South Oxfordshire and Vale of White Horse
Joint Local Plan 2041
EXAMINATION LIBRARY DOCUMENT
CEQ07

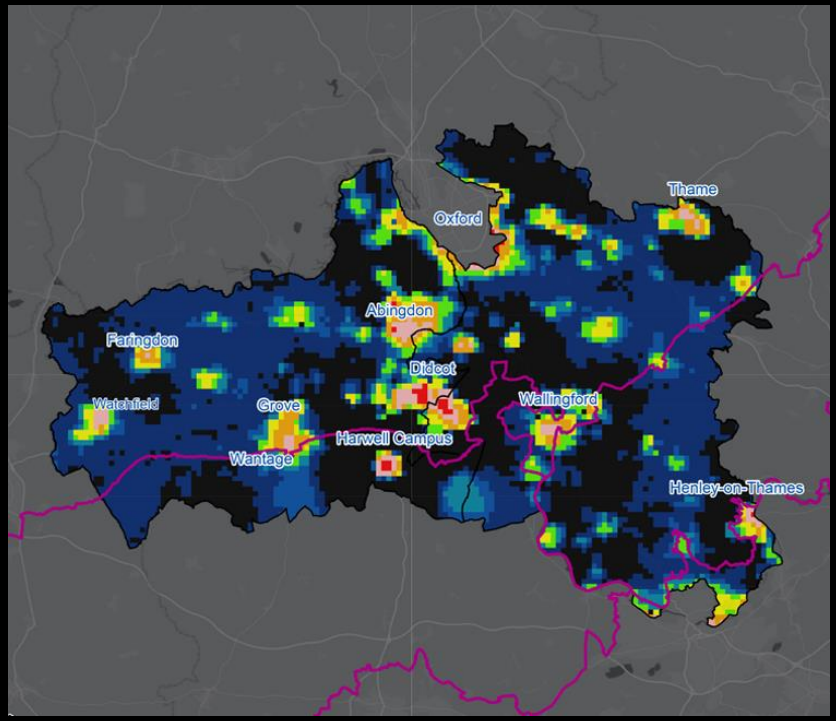
LIGHTING DESIGN GUIDANCE

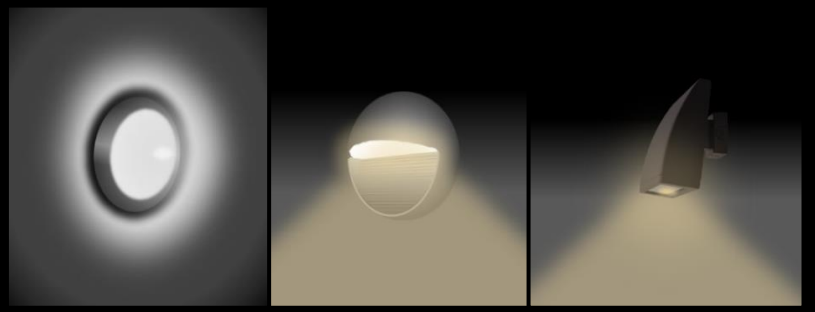
Guidance to reduce light pollution and protect our dark skies.

September 2024

South Oxfordshire District Council
Listening Learning Leading

Vale of White Horse District Council





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Guidance prepared by Darkscape Consulting to be used by Vale of White Horse and South Oxfordshire District Councils.

Darkscape Consulting does not take responsibility for the use of this guidance by planning officers in applications.

All illustrations and advice images Darkscape Consulting.

1 INTRODUCTION

South Oxfordshire and Vale of White Horse are mixed areas of urban development and open rural countryside with dark skies as an important natural character. The Councils seek to protect these skies by reducing the impact of artificial lighting at night by adopting the principle of Responsible Artificial Lighting at Night (ROLAN). These principles will also benefit wildlife, reduce energy consumption for the climate emergency and improve health and well-being.

There are two nationally protected landscapes within the area; the Chilterns and the North Wessex Downs National Landscapes. With small towns and areas of open and relatively uninhabited countryside the Councils 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 from surrounding cities and towns increases light pollution and reduces our ability to appreciate and benefit from our dark skies. Light pollution 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.

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.

This guidance is primarily designed to ensure the new lighting proposals are dark sky compliant but also provides advice for those wanting to reduce their own lighting footprint.

1.1 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 using ROLAN and reduce light pollution by effective design using industry standard best practice – it does not call for an outright ban on lighting but rather follows the Institution of Lighting professional advice;

the right light in the right place at the right time with the right controls.

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 skies. It will also contribute to protecting the landscapes wider special qualities, defined character and tranquillity.

More fundamentally, this guidance aims to support positive behaviour by establishing a proactive dark sky 'mind-set' by looking beyond the immediate areas to be lit and ensuring that relevant standards, landscape assessments and other professional guides are followed.

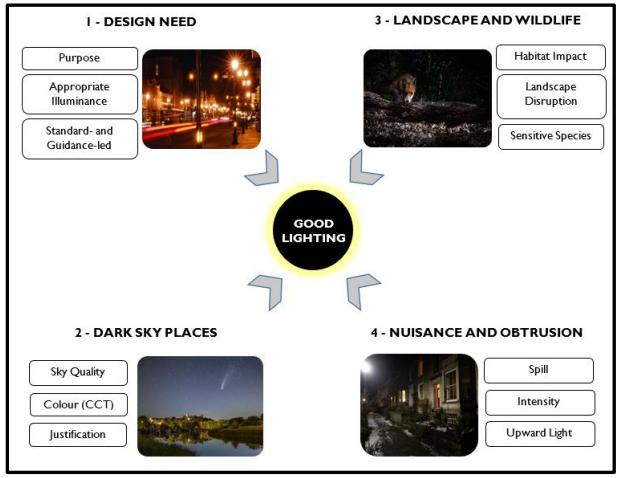


Figure 1 - The Dark Sky Mindset. Good lighting needs all these considerations

Public bodies under section 85 of the Countryside and Rights of Way Act 2000 who have a duty to the 'seek to further' 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.

1.2 Who is this guidance for?

This document provides guidance for anyone who is using, replacing, or installing new external lighting in or around South Oxfordshire and Vale of White Horse. This includes householders, businesses and developers who may or may not require planning permission. It also is for those installing new glazing and windows to reduce internal light spill.

This guidance is primarily aimed at;

1. Planning officers who need guidance on assessing lighting and glazing designs in and around South Oxfordshire and Vale of White Horse

2. Non-domestic schemes that may need planning permission and a more thorough design led by professional principles

3. Those seeking to install minor lights or glazing for mainly domestic purposes who need general advice without a lighting designer

The guidance will also benefit

4. Those wishing to lower and reduce their own light pollution outside the planning system

5. National Landscape partners and stakeholders providing advice and policy and development framework support

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

1.3 Do I need Planning Permission for lighting?

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. 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:

- A lighting scheme of such nature and scale that it would represent an engineering operation, or a material change in appearance
- Lighting such as the floodlighting of sports pitches, car parking or manèges
- A lighting scheme on a listed building that would significantly affect its character.

1.4 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, obtrusive light, detailed specifications and plans. Qualified and competent designers will ensure that the luminaires achieve all the necessary requirements to satisfy both lighting needs and dark sky compliance.[1] Designers will produce a design that will contain obtrusive light calculations, plans, impacts assessments and confirm specifications against the ambient lighting environmental zone (E-zone) for the place.

If you are an employer or have the public working or accessing your property, you have a duty of care and should follow Health and Safety Executive recommendations and provide suitable and sufficient light. While HSE guidance refers to British Standards illuminance levels, the use of standards is not a legal requirement. However, you should ensure that you are providing appropriate, suitable and sufficient light as a duty of care.

In any circumstance, you will probably need some form of lighting design if your development build is new and needs planning permission. The level of detail and inclusions within a lighting design should be proportionate to the complexity of the development - planning officers may request additional information to make a determination.

Unfortunately, there is no clear threshold to determine when a lighting designer should be used.

You should think about a lighting designer if your lights are

- Not minor and require separate construction infrastructure
- Non-domestic in character, e.g. commercial, sports, amenity
- Used for providing lights for safety, workers or the public
- Used in built up areas where intrusion into other properties is likely
- Providing sports, amenity or roads
- Used in shared areas where vehicles and pedestrians directly.
- Where minimum levels of lighting are needed for specific tasks

In general, E1 zone specifications should be used within a design, in all open rural spaces (without streetlights) within South Oxfordshire and Vale of White Horse.

Lighting that does not usually require a lighting designed plan and can be completed by other means includes:

- Domestic lighting uses; doorways, driveways.
- Single access lighting for doorways
- Walkways separated from vehicle routes
- Small car parks or driveways
- Small private access roads

Further guidance is provided with this document to assist those seeking to plan their lighting without a lighting designer.

Section 5 provides some information on lamp types and powers for a range of uses that can be used to provide sufficient illuminance for most simple uses.

If in doubt – contact a lighting designer.

[1] Lighting designers can be found on the Institution of Lighting Professionals website Directory | Lighting Journal

1.5 The Structure of the Guidance

As understanding light, dark skies and policies can be technically difficult, this guidance has been structured to ease navigation and understanding. The guidance is split into four main sections;

Light Pollution and Dark Skies

This section will provide brief overviews on:

- Understanding Light Pollution and what is a dark sky
- Introducing the main principles and metrics of responsible lighting
- An overview of the sky quality of South Oxfordshire and Vale of White Horse districts.
- Setting general policies with lighting zones

Technical Content

This section will provide the main technical elements of a lighting design that a planning application should include;

- Technical elements of main principles
- Environmental zone and landscape impacts
- Planners Checklist
- When a lighting designer is needed
- What to include within a lighting design – simple and designer led

Best Practice Advice Guides

This section provides generalised illustrations of good and bad lighting design for a number of common lighting applications.

Supporting Information

This section will provide additional information for lighting designs

- Purchasing recommendations for luminaires
- Further guidance material and references

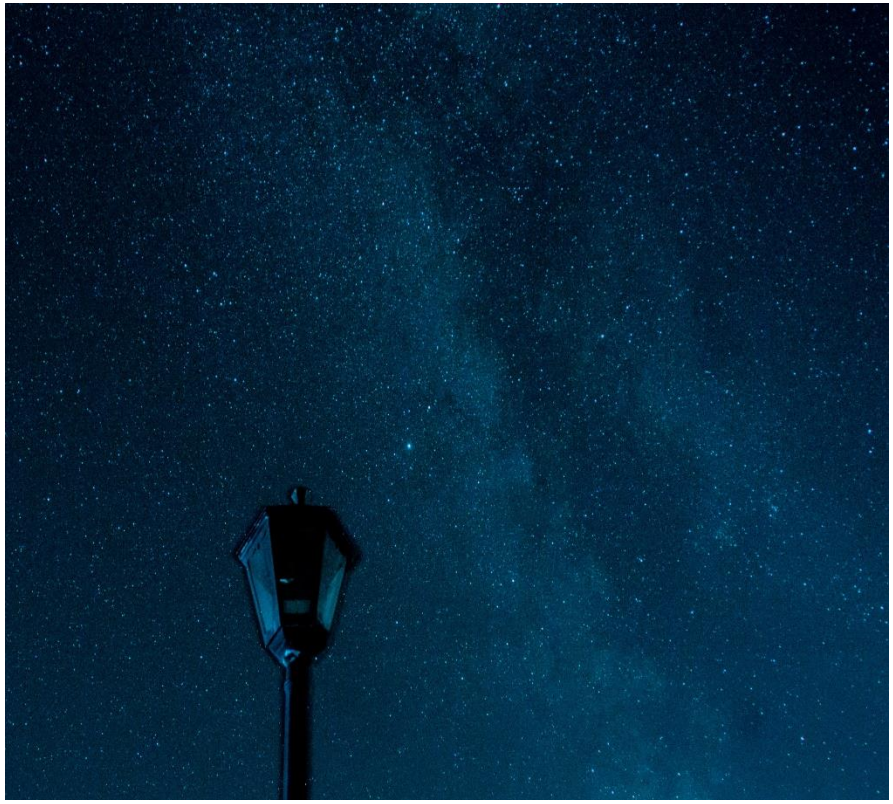


Figure 2 - The Battle of the Photons - protecting the night sky by responsible artificial lighting at night. Credit Dan Oakley

2 LIGHT POLLUTION AND DARK SKIES

2.1 Understanding Light Pollution

According to DarkSky International definition, "light pollution is the human-made alteration of outdoor levels from those occurring naturally". It is recognised as having three main elements:

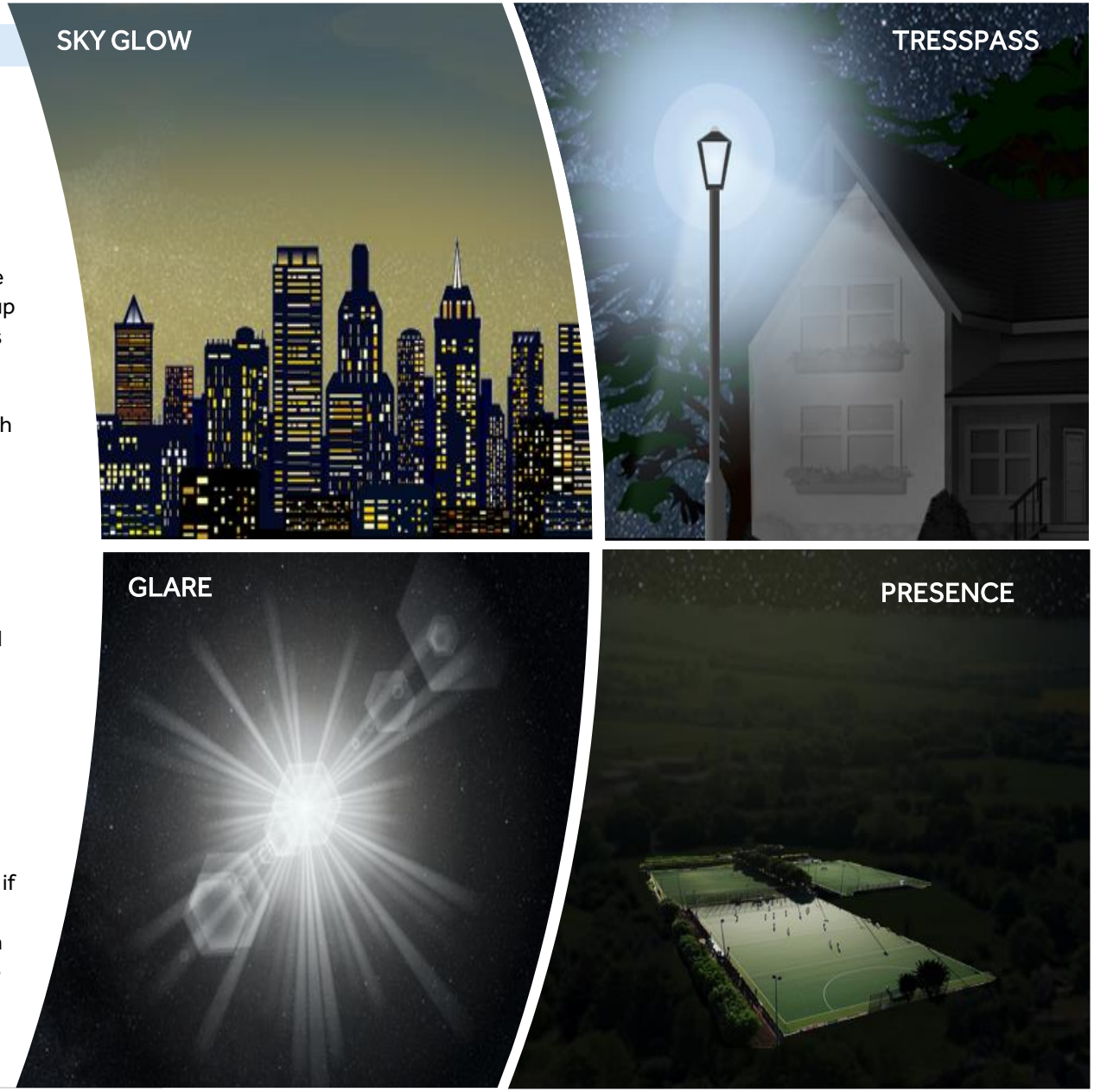
Sky Glow: This is the brightening of the night sky which can be seen emanating from the horizon, originating mostly in built-up areas. It is caused by light scattering on aerosols and particles in the air. Light that travels near the horizontal is the most damaging as it travels furthest through the lower, denser atmosphere. 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.

Trespass: This is external light spilling where it is not intended or needed. Although this definition generally relates to windows and private property, the term 'light intrusion' also applies to natural habitats and areas of high species interest.

There is a fourth element that is relevant to protecting a dark sky landscape.

Presence: This is where the presence of light has an undesirable visual impact, particular in a dark landscape. Even if a lighting scheme were designed to avoid sky glow, glare and trespass there still exists a possibility of significant impacts on dark and sensitive landscapes and wildlife due to the presence and the light it provides.



2.2 Lighting Metrics

The brightness of light is measured in three ways; **Lumens**, **Candela** and **Lux**. Lux and lumens are properties of light that are useful to assess the appropriateness of lighting installations. Obtrusive lighting criteria are aimed to ensure that the output (lumens), Intensity (candela) and illuminated brightness of surfaces (lux) is appropriate within South Oxfordshire and Vale of White Horse.

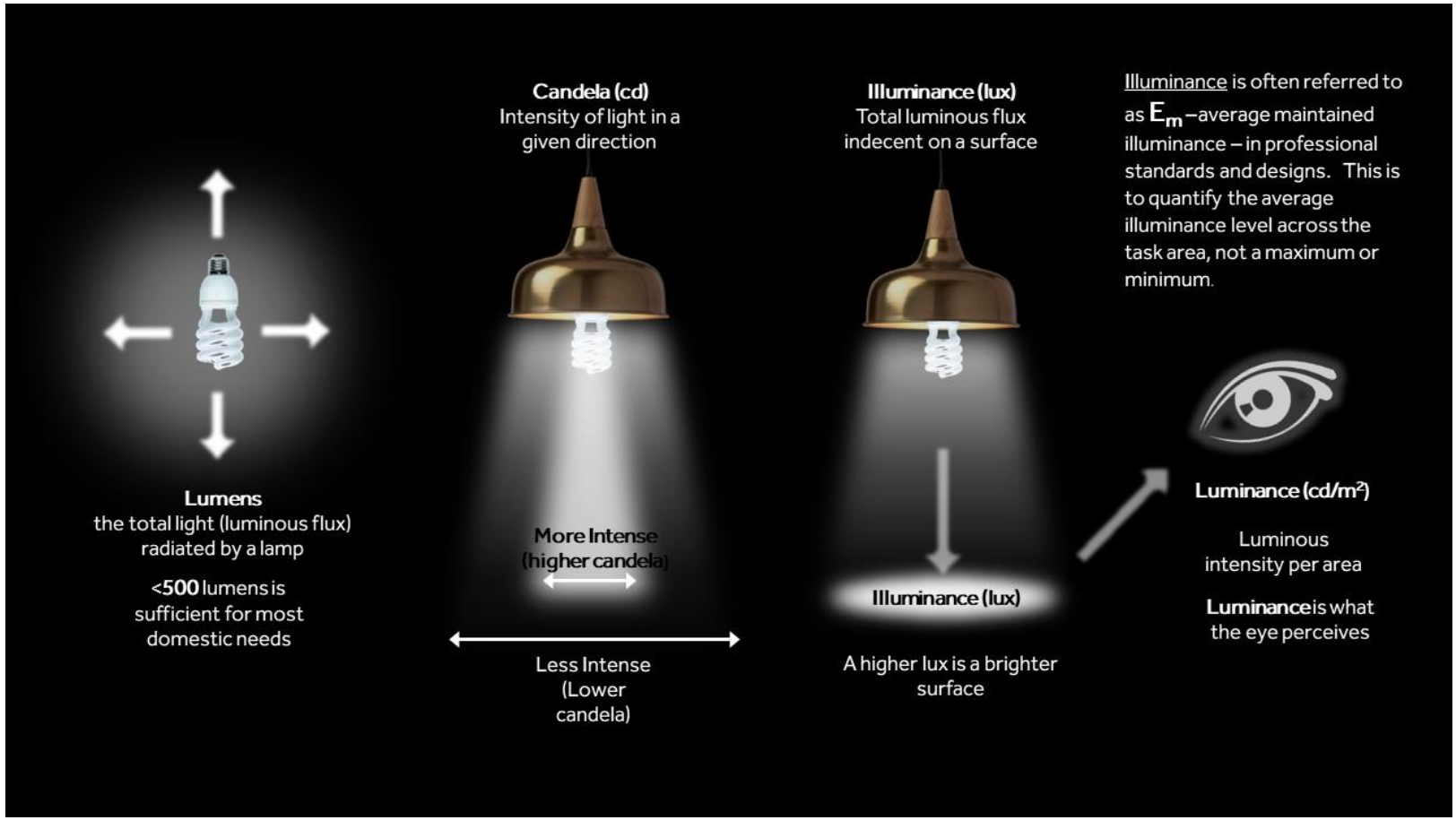


Figure 3 - Light Metrics and how they are connected

Lumens is how much light is emitted (luminous flux) 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 ($\mathbf{E_m}$) 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 obtrusion 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 or less.

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 4 - 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.

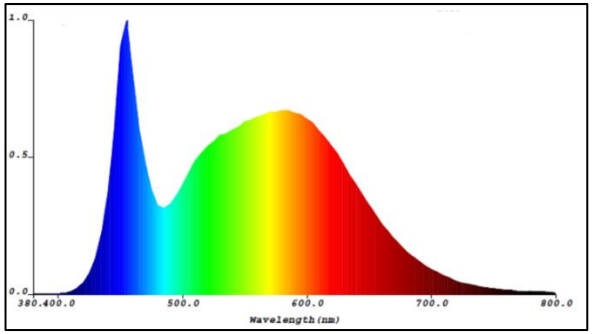


Figure 5 - The colour spectrum from a 5000K lamp with a prominent blue peak which exacerbates light pollution.

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 or CCTV will need specific colour rendition levels to achieve safe and natural play.

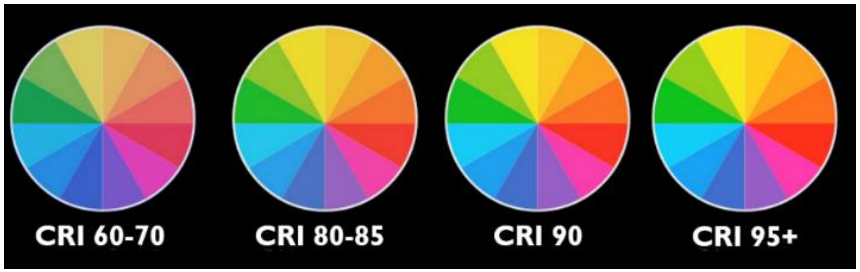


Figure 6 - Colour Rendition Index (CRI).

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.

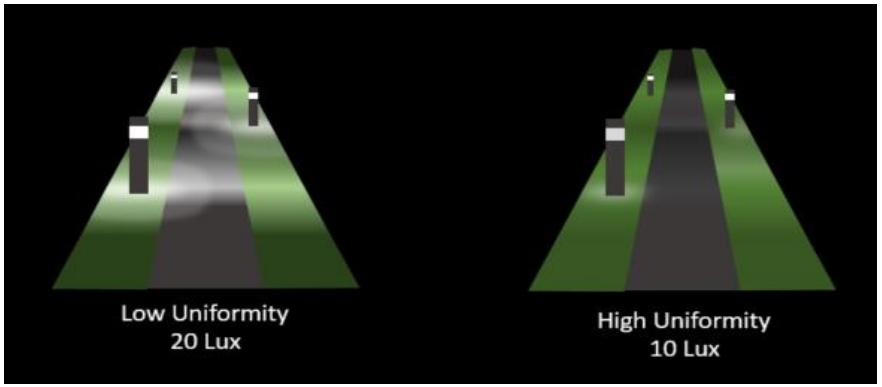


Figure 7 - Uniformity and illuminance

2.3 Light pollution in context

The three main elements of sky glow, light trespass and glare will typically combine to present challenges to a lighting design and its assessment. Provided that some simple principles are followed then impacts can be reduced.

Light pollution is not just about design, it has wider impacts including.

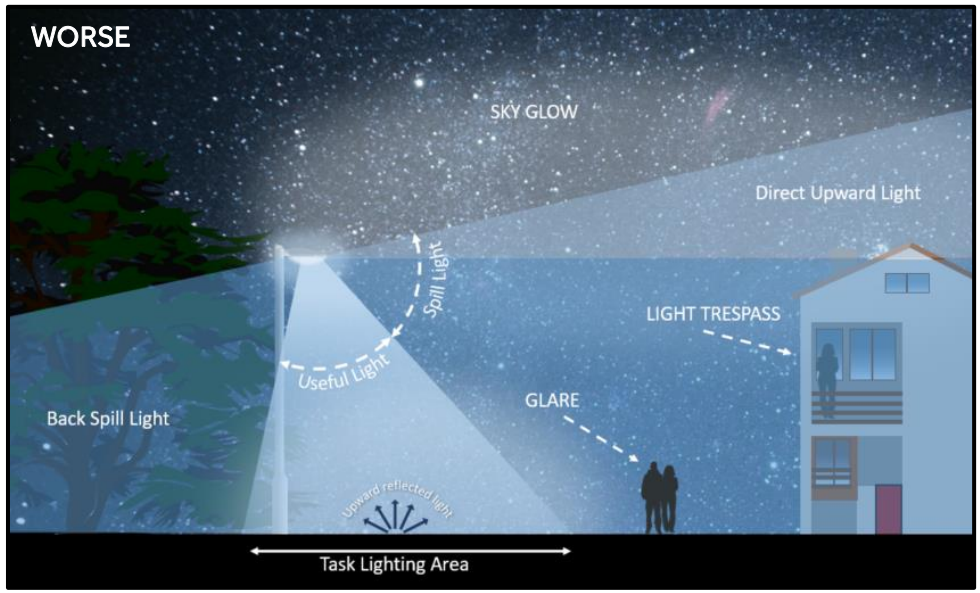


Figure 8 - Light Pollution. Sky Glow, Light Trespass and Glare.

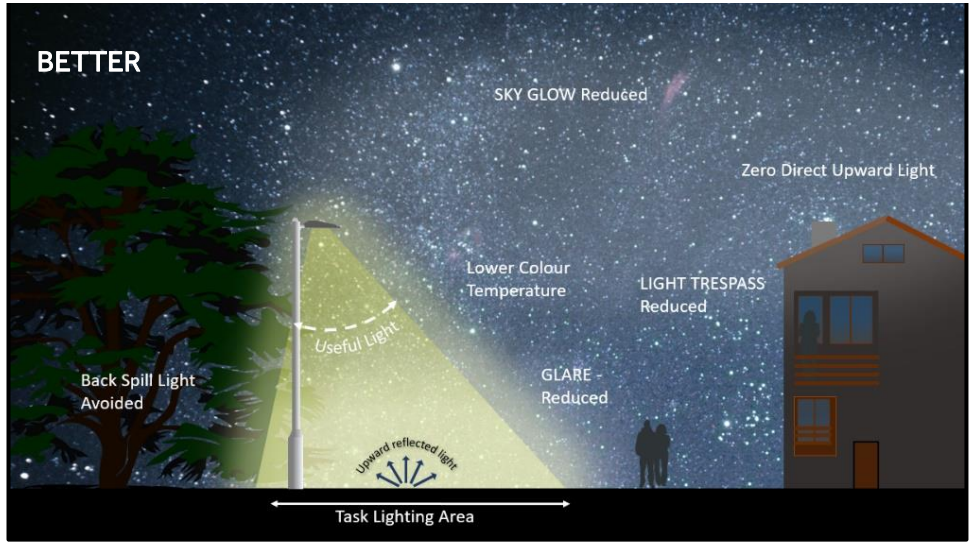


Figure 9 - Reduced sources of Light Pollution. The presence impact remains

2.3.1 Health and Wellbeing

It has long been known that light pollution can disrupt the circadian rhythms (body clocks) of people. While the impacts of lights that shine directly into windows can be immediately understood, the general brightening of the sky can lead to further health issues. Disruption to sleep will produce poor circadian regulations which can cause loss of attention, increased stress and fatigue, while particularly blue-light rich lighting suppresses the increase of the hormone melatonin, which regulates the bodies sleep-awake cycle. Poor lighting can also impact on more intangible health concerns; a recent study 'Wellbeing and community on the dark island of Sark' showed that wellbeing is intrinsically linked to the ability to see a full starry sky.[2]

2.3.2 Wildlife and Dark Skies

As well as the dark skies contributing to the sense of remoteness and peacefulness in the area, a number of nocturnal species for nature recovery are dependent on dark skies for feeding, including a variety of bat species, numerous species of night-flying moths which are UK BAP Priority species, dormice, and glow-worms.

The impact of artificial light on wildlife is a growing area of research. The evidence is showing that light can be very disruptive to many different species, not just from a disruption to their circadian body clocks, but also as a barrier to migration, movement and ecosystem integrity. Evidence shows that artificial light causes negative phenology adaptions in many species and disrupts the movement of species in an otherwise dark habitat. For example, glare from artificial lights can impact wetland habitats that are home to amphibians such as frogs and toads, whose night-time croaking is part of the breeding ritual. Artificial lights disrupt this nocturnal activity, interfering with reproduction and reducing populations[3].

Where appropriate, lighting designs should appraise the impact of the installation on wildlife. While light can have some impact on species and habitats, there are a few notable varieties that should be especially considered:

2.3.2.1 Bats[4]

As nocturnal animals, all bat species in South Oxfordshire and Vale of White Horse can be impacted by artificial light. All bat species in the UK are protected by law. It can be illegal to kill, capture or disturb bats, obstruct access to roosts or damage/destroy roosts. Lighting in the vicinity of bat roosts can cause disturbance and could constitute a criminal offence. For planning applications, it is important to consider:

- Whether surveys for bats are required,
- Not directly illuminating bat roost entrances or flight lines,
- Avoid illuminating foraging areas and routes

Lighting schemes should be designed in accordance with ILP GN08/23 Guidance Note 8: Bats and Artificial Lighting

2.3.2.2 Birds

Evidence shows[5] that artificial light can reduce sleep in birds, which disrupts the long-term circadian rhythm that dictates the onset of breeding. Birds are likely to be disrupted by changes to insect behaviour due to artificial lights. In general:

- Do not directly illuminate areas likely to be important for nesting birds

2.3.2.3 Invertebrates

Artificial light, particularly blue-spectrum UV rich, can significantly impact invertebrates; disturbing feeding, breeding and movement which may reduce and fragment populations. It is estimated that a third of insects that are attracted to lights will die as a result of their encounter[6]. Evidence also shows that pollination rates in illuminated plants can be reduced by 62%[7]

- Avoid illuminating water, reflective surfaces and ecological areas
- Ideally, use colour temperature, CCTs of less than 3000K
- Use narrow band minimal UV sources

[2] Ada Blair: Wellbeing and Community on the Dark Sky Island of Sark 2016: B0955WHFJ8
[3] Mazelka et al: Artificial lighting at night alters aquatic-riparian invertebrate food webs. Ecological Applications. Volume 29, issue 1. Jan 2019
[4] Guidance Note 8 Bats and artificial lighting | Institution of Lighting Professionals (theilp.org.uk)
[5] Aulsebrook et al: White and Amber light at night disrupts sleep physiology in birds. Volume 30 Current Biology, issue 18. 21 September 2020
[6] Owens et al. Light pollution is a driver of insect declines. Biological conservation Vol 241, Jan 2020, 108259
[7] (Knop et al 2017. Nature 548)

2.4 Existing Light Pollution Policies and Regulations

Light pollution and the requirement to use responsible outdoor lighting at night is primarily controlled through the planning process. This is achieved through the use of national and local policy documents for South Oxfordshire and Vale of White Horse. Additional legal requirements also apply.

2.4.1 Light Pollution and National Planning Policy Framework (NPPF)

The National Planning Policy Framework NPPF (2023) provides local authorities with a baseline when developing planning policy; paragraph 191:

> 191 – 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 which would include darkness. Para 182 requires that 'great weight should be given to conserving and enhancing' protected landscapes which have the highest status of protection. Para 182 also requires that development is limited and sensitively designed to 'avoid or minimise adverse effects' on the designated area. This would include well designed lighting and understanding the full impact on darkness.

Para 183 – which specifically relates to National Landscapes - also note that permission for major development be refused other than in exceptional circumstances.

The NPPF will be subject to updates which may mean this guidance does not reflect the latest version. Applicants will be expected to use the current NPPF and relevant policies. The guidance uses the latest version available.

2.4.2 South Oxfordshire and Vale of White Horse Joint Local Plan Policy

Joint Local Plan Policy CE11 seeks to minimise lighting pollution across the districts and protect our darkest skies from the impact of light pollution. Where possible, the policy will support the restoration and improvement of areas to enhance and/or extend the districts' dark skies.

2.4.3 Levelling Up and Regeneration Act 2023

The Levelling-up and Regeneration Act 2023 provides further duties for public bodies to conserve and enhance the natural beauty of protected areas. Specifically; section 245 (6) (a) (A1) states that:

> 245: 6 (a) A1) In exercising or performing any functions in relation to, or so as to affect, land in an area of outstanding natural beauty in England, a relevant authority other than a devolved Welsh authority must seek to further the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty

Public bodies should ensure that lighting designs meet this section.

2.4.4 North Wessex Downs Lighting Guide

The North Wessex Downs currently has a lighting guide that can be found here. Joint Local Plan policy CE11 notes that, *proposals for development should reflect the guidance set out in the North Wessex Downs Position Statement on Dark Skies and Artificial Light and supporting guidance found in Dark Skies of North Wessex Downs AONB: A Guide to Good External Lighting.*

The requirements of North Wessex and this guidance are consistent with the aims of protecting dark skies and responsible outdoor lighting at night.

2.4.5 South Oxfordshire and Vale of White Horse Dark Skies/Light Impact Assessment – Methodology Report.

In January 2023, South Oxfordshire and Vale of White Horse District Councils commissioned Land Use Consultants (LUC) to produce landscape evidence contributing to the Joint Local Plan that will guide development in the districts to 2041. This evidence identifies the darkest areas of the districts

and establishes suggested ambient lighting zones. The maps can be found in sections 2.6 and 2.7. The methodology report can be found here.

2.4.6 Light Pollution and the Law

In 2005, Clean Neighbourhoods and Environment Act 2005 – Statutory Nuisance (para 102 -2) was extended to include light nuisance,

"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.

2.4.7 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 on 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 in England, a relevant authority other than a devolved Welsh authority must seek to further the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty.

2.4.8 Light Pollution and Wildlife sites and species

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 avoid, mitigate or compensate for these impacts. 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.

2.4.9 Illuminated Adverts

Advertisements illuminated or otherwise subject to Town and Country Planning (control of Advertisements) regulations 2007 may require planning permission.

2.4.10 Health and Safety Executive

If you are an employer with workers or have the public accessing your site you will have a duty of care. This means providing a safe environment that is sufficiently illuminated to prevent harm. A risk assessment should be undertaken to determine where harm may be prevented with lighting.

2.4.11 Neighbourhood Plans

Development within the parishes of South Oxfordshire and Vale of White Horse, should ensure that any Neighbourhood plans are references and included within any proposed lighting. Many parishes are in the process of completing plans that will capture any local considerations which may include key wildlife receptors, heritage or other assets of relevance. The list of neighbourhood plans can be found:

- South Oxfordshire District Council
- Vale of White Horse District Council

2.5 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 Dark Sky International place application.

The SQM will return a value of the brightness (magnitudes) of an area (arcsecond^2) 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.

A sky quality monitor (SQM) does have limitations. As it has a small 10-degree point-of-view it can often omit the light pollution sources at the horizon which usually define the overall visual perception of a place. To overcome this, places can use other sources of evidence to describe sky quality.

Panoramic photography is used to show the location and impact of places within a landscape, but overhead satellite data which measures Visual Infra-red Radiometer (VIIRS) can be used. In the UK, the CPRE Night Blight dataset is often used and measures the luminance of the ground measured in Nano Watts per cm^2 per steradian. While there is no conversion between SQM and satellite data (one is measuring the sky brightness and the other ground brightness) there is good agreement between the two. Areas of darkness shown in satellite data will probably measure commensurate expected SQM values.

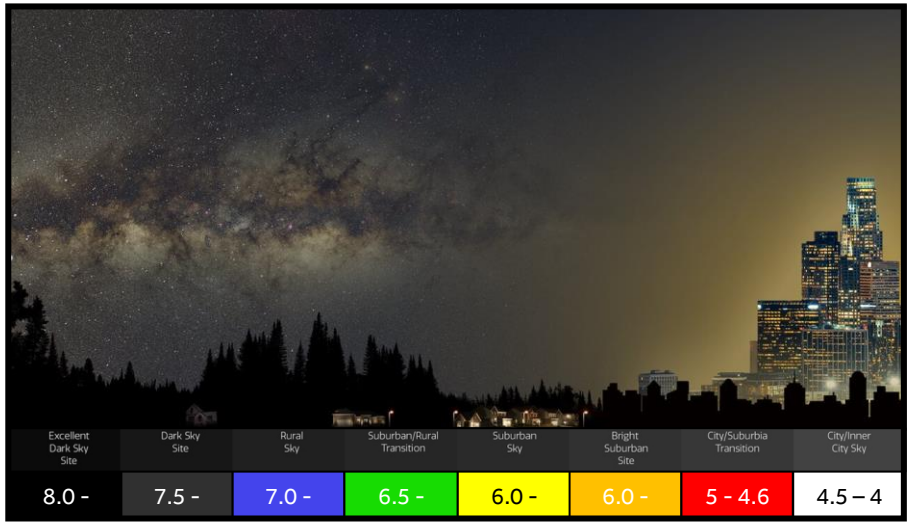


Figure 10 - Credit: NOIRLab/NSF/AURA, P. Marenfeld. Global sky conditions from city to the best dark sky sites. Bortle scale expressed in naked eye limiting magnitude has been added. Note that the Milky Way will start to become visible in the suburban sky, 20.5+

2.6 Dark Skies In South Oxfordshire and Vale of White Horse

The following image from the LUC datasets use VIIRS data to measure sky quality in the landscape. The maps measure the radiance emanating from the ground and is expressed in NanoWatts/cm^2/sr – which is a metric that descibes the radiant energy flux (Watts) emanting from a luminous area of the ground (m^2) in the direction of an observer (sr). The lower the numbner, the less ground radiance and the better the skies.

The maps show that there are areas of good sky quality across South Oxfordshire and Vale of White Horse where the Milky Way is visible.

Data from the CPRE Night Blight Mapping - which uses the same VIIRS data sets - allow protected landscapes to be ranked nationally. They are ranked acording to the quality of their sky quality with darker being higher ranked.

The data shows that The North Wessex Downs ranks 26th nationally with 15% of the landscape with the darkest ranking of skies <0.25 Nano Watts/cm^2/sr. The Chilterns ranks 30th nationally with 15% of the landscape with skies between 0.25 and 0.5.

Out of 326 districts in England, The Vale of White horse distrct ranks 95th with ~44% of skies < 0.5, 1.7% <0.25. South Oxfordshire ranks 89th with ~31% of <0.5 and only 0.1 of <0.25 highest quality dark skies.

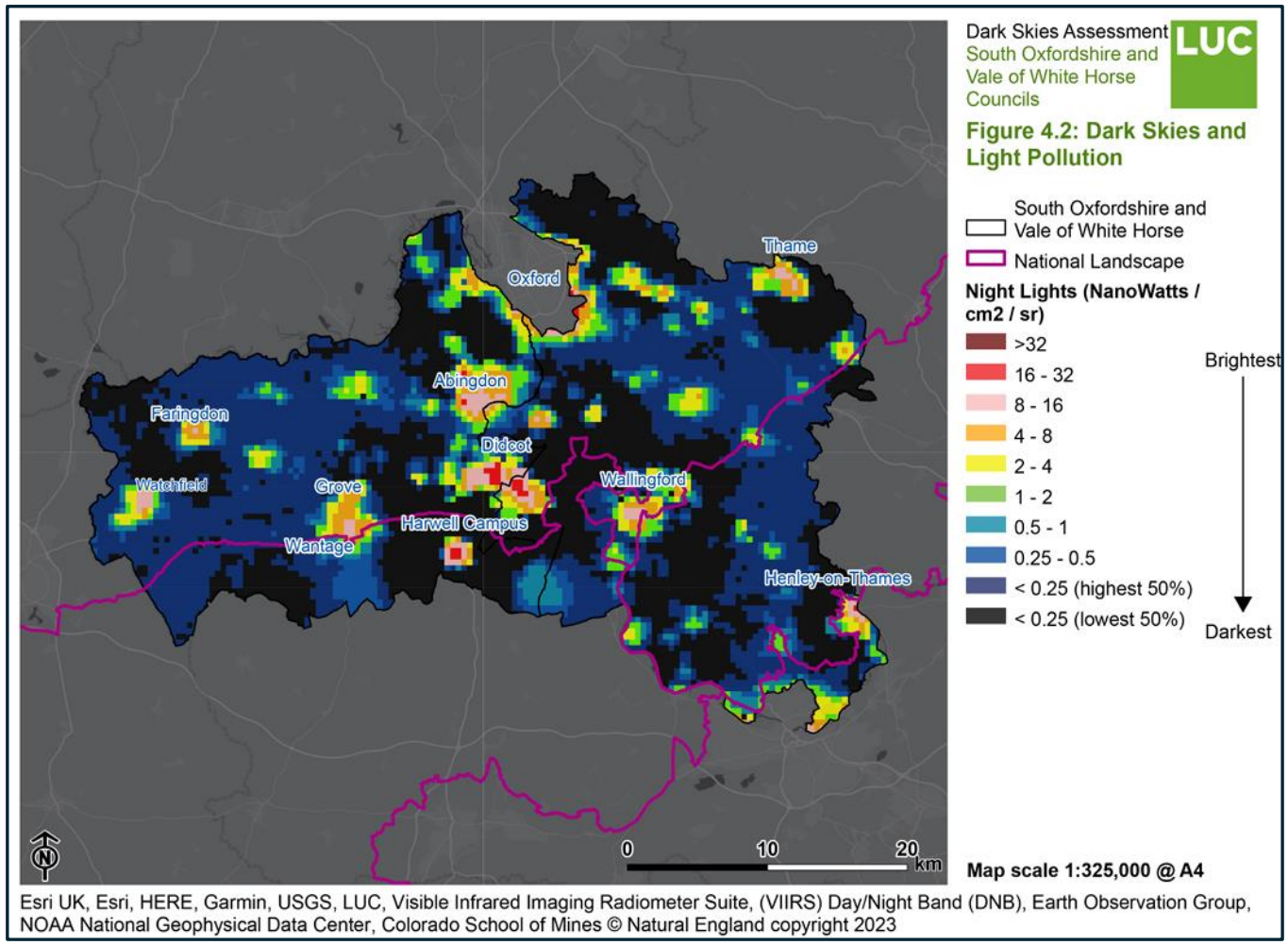


Figure 11 - VIIRS satellite data across the districts. From Dark Skies/Light Impact Assessment Methodology Report: LUC and Hoare Lea Jan 2024

2.7 Environmental Ambient Lighting Zones

The standard practice in external lighting design is to apply ambient lighting environment zones (E-zones) which separate different lighting areas according to the expected level of ambient and spill light. They recommend different lighting specifications for the sky conditions to mainly avoid obtrusive light to people (not landscapes). Due to the difference in ambient lighting and sky quality between urban and rural settings, different levels of obtrusive light are used within The Institution of Lighting Professionals guidance on the reduction of obtrusive light (GN01 ILP: 2021) This document should be referenced within a lighting design.

Zone	Sky Quality	Surrounding	Lighting Environment	Examples
E0	20.5+	Protected	Dark	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	**20 to 20.5**	**Natural**	**Dark**	**Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.**
E2	15 to 20	Rural	Low District Brightness	Sparsely inhabited rural areas, villages or relatively dark outer suburban locations
E3	<15	Suburban	Medium District Brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	<15	Urban	High District Brightness	Town / City centres with high levels of night-time activity

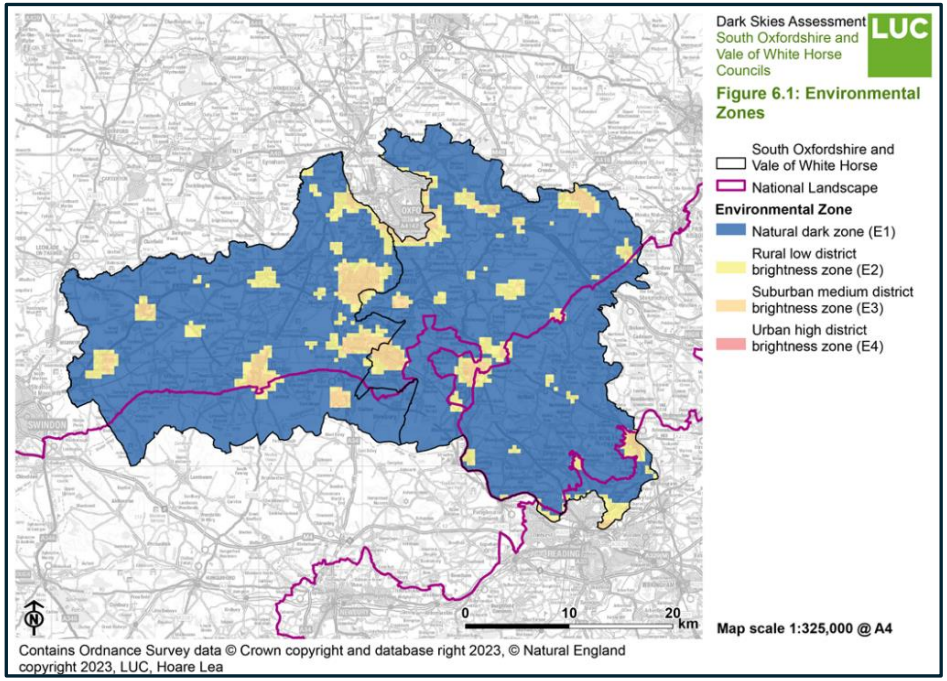


Figure 12 - Environment Zones of South Oxfordshire and Vale of White Horse. From Dark Skies/Light Impact Assessment Methodology Report. LUC and Hoare Lea Jan 2024

2.7.1 E-Zone – Appropriateness

The LUC methodology report provides suggested ambient lighting zones based upon satellite data. As the figure 12 shows, the districts mostly have areas of E1 zones with E2 and E3 zones in and around urban areas – streetlighting can be found in all these zones. While this establishes general zones, it does not reflect the level of lighting development and control that is sought by South Oxfordshire and Vale of White Horse District councils - protection of dark skies requires avoiding some forms of development in rural areas.

ILP GN01 2021 Table 7 has recommended levels of lighting for development within zones to minimise sky glow through the overall upward flux ratio[8]. This table shows, for example, that sports lighting within E2 zones can be expected in rural areas around urban centres (see section 3.4.9). However, sports lighting is not a preferred development type in these E2 (or E1) areas due to the landscape impact. Consequently, the objective of South Oxfordshire and the Vale of White Horse is to ensure development is appropriate and consistent with policy CE11 rather than installations expected within ILP GN01 2021 and the LUC Methodology report.

Additionally, as satellite sky quality data has been used to indicate expected light levels in E-zones, there is a further possibility that a lower or poorly on-the-ground measured level of sky quality included by an applicant may be recorded and justify the installation of E2 or even E3 lighting (sports lighting in a small village for example). This may present a significant and inappropriate risk to the dark landscape and the overall conservation of rural character.

IMPORTANT: INSTALLATION APPROPRIATNESS

Some installations may be initially justifiable in terms of sky quality under ILP GN01 or LUC methodology assessment, but they could present an unacceptable threat to Joint Plan Policy CE11 dark skies and the character of the landscape.

Only lighting installations that are appropriate and expected only to E1 zones within ILP GN01 2021 are preferred in all open rural spaces (E1 and E2) within South Oxfordshire and Vale of White Horse.

South Oxfordshire and Vale of White House District Council seeks to minimise the landscape impact of any inappropriate and uncharacteristic installations regardless of zone and supersedes other guidance's and assessments in this respect.

[8] Upward flux ratio is the combined light from the luminaire *and* the scattering of light from the surface. It differs from upward light ratio as this relates to individual luminaires not the entire installation.

2.7.2 E-Zone – Upward Light

GN01 ILP stipulates different levels of upward light, intensity, glare and building luminance for these zones, but in one important respect does not fully meet responsible artificial lighting at night recommendations. The upward light from luminaires is allowed to increase from 0 to 5% as urbanisation increases, with 2.5% allowable in rural E2 zones. This conflicts with zero upward light to meet policy requirements.

IMPORTANT: UPWARD LIGHT RATIO (ULR)

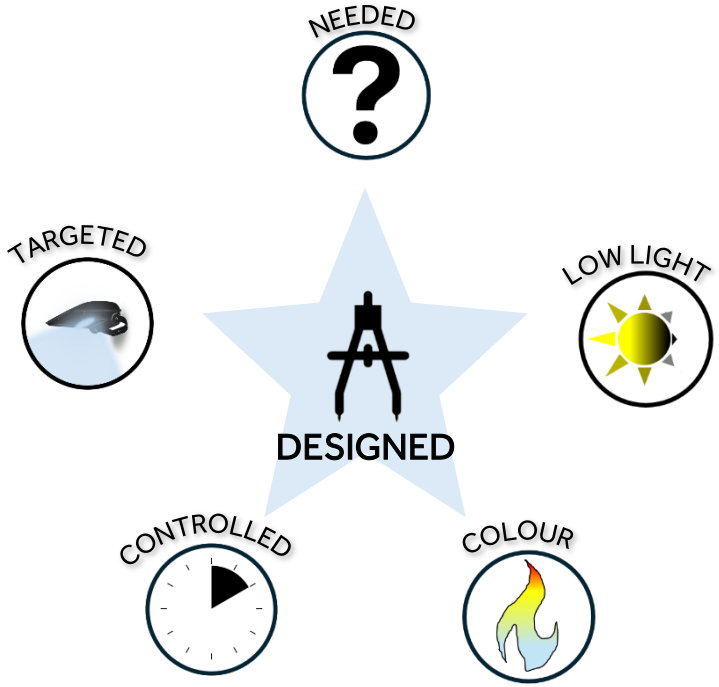
In all zones an installed upward light level of **ZERO** is sought in all cases, irrespective of ambient lighting zone. This is in contrast to the ILP GN01 guidance which allows positive values of ULR in E2/3/4.

South Oxfordshire and Vale of White Horse seeks development to have zero upward lighting in all cases and supersedes the ILP guidance and LUC methodology report zoning in this technical respect.

3 LIGHTING DESIGN TECHNICAL CONTENT

3.1 The Five Key Principles of Responsible Outdoor Lighting

Lighting installations should be **designed** to ensure they are fit for purpose and minimise impact. This does not necessarily require the services of a lighting designer, but there should be a process where lights are properly planned and installed. The design process should consider the main principles of responsible outdoor lighting to ensure all wider impacts of light pollution are reduced.



NEEDED

Lighting should be clearly justified, appropriate for the area with a clear purpose and benefit without presenting unacceptable intrusion.

TARGETED

Light should be directed to where it is needed and not spill into neighbouring spaces, or in a direction that causes a nuisance to neighbours, wildlife or the night sky.

LOW LIGHT

Light should be no brighter than necessary and provide appropriate illuminance for the activity.

COLOUR

Warm colour lights should be used to reduce the impact on sky glow, wildlife and human health.

CONTROLLED

Lights should be shielded at all times, dimmed or turned off when not required.

3.2 General Outdoor Lighting Checklist

USEFUL

- ☐ Is the light needed? -has the design fully justified the use of external lighting? (The reasons should be clear and evident, and critical to the development, e.g. access, safety and business needs)
- ☐ Has unjustified aesthetic and decorative lighting been avoided?
- ☐ Is the proposal lighting inappropriate in the landscape or potentially harmful to wildlife?

LOW LIGHT

- ☐ Do designs should use lowest light levels to achieve illuminance for the task and reference relevant standards, e.g. Sports England, BS Standards, advertisements.
- ☐ Are the fixings installed at the lowest possible height?
- ☐ Are the fixings "cut-off" or are baffles or shields provided if necessary to control ULR?
- ☐ Is calculated average illuminance within required %-age of recommended average?

To help assess the impacts of the lighting proposals on the dark skies in South Oxfordshire and Vale of White Horse, should ensure that proposals minimise adverse impacts, the following checklist is recommended.

TARGETED

- ☐ Has correct environmental zone been referenced and used in the lighting calculations?
- ☐ Do the designs shows that all luminaires achieve zero upward light (0% ULR)
- ☐ Does the luminaire schedule show compliant fittings with image or photometry?
- ☐ Do the design shows that light does not intrude into neighbouring areas?
- ☐ Has the local and wider landscape setting been considered in visibility and impacts of lighting?
  - Topography, existing vegetation
  - Nearby sensitive wildlife sites or ancient woodland
- ☐ Has an obtrusive lighting compliance statement been submitted using ILP guidance?

COLOUR

- ☐ Has colour temperature for each luminaire been provided? And CRI where appropriate?
- ☐ Colour temperature should be less than 3000K, ideally 2700K
- ☐ Luminaires should avoid 500nm wavelengths - lighting which emits an ultraviolet component or that has a blue spectral content can be particularly harmful to wildlife.

CONTROLS

- ☐ Has information regarding the proposed timing / curfew for proposed lighting been submitted?
- ☐ Do the controls reflect summer to winter variations, and have they been chosen to minimise adverse impact on dark night skies and on nocturnal wildlife?
- ☐ What are the proposed methods of control, e.g. automated timer or movement sensor?

The general checklist here, and the best practice specific checklists in the following sections, should be used and presented within a lighting proposal. They are useful in providing planners with the information on the compliance of key metrics.

3.3 Lighting Designs

The installation of external lighting will require design, planning and the submission of key information to planners to assess. The level of detail and scope of inclusions needed to produce a complete design does, however, depend upon the level of complexity of the development and if a lighting designer has been used. Lighting designers are usually required to calculate obtrusive light calculations, provide plans, illuminance levels and provide nighttime assessments using professional software – this is not always appropriate to simple designs and can be expensive.

A lighting designer may not be appropriate in all circumstances and may not be necessary if you are confident, you can install compliant and appropriate lighting yourself. Simple designs that feature simple plans, low number of lights in smaller areas can be submitted provided key elements are provided for planners to check the lighting compliance.

The level of detail and inclusions within a lighting design is proportionate to the scale of the development. Proposals should ensure that sufficient inclusions are provided to enable a determination – more information may be requested by planning officers should further information be needed.

3.3.1 Simple Lighting Installations

For simpler lighting installations you may do yourself, it does not need all the elements of a more complicated design prepared by a lighting designer.

The key information to include will be

- Checklist compliance
- Images of the luminaire – ideally as expected on installation
- The colour temperature, CCT
- The power output, lumens and watts
- How it will be installed to achieve zero light
- Where it will be installed – basic site plan
- Any controls or timers being used
- How many lights

Much of this information will probably be on the product website either as listed or under the 'specification' tables. Sometime a separate spec sheet is provided like this example. There is sufficient information provide to show that this domestic light is dark sky compliant - <500 lumens, 3000K and zero upward light.

Figure 13 - Example Luminaire specification for a wall lighting (Nitelux). Note that the datasheet has information on lumens, power, colour temperature and shows that zero upward light can be achieved upon installation.

3.3.2 Professionally designed lighting installations

Lighting installations that are more complex and need precise calculations of obtrusive light, illuminance and nighttime impact should be created by a qualified lighting designer[9]. A design should contain essential assessment 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. A design should not only describe the lighting details and plans but should show how it complies with the responsible lighting principles and checklists in this document and how it protects the night sky and wildlife.

Planners will need to quickly and clearly understand how a lighting design 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 impact, and use the checklists to show compliance.

The more clearly you can show this information with a design, the better.

It is highly recommended that key checklist items (illuminance levels, upward light, colour temperature, etc) are clearly marked and highlighted. This will make a planning officers job much easier and will reduce the possibility of delays clarifying this information.

For more prominent or complex designs a lighting design should include and make clear the key checklist items to planning officers and reference 'PLG 04 – Guidance on undertaking environmental lighting impact assessment'. The level of detail will largely depend on if the installation, its location and impact. It will require the services of a lighting designer.

Note that for small and minor domestic lighting, a designer may not be required, in which case some basic technical content should be included, such as upward light, basic plans, colour temperature, product images and any controls. Illuminance calculations are not required for minor domestic fittings.

Table 1 - Recommended design elements based on ILP: PLG 04

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 • Design objectives and task requirements • Relevant guidance, standards and legislation that relate from local to landscape • Task calculations • Obtrusive light calculations • Luminaire schedules and installation plans • Luminaire specifications (lumens, CCT, CRI, spectral distribution) • Renditions
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 through a **night-time visual impact assessment**.
6	**Potential mitigation**	A description of any potential mitigations used, including curfews, reduced illuminances, or shielding
7	**Checklist**	The relevant best practice development type should be included
8	**Conclusions**	A summary of the report covering installation and operational phases. This should include the main technical requirement, summary checklist and be clearly presented to a planner.

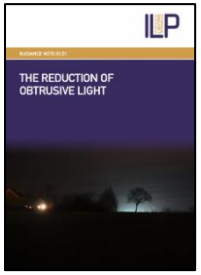
[9] Lighting consultants can be found Directory | Lighting Journal

3.4 Lighting Design Elements (Designer Produced)

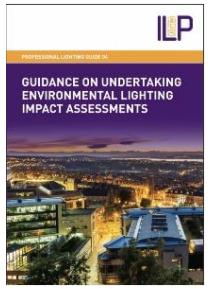
A professional lighting design should include some key elements for assessment. While there is some variance on the functionality of the software being used, there are some essential elements that should be included. For the ease of understanding and assessment by planners, it is highly recommended that designers ensure that this information is prominent and easily accessible to the reader. A qualified lighting designer will have no problem in providing most of this information.

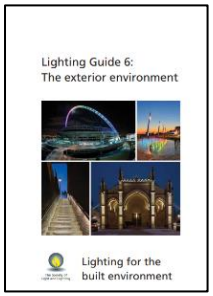
3.4.1 Key lighting reference documents

The advice in this guidance and a good lighting design will require the reference of key documents. They should form the initial basis for developing a lighting design. Many of the policies within this guidance are based upon the information within these documents.



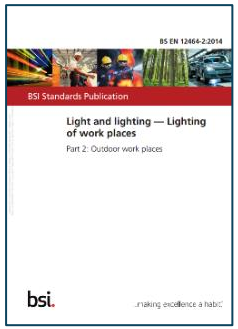
Both ILP documents Guidance on Undertaking Environmental Lighting Impact Assessments PLG04 and The Reduction of Obtrusive Light GN01/21 GN01 and PLG 04 are fundamental documents for lighting designs. Other ILP guides (see appendix) are also useful.





CIBSE: SLL: LG06: The exterior environment (2016) This provides the reader with a firm foundation from which to approach exterior lighting design.

British standards on lighting in workplaces BS-EN 12646-2 and roads BS 5489-1 should be referenced to ensure correct illuminances.



3.4.2 Baseline Information

Details of any existing lighting within the proposal should be included – this is often useful to look for opportunities to improve poor lighting. Nearby sources of light, e.g. villages, floodlit facilities, should be indicated to provide context upon the overall setting. Night-time photography from a number of viewpoints should also be included for most non-domestic proposals.

Light pollution maps provided within LUC and Hoare Lea (Jan 2024) Dark Skies/light Impact Assessment Methodology Report which can also be found on the Joint Local Plan Policies map, are useful to provide some background information on the setting and the wider environment. CPRE Night Blight datasets and lightpollutionmaps.info are also useful.

Sky quality can be provided either through lux levels or sky quality monitors, but this will not impact on the need to use luminaires that achieve zero upward light. If a sky quality monitor is used, the methodology used by DarkSky International should be used.

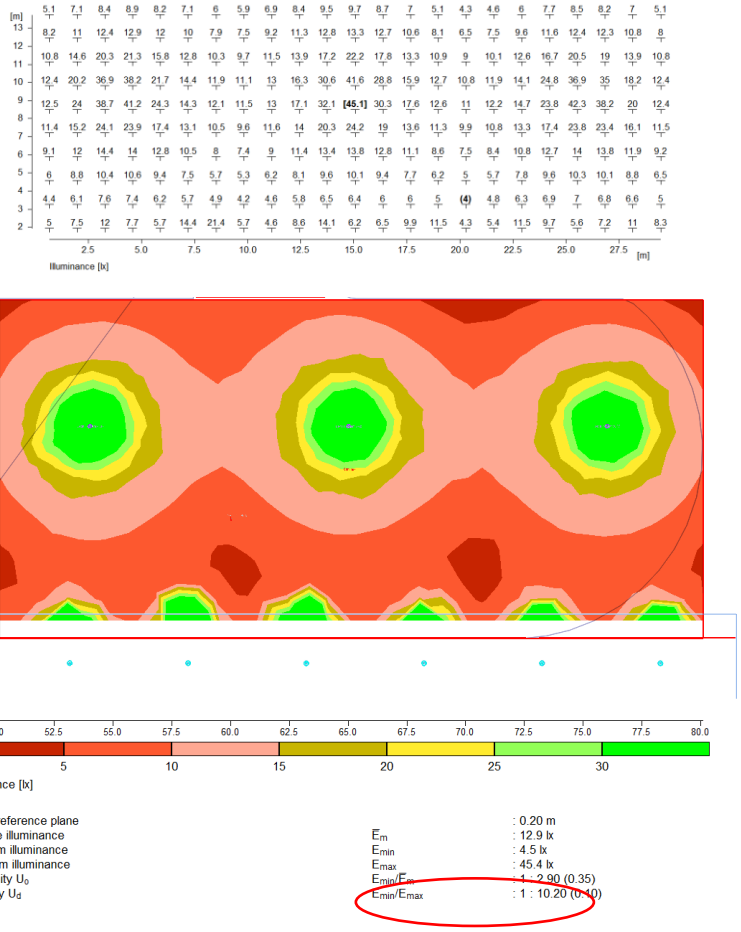
Figure 14 - Baseline elements: Photography, Sky Quality data from satellites and SQM

3.4.3 Illuminance Calculations

Designs should include calculation details of the illuminance levels used within the task areas. They can either be tabular, isoline or coloured contours. Ensure that the **reference illuminance standard** and **the calculated average** E_{min} is highlighted.

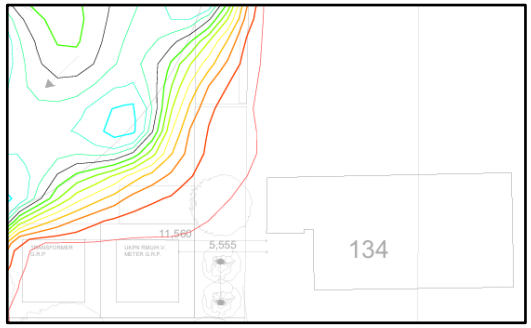
Calculated average illuminance should be designed to be with a percentage tolerance of the recommended average illuminance level:

- **10% for amenity lighting**
- **25% for sports lighting within 25%.**



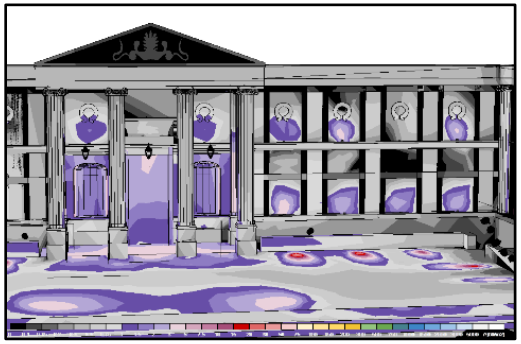
3.4.4 Light Spill in Neighbouring properties

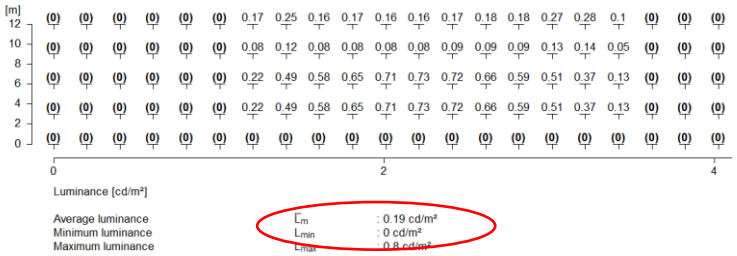
For designs that may pose a threat to nearby properties or wildlife areas, wider illuminance plots that show the light spill into these areas should be calculated. Confirmation of the vertical light spill into premises should be shown. The light spill should be referenced against GN01 for the appropriate E-zone.



3.4.5 Luminance Calculations

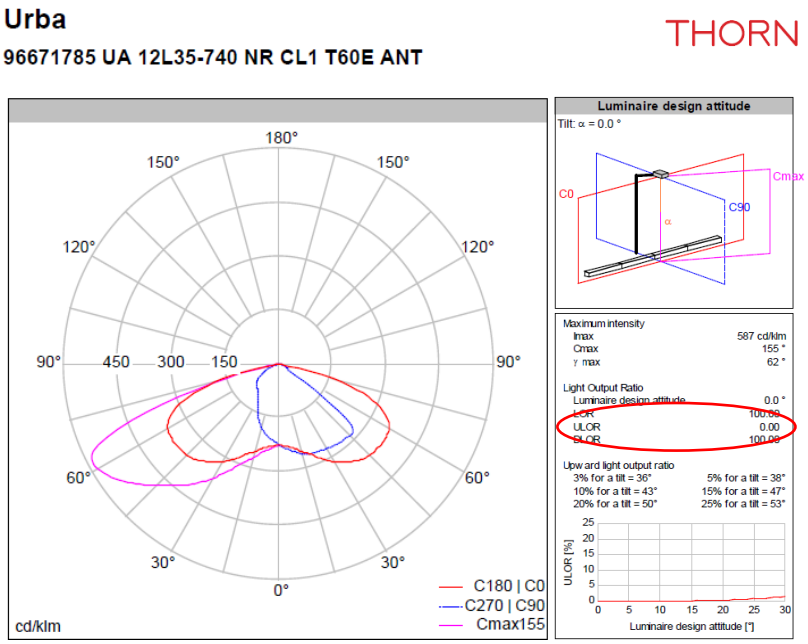
For specific building façade illumination only, designs should include luminance values in either tabular or contour form. The luminance should be referenced against the GN01 for the appropriate E-zone. Lights mounted on walls that illuminate the ground should not need to provide this information. **Average illuminance** L_m for the building area should be highlighted.



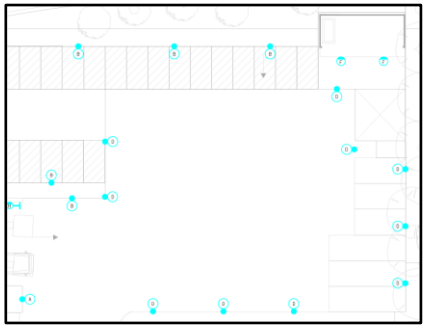


3.4.6 Luminaire schedule

Details of all luminaires should be provided. This should include details on upward light, lumen output and colour temperature *after installation*. Where possible Isometric polar plots (that indicate upward light) should also be provided and highlighted. Images of the luminaires are extremely useful and should be included.



3.4.7 Luminaire Plans



The position and installation details of the luminaires (tilt angle) should be provided, preferably in plan or elevation form. Tabular X-Y coordinate representation should not be included. Different types of luminaires should be indicated. A combined luminaire and tree plan should also be provided to help eliminate physical conflicts between these two elements of design. Oxfordshire CC guidance generally states a 10m offset between column and trunk depending on lighting directionality.

3.4.8 Colour renditions.

3D renditions should be provided where proposals are complex, have a number of different illuminance standards and task areas. They are useful in showing the overall lighting character particularly within an overall night-time landscape Internal Spill.

3.4.9 Nighttime Landscape Impact and appropriateness

While a lighting installation can comply with all aspects of the technical specs and minimise light pollution as far as reasonably practicable, the presence of the lighting itself may cause an inappropriate visual nighttime landscape impact. Unfortunately, as there is little wider guidance and what is specifically inappropriate in landscapes, some level of assessment is needed.

ILP PLG04 '[Guidance on Undertaking Environmental Lighting Impact Assessments]', section 9, also refers to wider considerations as 'residual' impacts - rated from negligible, minor, moderate and major significance. This risk assessment-based methodology requires additional mitigations to reduce residual impacts. However, even after all practical mitigations have been considered the remaining lighting presence may still present a significant lighting threat particularly in a dark landscape. In these cases, developments may require re-design or outright rejection.

ILP GN01 *Table 7 Maximum values of upward flux ratio of installation* provides some indication of appropriate lighting in different places. Only road lighting (of four luminaires or more) is appropriate in E1 zones.

Light Parameter	Type of installation	E0	E1	E2
Upward flux ratio %	Road	n/a	2	5
	Amenity	**n/a**	**n/a**	**6**
	Sports	**n/a**	**n/a**	**2**

Some installations may constitute a significant landscape impact and may not be appropriate regardless of lighting compliance.

The assessment of what constitutes an acceptable level of lighting or 'significant' impact is difficult as it depends on a wide range of factors that alters the visual perception and contrast of the sources. Factors would include;

- Illumination levels
- Mounting height
- Glare
- Aspect, area and extent
- shielding
- Background ambient light

Using the general level of preferred development within South Oxfordshire and Vale of White Horse it is possible to use a level of maximum illuminance to provide some basis for determining the level of inappropriateness. Using this, a maintained average of **10 lux**[10] threshold (using four or more luminaires) can be set to indicate when illuminance levels and the residual impacts are becoming more inappropriate.

Additionally, based on a recent planning inspectorate decision[11], additional factors can be added to provide some indication of what types of development constitute negligible, minor, moderate adverse impacts. From this reference, the introduction of a maintained average illuminance of **10 lux** does at least provide a 'minor' significance level of landscape impact, but this is highly dependent upon the extent, visibility and location of the design. Although every case will be different, **developments with a 'minor/moderate' adverse impact may be introducing inappropriate adverse harm to a dark landscape depending upon the setting and sky quality.**

While these are not rigid definitions of what is acceptable and may not apply to more sensitive areas, they should act as a general indication and guide to inform planners and designers as to what could be an inappropriate lighting impact given the typical character of the landscape.

Using the terminology in ILP PLG04, some examples are provided in the following page, assuming all design specifications are already met and lighting is compliant. The list of examples is not exhaustive but serves to include typical proposals in rural areas.

[10] 10 lux is the recommended illumination level for a small rural car park (I.L.E Engineer guide).

[11] Appeal Ref: APP/Y9507/W/22/3308885 29 March 2023

A lighting designer should prepare a nighttime landscape assessment to include;

- Baseline Nighttime photography from prominent views
- 3D rendered software representations.
- If possible – a calculation of the upward light flux GN01.[12]
- A residual landscape risk impact based upon PLG04 Table 12 is applied but after all mitigations have been included.
- Summary of nighttime landscape impacts

3.4.10 Guidelines for Landscape and Visual Impact Assessment (GLVIA)

Guidelines for Landscape and Visual Impact Assessment (GLVIA) should also be used when assessing the landscape and visual effects of lighting. The qualitative and quantitative assessments produced by the lighting designer should be used to inform the qualitative assessment of the effects of the predicted light which forms part of the Landscape and Visual Impact Assessment process. Any effects from internal light spill from glazing should also be included in the assessment.

Proposals that are likely to result in significant effects on the landscape and/or views and visual amenity will require a Landscape and Visual Impact Assessment (LVIA) to be undertaken. For smaller scale proposals a full LVIA may not be required in these instances a proportionate landscape appraisal can be undertaken. The District Council should be consulted with respect to the type of assessment required. In all cases the assessments should follow the methodology set out in current GLVIA guidelines.

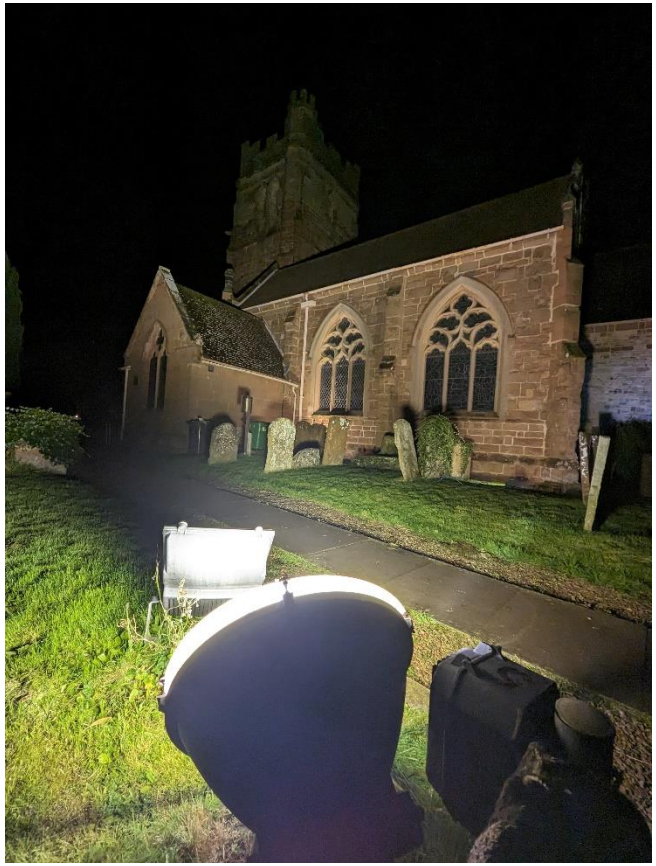
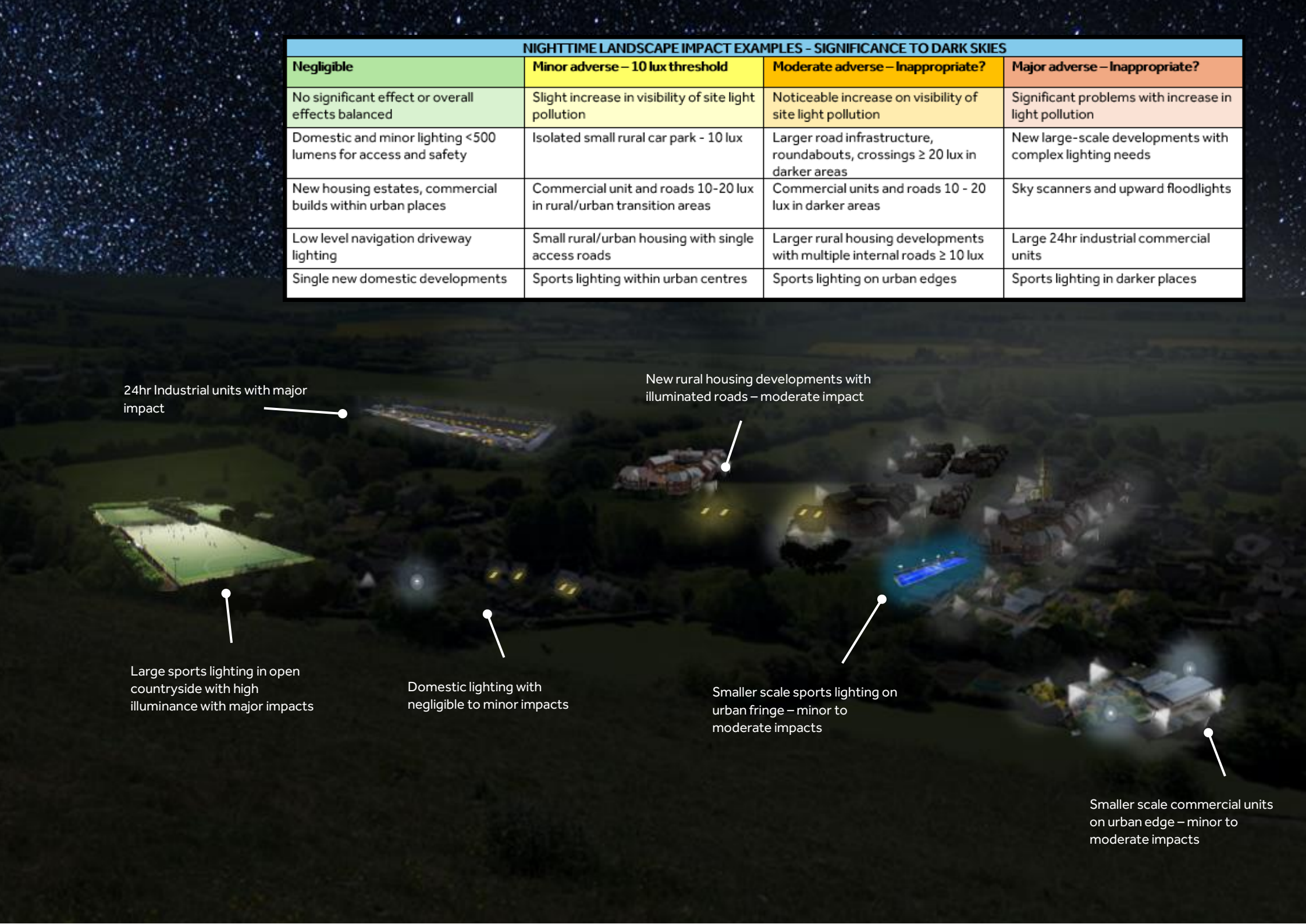


Figure 15 - How not to illuminate. Inappropriate luminaires used to illuminate a heritage asset with significant landscape impact (not in Oxfordshire). Credit Dan Oakley

[12] This is difficult to do even with mainstream lighting software and may not be included or even possible to produce.

NIGHTTIME LANDSCAPE IMPACT EXAMPLES - SIGNIFICANCE TO DARK SKIES			
Negligible	**Minor adverse – 10 lux threshold**	**Moderate adverse – Inappropriate?**	**Major adverse – Inappropriate?**
No significant effect or overall effects balanced	Slight increase in visibility of site light pollution	Noticeable increase on visibility of site light pollution	Significant problems with increase in light pollution
Domestic and minor lighting <500 lumens for access and safety	Isolated small rural car park - 10 lux	Larger road infrastructure, roundabouts, crossings ≥ 20 lux in darker areas	New large-scale developments with complex lighting needs
New housing estates, commercial builds within urban places	Commercial unit and roads 10-20 lux in rural/urban transition areas	Commercial units and roads 10 - 20 lux in darker areas	Sky scanners and upward floodlights
Low level navigation driveway lighting	Small rural/urban housing with single access roads	Larger rural housing developments with multiple internal roads ≥ 10 lux	Large 24hr industrial commercial units
Single new domestic developments	Sports lighting within urban centres	Sports lighting on urban edges	Sports lighting in darker places



4 BEST PRACTICE ADVICE GUIDES

4.1 Minor and Domestic Lighting Developments

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

- Minor and Domestic Lights
- Internal light spill through glazing.

The technical requirements for domestic lighting are quite simple and follow the 5 main principles. The key environmental E-zone criteria can be met provided domestic lights are designed to the following criteria, however the impact of domestic lighting on landscape character should also be taken into account. Consider if lighting is necessary, then;

- Aim for 500 lumens or less with <3000K or less
- Fully shielded above 500 lumens
- No greater than 1500 lumens
- Fitted with proximity sensors.
- Pointed where it is needed and not beyond the property.

Figure 16 – Five lighting principles -postcard from UK Dark Sky Partnership

Minor Lights Checklist for Planners, homeowners, and applicants

NEEDED

- ☐ Is the lighting needed and justified?
- ☐ Has unnecessary decorative lighting been avoided?

TARGETED

- ☐ Do lights point where they are needed?
- ☐ Are any lights above 500 lumens fully shielded?
- ☐ Is illumination beyond the property or wildlife avoided?

LOW LIGHT

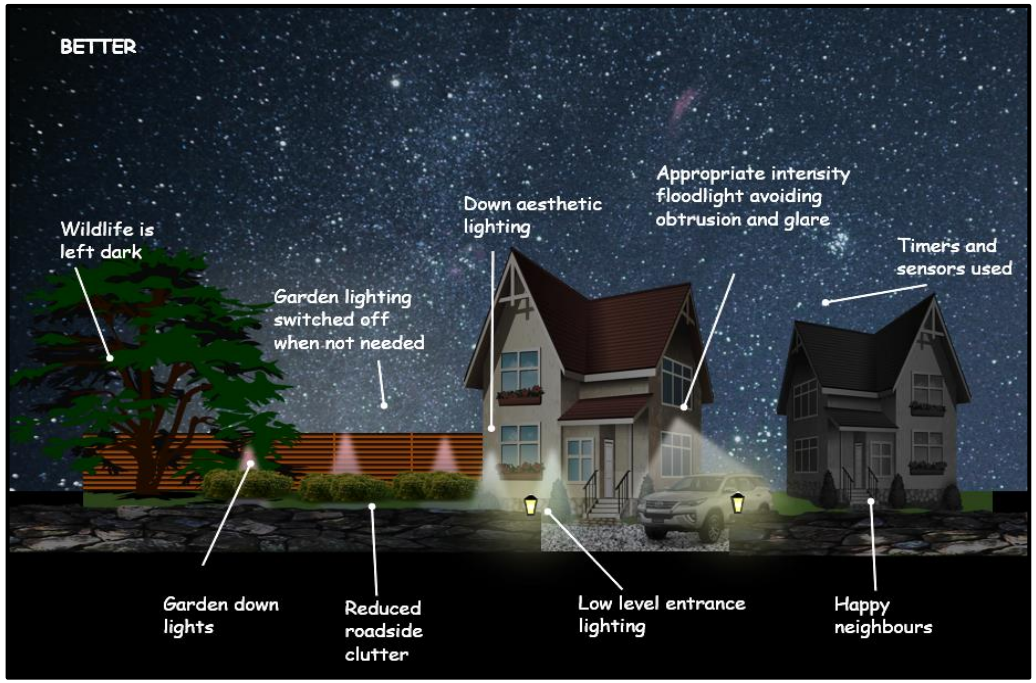
- ☐ Lights with 500 lumens used?
- ☐ Are lights above 1500 lumens avoided?
- ☐ Are the fixings installed at the lowest possible height?

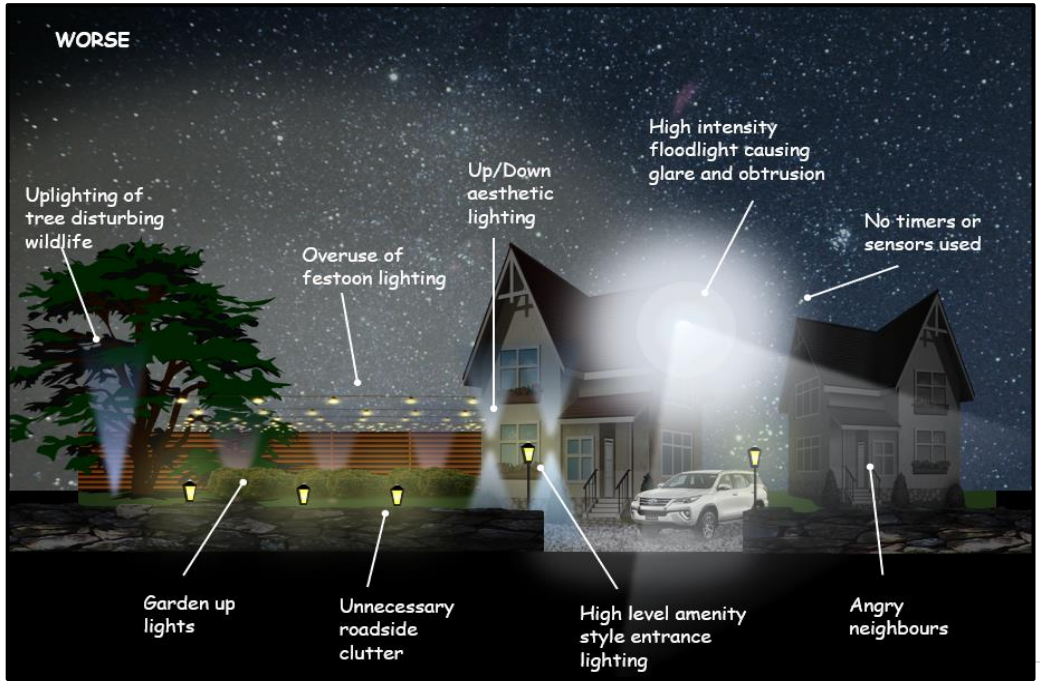
COLOUR

- ☐ Do the lights use 3000K (Warm white) and lower?

CONTROLLED

- ☐ Do the lights use PIR sensors or controlled timers?
- ☐ Are dusk-till-dawn lights avoided?





Key Considerations

4.1.1 Nuisance to neighbours

Badly installed lighting can annoy your neighbours. To avoid this, 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.

4.1.2 Over lighting in domestic luminaires

While it is tempting to get the best value, many domestic options are over bright and too powerful for most domestic uses. You do not need more than 1500 lumens and 500-1000 will be sufficient for most domestic uses. Residential streetlights operate at their lowest setting ~ 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.

4.1.3 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.

4.1.4 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 in use.

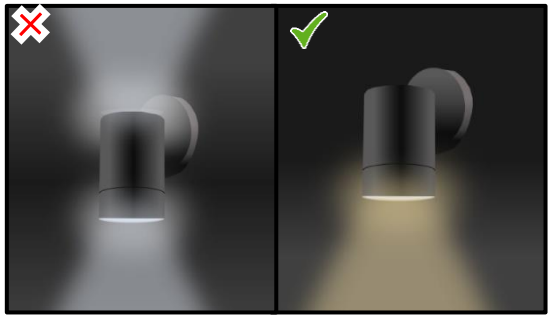
Luminaire Advice for homeowners

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.

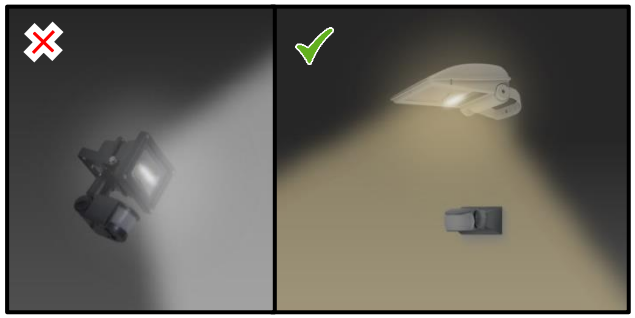
These can be difficult to find so ensure a light of less than 500 lumens or choose an alternative historical design.

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 aesethetic quality with a down lighter.

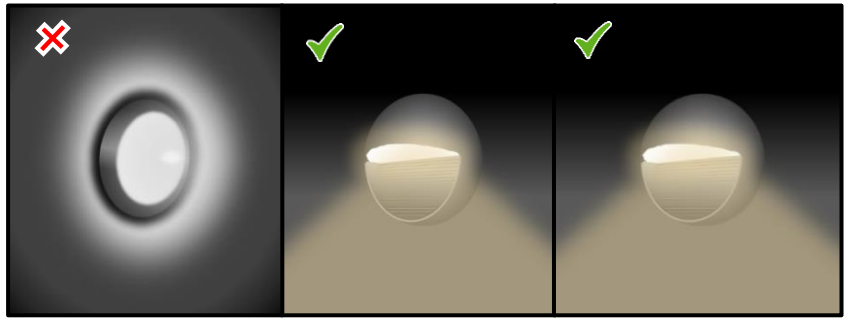
Halogen Luminaires and PIR Sensors



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.



4.2 Internal Light Spill

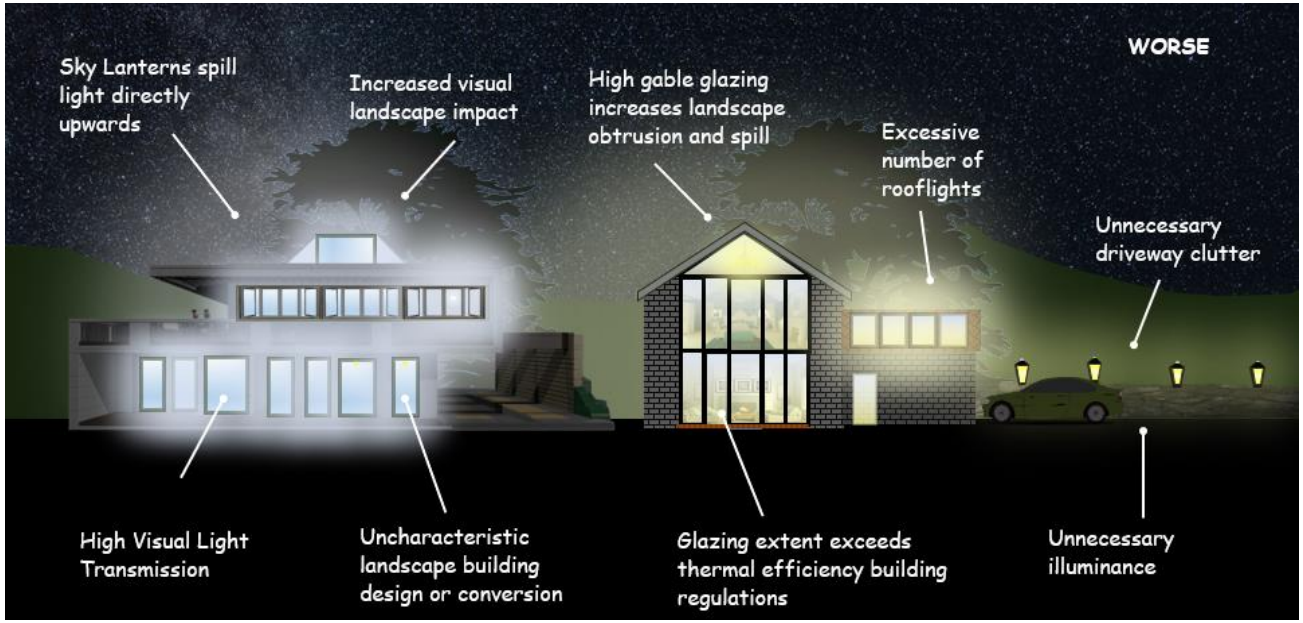
Internal light spill through domestic glazing can have a greater impact on the landscape than external lighting. If glazing is excessive, of poor quality or points upwards such as rooflights, internal light can present obtrusive light sources that reduce dark skies and disrupt the continuity of the landscape.

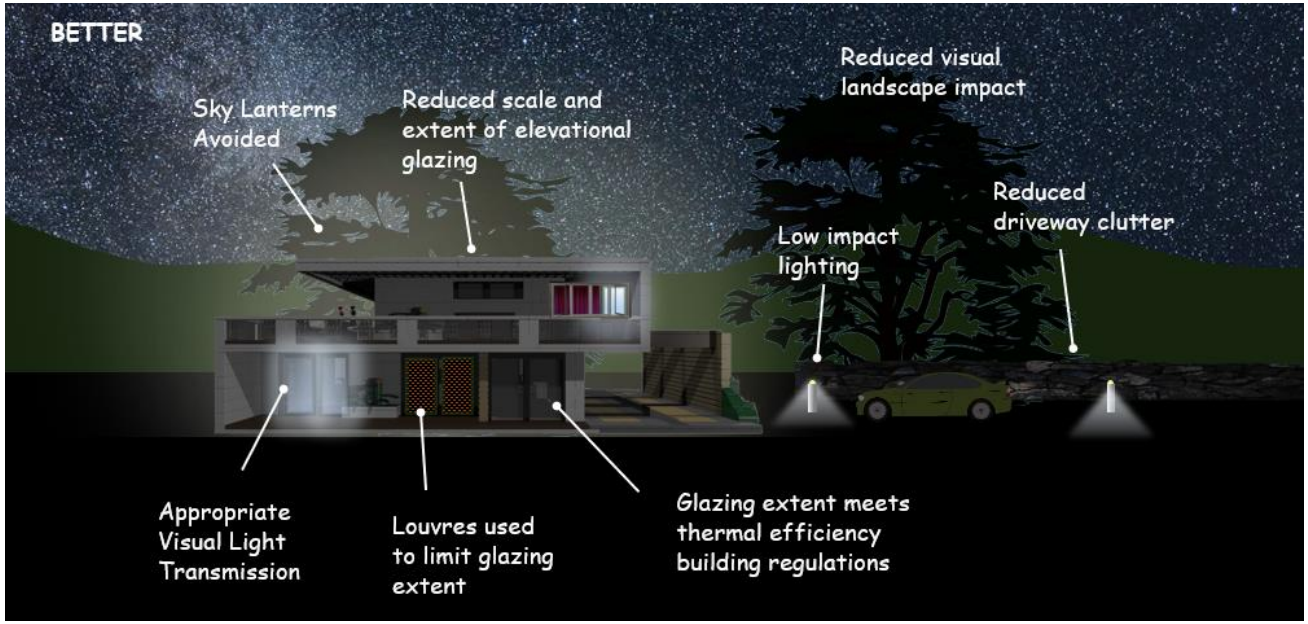
Generally, the loss of overhead sky quality is not as severe as it can be for external lighting, but as the extent of the light occupies a greater area than that of a single lamp it does have greater potential to disrupt the quality of the landscape. However, it is within the control of residents to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

Glazing on commercial and business properties will also have a similar impact which can be more pronounced in rural areas. Internal spill should first be controlled by design. Behaviours that limit light should be encouraged however these are often outside the planning system and should not be relied on as mitigation – turning lights off at close of business and using blinds/curtains.

Due to the difficulties of control with internal light spill, proposals should look to follow the following general design principles, in order of priority;

- Avoid excessive glazing on elevations
- Avoid the need for roof lights
- Use appropriate visible light transmission
- Mitigate with internal control systems





Key Considerations

4.2.1 Excessive Glazing – Landscape Impact and character Design

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 reducing this impact by adopting a more characteristic design process and reducing the extent.

4.2.2 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 L1to 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.

4.2.3 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 +/- 0.05 is preferred with 0.5 for roof lights. These values are within the standard purchasing options for these glazing types.

4.2.4 Black out blinds/Louvres

The use of automated black out blinds can considerably reduce the amount of internal light spill from roof lights and should be the last mitigation after other design considerations are met. 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.

Figure 17 - The visual impact of internal light spill (imaged brightened for printing). Credit Dan Oakley

4.3 Housing Developments

New housing developments proposed in the rural villages within the districts have the potential to create light pollution and adversely affect dark skies in a number of ways including light spill from the dwellings themselves but also from street lighting and any amenity lighting.

4.3.1 Location of development and layout

Light pollution should be considered at the site allocation stage or within a development suitability assessment. Highly visual exposed sites such as those on higher elevations or in close proximity to ecologically sensitive areas should be avoided. Layouts should seek to minimise adverse lighting impacts by the appropriate orientation of streetlights, buildings and road junctions to protect wildlife-rich sites and urbanisation on rural settlement edges.

4.3.2 Street Lighting & Amenity lighting

While Highways Authorities have a duty of care to the road user, there is no statutory requirement on UK local authorities to provide public lighting. The Highways Act 1980 empowers a highway authority to provide lighting for any highway or proposed highway for which they are, or will be, the highway authority.

Uncharacteristic streetlighting should not be considered as required in all cases and should be avoided where possible. Oxfordshire County Council's Street Design Guide and Street lighting Policy can be used to determine design parameters. If a development requires street lighting which is to be adopted by the local Highways Authority, or private management company the potential for lights to be controlled by dimming or part night schemes should be explored. This is particularly important with lighting in dark areas or on the edge of urban settlements that point to dark zones.

To avoid over lighting, calculated average levels of illuminance should not exceed ~10% tolerance of the recommended levels.

Housing Development Checklist

NEEDED

- ☐ Is the lighting needed and justified?
- ☐ Has unnecessary decorative lighting been avoided?
- ☐ Are the developments located away from dark sky sensitive areas, e.g. ancient woodland wildlife-rich sites and habitats?

TARGETED

- ☐ Do lights pointing where they are needed?
- ☐ Are any lights above 500 lumens fully shielded?
- ☐ Is illumination beyond the property or wildlife avoided?

LOW LIGHT

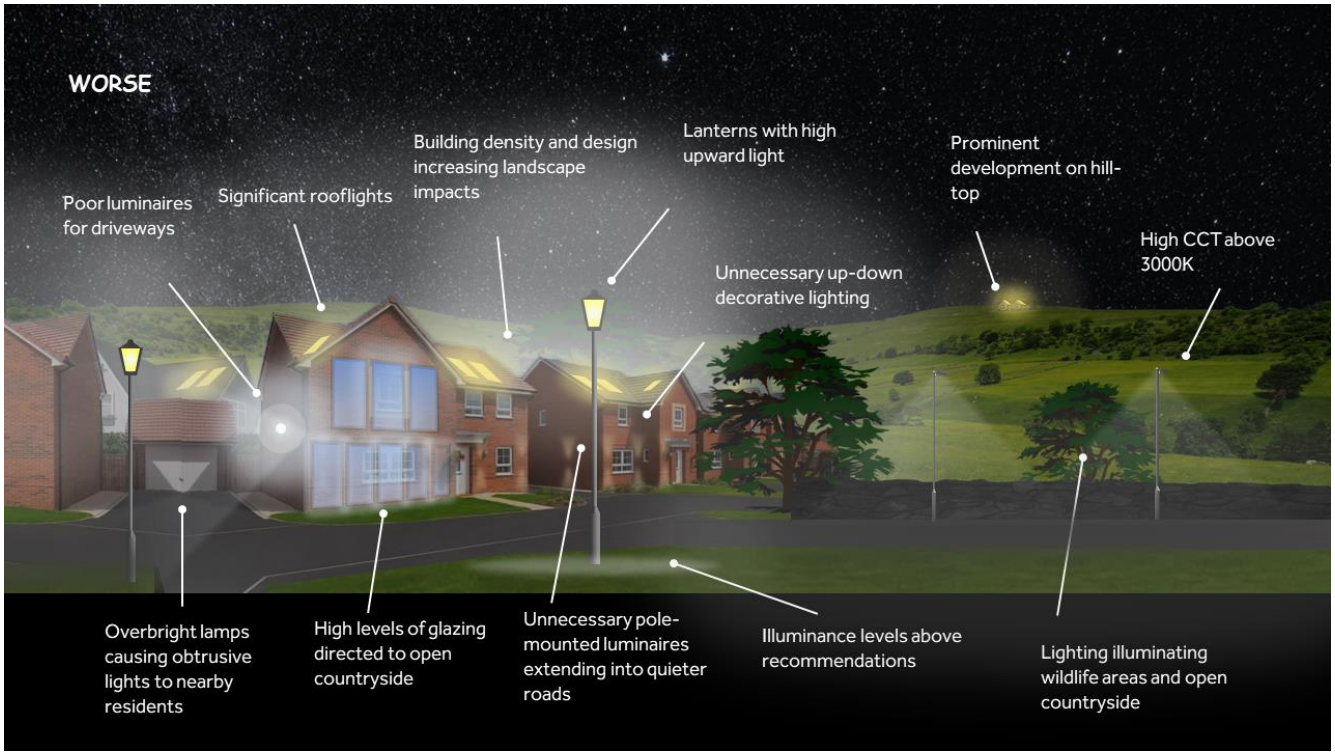
- ☐ Lights with 500 lumens (~5W LED) used?
- ☐ Are domestic lights above 1500 lumens avoided?
- ☐ Are the fixings installed at the lowest possible height?
- ☐ Are Illuminance standards for good lighting referenced and within ~10% of recommended levels?
- ☐ Does the development avoid unacceptable landscape impacts?
- ☐ Are adaptive illuminance levels appropriate?

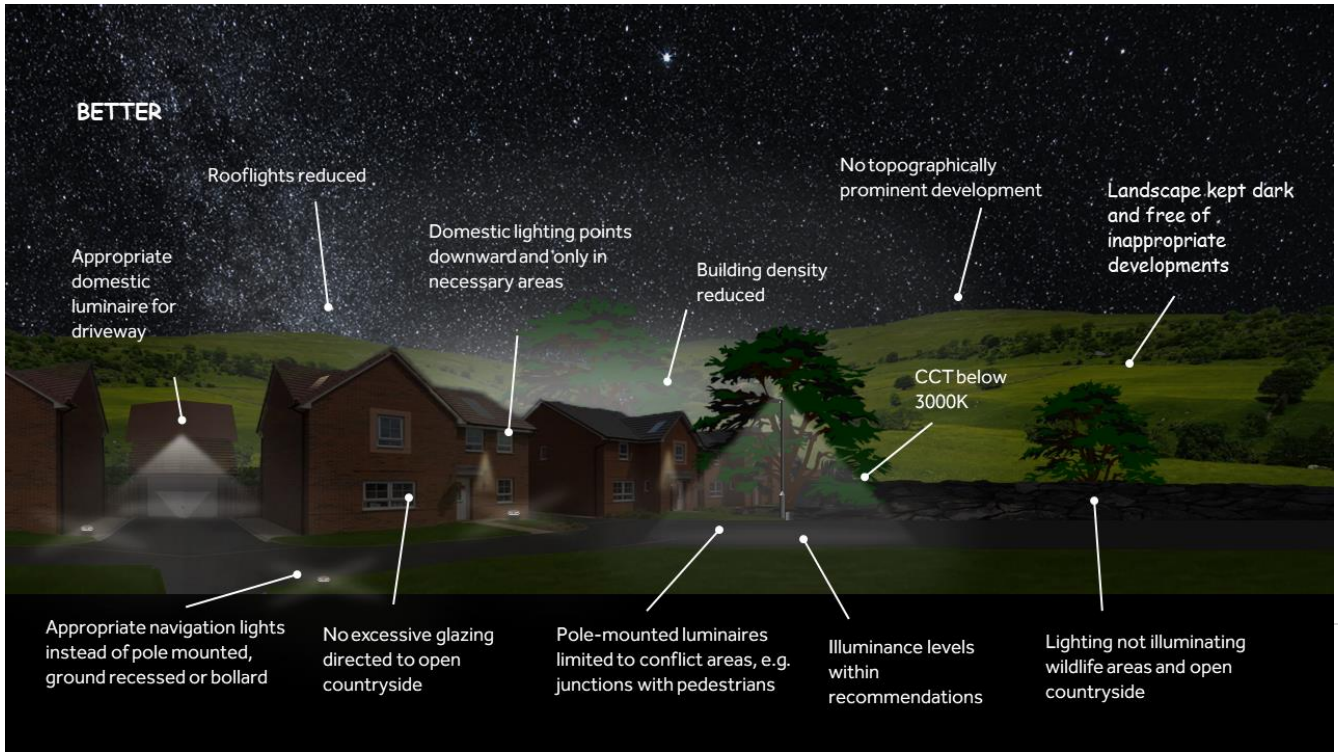
COLOUR

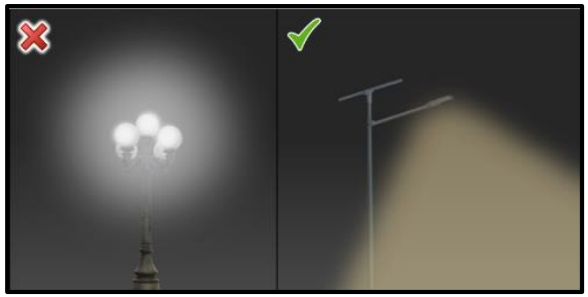
- ☐ Do the lights use 3000K (Warm white) and lower?

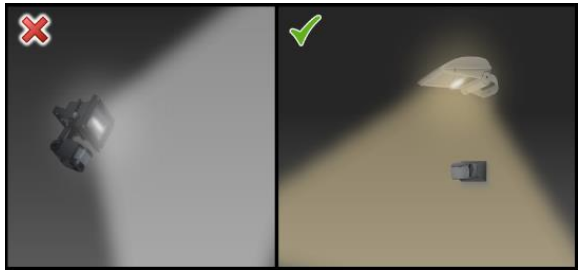
CONTROLLED

- ☐ Do the lights use PIR sensors or controlled timers?
- ☐ Is part night lighting or dimming used?

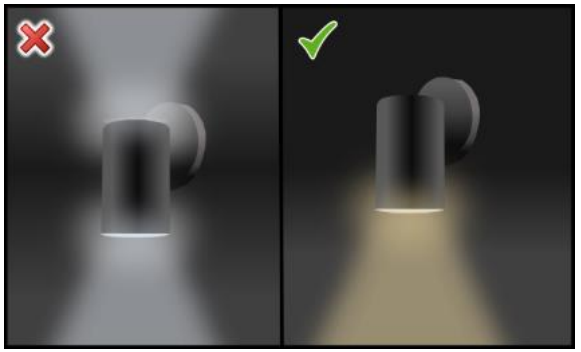








- **PIR – Proximity sensors should be installed separately as this avoids lights that cannot be tilted. The sensor should be fitted in a place to avoid the unnecessary triggering by wildlife.*



Key Considerations

4.3.3 Size and layout

The larger the site, the higher level of light pollution will be produced. More dwellings will require more domestic lights and internal sources and more roads potentially requires more streetlights. Larger developments may also generate 'conflict areas' where pedestrians and faster moving traffic share similar spaces – these areas often require column mounted streetlights.

To avoid these issues, the size, orientation and layout of the developments should be carefully considered at the very earliest stages of allocation and design to ensure that the need for higher levels of lighting and their prominence is avoided.

4.3.4 Column mounted luminaires

The use of streetlighting should not be required in all cases and avoided where possible. Where possible and where crime levels allow, column mounted street light luminaires should be avoided with a preference for lower lumen and low height luminaires such as bollards or ground recessed fixtures. Streetlights on high columns will be more noticeable in the landscape and will be producing higher levels of luminous flux anywhere from 3000 to 10,000 lumens for most residential purposes.

Lower height luminaires such as bollards and ground recessed lamps offer alternatives to areas where navigation is more important than luminous surfaces. However, the use of these types of luminaires must be carefully weighed against the need for required BS5489:2013 illuminance levels in key areas, maintenance and the possibility of damage.

4.3.5 Dwelling Character and glazing

The choice of modern style buildings and architectural fashions can produce dwellings with higher levels of glazed surfaces. While rooflights can be managed through extent and automated black out blinds, it is preferable that new development proposals reflect the local South Oxfordshire and Vale of White Horse building character that traditionally adopts lower levels of glazed surfaces.

4.3.6 Adaptive Dimming and part night lighting

Dimming or part night lighting schemes should be considered in any size housing development. Analysis of expected traffic volumes should inform the use of reduced illuminance levels throughout the night. For example, where traffic levels allow, illuminance could be lowered from 10 to 5 lux during hours of limited use. This is particularly relevant to brighter lit conflict areas that may benefit from reduced illuminance in low traffic times. PIR sensors are an additional option to use and ensure lights are only on – or made brighter – when needed. They should be installed separately and placed in areas that avoid wildlife routes.

In some circumstances part night lighting may also be explored as an option. This is not just beneficial to light pollution but will also reduce energy costs.

4.3.7 Developer Marketing

A housing estate that has a low impact and compliant lighting will benefit the surrounding countryside and wildlife. Being able to promote the development as sympathetic housing with access to nocturnal wildlife areas may offer the means to market the sale of properties more effectively. Prospective owners may prefer to live in areas where the benefits of higher quality nature area and access to dark skies are shown.

4.3.8 Rooflight Orientation

To prevent visual intrusion into the wider landscape, rooflights should be oriented to point away from the open countryside. Rooflights should be on elevations that face inwards towards the development rather than outwards.

4.3.9 Existing Street lighting in Area

Many parishes in the area do not have any street lighting. Development would be expected to remain consistent with the provision of street lighting in these un-lit areas. Note that all theses unlit and lit areas fall under the E1 and E2 zones – this is why the E1 levels of design are preferred across the open areas of countryside.

Parishes with no Street lighting			
Adwell	Drayton St. Leonard	Little Coxwell	Stadhampton
Ardington	East Hanney	Little Milton	Stanton St. John
Ashbury	Eaton Hastings	Little Wittenham	Stoke Row
Aston Tirrold	Ewelme	Littleworth	Stoke Talmage
Aston Upthorpe	Fernham	Lockinge	Sunningwell
Baldons	Frilford	Longcot	Swyncombe
Baulking	Garford	Lyford	Sydenham
Berrick Salome	Goosey	Mapledurham	Tetsworth
Blewbury	Goring Heath	Milton	Upton
Bourton	Grafton and Radcot	Newington	Warborough
Brightwell Baldwin	Great Coxwell	North Moreton	Waterperry
Brightwell-cum-Sotwell	Great Haseley	Nuffield	Waterstock
Britwell	Harpsden	Nuneham Courtenay	West Challow
Buckland	Hatford	Pishill with Stonor	West Hagbourne
Buscot	Highmoor	Pusey	West Hanney
Charney Bassett	Hinton Waldrist	Pyrton	West Hendred
Checkendon	Ipsden	Rotherfield Greys	Wheatfield
Coleshill	Kidmore End	Rotherfield Peppard	Woodeaton
Compton Beauchamp	Kingston Lisle	Shellingford	Woolstone
Crowell	Letcombe Bassett	Shirburn	
Cuxham with Easington	Letcombe Regis	South Stoke	
Denchworth	Lewknor	Sparsholt	

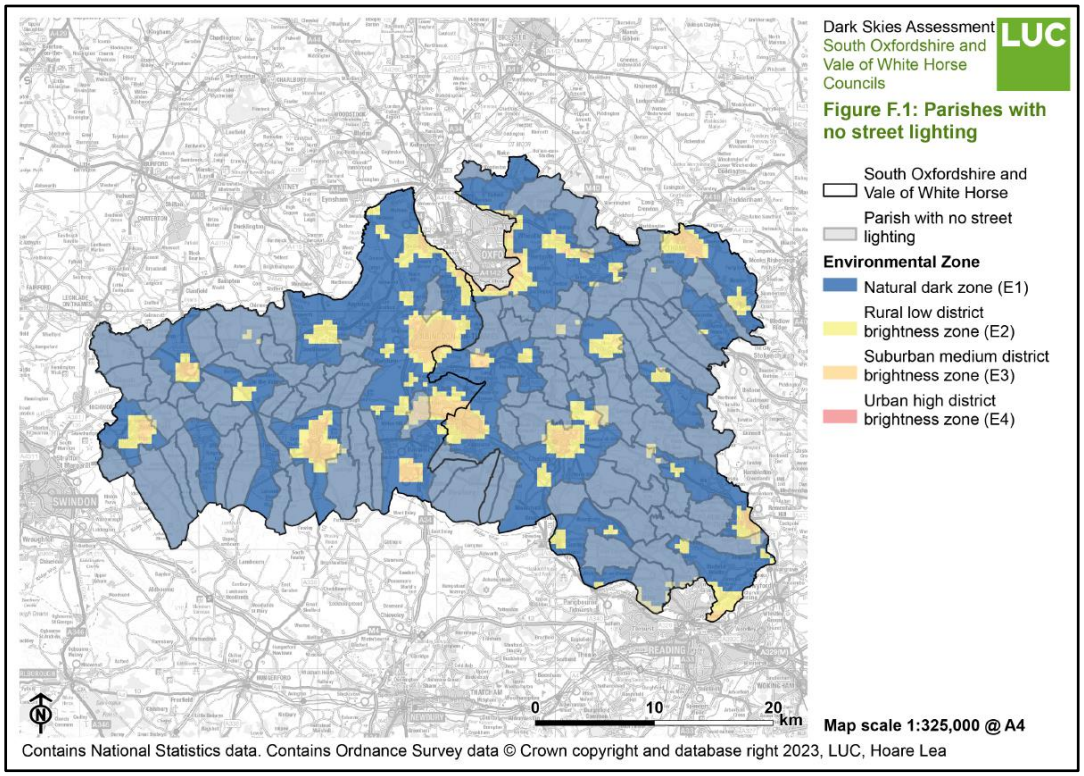


Figure 18 - Parishes with no Street Lighting - LUC Dark Skies Assessment

4.4 Commercial

Lighting installations associated with commercial and industrial buildings and activities in South Oxfordshire and Vale of White Horse generally comprise those associated with farm buildings and farm complexes, rural business parks, utilities and waste infrastructure, schools and carparks, and rural leisure operations such as golf courses and equestrian facilities.

While the size and scale of commercial properties varies, in all cases, general best practice lighting principles apply (see images below) with regard to the need for light, and what type, and appropriate locations for developments that require lighting (such as avoiding ridge-top locations, or particularly wildlife sensitive locations such as near ancient woodland).

Commercial lighting can include many development types; farms, 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 who can calculate obtrusive lights within the relevant E-zone. Installations near residential areas should ensure that lights are not obtrusive.

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.

Commercial Lighting Checklist

NEEDED

- ☐ Is the lighting needed and justified?
- ☐ Has decorative lighting been minimised?
- ☐ Is an Environmental Impact Assessment for nearby wildlife or residences required?

TARGETED

- ☐ Do lights point downward and where they are needed?
- ☐ Are any lights above 500 lumens fully shielded?
- ☐ Is illumination beyond the property or wildlife avoided?
- ☐ Are asymmetrical lights used for floodlighting?
- ☐ Have obtrusive lights to nearby premises been calculated?

LOW LIGHT

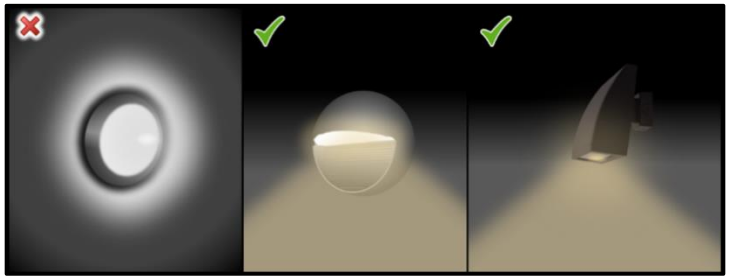
- ☐ Minor lights with 500 lumens (~5W LED) used?
- ☐ Are the fixings installed at the lowest possible height?
- ☐ Are Illuminance standards for good lighting referenced and within ~10% of recommended levels?
- ☐ Does the development avoid unacceptable landscape impacts?
- ☐ Are Illuminated signs less than 100 candela/m^2 and off at close of business?

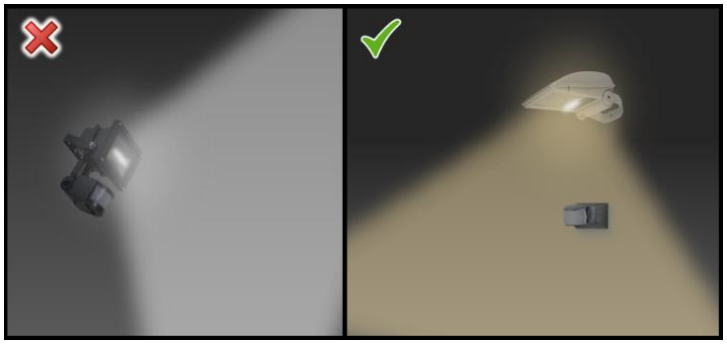
COLOUR

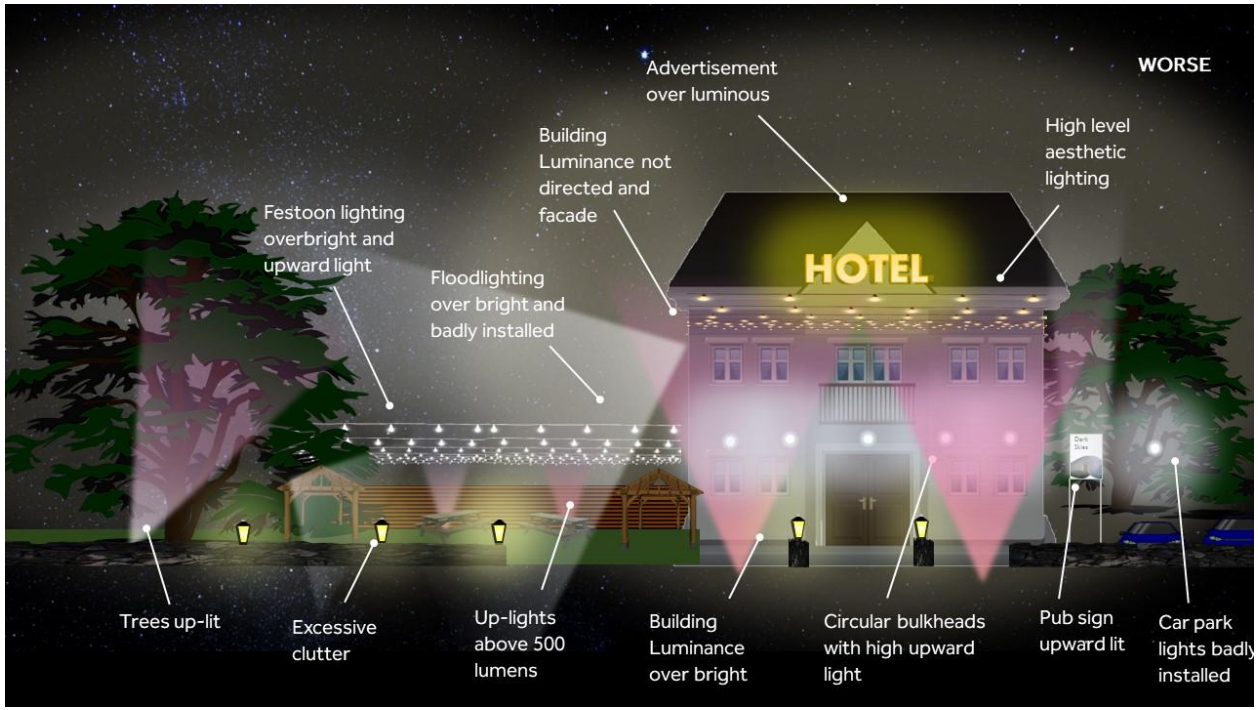
- ☐ Do the functional lights use 3000K (Warm white) and lower?

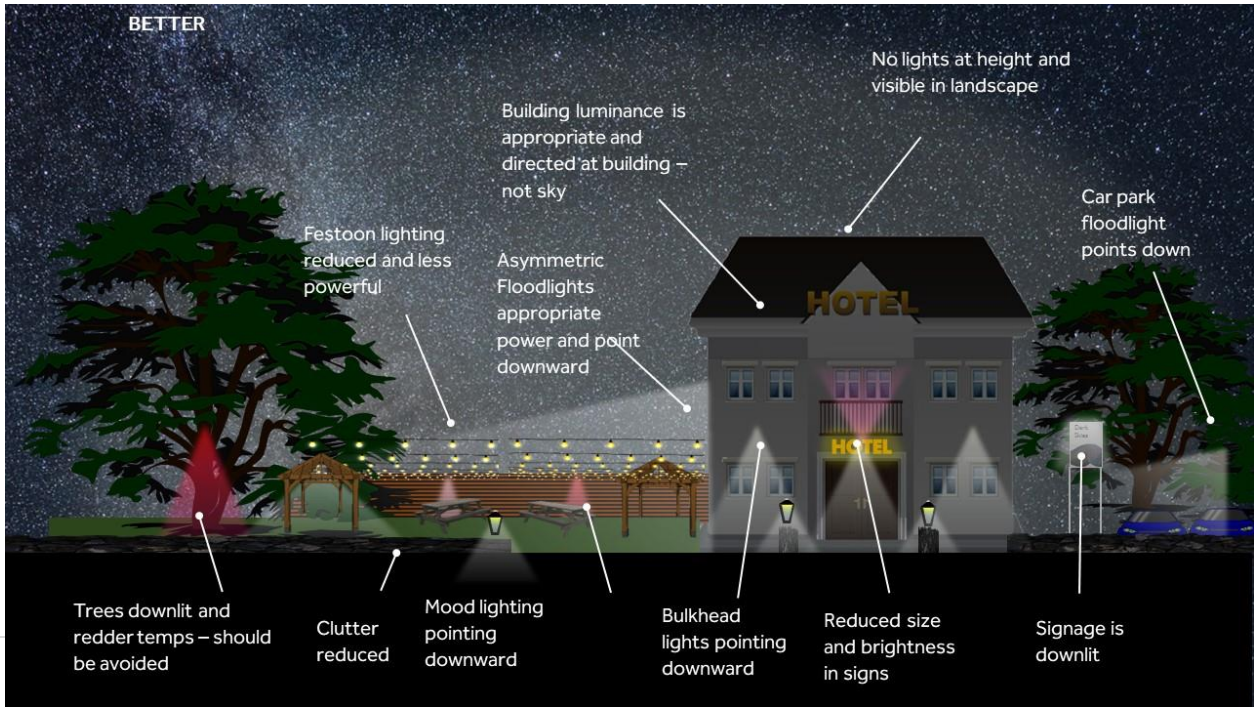
CONTROLLED

- ☐ Do the lights use PIR sensors or controlled timers?
- ☐ Are lights off at close of business?

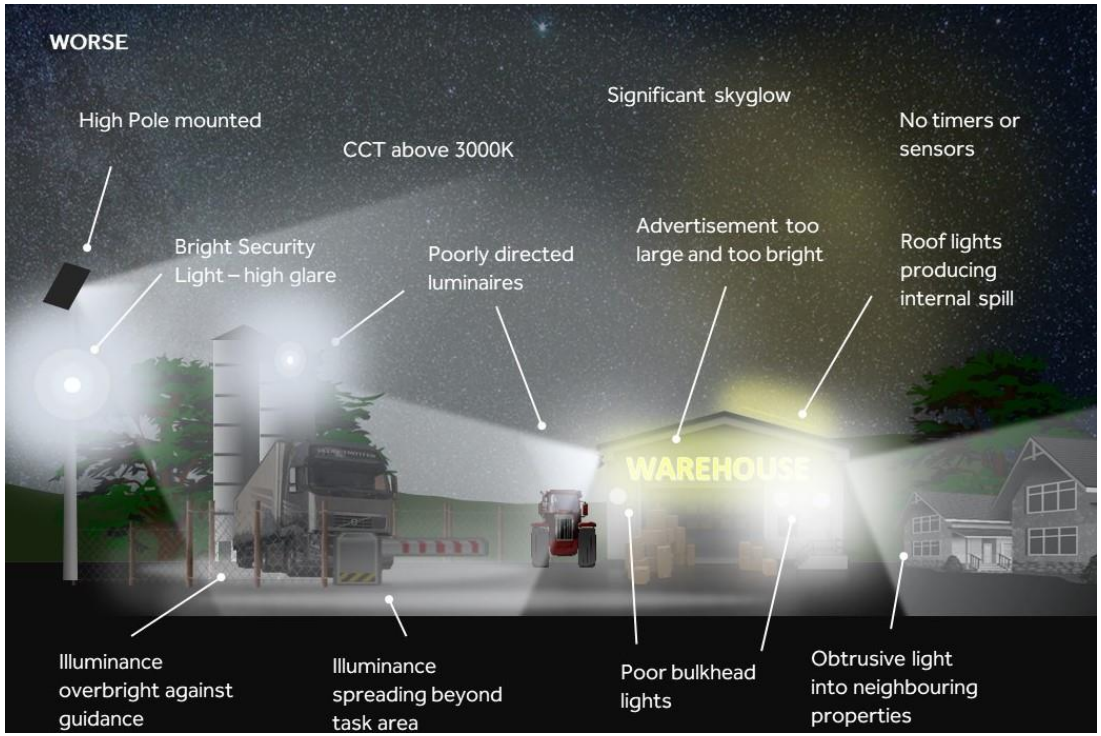


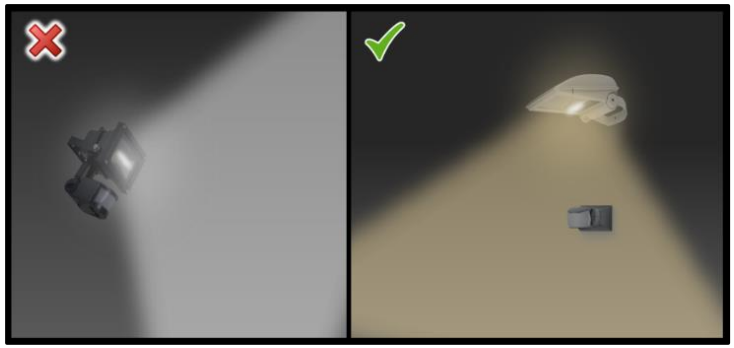


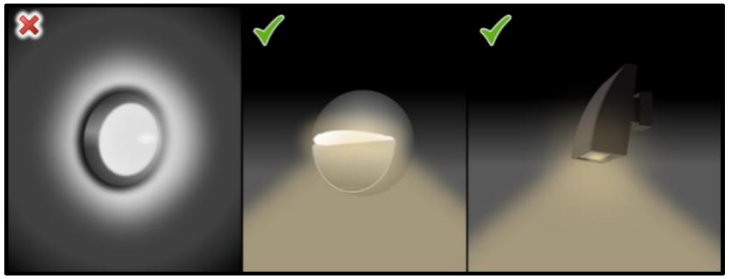


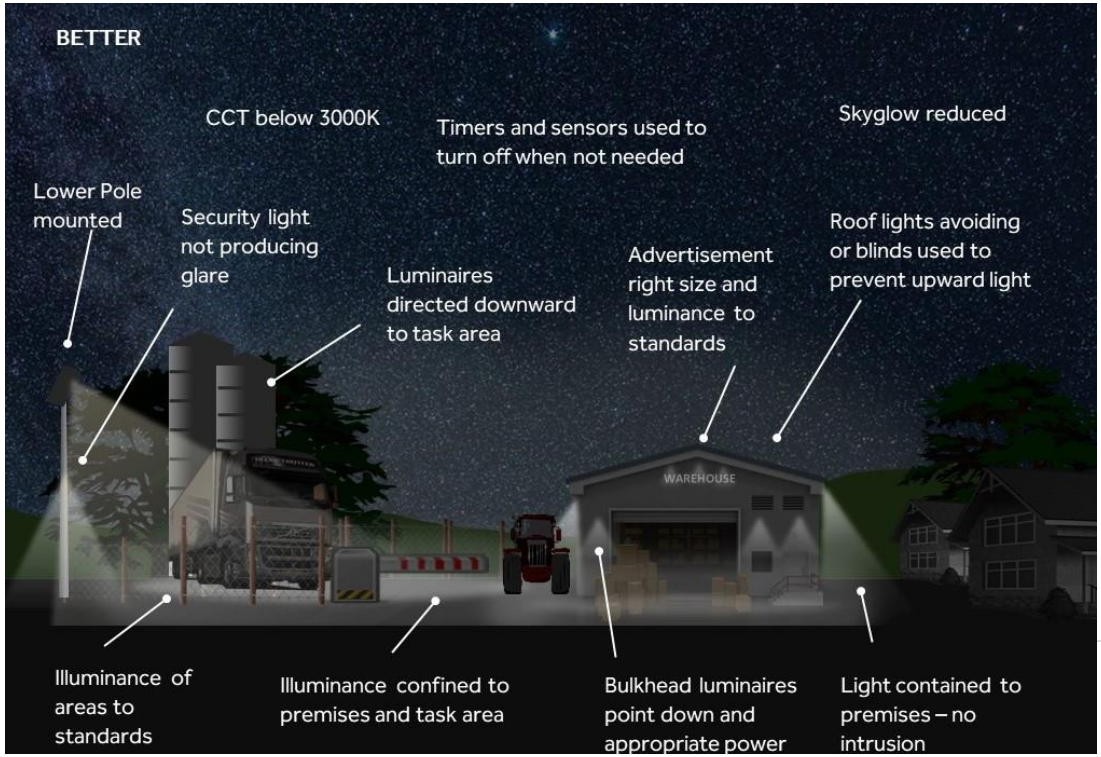


- Spherical bulkhead lights should be avoided. Standalone emergency lighting with zero upward light can be difficult to source due to the positioning of the battery pack. If possible - separate emergency power circuits should be considered fitted with eyelets.
- Overbright floodlights with poor optical control, built in PIR sensors and high CCT should be avoided. Lower power, asymmetrical flood lights with lower CCT should be used.
- Built in PIR sensors often obstruct the positioning of floodlights. A separate PIR sensor should be fitted in a position that best suits the movement of people, to limit being triggered by wildlife.
- Illuminated adverts should use ILP PLG05 to determine luminance and should be less than 100 candela / m^2 (nits) and be off outside business hours
- Festoon lighting should be avoided in rural areas


WORSE
High Pole mounted
CCT above 3000K
Significant skyglow
No timers or sensors
Bright Security Light – high glare
Poorly directed luminaires
Advertisement too large and too bright
Roof lights producing internal spill
WAREHOUSE
Illuminance overbright against guidance
Illuminance spreading beyond task area
Poor bulkhead lights
Obtrusive light into neighbouring properties






BETTER
CCT below 3000K
Timers and sensors used to turn off when not needed
Skyglow reduced
Lower Pole mounted
Security light not producing glare
Luminaires directed downward to task area
Advertisement right size and luminance to standards
Roof lights avoiding or blinds used to prevent upward light
WAREHOUSE
Illuminance of areas to standards
Illuminance confined to premises and task area
Bulkhead luminaires point down and appropriate power
Light contained to premises – no intrusion

Key Considerations

4.4.1 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 maintained average of 10 lux 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.

4.4.2 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 problems 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.
- Avoided in rural areas with open views

4.4.3 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 2021 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^2.

4.4.4 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.

4.4.5 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. Retail units with front shop windows should turn off internal lighting on close of business.

4.4.6 Lighting for Security

Security is an important consideration for a rural business. 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.

4.4.7 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.

Further guidance from the ILP should be followed that restricts the luminance levels. This is generally consistent with DarkSky International guidelines that require that illuminated signs do not exceed **100 candela m^{-2}**. Signs should be turned off at close of business or within an acceptable time frame.

While branding limitations may require use of multiple colours, the use of single colour on darker backgrounds is preferred.

4.4.8 Other Considerations

Businesses 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.

Key Considerations for Farms

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.

4.4.9 Wildlife in the Open Countryside

The rural location of businesses 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 spill into wildlife areas, waterways and the open countryside. The use of asymmetric luminaires that reduce spill and appropriate illuminance are essential.

4.4.10 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 assessment should be proportionate to the scale of the development and cover appropriate sections of guidance. 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.

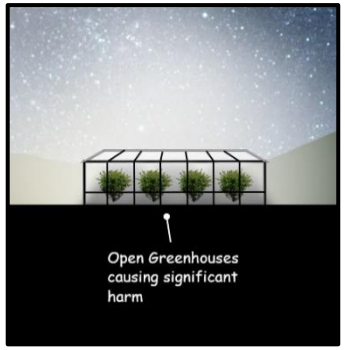
4.4.11 Farmyard Floodlighting

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 5 to purchase the right kind of lights for the approximate needs.

4.4.12 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.

Figure 19 - An example of good farm lighting. Courtesy Mike Hawtin. North York Moors National Park. Not the correct colour temperature, direction, shielding and appropriate levels of illuminance for safe working.

4.5 Sports

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 ménages can have a significant impact on the dark rural landscape particularly if installed without a designer. 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, upward light and limit obtrusive light. Using trees as fixing points should also be avoided. Temporary lighting should not be used as these types of luminaires are generally all-purpose and will not be appropriate for this type of activity.

Where possible, these installations should be sited in built-up areas where there is already a higher level of ambient sky glow. Every effort should be made to assess the surrounding area for access and provision for that activity, where it may be more appropriate to use. Clubs and societies should consider joint use and memberships to prevent the installation of high-powered lighting in dark areas.

To avoid over lighting, calculated average levels of illuminance shold not exceed ~25% tolerance of the recommneded levels.

Sports Lighting Checklist

NEEDED

- ☐ Is the location of the sports ground appropriate?
- ☐ Does the site constitute an inappropriate residual impact?
- ☐ Is the site located away from dark sky sensitive areas, e.g. ancient woodland wildlife-rich sites and habitats?

TARGETED

- ☐ Do lights point downward and where they are needed?
- ☐ Have asymmetric been lights been used to constrain light?
- ☐ Have obtrusive lights to nearby premises been calculated?

LOW LIGHT

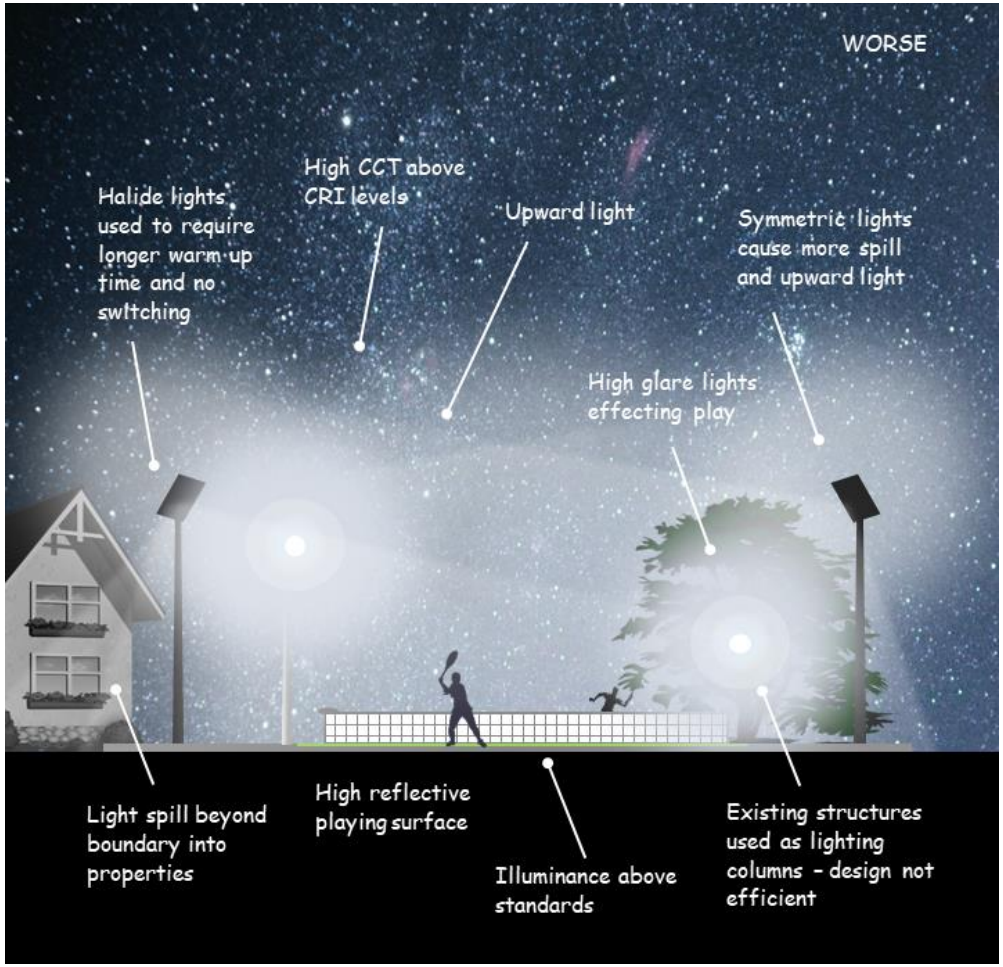
- ☐ Is Design scheme illuminated with appropriate standards within ~25% recommended levels?
- ☐ Have low reflective surfaces been considered?
- ☐ Are the fixings installed at the lowest possible height?

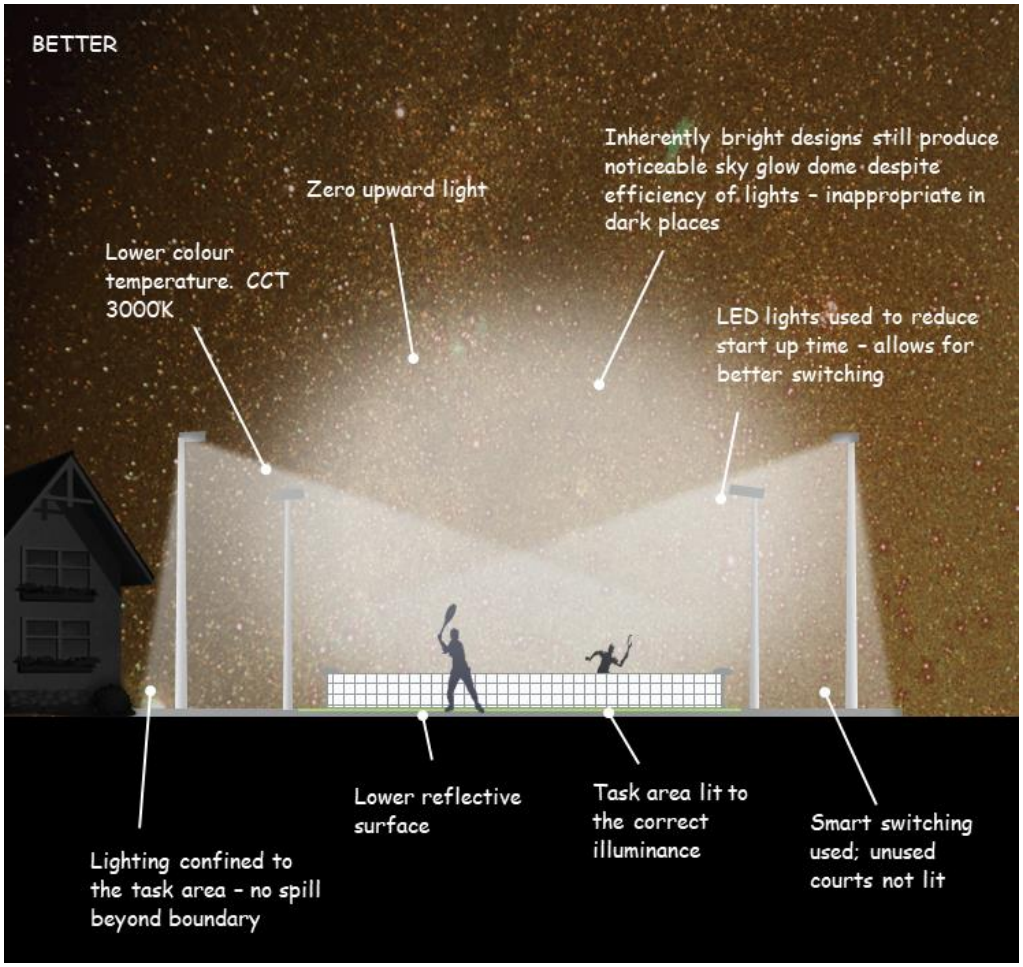
COLOUR

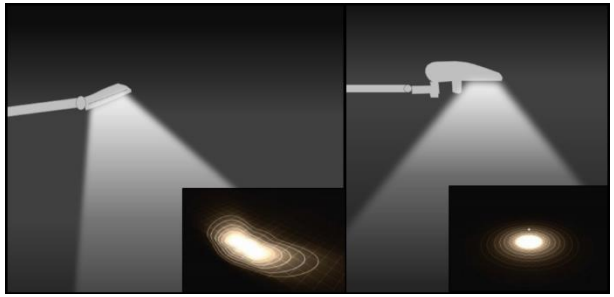
- ☐ Do the lights use lowest CCT?
- ☐ Is the CRI level appropriate for the level of play?

CONTROLLED

- ☐ Are the hours of use justified, limited and appropriate?
- ☐ Can each in-use playing surface be illuminated individually?







- Some sports lighting installations may not be appropriate in some places. Depending on the scale, location, prominence and background ambient levels, sports lighting in open rural areas or on the fringes of urban development may not be appropriate.
- Asymmetric lights have better light control and reduce spill

Key Considerations

4.5.1 Nuisance

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

4.5.2 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.

4.5.3 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.

4.5.4 Landscape and Visual Impact

Due to the higher levels of illuminance, sports pitches can have a significant impact on landscape character 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 may 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.

ILP GN01 21 Table 7 assumes that sports lighting is not expected in E0 and E1 zones. In areas where this is acceptable, 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. Proposals on the edges of urban areas that influence the open rural setting should ensure that all mitigations have been considered, particularly the careful use of curfews.

4.5.5 Over lighting

In order to reduce the possibility of over lighting, the calculated average of the illuminance levels should be within 25% of the recommended lux levels within relevant guidance and standards.

4.5.6 Curfew and use

Sports lighting should be subject to appropriate curfews ideally by 10pm or one hour after the end of play. The curfew can be adjusted for later times it the facility is within the centre of urban environment.

If the design of column spacing allows only pitches in use should be illuminated. Ideally a smart system should be considered to achieve this.

4.5.7 Level of Play

The lighting levels recommended will change according to the level of play. Levels of play are usually separated into community and recreation, local competitions with public viewing, and more professional and regional competitive uses. The higher the level of competition, the higher the levels of illuminance and CRI need to be. The correct level of play should be determined to ensure that the appropriate levels of illuminance are used.

4.6 Roads and Pathways

The illumination of residential roads and pathways is generally the responsibility of the Local Lighting Authority, Oxfordshire 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 policy adopted by the authority for ongoing maintenance. Oxfordshire County Council Street lighting and Illuminated Assets Policy

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.

The design of road and pathway lighting for amenity uses also depends on crime and CCTV requirements. In these cases, column lights and higher levels of colour rendition are favoured in order to provide sufficient illuminance of facial recognition – bollards are not useful in these areas and in achieving road illuminance. For low crime areas where CCTV is not required, lower-level luminaires such as ground level recessed luminaires or bollards remain a viable option to reduce the overall amenity impact. An analysis of crime rates will assist this assessment as recommended in Secured by Design.

Private road lighting that is not adopted by the local authority should ensure that lighting is installed only where needed and is appropriate for the level of use. Navigation lighting should follow as many of the checklist requirements as appropriate.

Road and Pathway Lighting Checklist

NEEDED

- ☐ Is the streetlighting necessary?
- ☐ Can column mounted luminaires be avoided in preference for bollards or ground recessed?

TARGETED

- ☐ Do all luminaires have zero upward light?
- ☐ Have asymmetric been lights been used to constrain light?
- ☐ Have obtrusive lights to nearby premises been calculated?

LOW LIGHT

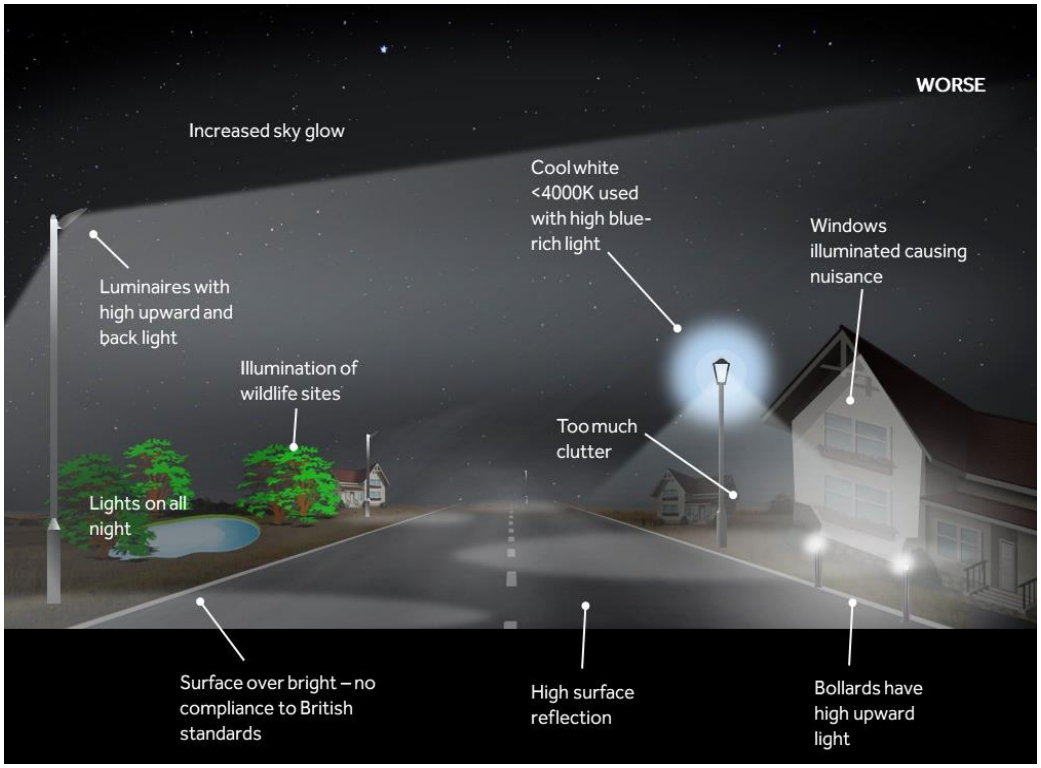
- ☐ Is design scheme illuminated with appropriate standards with ~10% recommend levels?
- ☐ Have low reflective surfaces appropriate and been considered?
- ☐ Are the fixings installed at the lowest possible height?
- ☐ Have traffic use adaptive illuminances been considered?

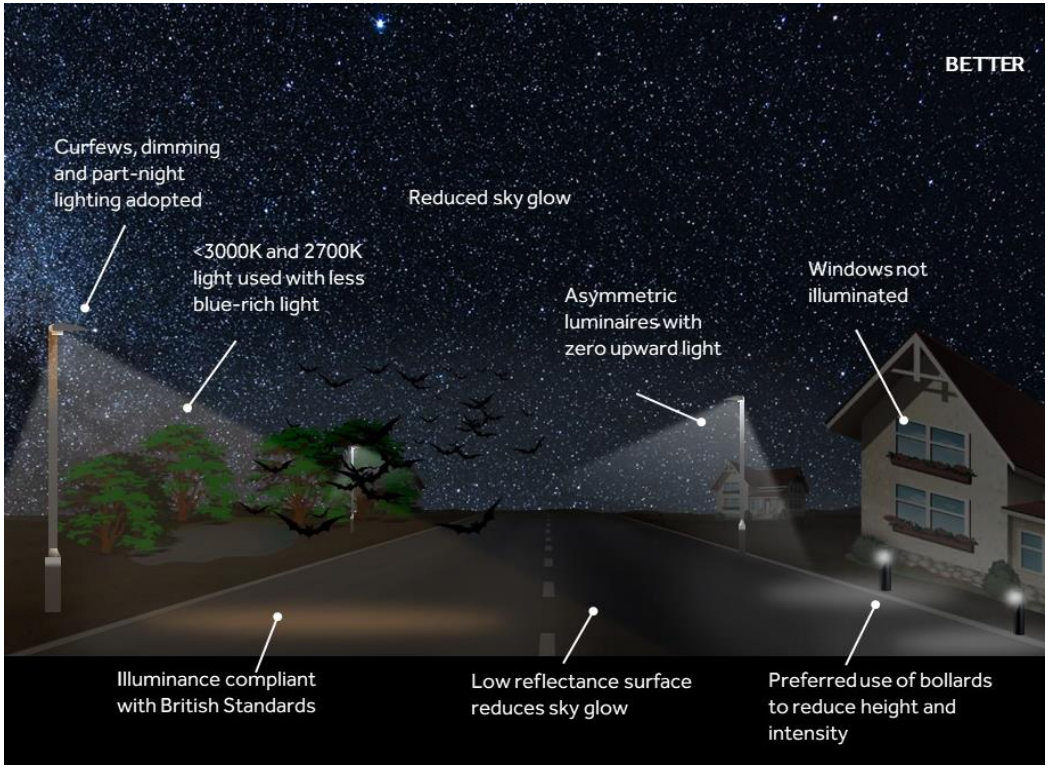
COLOUR

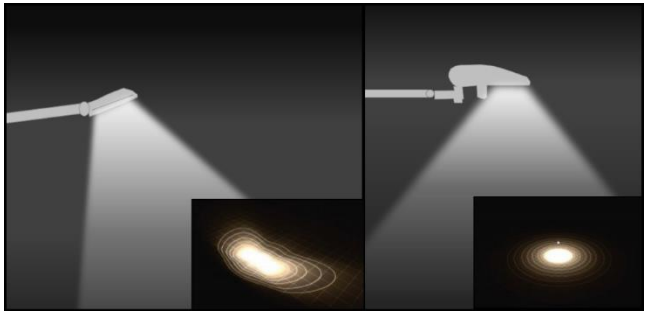
- ☐ Do the lights use a maximum of CCT of 3000K and lower?
- ☐ Has the minimum CRI level been met?

CONTROLLED

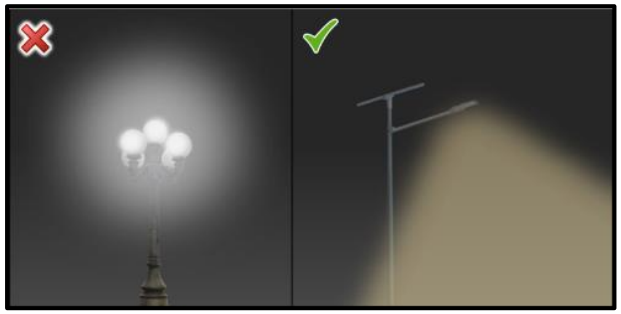
- ☐ Are the hours of use limited and appropriate?
- ☐ Can part night lighting be considered?







- Asymmetric lights have better light control and reduce spill



- Lights have zero upward light spill

- Bollards have zero upward light spill or low power (<500 lumen) recessed lights

Key Considerations and luminaire advice

4.6.1 Justification

Streetlights are a key determinant of sky quality, so it is important that there 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 that have lower levels of crime. The need for lighting could be avoided with effective consideration at the initial development design phase.

4.6.2 Low Mounting Height – Bollards and Ground Recessed

For quiet residential roads or pathways with no CCTV requirements 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 can be used in areas where the risk of vehicular damage or vandalism is low. Secured by Design guides provide more information for more urban areas. Ground recessed luminaires are another option where navigational lighting is useful. They are often lower than 500 lumens and can direct light sideways rather than straight up. Despite having some upward light, they are a viable alternative to more brighter column mounted lights in specific areas.

4.6.3 Adaptive Illuminance and Curfews

Modern LEDs can be dimmed 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, but it will reduce the night-time impact and save money. Curfews are particularly effective in rural parts of the landscapes.

4.6.4 Colour Correlated Temperature

LEDs with high colour temperature and a blue-white spectrum should be avoided as they contribute to the sky glow effect. It is recommended that colour temperatures of 3000K (and lower 2200-2700K), with low blue-light should be used in achieving British Standard CRI levels.

4.6.5 Low Reflectance surfaces

Different road and path materials reflect light different. To reduce the indirect light scatter, low reflectance road and path surfaces could be used. Black and dark grey asphalt has a 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.

4.6.6 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 A4440, red luminaires or 2200K could be used in these places. As ILP GN08 shows, bollards may not be appropriate in these areas.

4.6.7 Over lighting

In order to reduce the possibility of over lighting, the calculated average of the illuminance levels should aim to be within ~10% of the recommended lux levels within relevant guidance and standards.

4.6.8 Villages without Street lighting

There are a number of parishes that have no street lighting in the area. Section 4.3.9 provides a list and a map with these parishes.

4.6.9 Nearby Trees

The location of nearby trees should be considered when installing columns. Oxfordshire CC guidance generally states a 10m offset between column and trunk depending on lighting directionality. Conflicts between lights and trees should be avoided.

4.7 Car parks

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

Brtish Standards BS EN 12464 and BS 5489 can be used to determine illuminance and light quality. The level of illumination depends on the locaton of the parking and level of use. For example, A small quiet rural car park will need less illuinance than a larger, busier urban car park. There is no legal requirement to use a lighting designer to use British Standard levels, but owners should be expected to provide sufficient lighting where this a safety risk to users.

For exterior car parks, there are three general usage levels of lighting (average lux and unifomity 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 illluminance levels.

To avoid over lighting, calculated average levels of illuminance should not exceed 10% tolerance of the recommended levels.

Car Park Checklist

NEEDED

- ☐ Is the lighting absolutely necessary in all places?
- ☐ Does the lighting avoid wider landscape impacts?

TARGETED

- ☐ Do all luminaires have zero upward light?
- ☐ Have asymmetric been lights been used to constrain light?
- ☐ Have obtrusive lights to nearby premises been calculated?
- ☐ Do luminaires avoid glare to drivers?

LOW LIGHT

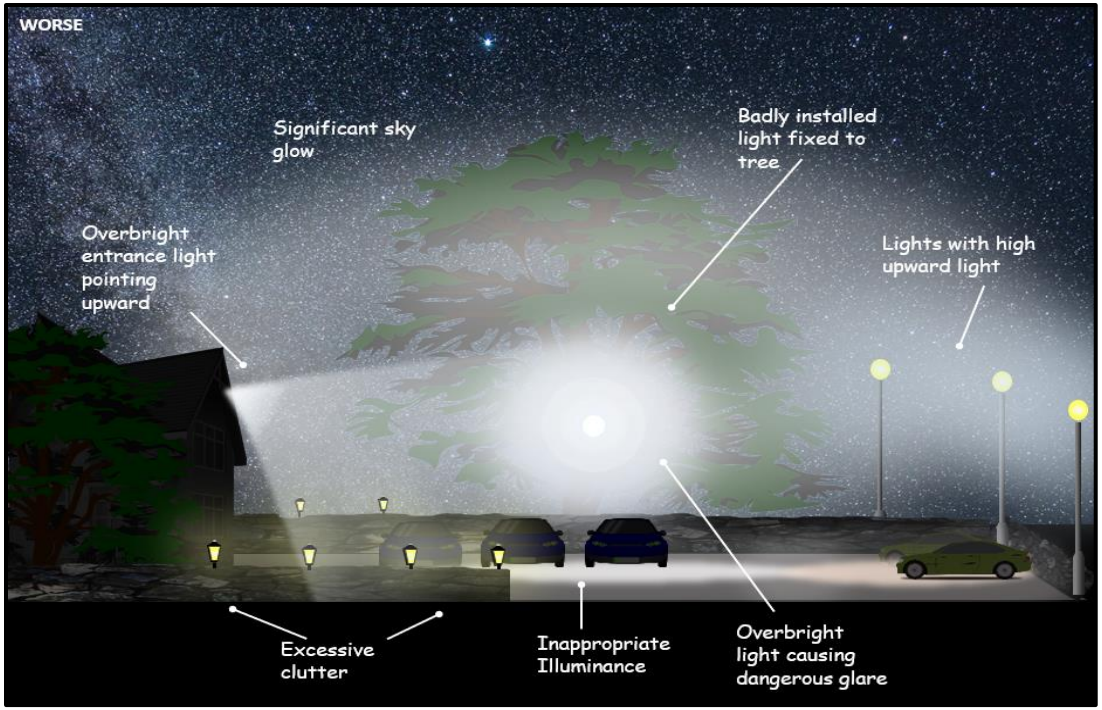
- ☐ Is design scheme illuminated with appropriate standards with ~10% recommend levels to usage levels?
- ☐ Can column mounted luminaires be avoided in preference for bollards or ground recessed?
- ☐ Are the fixings installed at the lowest possible height?

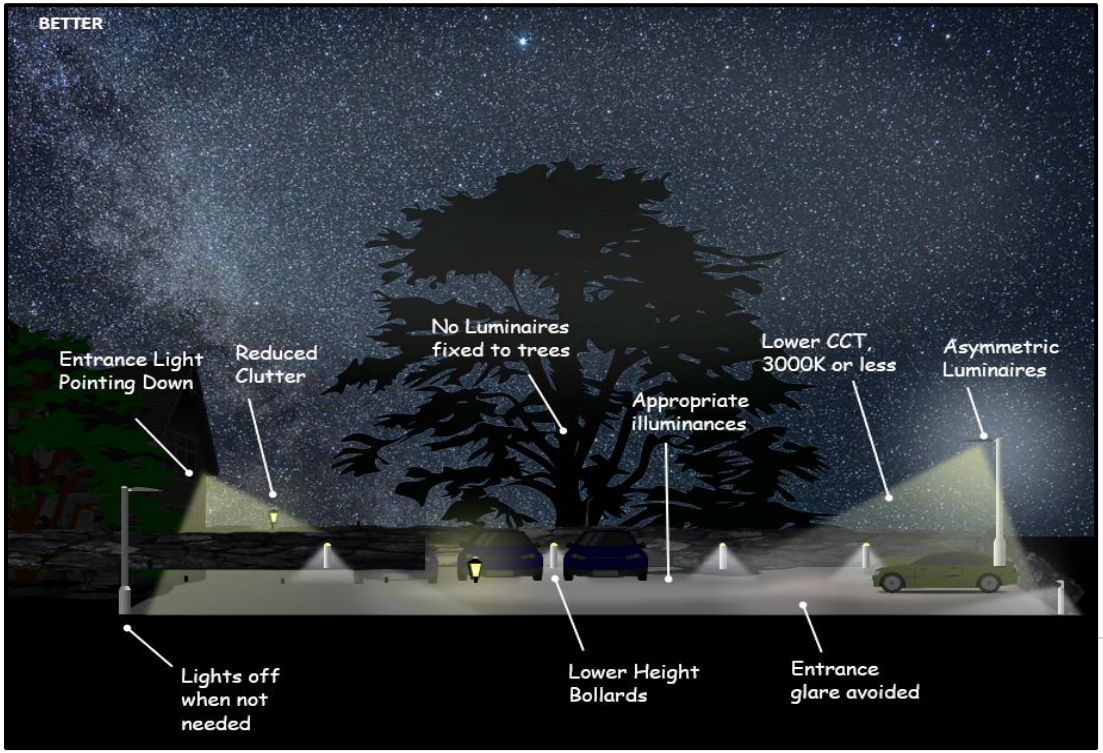
COLOUR

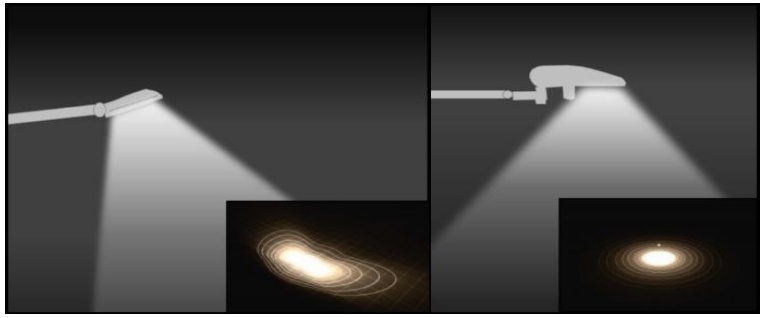
- ☐ Do the lights use a CCT of 3000K and lower?
- ☐ Has the minimum CRI level been met for CCTV?

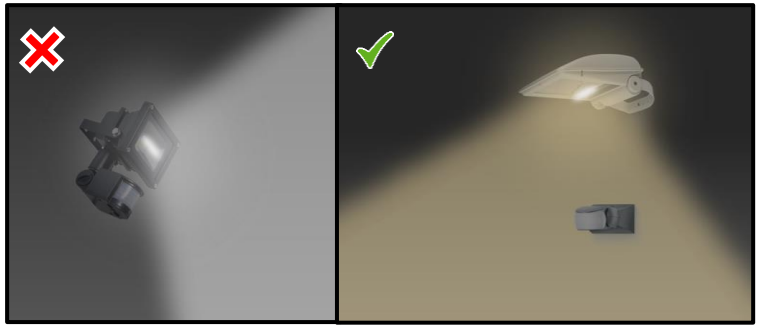
CONTROLLED

- ☐ Are the hours of use limited and appropriate?
- ☐ Can PIR sensors be used?









- Overbright floodlights with poor optical control, built in PIR sensors and high CCT should be avoided. Lower power, asymmetrical flood lights with lower CCT should be used.
- Built in PIR sensors often obstruct the positioning of floodlights. A separate PIR sensor should be fitted in a position that best suits the movement of people. A separate PIR sensor does not obstruct the correct positioning of the floodlight.

Key Considerations

4.7.1 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 vehicle 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.

4.7.2 Over lighting – illuminance

Many non-design 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 5 provides some recommendations for the strength of LED luminaires against the size of the area.

In order to reduce the possibility of over lighting, the calculated average of the illuminance levels should be within 10% of the recommended lux levels within relevant guidance and standards.

4.7.3 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.

4.7.4 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 as pole mounted lights. In this regard care should be taken to use bollards in appropriate spaces, or as navigation aids around the parking area.

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.

4.7.5 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.

The location of the lighting columns should not conflict with existing or proposed trees. Oxfordshire County Council Tree Policy should be referenced where conflicts arise. The policy generally states a 10m offset between column and trunk depending on lighting directionality.

4.7.6 Landscape appropriateness - 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. Lighting above 10 lux is likely to produce minor/moderate levels of adverse impact, depending upon the design.

4.8 Festivals, events and temporary lighting

Temporary installations of a duration of less than 28 days *may* not require planning control – Local Planning Authorities can advise on a case-by-case basis. Some installations such as festivals or music events can nevertheless have a substantial impact on dark skies and could be designed with a regard for dark skies.

4.8.1 Outdoor Festivals

A festival can produce the highest introduction of light pollution of any activity. Theatrical lighting, lasers, car parks, campsite lighting and large LED screens are designed to be bright, intense and dynamic which can produce impacts that can been seen over many miles. The principles of good lighting design should still be applied where possible, including car park and area lighting, pedestrian areas and some stage lighting. The following recommendations in the should be regarded:

- Festivals should avoid the winter months where the impact on dark skies is at its greatest throughout the night. In most cases, festivals are summer activities, but care should still be taken to reduce the pollution.
- Festivals should look to use access roads for patrons that do not encroach into the landscape.
- Festivals should avoid using distance penetrating sources such as sky scanners or lasers.

4.8.2 Light Festivals and Art

Lighting festivals are becoming popular events across the UK with many venues hosting spaces for artistic or theatrical lighting. While there is no standard design guidance for light festivals to use, nevertheless the principles of good lighting design in the context of dark skies as set out in this guidance should be applied in the artistic brief, particularly to ensure no adverse impacts to wildlife.

4.8.3 Surfaces

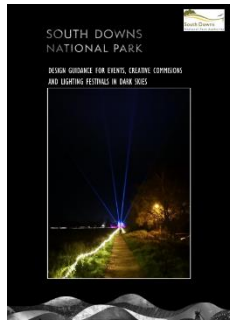
The type of surface can impact upon the visibility of the installation and the amount of light being reflected back into the atmosphere, with lighter coloured surfaces performing worse in this regard. Illumination of water in particular should be avoided. Evidence shows that illumination of reflective surfaces can impact wildlife. 'Polarisation of light by shiny surfaces attracts insects, particularly egg laying females away from water. Reflected light has the potential to attract pollinators and impact on their populations, predators and pollination rates'. (Bat Conservation Trust)

4.8.4 Temporary Floodlighting

Temporary lighting such as portable floodlight systems are extremely bright to cater for most purposes, but they are highly threatening to dark skies. Due to its design and general use, temporary lighting can be installed badly creating significant light pollution. Care must be taken to ensure that the power and installation of the equipment is appropriate for the task and is not obtrusive to neighbours.

- Where temporary lighting is seen to be used beyond the minimum period of 28 days or with consistent regularity over some years, then planning permission should be sought.
- Temporary and portable floodlighting should not be used in dark areas.
- Temporary and portable floodlighting should not be used for sports facilities. **A permanent design should be proposed.**

Further Information can be found in the South Downs National Park Design Guidance for events, creative commissions, and lighting festivals in dark skies.



5 SUPPORTING INFORMATION

5.1 Purchasing Recommendations

You cannot 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.

5.1.1 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.				

Table 2 - Lamp brightness comparison

5.1.2 DarkSky International Approved Lighting and Certifications

DarkSky Internationals Fixture Seal of Approval program provides objective, third party certification for lights that minimise glare, reduce light trespass and do not 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. DarkSky International does not sell lighting and is not endorsing any of the lighting shown in this document – the seal is for demonstration only.

Note: The IDA Dark Sky approved badge is sometimes used on product specs

5.2 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 properly qualified and competent lighting specialist should be consulted for the design.

This table provides approximate values and the user will remain responsible for the lighting and its use –

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

Area m^2	Approximate Target Illumination (E_m) (typical levels as listed in BSI and HSE documents)				
	(5 lux) Domestic use, public areas, walkways	(10 lux) Domestic use driveways, public small car parks, areas with 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	**3w** 400lm	**6w** 500lm	**11w** 1000lm	**30w** 3000lm	CONSULT LIGHTING SPECIALIST
50	**5w** 500lm	**11w** 1000lm	**23w** 2500lm	**60w** 6500lm	CONSULT LIGHTING SPECIALIST
100	**11w** 1000lm	**23w** 2500lm	**50w** 5000lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
250	**30w** 3000lm	**60w** 6500lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
500	**60w** 6500lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
1000	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST

Table 3 – Approximate Illumination levels for LED

Notes

- Lighting using 11W or 1000 lumens or less is generally a low risk (Green bolded cells)
- Lighting above 11W and 1000 lumens but less than 60W and 6500 lumens is a medium risk (Yellow)
- Lighting above 60W and 6500 lumens is high risk (Red). 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.

5.3 Relevant Documents

5.3.1 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. **Requires payment.**

CIBSE LG06: The exterior environment (2016) has further general guidance for lighting the exterior environment. **Requires payment.**

LUC Dark Skies/Light Impact Assessment Methodology Report. This provides mapping of skies within the area and methodology used to assess zoning. **Free Download**

5.3.2 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. **Requires payment**.

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. **Requires payment**.

BSI – Lighting and Lighting. Sports Lighting BS EN 12193:2018
These standard sets recommendations for illuminances and other lighting metrics for sports lighting. **Requires payment**.

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. **Free Download**.

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. **Free Download**

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**. Payment required**. The ILP has guidance for all of the UK and Ireland: PLG05: the brightness of Illuminated advertisements.

5.3.3 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. **Free Download.**

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. **Free Download.**

5.3.4 Landscape Impact and Wildlife

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. **Payment required.**

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. **Free download**

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. **Free Download.**

5.3.5 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. **Free Download**

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. **Free Download**.

5.3.6 Oxfordshire County Council

Oxfordshire County Council Street Design Guide.
This guide provides all relevant design principles for streets within Oxfordshire County. The primary purpose of this design guide is to bring together the key design principles from the multitude of disciplines covered by the existing guides. This will then allow designers and developers to very quickly understand all the County Council's clear expectations for early collaboration, standards, and innovation. **Free Download**

Oxfordshire County Council Street lighting and Illuminated Assets Policy.
This policy encompasses Oxfordshire County Council's corporate vision, objectives and embraces the 9 priority themes of the Council. The policy is also informed by the Local Transport Connectivity Plan, the Highway Asset Management Plan, the Energy Strategy, and the Carbon Management Plan. **Free Download**

Oxfordshire County Council Tree Policy.
This policy aims to protect trees within Oxfordshire County. Specific strategic policy objectives are to reduce the number of responsible foreseeable tree failures across the highway network. **Free Download**

5.3.7 General Lighting

The Responsible Outdoor lighting at Night
(ROLAN) Manifesto sets out ten core principles for external illumination and a plan of action to implement positive change in the lighting community to lead to a more sustainable, healthier, and safer future for all. **Free Download**