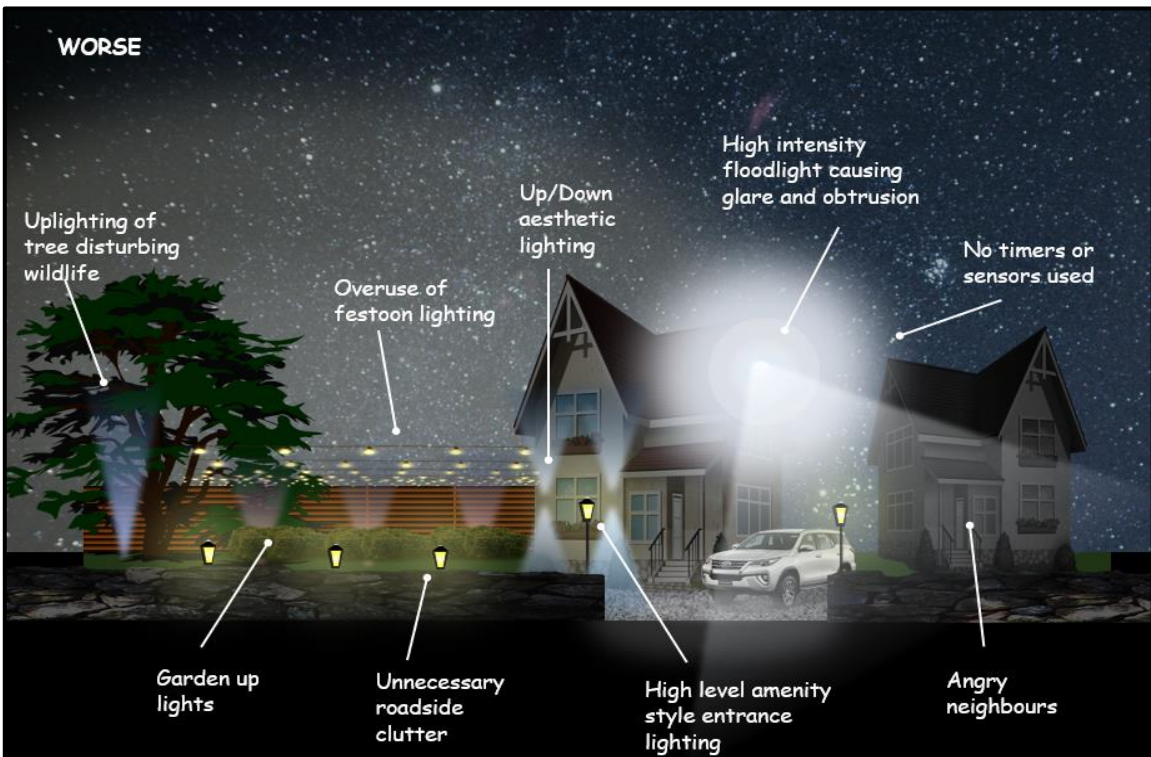
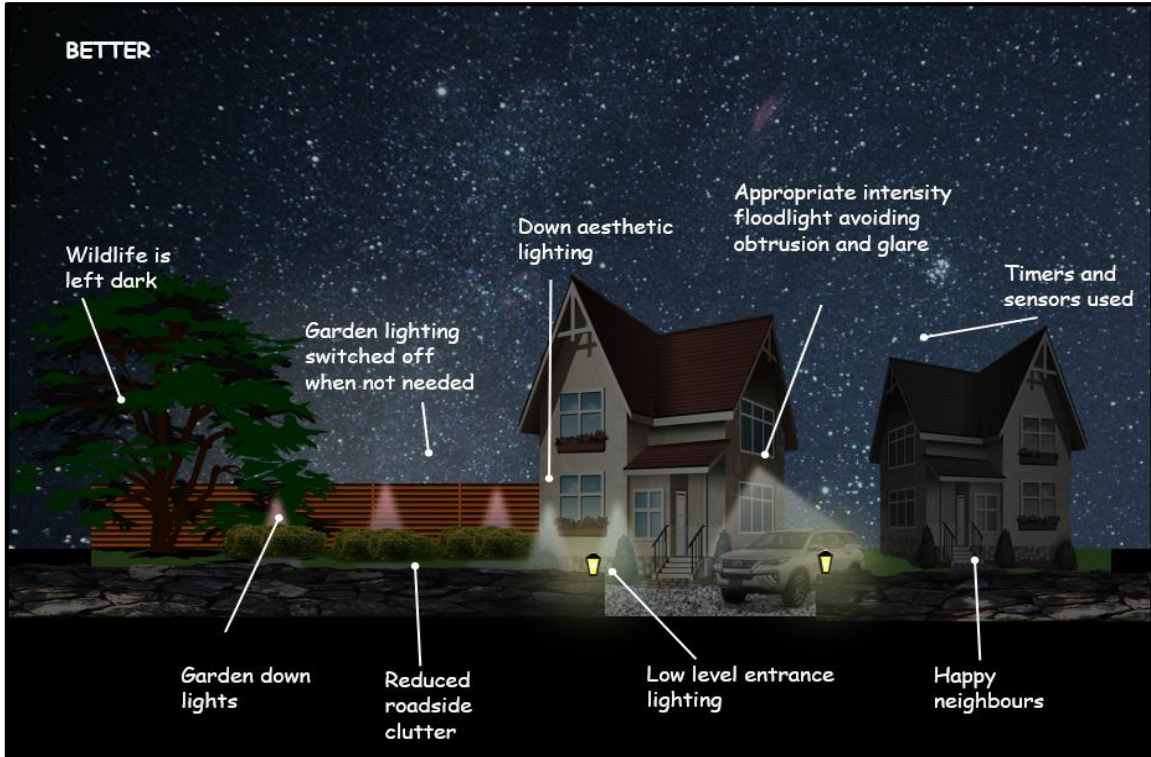
- Lamps of less than 500 lumens (~5W LED) is fine for navigating the garden path, and 1,000 lumens (11W LED) is acceptable for those requiring a little extra light for most uses, like parking the car and getting the keys in the door.
- You should not need a light greater than 1,500 lumens (~15w LED) for most domestic uses. Multiple low-powered lights in the right places are better than one bright light.
- Anything above 500 lumens, where this is justified, should be fully shielded so that the light goes downwards. LED lights are best to achieve downward light.
- Proximity sensors such as infra-red (PIR) should be used to light only when needed. Try and use separate sensors so you can angle the light without comprising its function (vice versa)



**Domestic and Minor Lighting Best Practices**

Domestic lights and internal spill can be relatively unobtrusive provided they are low powered and installed correctly. If done well – even with streetlights – you could get a good view of the night sky and have a low visual impact on the landscapes and their characteristic tranquillity.

In addition to the advice above, the Institution of Lighting Professionals has produced further domestic guidance. [ILP - GN09: Domestic exterior lighting: getting it right!](#). This leaflet advises on appropriate lighting for the task in hand, providing the level of illumination required but not becoming a cause for concern to adjacent residents or affecting the natural environment surrounding your property.



## Key Considerations

### *Nuisance to neighbours*

Badly installed lighting will always annoy your neighbours and can be a source of bad feeling. To avoid this, ensure you purchase lights under 1500 lumens, point them downwards and away from other properties, and use proximity sensors to turn off when not needed. Install them at the lowest practical height to reduce nuisance. If your light is too powerful and proven to be disruptive you may risk breaching environmental nuisance laws.

### *Over lighting in domestic luminaires*

While it is tempting to get the best bang for your buck many domestic options are over bright and too powerful for most domestic purposes. You do not need anything more than 1500 lumens and 500-1000 will be sufficient for most domestic uses and aesthetics. County Council Street lights operate at their lowest setting around 3000 lumens at a height of 5m, so bear this in mind when you install lights.

Overbright and badly directed light can also be a hazard to oncoming drivers as the glare could be dangerous.

If you need more light to illuminate an area, it is better to use more lower powered lights rather than one over-bright luminaire. Use the guidance in section 7 to select the right power.

### *Using minor domestic style lights for commercial needs*

Commercial lighting needs are often guided by illuminance standards and require a lighting designer but there may be circumstances where domestic and minor lights installed by the owner without using a lighting designer are more appropriate. For example, office doors, farm-shed entrance or a small pathway may require one single luminaire rather than a complex design. In these circumstances, this section on minor lighting and the following section on small commercial lighting should provide sufficient guidance to install the right light.

### *Aesthetic lights*

While it is accepted that exterior lights do change the look and feel of a building or garden, it is important to do this with the 'less-is-more' adage in mind. Mood lighting has a better impact when it can be clearly perceived and appreciated and not lost in unnecessary clutter.

### *Garden Wildlife*

Up lighting of trees should be avoided to benefit wildlife, especially with lights over 500 lumens. However, using red colours will also help as it disrupts wildlife less. Ensure to turn off when not needed.

## Planners Domestic Checklist

Domestic lighting will not usually require planning permission unless it is part of a new development or a change of use. Important aspects to look for are,

- 500 lumens for most domestic uses.
- Downward pointing luminaires.
- Less than or equal to 3000K Colour Temperature (warm white).
- Have a clear purpose and illumination area.
- Off when not needed.

## Designers Domestic Checklist

Within any planning report applicants should ensure to include and make clear;

- Justification for the lighting describing the relevant task areas
- Lumen and Colour Temperature levels are shown.
- Pictures of the luminaires are provided.
- Any deviation from best practice, e.g., using heritage style lanterns on listed buildings, is given.
- That the lighting is not obtrusive under ILP GN01 guidance to neighbours.

## Luminaire Advice

### *Coach or Heritage Style*

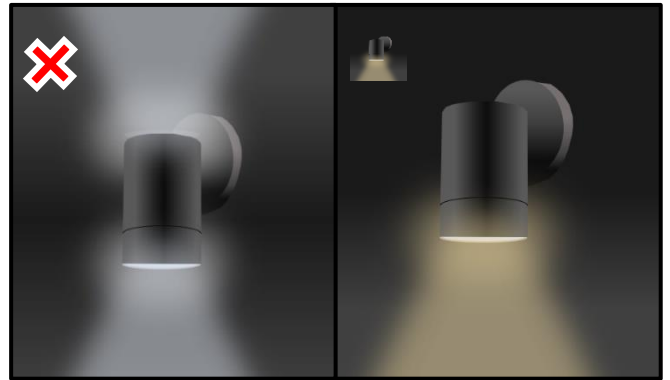


Avoid Coach Lanterns with hanging cool white lamps of high (more than 500 lumens). Use Coach lanterns of less than 500 lumens with a warm white LED in the top as this reduces upward light.

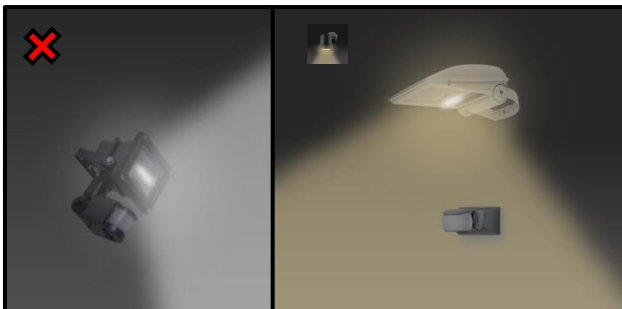
These can be difficult to find so ensure a light of less than 500 lumens or choose an alternative historical design.

### *Up Down Luminaires*

Avoid up-down wall lights as they are designed to generate upward light. Use down wall-lighters instead. Many luminaires of this style use a 8W GU10 lamp which can be higher than 500 lumens, Buildings will still retain an aesthetic quality with a down lighter.



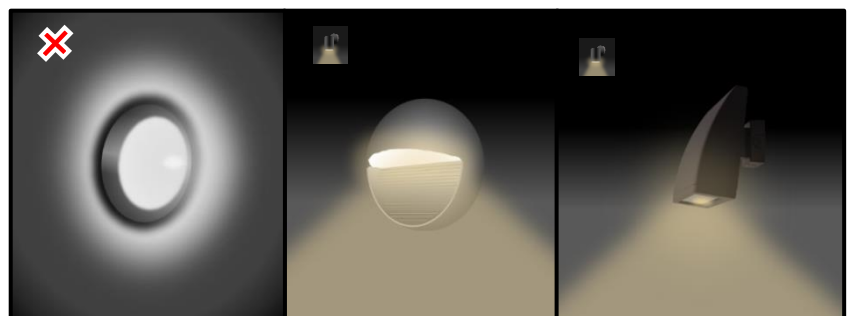
### *Halogen Luminaires and PIR Sensors*



Avoid bright halogen security lights with a fixed PIR sensor, as they cannot be tilted sufficiently and detect movement. Use tiltable lights with separate PIR Sensor so you can position the triggering point and tilt the luminaire properly. Appropriate power LEDs are good for this.

### *Walkways and bulkheads*

Avoid circular or other "window" shaped bulkhead lights that emit light upward. Use bulkhead lights that direct light downwards or have shielding. Try and ensure that emergency luminaires on batteries follow these principles.

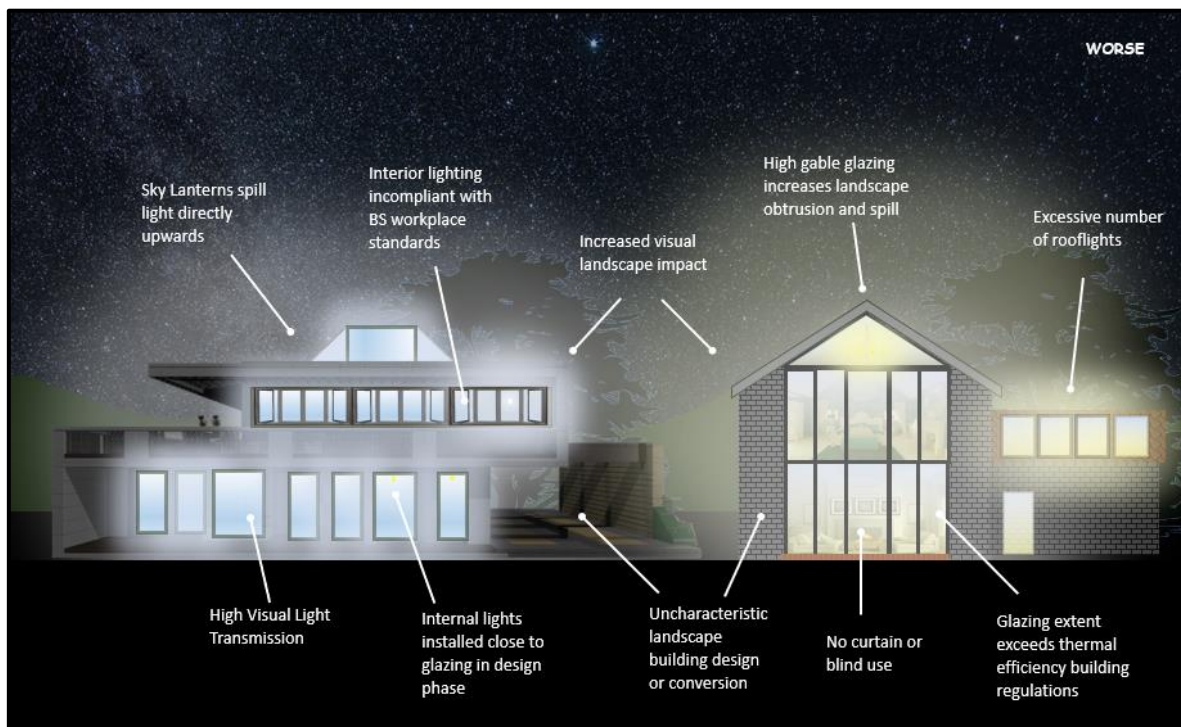
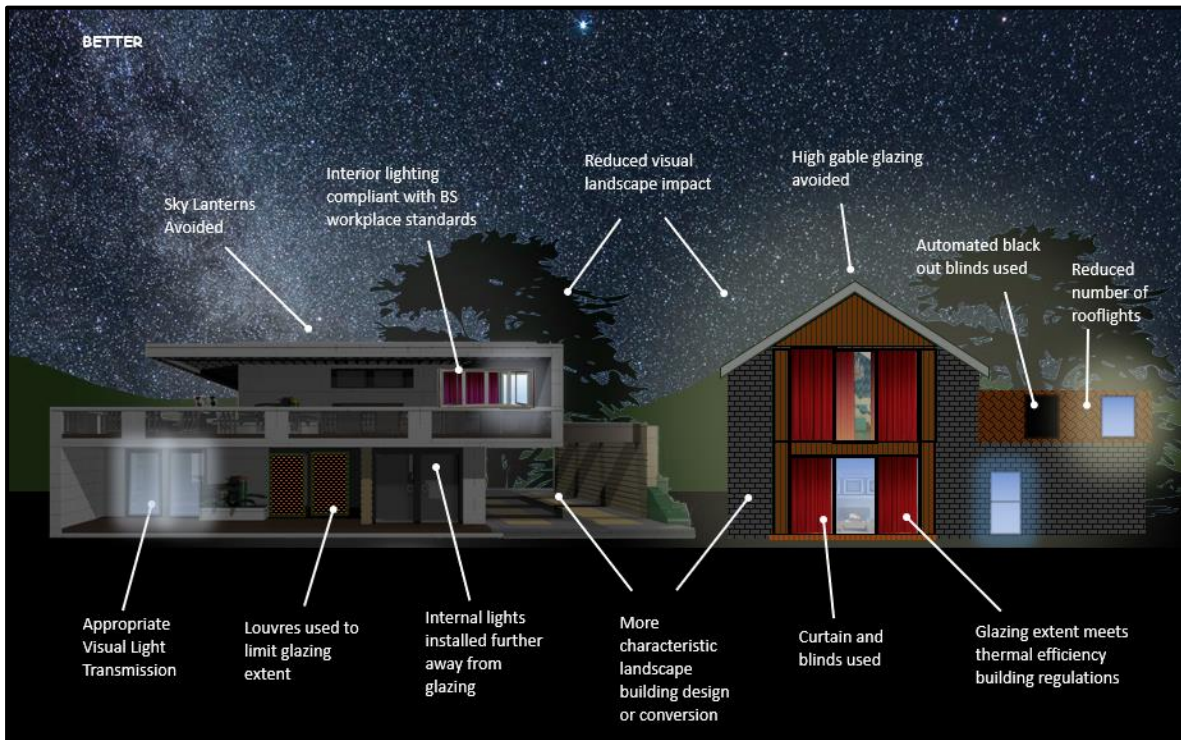




### Internal Light Spill

Internal light spill through domestic glazing can have a greater impact on the landscape than external lighting. If glazing is excessive, of poor quality or points upwards such as rooflights, internal light can present obtrusive light sources that reduce dark skies and disrupt the continuity of the landscape. Generally, the loss of overhead sky

quality is not as severe as it can be for external lighting, but as the extent of the light occupies a greater area than that of a single lamp it does have greater potential to disrupt the quality of the landscape. However, it is within the control of residents to remove all light spill with proper controls and behaviour.



## Key Considerations

### *Visible Light Transmission (VLT)*

Visible Light Transmission is the amount of light that passes through glazing. The VLT level can be selected to reduce the amount of internal spill. For domestic glazing, a VLT of 0.65 is preferred with 0.5 for roof lights.

### *Black out blinds/Louvres*

The use of automated black out blinds can considerably reduce the amount of internal light spill from roof lights. Some manufacturers of rooflights produce smart systems that trigger on the onset of darkness and can be controlled on mobile devices. Ensure that the fabric completely eliminates all internal spill.

Exterior louvres can also be used and may be a preferred option for walled glazing rather than rooflights.

### *Excessive Glazing – Thermal Issues*

Large extents of glazing that let in a large amount of solar radiation can cause houses to overheat. Building regulations require that glazing should not

exceed 25% of the floor area to meet energy efficiency building regulations (which does depend on thermal properties of the glass). [See Building Regulations Part L1](#) to reduce this thermal heating.

This can be avoided by reducing the glazing extent or using external shielding/blinds to reduce the solar input. Modern glazing is improving thermal regulation, but limits to the glazing should be considered.

### *Excessive Glazing – Landscape Impact and character*

Large continuous areas of glazing can cause obtrusive landscape impacts. Linear extents with high levels of internal lighting can be highly visible within a landscape, especially from view tops. The design of modern glazing systems can also be inconsistent with typical building landscape character which produces uncharacteristic impacts in a dark landscape. Consideration should be given to reduce this impact wither by adopting a more characteristic design process, reducing the extent or using external louvres or shielding to reduce the landscape impact.



Figure 20 - The visual impact of internal light spill. Credit Dan Oakley

## 6. Advice For Non-Domestic and Larger Developments

Non-domestic lighting is different from normal domestic lighting because it tends to have a greater impact and you may be obligated under a 'duty of care' or insurance needs to provide lights for other users than just yourself. It will also often be on a larger scale, use multiple light sources and be more complex.

This means that you need to consider a professionally led design because you may need to achieve more precise levels of illuminance, reduce pollution and light to meet the needs of your users. This can be more complicated than ordinary 'off the shelf' domestic lighting and may need professional input from a qualified lighting designer. For some small low-level schemes where domestic lights of around 500 lumens are used in small numbers and small areas, the domestic lighting guidance may be sufficient.

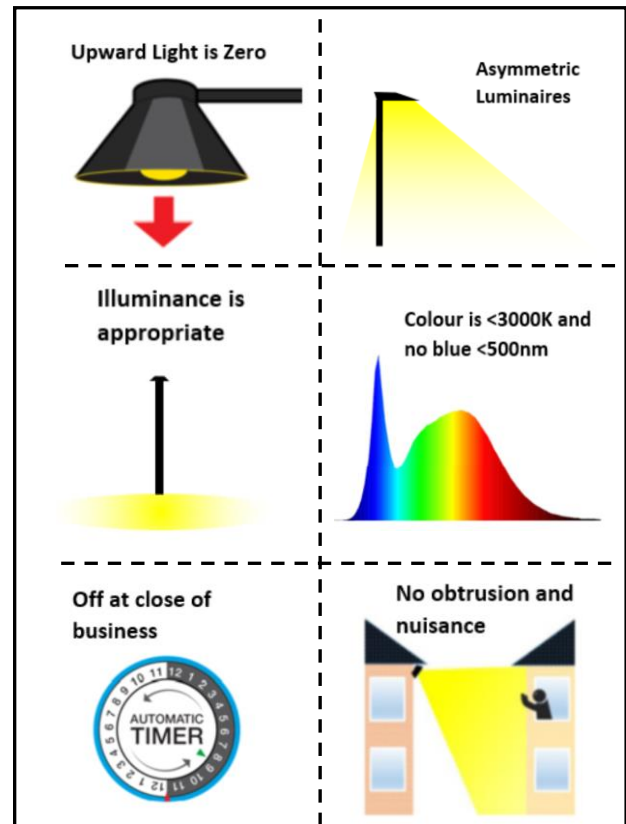
Further information on good lighting practice is provided on these areas in the following sections for both external and internal spill from glazing. Common non-domestic lighting schemes will generally include (but not limited to).

- Roads and walkways
- Public areas
- Sports facilities
- Small Business Commercial
- Offices
- Farms
- Car Parks
- Larger Commercial

Some of these developments may not be expected in dark places. GN01 ILP 23 recommends that sports and amenity lighting installations using 4 or more luminaires are not expected in E1 and E0 zones, and that roads lighting is not expected in E0 zones. This is an expectation and may not be realistic in the landscapes despite the E1/E0 zone.

### Non-domestic Lighting principles

There are important principles to consider on non-domestic lighting and luminaires. While the advice for domestic users is still applicable to non-domestic uses, there are additional principles that should be followed.



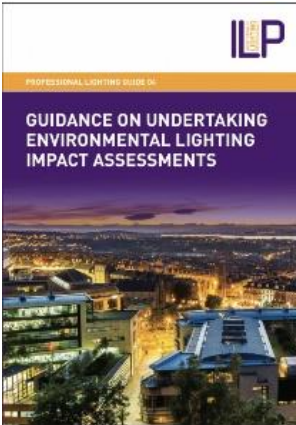
### **Planners and Designers Checklists**

To aid the assessment of non-domestic applications with planners it is recommended that designers ensure that key information is clearly expressed in any lighting design. Equally, planners should be able to understand and access the same metrics to make an assessment.

Section 9 and 10 provides a checklist for assessing the important metrics within a lighting design.

## Key Starting Design and Assessment Documents

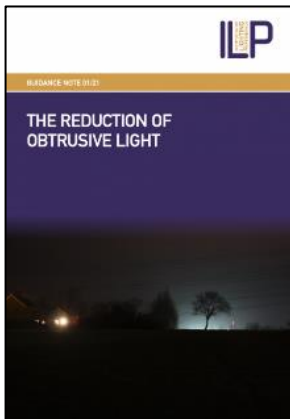
While exact lighting specifications can be found in relevant standards within the following sections, key documents that should be considered in all designs will include:



### [Institution of Lighting Professionals Guidance on Undertaking Environmental Lighting Impact Assessments PLG04](#)

This document describes the steps and industry standard methodology to conduct a lighting impact assessment. It includes sections on

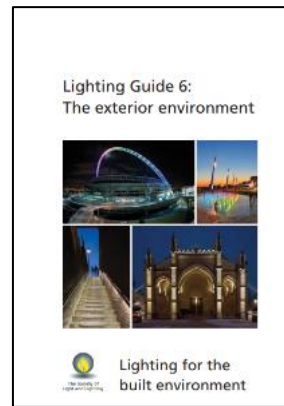
establishing a baseline of existing lighting levels, viewpoints and identification of critical receptors such as windows and wildlife areas. There is also a section on the residual impacts which should be taken into account throughout the planning decision process.



### [Institution of Lighting Professionals GN01/21 The Reduction of Obtrusive Light](#)

This widely used and referenced guidance note specifies limitations and recommendations for lighting to prevent obtrusive light. It also considers industry

comment regarding the assessment and definition of obtrusive lighting. It establishes upward light, upward flux, intensity and illuminance criteria for lighting zones.



### [CIBSE: SLL: LG06: The exterior environment \(2016\)](#)

The guide aims to provide readers with a firm foundation from which to approach exterior lighting design. Since light source technology is advancing rapidly, the guide provides a holistic approach to the design of the exterior environment,

rather than concentrating on product performance, which quickly becomes out of date.

### [Towards a Dark Sky Standard](#)



As a precursor to the planning process and as an extra resource for applicants, "Towards A Dark Sky Standard" is a general guide and overview of the key considerations needed for good lighting design and the protection of dark skies. While it is not a

formal planning document, the information within it will help applicants, developers, lighting professional and the general public to install lighting that does not unnecessarily impact on dark skies.

## General Considerations

### *Asymmetric luminaires*

Asymmetric luminaires are very useful in controlling lighting, particularly in all non-domestic settings. These luminaires have optics that internally bends the emitted light from the lamp and directs it to specific areas reducing waste light, for example long thin paths. Symmetric luminaires have no directing optical controls which means that the light is distributed more evenly over wider angles, usually 120 degrees. The benefit of asymmetric lights is that they can be installed flat so upward light, and spill is reduced. They can also be installed at a lower height as the light is more efficient in illuminating the right area. Many new LEDs in streetlights and floodlights have asymmetric beams to achieve more efficient illuminance standards. Asymmetric domestic lights are much harder to find as they are more general in use.

### *Illuminance appropriate and Visual Impact*

Higher levels of illuminance will be more prominent in darker landscapes and will introduce more significant levels of visual landscape impact. Regardless of the efficiency of the lighting scheme

to reduce obtrusive light, the residual level of luminance (the light coming from a surface) which cannot be avoided, may still present an inappropriate visual impact for the setting. Generally, illuminance levels (light shining on a surface) of over 10 lux will begin to create a noticeable luminous landscape impact. While much depends on the size, extent and intensity of a lighting scheme, illuminance requirements over 10 lux may need to be avoided due to the inherent harm.

### *Upward Flux*

Under ILP GN01 23, designs should calculate the upward flux ratio which allows the effect of both direct and reflected components of the whole installation to be considered. It takes into account the contribution of the reflectance from the illuminated area and spill areas and ensures that the overall level of upward light aims to reduce the impact of sky glow.

Table 7 in ILP GN01 23 recommends UFR values for each ambient lighting zone and assumes that road, amenity and sports lighting using 4 or more luminaires are not expected in E0 and E1 zones.

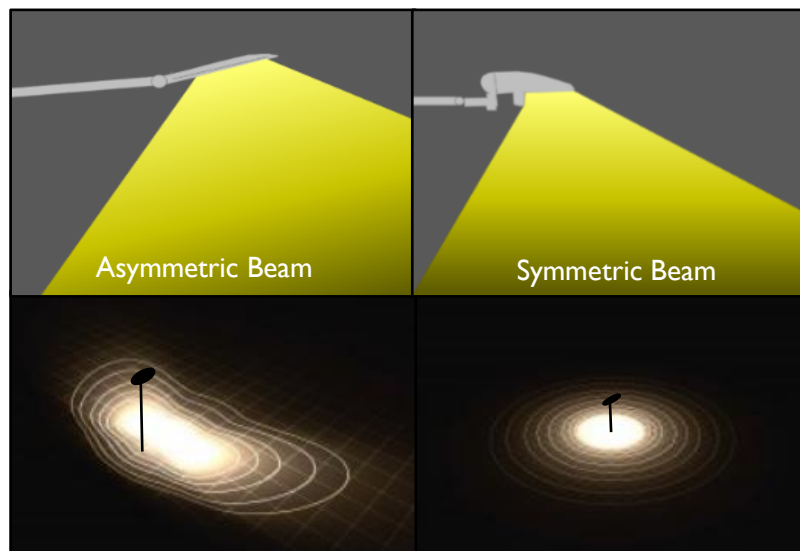
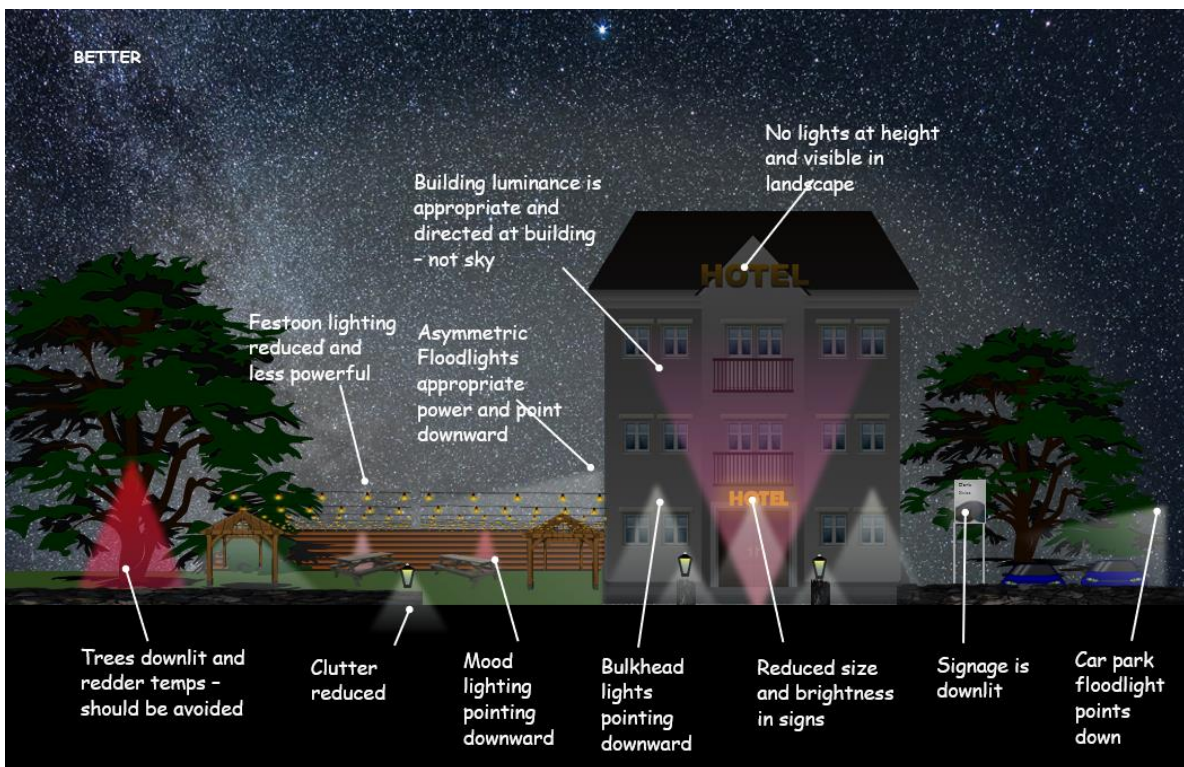
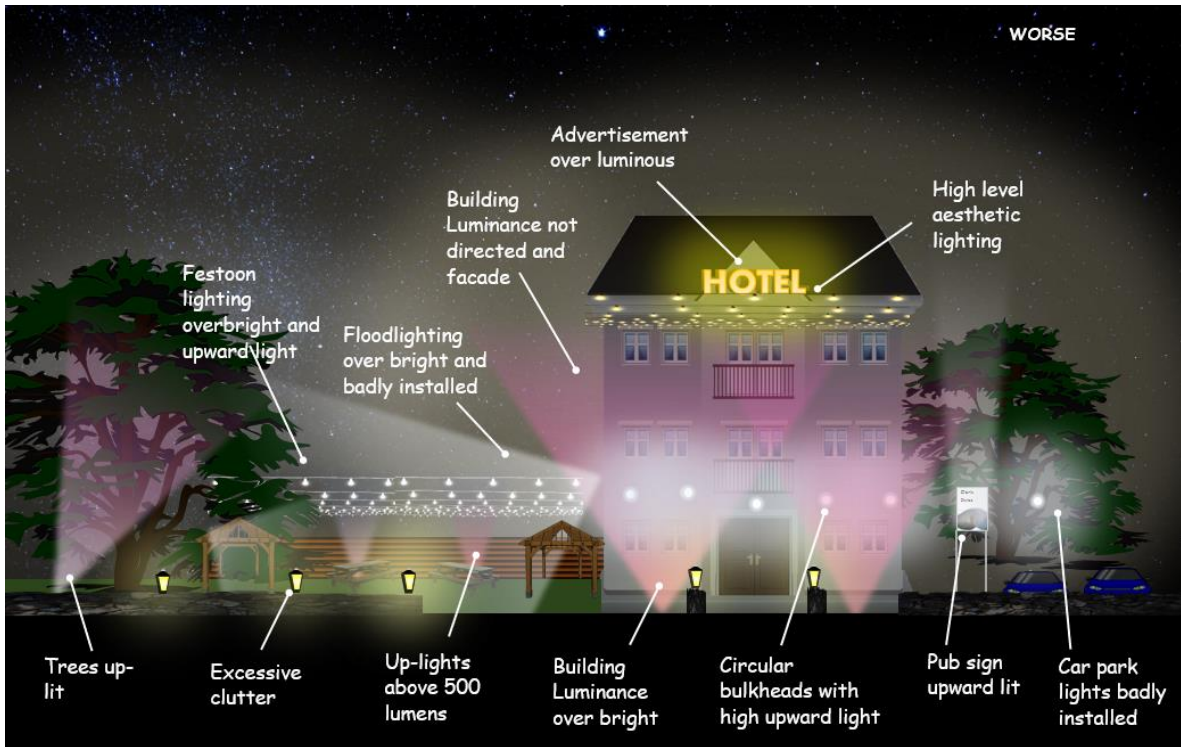


Figure 21 - Asymmetric and symmetric beam patterns.

**Small Commercial Lighting Good and Bad Practice**

Commercial developments present some of the largest challenges to a dark landscape as owners tend to install their own lighting and assume that more is better and offers a competitive advantage. However, due to these assumptions small

commercial places can – and often – install over bright and numerous sources of light pollution with little thought for dark skies or the wider landscape. Some common problems are shown in the following images.



## Context

Small commercial lighting can include many development types; shops, hotels, pubs, offices, theatres and communal buildings like village halls, doctors surgeries. Typical lighting needs vary but will likely need to provide illuminance for doorways, car parks, pathways and advertisements which sometimes can be achieved with minor lights. Some commercial uses will depend on the 'night economy', such as pubs, that will want to use architectural and aesthetic lighting to create welcoming spaces.

The decision to use a lighting designer is the responsibility of the owner. Premises that are using single or a low number of minor domestic style luminaires may benefit from following the advice in the domestic section. However, premises that have more defined public and amenity areas, such as walk-ways, car parks or trip hazards that will require brighter or more luminaires and compliance with illumination standards should consult a lighting designer.

You need to provide a duty-of-care to your users and that implies an appropriate level of light to avoid liabilities and unnecessary risk.

### Key Considerations

#### *Car Parking, roads and paths*

Car parks have different illuminance needs for different levels of use and locations. If lighting is justified, small, quiet car parks in rural areas should have a recommended 5 lux maintained average with larger car urban parks receiving 15 lux preferably using bollard lighting rather than column mounted luminaires. Proximity sensors should be used.

For illuminance levels refer to [BS EN 12464-2:2014](#). Road or path lighting may also be required which needs to comply with design requirements of road lighting, covered in [BS 5489-1-2020](#): and [BS EN 13201-2](#) – Road Lighting Performance requirements.

See section below for more information on roads and paths.

#### *Advertising Regulations – Commercial*

Although advertising is subject to [regulations](#) (Town and Country Planning 2017) steps should

be taken to illuminate signs only when needed, using low powered downward lights, such as LED strips. The luminance of lights is addressed in [ILP PLG 05: The Brightness of Illuminated Advertisements](#).

#### *Aesthetic lighting*

Architectural and aesthetic lighting choices such as festoon strings and fairy lights are popular with commercial lighting, so it is important that any 'mood' lighting leaves a minimal impact. To do this:

- Avoid up lighting building facades above ILP guidelines.
- Point downwards.
- Turn off at close of business.
- Avoid bright lights that create glare – this could create problem for your visitors.
- Minimise the number of fixtures.
- Mount at the lowest practical height
- Festoon lighting should use low powered lamps, <150 lumens per meter.

#### *Architectural Façade Lighting*

The intentional illumination of building facades should be avoided, especially in rural areas where the luminance of buildings can be very prominent in the landscape. Powerful floodlight up lights should not be used, as they are poorly controlled and bright. Modern alternatives such as low powered unobtrusive window lighting, should be considered. The ILP GN01 2022 guidance note should be used to ensure that building luminance complies with the relevant environmental zone. In E0/E1 zones the luminance should be less than 0.1 cd/m<sup>2</sup>.

#### *One single bright light vs more, lower powered*

Larger spaces should not be illuminated with one single bright light – usually installed at an inappropriate height. Instead, larger spaces should be lit with more, lower powered lights at lower heights. This will spread light more evenly, reduce glare and reduce visual impact.

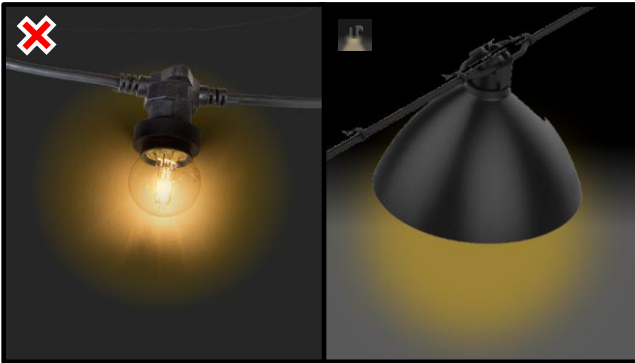
#### *Internal Light Spill*

Black-blinds and curtains should be used for properties with high levels of internal spill and prominent landscape visual impact. Blinds should be programmed to trigger on the onset of astronomical darkness which is approximately one hour after sunset

## Luminaire Advice

### *Walkways and bulkheads*

Avoid circular or other “window” shaped bulkhead lights that emit light upward. Use bulkhead lights that direct light downwards or have shielding. Try and ensure that emergency luminaires on batteries follow these principles.



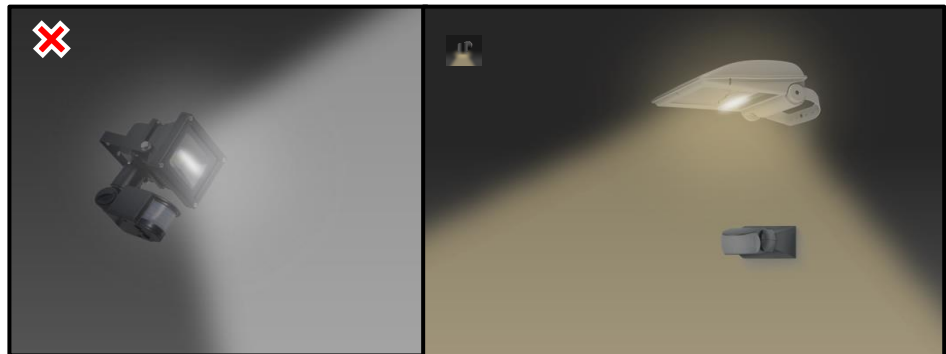
### *Festoon and String Lighting*

Festoon and string lighting is a common choice in many commercial businesses to create an appealing aesthetic. There are many types and styles, but it is best to avoid festoon lights that have bright individual lamps. Aim for 200 lumens (4W LED) and less.

Upward light can be controlled using shielded lamps, but these are difficult to find. Ensure that low lumens <200 lumens are used.

### *Area Floodlighting*

Area floodlighting can be over bright, badly installed and cause uncomfortable glare to users. Halogen PIR lights should be avoided, with a preference towards appropriate power, 3000K LED's with a separate sensor.





### Car Parks Good and Bad practice

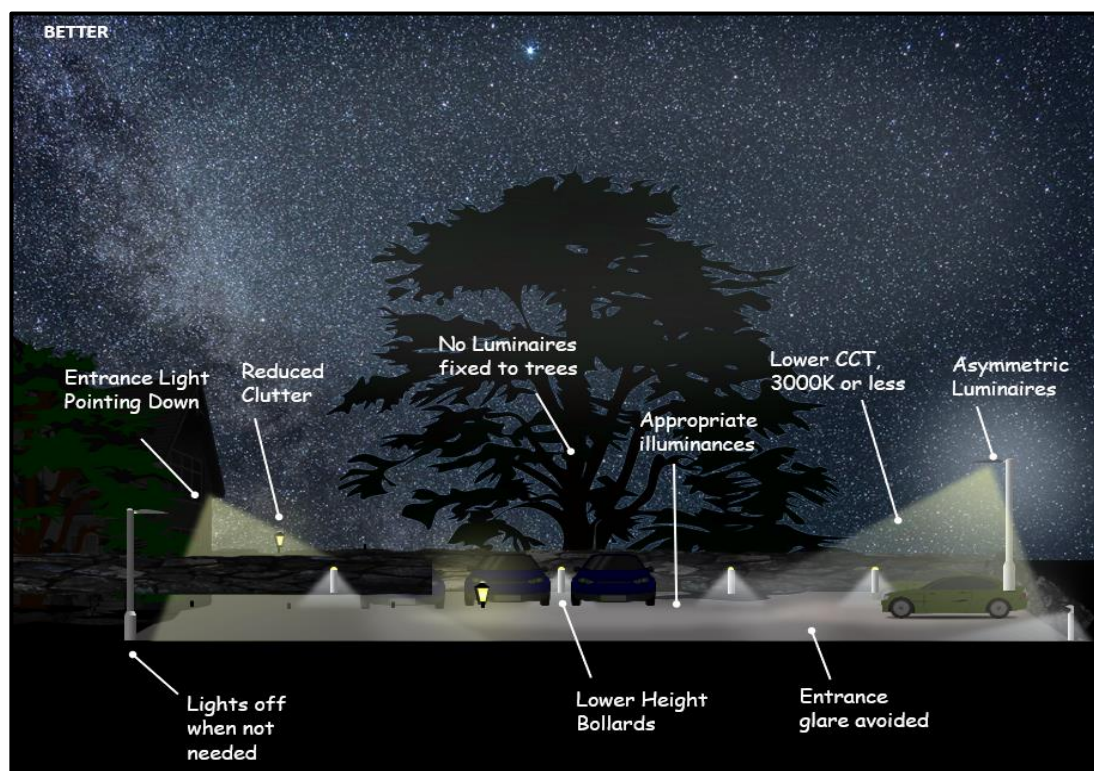
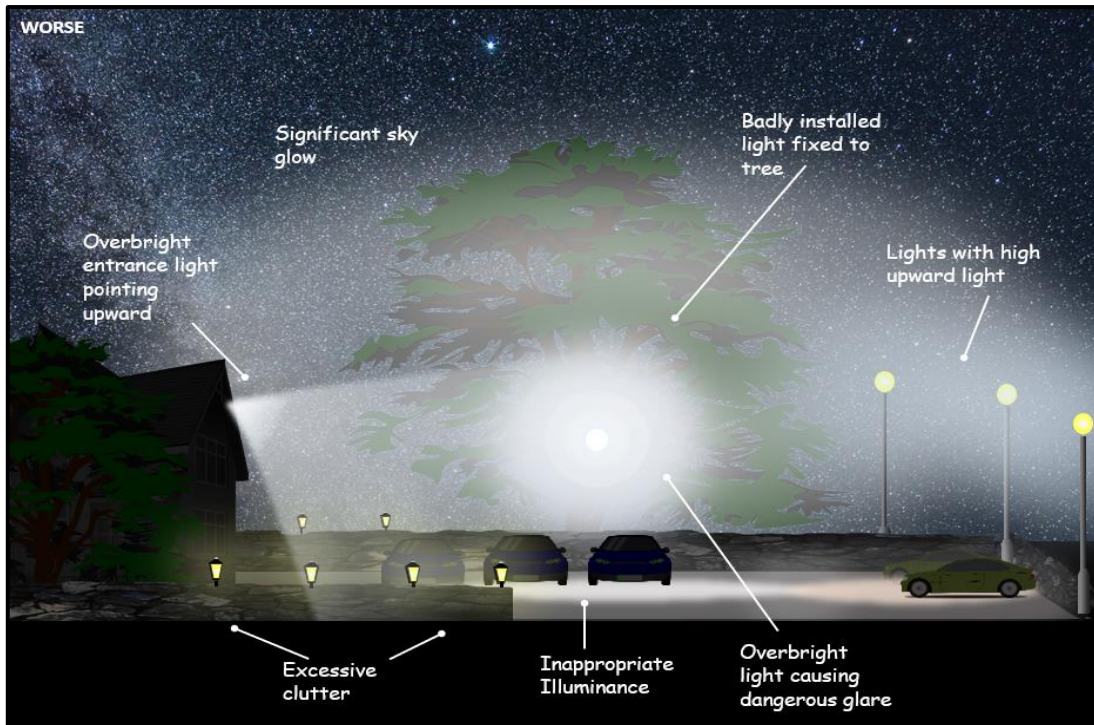
Car parks will need lighting as they either need to provide adequate light for workers or for the public pedestrians walking to and from their vehicles.

British Standards BS EN 12464 and BS 5489 should be used to determine illuminance and light quality. The level of illumination depends on the location of the parking and level of use. For example, A small quiet rural car park will need less illuminance than a larger, busier urban car park.

For exterior car parks, there are three general usage levels of lighting (average lux and uniformity of 0.25) under the British Standards

- High usage: 20 lux,
- Medium: 10 lux
- Low: 5 lux

For areas with higher crime areas, the Secured by Design offers additional design advice in addition to these illuminance levels.



## Key Considerations

### *Over lighting – Glare*

Intense luminaires installed badly can create glare issues for users. This can be a particular issue when lights point directly towards entrances where oncoming vehicles users may suffer glare and increase the potential of harm to other users. It is important to direct light properly, with the right intensity and avoid excessive glare into conflict areas.

### *Over lighting – illuminance*

Many non-designer led car parks tend to use lights that are over bright for the appropriate illuminance. This will increase the surface luminosity and increase the sky glow impact. Luminaire power should be appropriate for the level of illuminance – section 7 provides some recommendations for the strength of LED luminaires against the size of the area.

### *Asymmetric Luminaires – Upward light*

As car park floodlighting typically uses higher strength luminaires, there is more availability to use asymmetric luminaires than symmetric. Asymmetric luminaires will direct the light better and avoid the potential for creating upward light.

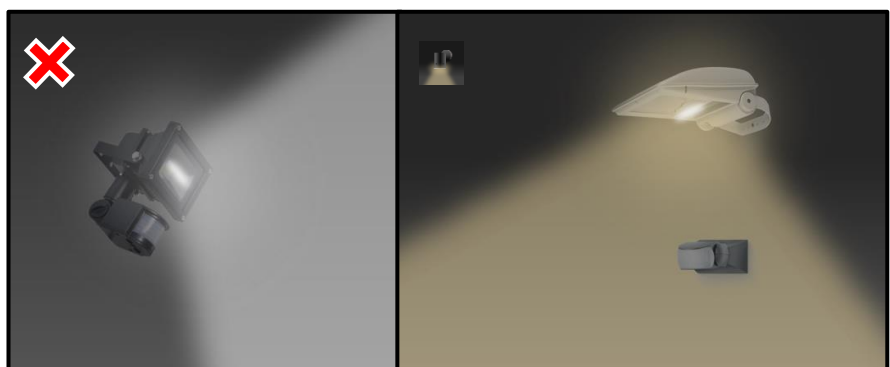
### *Bollards or poles*

Low level bollards are useful as they reduce the height of luminaires and reducing the intensity. However, bollards can be susceptible to damage and they don't spread the light as effectively over larger areas than pole mounted lights. In this regard care should be taken to use bollards in appropriate spaces, or as navigation aids around the parking area.

## Luminaire Advice

### Area Floodlights

Avoid symmetrical halogen security lights with high colour temperatures and a fixed PIR Sensor. Use tiltable warm white LED lights with appropriate power to avoid glare. If a sensor is used, you can position the PIR sensor to trigger for people not wildlife.



Bollards may not be appropriate in higher crime areas, as they struggle to provide sufficient vertical illuminance for CCTV. The secured by design guidance should be referenced in these circumstances.

### *Ecological and Landscape Visual Impact*

As car parks can be quite large, well used and require high pole mounted luminaires, the visual impact on the landscape and ecology can be high. Although car park lighting can comply with standards, the overall presence of the lighting can produce significant residual impacts that may be difficult to overcome.

Additional mitigations should include, using a CCT of 3000K and less to reduce sky glow, shielding prominent and potentially obtrusive luminaires from view and – importantly – using timers or sensors to ensure that lights are off when not needed.

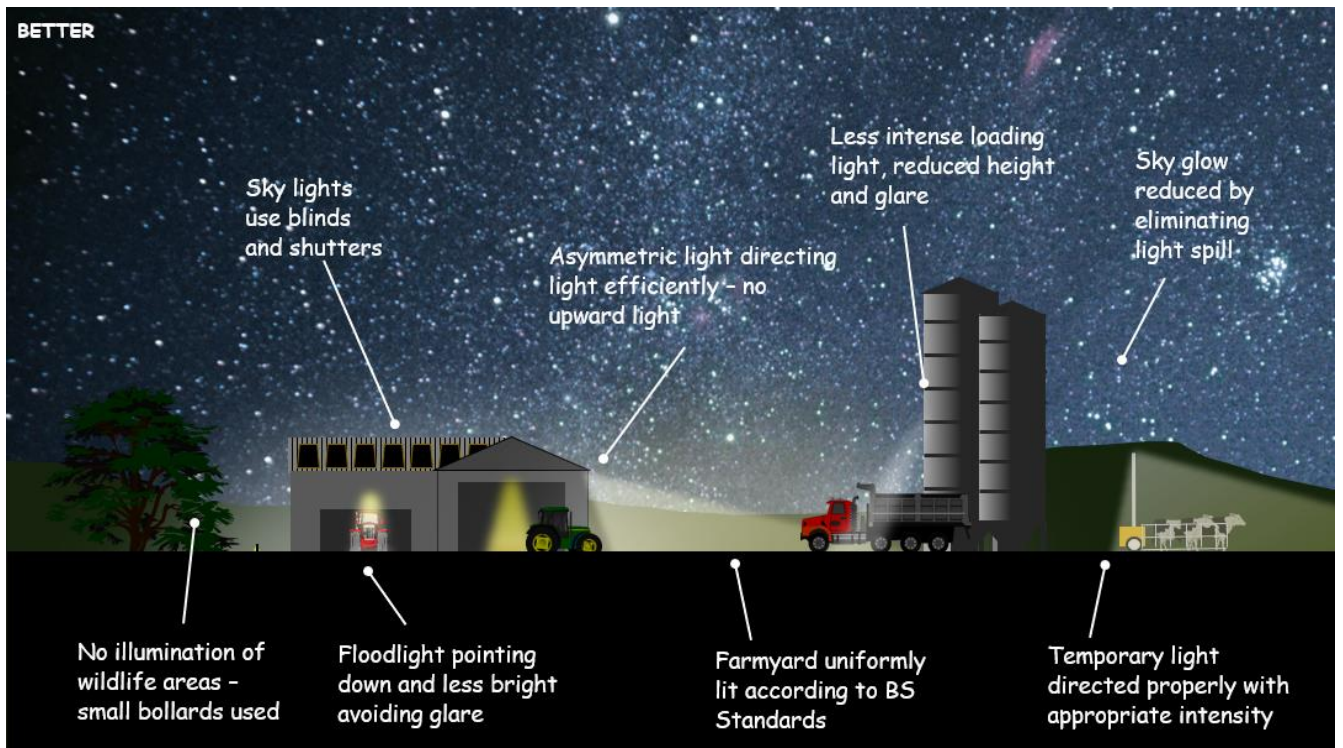
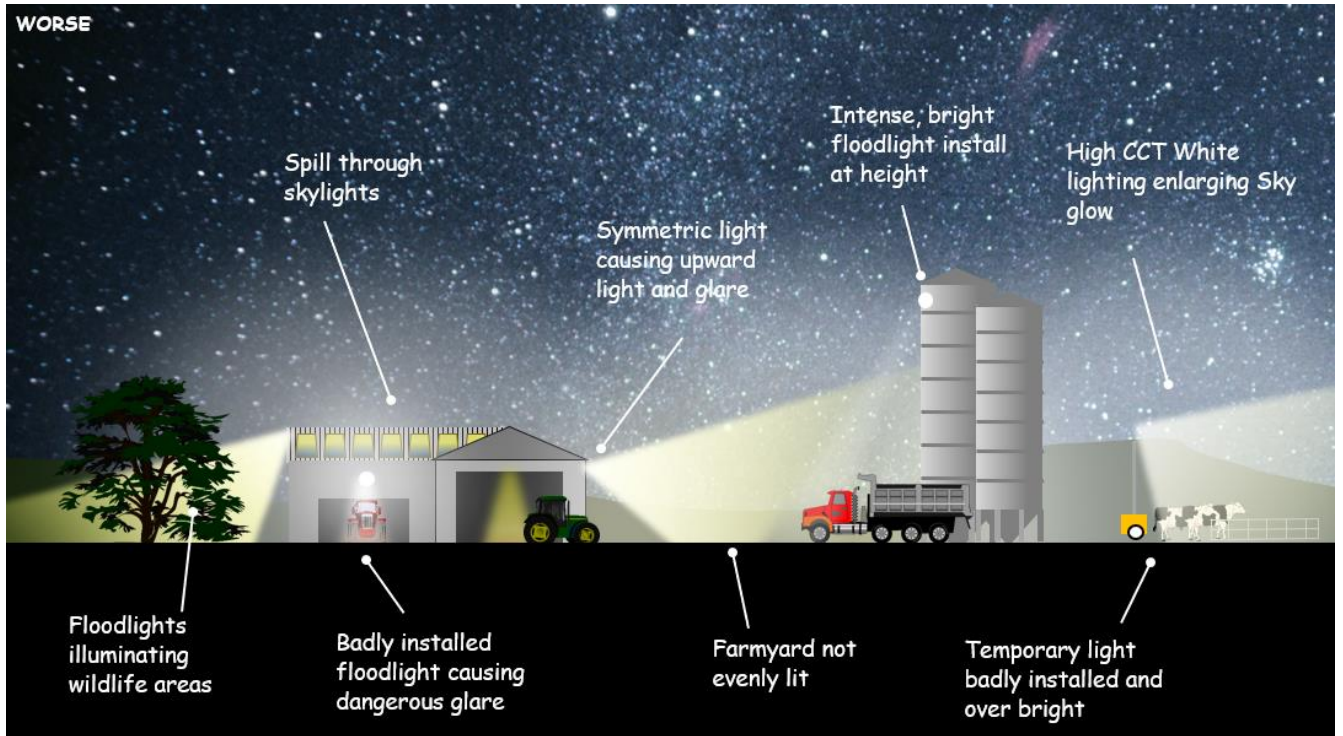
### *Upward Flux – Amenity Light*

ILP GN01 21 Table 7 assumes that amenity lighting is not expected in E0 and E1 zones. While this may be difficult in practice as there is a legislative driver to provide lighting for public car parks, every effort should be made to use low reflectance surfaces for new car parks to reduce the creation of sky glow and the upward flux ratio. The overall landscape impact, including the residual impact will also determine the acceptability of amenity lighting in these zones.

**Farms Good and Bad Practice**

Farms have some permitted developments rights for lighting on existing buildings, which means that luminaires could be installed that have very little consideration for design. Due to their rural location, the contrast between a dark landscape

and lighting means that the visual impact can appear relatively higher than urban settings. Principles of good lighting should be followed to avoid landscape impacts.



As a farm is a place of business owners must be careful to illuminate different areas of the farm properly. According to HSE Lighting at work [HSG38](#) and British Standards [BS EN 12464-2 2014](#) *Light and Lighting of workplaces*, farmyards have two general areas of varying illuminance;

- **Farm-yards:** with moving vehicle, machines and people – require 20 lux average
- **Equipment sheds and Animal sorting pens:** with movement in hazardous area – require 50 lux average.

Other lighting criteria such as uniformity, glare and CRI values are also recommended in [BS EN 12464-2](#). This document provides some LED power purchasing recommendations for achieving different illuminance levels for simple applications where larger, complex and more hazardous areas may need a lighting designer.

### Key Considerations

#### *Farmyard Floodlighting*

Lighting of farmyards is usually achieved with area floodlights. It is important to consider asymmetric luminaires to reduce upward light and ensure glare is not an issue. Badly installed bright lights can cause glare issues where unwanted visitors and workers can become hidden – this is a safety and crime issue. They can also cause significant visual intrusion in a dark landscape which can be detrimental to wildlife and visual intrusion. Areas that are more hazardous or have more conflicted uses with people and machinery should receive greater attention. Floodlights should be installed at the lowest practical height to achieve the illumination.

Use the table in section 7 to purchase the right kind of lights for the approximate needs.

#### *Farm Building Roof Lights and Greenhouses*

Greenhouses, open barns, poly tunnels or sheds with large amounts of glazing and roof-lights can introduce significant impacts. While natural light and artificial light is important to operate in all hours, internally installed luminaires should be lower than roof lights to avoid direct upward light spill. For new buildings and improvements, black out blinds should be considered to activate upon the onset of darkness. This is particularly important for greenhouses as the internal light spill can reduce sky quality for many miles.



Operational open barn elevations may be more difficult to shield due to the need for natural light during the daytime. External louvres can be used in addition to turning off lights at night when they are not needed. Farm animals will benefit from dark skies as well.

#### *Wildlife in the Open Countryside*

The rural location of farms means that they will be surrounded by wildlife and darkness where even the smallest lights can be more visually obtrusive than urban settings. As a growing amount of evidence is showing, light pollution disrupts wildlife just as much – perhaps even more – than people. Migration routes, circadian rhythm, pollination and even agricultural efficiency can be affected by light pollution. As such it is important that lights do not unnecessarily illuminate or shine into wildlife area, waterways and the open countryside. The use of asymmetric luminaires that reduce spill and appropriate illuminance are essential.

#### *Ecological and Landscape Impact Assessment*

Due to the location of farms in the rural landscape, an ecological and landscape impact assessment such as the [Institution of Lighting Professionals Guidance on undertaking environmental lighting impact assessments](#), should be taken. The contrast between light and dark, particularly in more remote rural farms, means that the impact of lighting is magnified compared with other higher ambient lighting areas. For more remote farms away from the urban fringe, consideration to the wider environment should be made and should include an assessment of the impact through ecological receptors and the view from the surrounding landscape. More consideration of the

illumination levels, hours of use and intensity should be considered.

### Lighting for Security

Security is an important consideration for a farm. While there is no direct evidence to show that lighting or lack of it has any effect on crime, the document [Secured By Design – Lighting Guide](#) by the Police gives general advice for this type of lighting. However, security lighting should be considered carefully and complemented by supplementary systems, e.g., smart alarms. Any

lighting should still be of the right brightness, colour to avoid upward light spill.

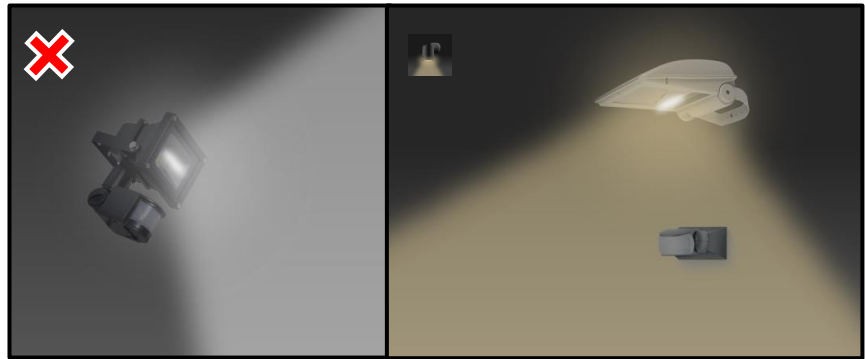
### Other Considerations

Farms may also require lighting for car parks, roads, advertisements, small business premises or sports (menage) lighting. Other good and bad practices chapter should be referenced when considering these lighting schemes. Likely references will include small commercial lighting, parking and roads/paths.

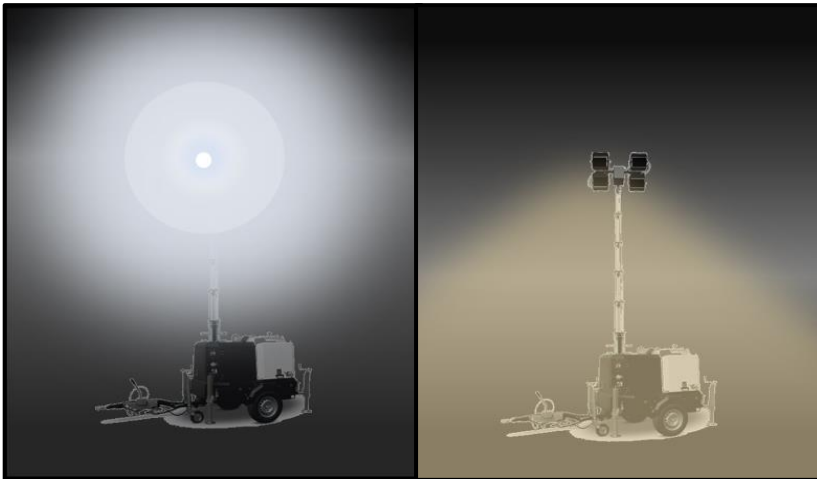
## Luminaire Advice

### Area Floodlights

Avoid symmetrical halogen security lights with high colour temperatures and a fixed PIR Sensor. Use tiltable warm white LED lights with a separate PIR sensor. You can position the PIR sensor to trigger for people not wildlife.

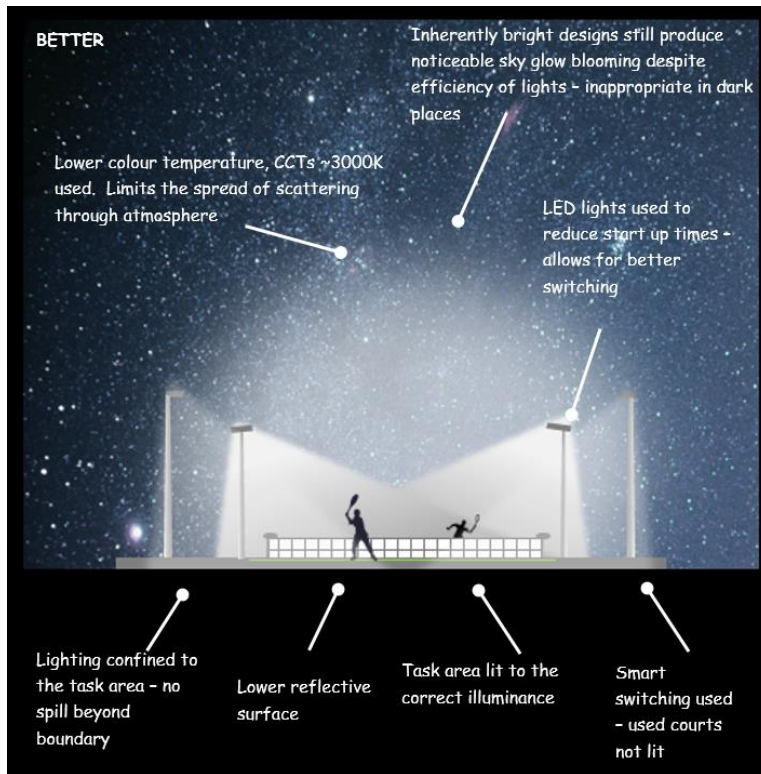


### Temporary Floodlights



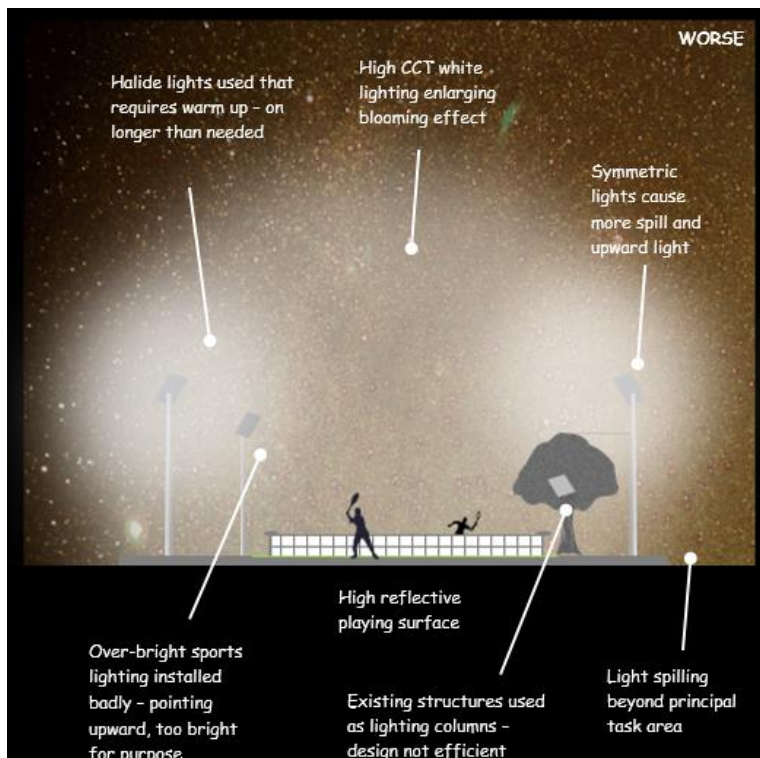
Lights on mobile generators which can be erected for temporary needs should follow good practice. Care should be made to ensure that the lights are pointing downward, and the minimum amount of light is used to perform the task. Temporary lights can be capable of producing very high brightness to cover many different tasks. Try and use as few individual lamps as possible.

## Sports Lighting Good and Bad Practice



Sports lighting has a very high impact in dark sky places and a **lighting designer is needed**. These developments often reduce sky quality and can be seen for miles in the surrounding landscape. This is due to the high illuminance and colour needs to enable users to play safely. The luminaires are often installed at high levels to ensure correct illuminance even with asymmetric lights, which means the lamps can be very bright and visible. As such, the lowest practical mounting height should be used in achieving the designed illuminance.

Different sports require different levels of illuminance and colour depending on the skill level, intensity and ability to see play. Community level sports such as football tennis and hockey, will require illuminance levels of 300 lux with appropriate uniformity of around 0.7. Lighting requirements can be found in the [Sports England Artificial Lighting Guide 2012](#).



Horse arenas and equestrian menages can have a significant impact on the dark rural landscape. The illuminances needed can range from 100 to 500 lux ([BS EN 12193](#)), and would be very prominent even if low reflectance material is used. A lighting designer should be used to ensure that luminaires are installed correctly, and suitable curfews used. Luminaires should not be erected 'ad-hoc' on existing structures as they will probably not achieve appropriate illuminances and limit obtrusive light. Using trees as fixing points should also be avoided. Temporary lighting should not be used as the luminaires are general in purpose and will not be appropriate for this type of activity.

## Key Considerations

### *Nuisance*

Sports lighting near residential areas can cause nuisance due to their intensity and glare. It is important that light obstruction is avoided. Designs should reference [ILP GN01 \(2021\)](#) 'The reduction of obtrusive light' which recommends levels of intrusion into windows and boundaries.

### *Sky Glow – Asymmetric Sports Lights*

High powered symmetric lights can cause significant sky glow, particularly if the main beam points to the middle of the playing surface. Modern asymmetric LEDs should be used to direct light more efficiently without causing upward light. They are designed to be installed flat and at the correct lowest height to reduce intensity and upward light.

### *Colour in Sports Lighting*

Sports illuminance needs a high level of colour rendition (CRI) to allow players to sight the play properly and pick a ball out from the background. This means that higher colour temperature LED (5000K+) are often used to achieve higher colour rendition which exacerbates the impact of skyglow as the light penetrates further into the atmosphere. This effect can be avoided. Modern LEDs have much better range of colour rendition with lower colour temperatures which is stated on the product spec. Colour rendition index levels of 60 are normally required for most community levels of play. The spectral range should also be

checked to avoid blue colours with higher colour temperature needs.

### *Landscape Visual Impact on Special Qualities*

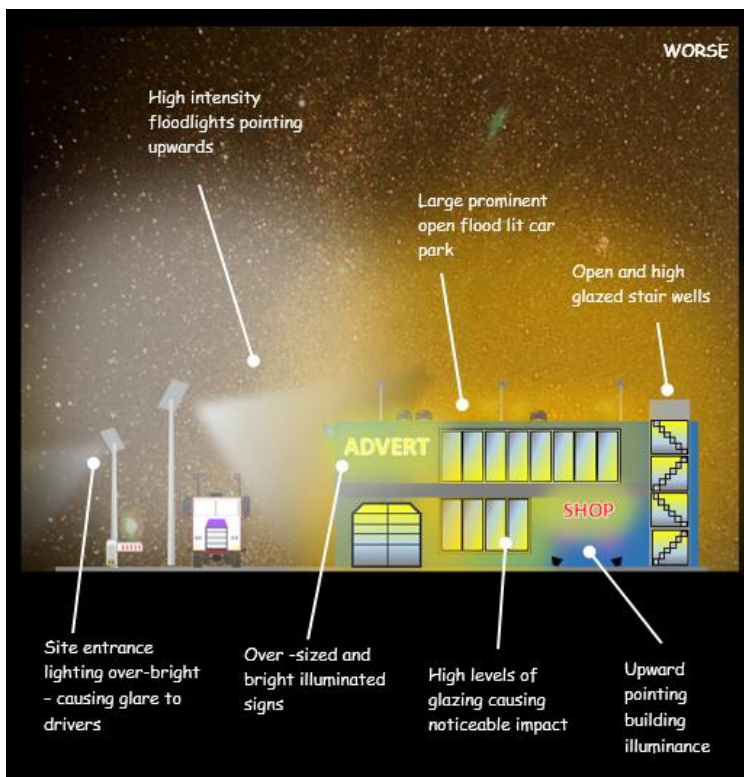
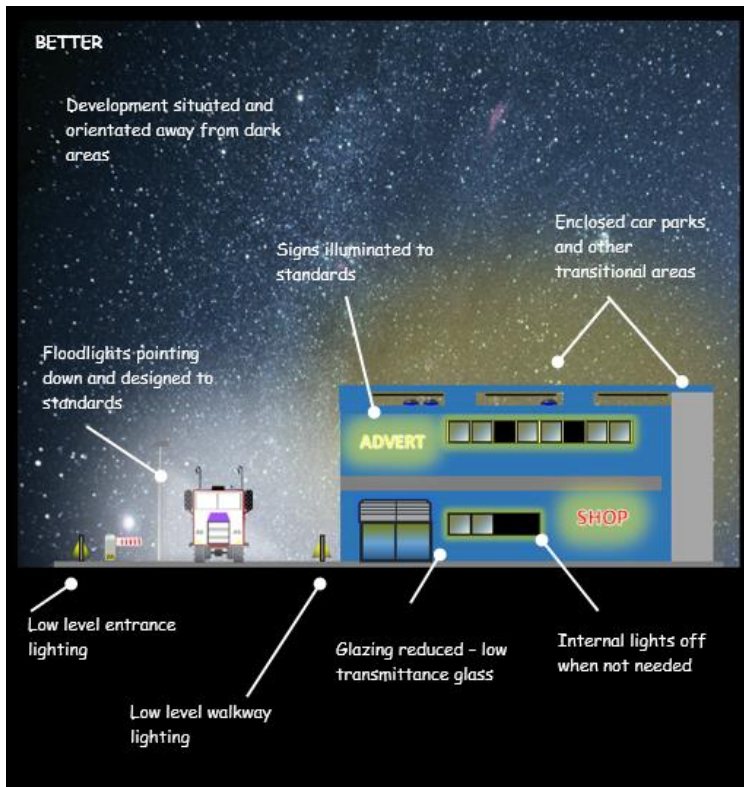
Due to the higher levels of illuminance, sports pitches can have a significant impact on landscape and the landscapes special defined qualities even if the design of the lights is compliant with standards. For example, a tennis court may have compliant lighting in terms of illuminance, colour rendition and colour temperature but due to the light presence of the illuminated surface, it can create a significant visual landscape impact. There is very little you can do to mitigate against this and depending on the location, could harm darker skies. The residual impact could be of such significance that it may present a threat to dark skies and may need to be reconsidered or avoided.

### *Upward Flux*

ILP GN01 21 Table 7 assumes that sports lighting is not expected in E0 and E1 zones. While this may be difficult in practice, every effort should be made to use low reflectance surfaces to reduce the creation of sky glow and the upward flux ratio. The overall landscape impact, including the residual impact will also determine the acceptability of sports lighting in these zones.

In this respect, it is always preferable to site sports lighting in urban areas where it is accessible and has a much reduced impact due to the high ambient lighting level.

## Large Commercial Lighting Good and Bad Practice



Larger scale commercial lighting can have a large impact due to its scale, use and requirement – and a **lighting designer is needed** in nearly all cases. It is unlikely that a safe and effective design cannot be achieved without an experienced lighting designer.

The range of luminaires used can be complex to meet the needs of illuminance standards for different work and public areas. Bulkhead, street, floodlight, bollards and advertisements are all typically used, all requiring a specific purpose and need.

Luminaires are often mounted at increased height (up to 15m) and will be more powerful to ensure illuminance levels under British Standards [BS EN 12464-2 2014](#) *Light and Lighting of workplaces* are met.

The levels of illuminance can be higher than most single commercial designs and over wider areas. This means that the generated sky glow is larger and more intense, and the visual intrusion of lights can have wider landscape impacts.

Large, glazed buildings and industrial complexes can generate significant internal spill, particularly if larger single elevations are used that appear as linear blocks of light in the landscape.

There may also be additional impacts from increased traffic flow, particularly if the development is new. The light of headlights can create noticeable landscape impacts even though the effect is temporary.



## Key Considerations

### *Advertising Regulations*

Although advertising is subject to [regulations](#) (Town and Country Planning 2017) steps should be taken to illuminate signs only when needed, using low powered downward lights, such as LED strips. The luminance of lights is addressed in ILP PLG 05: The Brightness of Illuminated Advertisements and should be relevant to the ambient lighting E-zone. Lights should off at close of business.

### *Mounting Height*

The lowest practical mounting height should be used for all luminaires in achieving the required illuminances. High mounted luminaires that illuminate wide areas with over bright lights should be avoided. Using more lower powered lights than fewer high-powered lights is more preferable.

### *Car Parking*

Car parks have different illuminance needs for different levels of use and locations. If lighting is justified, larger car parks will need 10 to 20 lux depending on usage and hazardous areas. Sometimes, lighting with bollards is more difficult to achieve uniform illuminances. If column mounted lights are used it is important to reduce the height to the minimum in achieve illuminances. For illuminance levels refer to [BS EN 12464-2:2014](#). Road lighting may also be required which needs to comply with design requirements of road lighting, covered in [BS 5489-1-2020](#): and [BS EN 13201-2](#) – Road Lighting Performance requirements.

### *Asymmetric Luminaires and colour*

Due to the large illumination area and larger sky impact, asymmetric lights should be used to avoid upward light where it is not needed. The lowest colour temperature should be sought ideally 3000K but 2700K where possible, with blue-rich LEDs

avoided. CRI's of 0.7-0.8 should be achievable with modern LEDS of 3000K.

### *Internal Light Spill*

Large commercial buildings can have significant internal light spill. Extensive glazed elevations, sky lights or Perspex roofs can allow internal light to spill out and be visually intrusive. Large, continuous glazed elevations should be avoided, and black-out blinds should be considered for all glazed surfaces (glass or plastic) that have internally lit spaces throughout the night. For glass, a suitable visible light transmission should be used to reduce the amount of light passing through the material.

Depending on the size of the glazing there could be potential landscape impacts. Commercial sky lights should aim for a lower VLT (<0.4) than domestic sky lights as the internal lighting environment may be higher. Large structural elevations should also have a low VLT, ideally achieving 0.4.

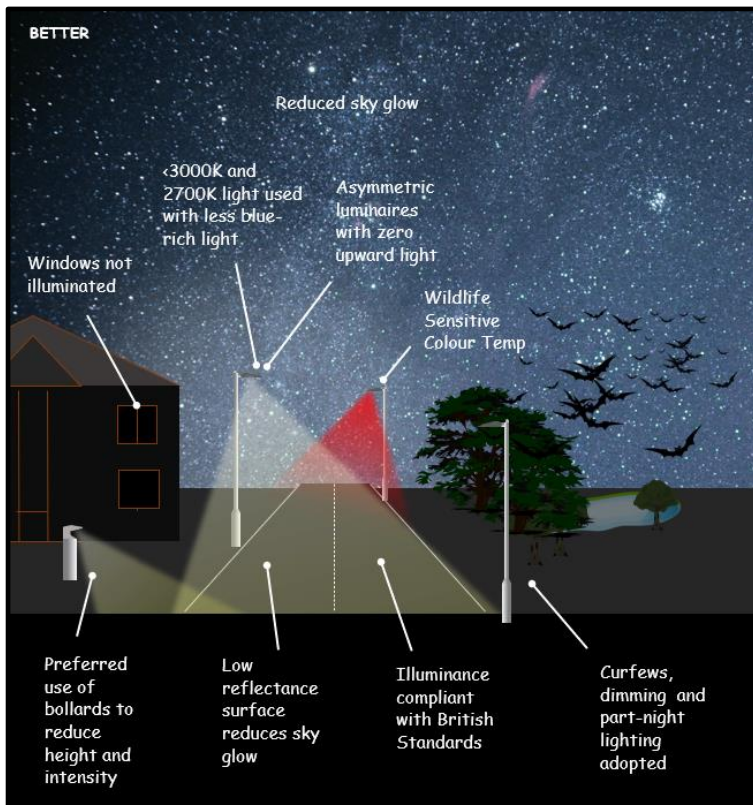
In order to achieve the correct internal illuminance [BSI - Light and lighting of workplaces BS EN 12464-2:2011 Part 1: Indoor Work Places](#) should be used.

### *Construction Phase*

Any temporary lighting required during the construction phase should receive the same consideration as planned permanent lighting. Temporary lighting should ensure that an appropriate CCT is used, that the lights are pointing downwards, that they are off and they are of appropriate illuminance to avoid over lighting.

While the need for site security is appreciated, any security CCTV lighting should ideally be on proximity sensors to operate only when triggered.

## Roads and Paths Good and Bad Practice

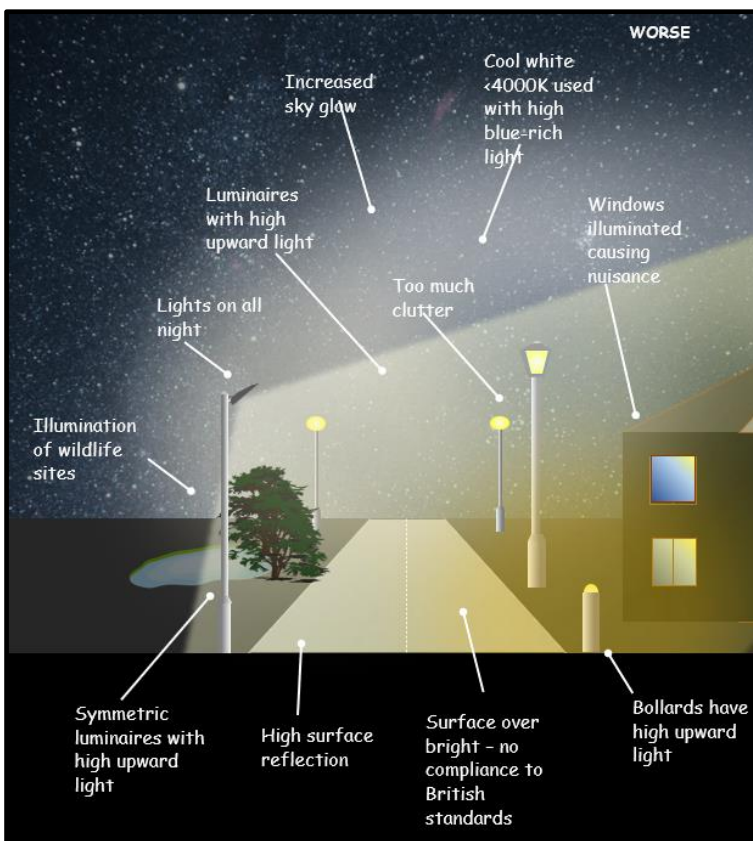


The illumination of residential roads is generally the responsibility of the Local Lighting Authority (usually the county Council) or the Highways Agency for larger roads. New developments that require street lighting of roads should comply with the Local Lighting Authority's design guidance adopted by the authority for ongoing maintenance. The installation of street lighting for roads is not a legal requirement – you don't have to provide lighting unless there is a clear safety need. However, if lighting is installed, there is a legal responsibility for the owners to maintain it according to British Standards.

As such a **lighting designer should be consulted.**

Some commercial and industrial developments will also require road and path illumination and should follow the same design requirements.

The design requirements of road lighting is covered in [BS 5489-1-2020](#): Design of road lighting and [BS EN 13201-2](#) – Road Lighting Performance requirements. Lighting of roads and public amenity areas - Code of practice. The illuminance of roads depends on the traffic use and the mix of pedestrian needs, (road class). Both standards should be used to determine road class.



## Key Considerations

### *Justification*

Streetlights are a key determinant of sky quality, so it is important that there is a clear and essential need for the lights. Adding streetlights is often an 'expectation' but this should be challenged and assessed for actual need especially in more rural areas. The need for lighting could be avoided with effective consideration at the initial development design phase.

### *Low Mounting Height - Bollards*

For quiet residential access roads or pathways low bollards could be used instead of higher column mounted streetlights. Bollards will help reduce the source intensity and visibility while keeping illuminance levels. Spill can also be limited using asymmetric optics. Bollards also reduce the generation of sky glow as the lamp is relatively less bright than pole mounted lights.

Bollards should be used in areas where the risk of vehicular damage or vandalism is low. The Secured by Design guides provide more information for more urban areas.

### *Illuminance Curfews*

Modern LEDs can be dimmed down to achieve different levels of illuminance. As roads and paths will have a mixed level of use-age throughout the night, it is recommended that LEDs be dimmed to different road classes that reflect the changing use. Lights can also be subject to a part-night lighting regime where some lights are switched off when usage is very low. A consultation is often needed to achieve this, but it will reduce the night-time impact and save money. Curfews are particularly effective in rural parts of the landscapes.

### *Colour Correlated Temperature*

Some LEDs will have high colour temperature and a blue-white spectrum. They should be avoided as they contribute to the sky glow effect. The British Standards refer only to Colour Rendition levels (CRI) rather than colour temperature, as colour rendition can be achieved with different levels of colour temperature. In this respect it is recommended that colour temperatures of 3000K and 2700K, with low blue-light should be used in achieving British Standard CRI levels.

### *Low Reflectance surfaces*

Different road and path materials reflect light differently. To reduce the indirect scatter of lights, low reflectance road and path surfaces should be used to reduce the light scattering into the

atmosphere. Black and dark grey asphalt has a much lower reflectance (albedo) of around 0.05 to 0.1 new, compared to grey cement concrete, 0.35 to 0.4. Care should be taken in urban areas to ensure that low reflectance materials do not increase the heat retention to uncomfortable levels.

### *Lighting for Wildlife Corridors*

In some places, road lighting may need to be installed close to highly sensitive wildlife routes, where priority species, such as bats, may be disrupted by lighting. Following examples from other places in the UK, such as [Worcestershire](#), red luminaires could be used in these places.

### *Upward Flux*

ILP GN01 Table 7 assumes that road lighting is not expected in E0 zones and 2% in E1. While this may be difficult in practice, every effort should be made to use low reflectance surfaces to reduce the creation of sky glow and the upward flux ratio. The overall landscape impact, including the residual impact will also determine the acceptability of road lighting in these zones.

## Luminaire Advice

### *Column mounted luminaire*

Luminaires with a high amount of upward light should be avoided. Blue rich CCT's above 3000K should also be avoided. Even with heritage area needs where historic style limits the choice, street lighting should be <3000K and direct light downward as much as possible.



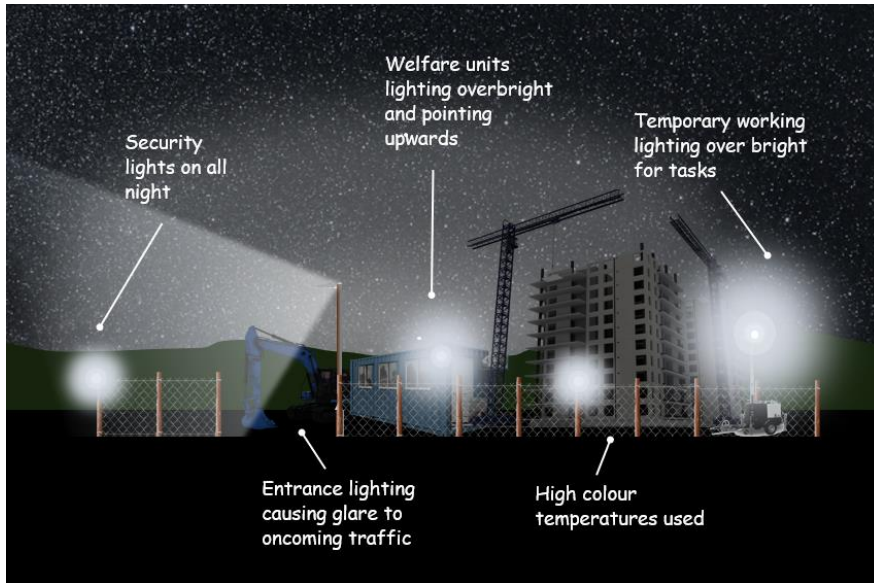
### *Bollards*



Where appropriate, low level bollard lighting can significantly reduce the visual impact of lighting but maintain illuminance. Luminaires with a high upward light should be avoided. Modern bollards can direct light downwards much better. <3000K should also be preferred. Asymmetric luminaires should also be considered where light spill could be contained.

## Construction Phases

New developments will require construction phases that need safe illumination for workers. The lighting will be temporary but could have a significant impact on landscapes. Any lighting for construction phases should follow the same principles as permanent lighting. A lighting designer should be consulted to produce an effective lighting plan, especially for larger projects.



### Key Considerations

#### *Illuminance levels*

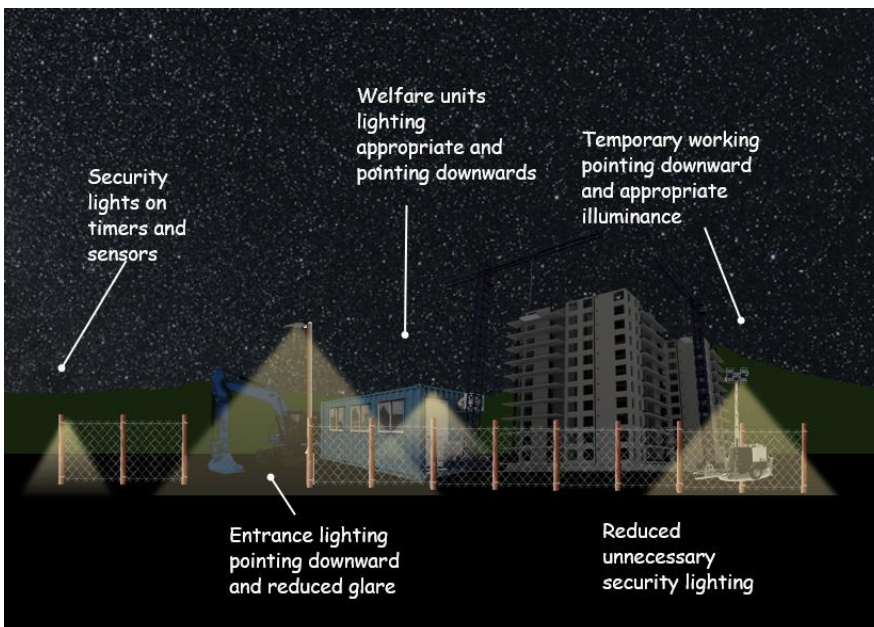
The illuminance of areas should be appropriate for the task with reference to British Standards BS EN 12464-2 lighting of outdoor workplaces. Care should be taken to ensure that the minimum amount of light is provided to workers, but it is not over illuminated. The choice of LEDs power should reflect this.

#### *Upward Light*

All lights should be pointing downwards to avoid the generation of sky glow. Fixtures that cannot be adjusted downwards should be avoided.

#### *Colour Temperature*

High colour temperatures above 3000K should be avoided. LED with 3000K should have sufficient CRI to achieve lighting requirements for CCTV.



### *Security and night lights*

While the need to provide sufficient light for security through the night is appreciated, care should be taken to ensure that any security lights are on suitable timers and sensors to trigger on the detection of movement. Construction tasks lights should be off at close of work leaving only essential security lighting that should comply with lighting requirements on upward light and colour temperature.

### *Using a lighting designer.*

As a construction site is a place of work, there needs to be an appropriate level of illuminance that meets working standards for health and safety. It is recommended that a lighting designer be consulted to produce an appropriate lighting plan that achieves illuminance levels but does not necessarily pollute the sky. The construction lighting should be considered within a landscape and visual impact assessment (LVIA) and within the lighting plans luminaire details.






## 7. Lighting Purchasing Recommendations

You can't always trust 'Dark Sky Friendly' labels on products. Use the following guides to purchase the right lamps for your needs. Remember that 500 lumens is suitable for most domestic needs and to use warm white lamps

### Minor Lamps: Brightness and approximate power

This table below, based on recent searches, provides the power wattages for different types of

bulb brightness that you will find in most retailers. Some are being phased out, but you may still have some in the cupboard that you might want to use. For most minor domestic purposes, 500 lumens is normally more than enough. For lamps greater than 500 lumens, you should use shielding or luminaires that direct all the light downward.

BULB BRIGHTNESS (lumens)	220+	400+	700+	900+	1300+
Incandescent 	25W	40W	60W	75W	100W
Halogen 	18W	28W	42W	53W	70W
CFL 	6W	9W	12W	15W	20W
LED 	4W	6W	10W	14W	18W
LED GU10 	3W	5W	8W	10W	12W

<500 Lumens is better.

### IDA Fixture Seal of Approval

The IDA's [Fixture Seal of Approval program](#) provides objective, third party certification for lights that minimise glare, reduce light trespass and don't pollute the night sky.

All products approved in the program are required to be fully shielded and to minimize the amount of blue light in the night-time environment. IDA does not sell lighting and is not endorsing any of the lighting within this document – the seal is for demonstration only.



**Watts and Lumens: to achieve the right illumination (lux)**

The table below recommends LED wattages (W) and lumen values (lm) to achieve approximate levels of illuminance for certain standardised tasks within an area. While they are more relevant to non-domestic installations, any householder should aim to purchase LEDs at the recommended level to achieve minimum lighting footprints. There are also special cases under Permitted Development, where non-domestic users are not subject to design controls. In these cases, the table should provide some guidance on correct purchasing. Note that when the area or the level of

illumination increases and the potential impact is sufficiently high, a proper qualified and competent lighting specialist should be consulted for the design.

This table provides approximate values for areas listed in BSE and HSE documents, however, the user will remain responsible for the lighting and its use –

**if in doubt and to verify levels, consult a professional lighting consultant.**

Remember – try buy asymmetric and 3000K or less!

Area to be lit m <sup>2</sup>	Approximate Target illumination levels (Typical levels as listed in BSI and HSE documents)				
	(5 lux) DOMESTIC areas, walkways	(10 lux) DOMESTIC driveways, small car parks, traffic areas for slow moving vehicles	(20 lux) Farmyards, clearance and excavation	(50 lux) Loading and unloading, vehicle turning, construction areas, equipment sheds	(100 lux) Sports, fine detail and precision work*
25	<b>3w</b> 400lm	<b>6w</b> 500lm	<b>11w</b> 1000lm	<b>30w</b> 3000lm	CONSULT LIGHTING SPECIALIST
50	<b>5w</b> 500lm	<b>11w</b> 1000lm	<b>23w</b> 2500lm	<b>60w</b> 6500lm	CONSULT LIGHTING SPECIALIST
100	<b>11w</b> 1000lm	<b>23w</b> 2500lm	<b>50w</b> 5000lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
250	<b>30w</b> 3000lm	<b>60w</b> 6500lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
500+	<b>60w</b> 6500lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST

Notes

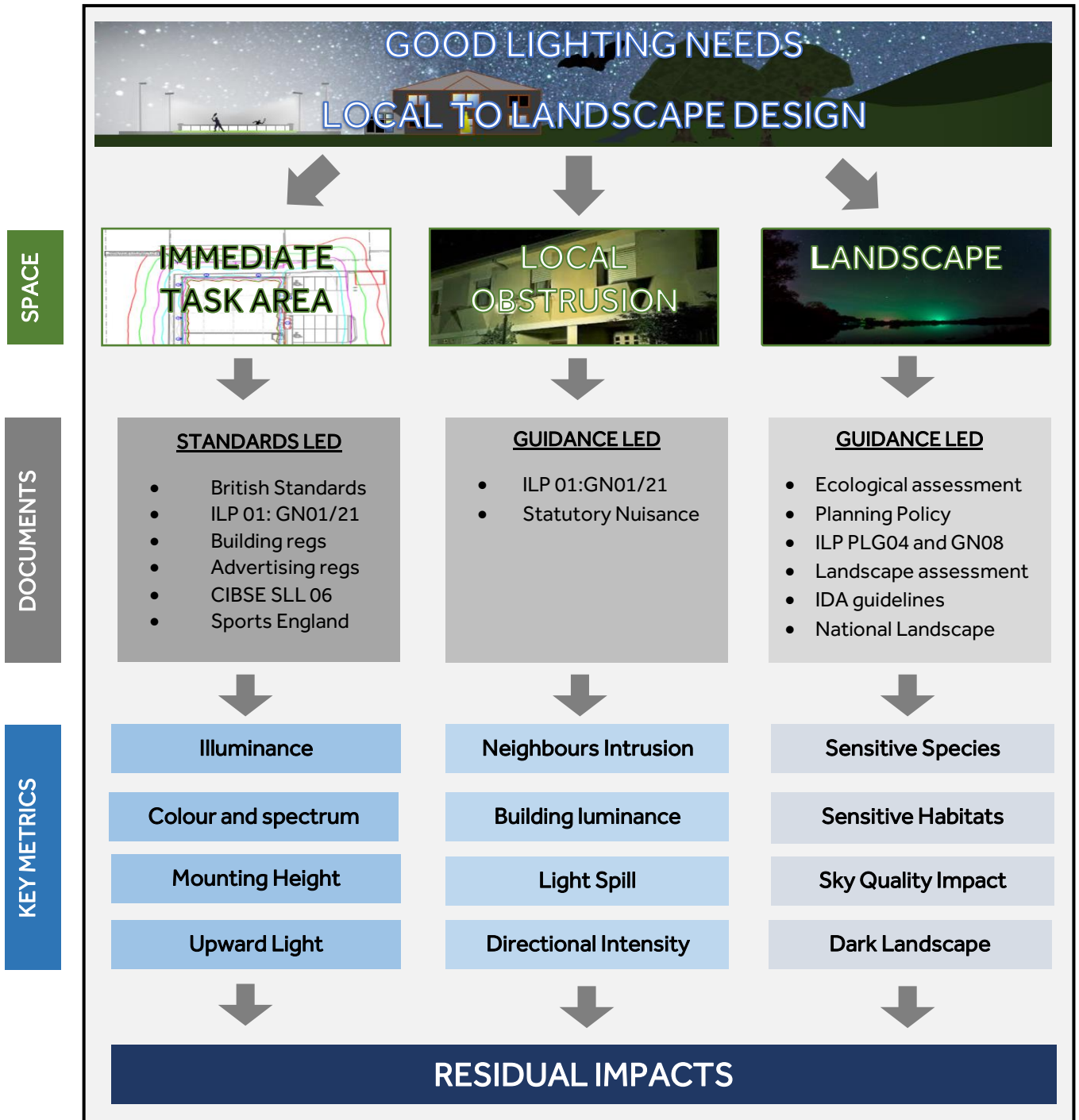
- Lighting using 11W or 1000 lumens or less is general a low risk (**Thick bolded cells**)
- Lighting above 11W and 1000 lumens but less than 60W and 6500 lumens is a medium risk
- Lighting above 60W and 6500 lumens is high risk. This lighting should be properly designed in consultation with a lighting specialist. It is not appropriate for households.
- The comparable lumens approximations within the table are valid as of 2020. The efficacy of lumens per watt depends on available technology.

A specialist lighting consultant should be used for any fine detail and precision work, due to the inherent risk.

## 8. Key Documents, Standards and Guidance for a Lighting Plan

The following diagram illustrates the key documents used in non-domestic lighting plans and how they relate to the different spatial scales - from local to landscape. The diagram shows which metrics are important to each spatial consideration.

When all documents and metrics have been covered, there will remain residual impacts that sometimes cannot be avoided.





### **Lighting Impact Assessment**

#### **The ILP Professional Lighting Guide 04 –**

Guidance on undertaking environmental lighting impact assessments, has additional information on these elements. Particular care should be taken when considering the residual impacts. These are impacts that are often outside the control of a light designer and should be considered as part of a wider night landscape visual impact assessment.

#### **CIBSE LG06: The exterior environment (2016)**

has further general guidance for lighting the exterior environment.

### **Determining lighting for immediate task areas**

#### **BSI - Light and lighting of workplaces: BS EN 12464-2:2014**

This standard sets specific requirements for lighting of tasks in most outdoor workplaces and their associated areas in terms of quantity and quality of illumination. Section 5 provides the lighting requirements for various tasks, e.g. farmyards, pedestrian walkways.

#### **BSI – Lighting of roads and public amenity areas. Code of practice BS 5489-1:2020**

This standard sets recommendations for general principles of road lighting and its aesthetic and technical aspects, including advice on operation and maintenance.

#### **BSI – Lighting and Lighting. Sports Lighting BS EN 12193:2018**

This standard sets recommendations for illuminances and other lighting metrics for sports lighting.

#### **HSE – Lighting at Work HGS38.**

This guidance explains how lighting contributes to the health and safety of people at work. It deals with assessing and managing the health and safety risks attributable to lighting in the workplace, good practice and the minimum recommended illumination levels that meet H&S requirements.

#### **Sport England – Design Guidance Notes: Artificial Sports Lighting**

This Design Guidance Note considers artificial sports lighting for both internal and external sports activities and identifies those that have special requirements. Recommended illuminances for activities are provided.

#### **Illuminated Adverts**

The Illuminated Advert regulations covered by

the Town and Country Planning (control of advertisements) (England) 2007, discuss the specifications for installation. Luminance and controls are recommended for different ambient lighting zones. The ILP has guidance for all of the UK and Ireland: [PLG05: the brightness of illuminated advertisements](#)

### **Assessing and reducing the impact of obtrusive light**

#### **Institution of Lighting Professionals GN01/21 The Reduction of Obtrusive Light**

This widely used and referenced guidance note specifies limitations and recommendations for lighting to prevent obtrusive light. It also considers industry comment regarding the assessment and definition of obtrusive lighting. It establishes upward light, intensity and illuminance criteria for lighting zones

#### **Clean Neighbourhoods and Environment Act 2005 – Statutory Nuisance**

This statutory legislation specifies that installations be avoided where ‘artificial light emitted from premises (is) prejudicial to health or a nuisance.’ (Section 102 (2)(fb)). To avoid enforcement by the local authority, lights should be pointing in the right direction and be appropriate for use.

### **Landscape Impact and Wildlife**

#### **ILP Guidance on Undertaking Environmental Lighting Impact Assessments PLG04**

In sensitive wildlife areas such as National Parks, National Landscapes, National Nature Reserves or protected landscapes, sufficient consideration should be given to appropriate lighting plans. This guidance provides advice on both rural and urban environmental impacts. This guidance also includes assessments on residual impacts that cannot be easily mitigated by designed.

#### **CIBSE: SLL: LG06: The exterior environment (2016)**

The guide aims to provide readers with a firm foundation from which to approach exterior lighting design. Since light source technology is advancing rapidly, the guide provides a holistic approach to the design of the exterior environment, rather than concentrating on product performance, which quickly becomes out of date.

#### **Bat Conservation Trust and ILP: Bats and artificial lighting in the UK**

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.

#### [Towards a Dark Sky Standard](#)

As a precursor to the planning process and as an extra resource for applicants, "Towards A Dark Sky Standard" is a general guide and overview of the key considerations needed for good lighting design and the protection of dark skies. While it is not a formal planning document, the information within it will help applicants, developers, lighting professional and the general public to install lighting that does not unnecessarily impact on dark skies.

#### **Energy, avoiding nuisance and crime.**

##### [Building Regulations](#)

If you are installing an external light which is supplied from your electrical system, then you should ensure reasonable provisions are made to enable effective control and/or use of energy efficient lamps. One recommended option is to install a light **not exceeding 150W per light fitting** (which is excessive for most LED domestic uses) where the lighting automatically switches off, both when there is enough daylight and also when it is not required at night.

##### [Secured By Design – Lighting Guide](#)

This guide, produced by Police Crime Prevention Initiatives, aims to increase awareness of security, public safety and lighting. It recognises the need to balance different objectives and incorporates the requirement to avoid causing light pollution in the design of buildings, estates and public spaces.



Figure 22 - Orion Nebula . Mike Barrett

## 9. Lighting Assessment and Plans

Whether a lighting scheme requires planning permission or not, it may need the services of a qualified lighting designer to create an assessment or plan. A plan should contain essential information to show how the lighting is justified, what luminaires are used and where, how it complies with relevant standards and considers wider landscape and wildlife considerations.

Planners will need to quickly and clearly understand how a lighting plan complies with relevant standards and how it will not cause harm to the landscape by producing light pollution. A design should clearly summarise the justification, the tasks need, mitigations, local and landscape impacts. The more clearly you can show this information, the better.

A lighting assessment should include and make clear the following to planning officers.

1	Site description	A summary of visual impact assessment description adapted for lighting, including indication of applicable environmental zone
2	Assessment method	A description of the methodology for site visits, design and evaluation
3	Baseline Assessment	An assessment of the current lighting at site, identification of sensitive ecological receptors, special qualities, viewpoints and general dark sky conditions
4	Proposed development	This is the main technical part of the plan. It should include <ul style="list-style-type: none"> <li>• Design objectives</li> <li>• Task requirements</li> <li>• Relevant guidance, standards and legislation that relate from local to landscape</li> <li>• Task calculations</li> <li>• Obtrusive light calculations</li> <li>• Luminaire schedules and installation plans</li> <li>• Luminaire specifications (lumens, CCT, CRI, spectral distribution)</li> </ul>
5	Residual effects	Assessment of the changes caused by the lighting, including during the construction and operational phases. This should also include effects to the dark landscape and wildlife and overall visibility after installation and mitigations.
6	Potential mitigation	A description of any potential mitigations used, including curfews, reduced illuminances, or shielding
7	Conclusions	A summary of the report covering installation and operational phases. This should summarise the main technical requirements and be clearly presented to a planner.

[The ILP Professional Lighting Guide 04](#) – Guidance on undertaking environmental lighting impact assessments, has additional information on these elements.

[CIBSE LG06: The exterior environment \(2016\)](#) has further general guidance for lighting the exterior environment.

## 10. Planners Checklist

The following flow charts aim to provide designers and planners with the basics steps to develop and assess lighting installations and internal glazing.

### External Lighting

#### JUSTIFIED LIGHTING

- There must be a clear justification for lighting with full consideration to mitigate at the design phase. It should serve a beneficial purpose and be necessary.
- The need for planning permission should be checked.



#### DETERMING LIGHTING TASKS NEEDS

- Ensure that lighting conforms to recommend illuminance, spill and glare levels in appropriate key documents, e.g. BS 5489, 12464 using lowest illuminance levels as necessary
- Ensure that critical dark skies criteria are included
  - Upward Light Ratio = zero
  - <3000K CCT or less, aiming for <500nm spectrum



#### ASSESS LOCAL IMPACT

- Nearby locations where lighting could be a direct or indirect visual nuisance for both humans and wildlife are identified.
- Lighting has regard to obtrusion and nuisance in key documents, ILP GN01, Building Regulations



#### ASSESS LANDSCAPE IMPACT

- Sensitive receptor sites and dark area have been assessed and identified.
- Use a lighting impact assessment.



#### APPLY MITIGATIONS

- Appropriate mitigations have been considered.
  - Curfews and dimming regimes
  - Proximity sensors
  - Additional shielding and louvres



#### CHECK THE PRESENCE AND RESIDUAL IMPACT

- Does the residual lighting impact still represent a significant intrusion into the landscape even if the lighting complies with obtrusion and illuminance standards?
- Is there a reduction in sky quality and an increase in sky glow domes

## Internal Lighting

### **DETERMINE THE GLAZING TYPE**

- What is the intended purpose of the glazing?  
Domestic/Commercial?
- Are there alternatives?



### **ASSESS THE GLAZING EXTENT**

- Is the amount of glazing appropriate for the use and location?
- The decision should be based on analysis of the development in the landscape taking to account
  - Landscape impact
  - Disruption to dark landscapes
  - Visible intrusion
  - Urban/rural density and remoteness
  - Shielding by vegetation and buildings



### **SET RECOMMENDATIONS FOR VLT**

- Use the table to set recommended factors for visible light transmission.



### **APPLY MITIGATIONS**

- Determine and set additional mitigations (e.g. blackout blinds, hours of use)

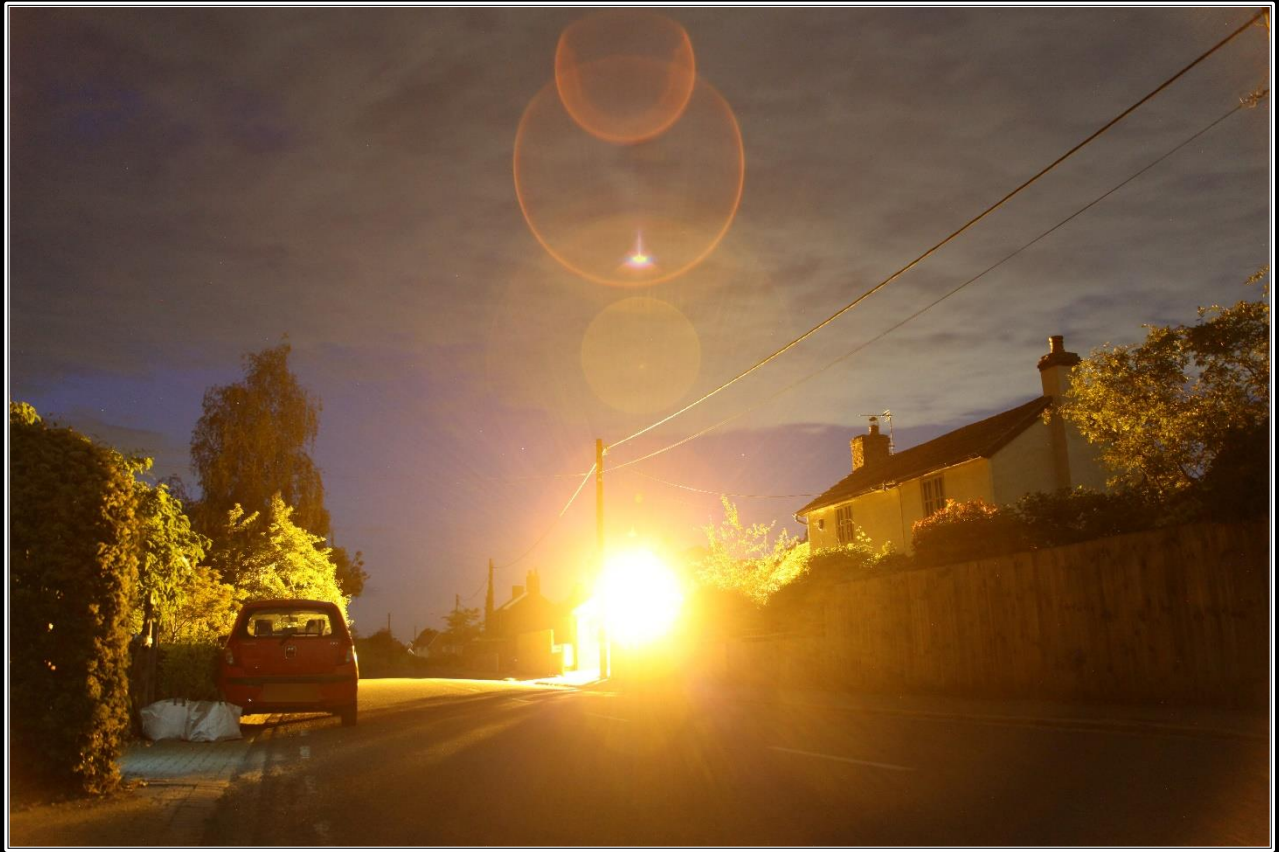


Image Credits:

Front Cover: Mike Barrett. Fish Eye image showing the Milky Way and light pollution in Polestead

Back cover: Nik Szymanek. Poor lighting control and sky pollution in Boxted