



UK DARK SKIES  
PARTNERSHIP

# LOCAL AUTHORITIES, COMMUNITIES AND DARK SKIES TOOLKIT



**A toolkit to help Local Authorities and communities to work  
together on protecting and improving dark skies and reducing  
light pollution**

**October 2022**

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# I Overview

The purpose of this toolkit is to recommend principles, methods and technical specifications for Local Authorities (LA) and communities wanting to improve and protect their dark skies and reduce light pollution. Our aim is to improve the consideration of dark skies within any Local Authority or community in the UK. We hope to encourage and support collaboration to develop effective actions in all aspects of local government responsibility for light pollution.

The recommendations with this toolkit are based on the success of Local Authorities within the UK's growing number of dark sky places. Many of these places are landscapes, cities and communities that have been accredited by the International Dark-Sky Association (IDA) for their commitment to protecting dark skies.

You don't have to be working towards or be an IDA Dark Sky place to reduce the impact of light pollution – but you can follow their example.

## 1.1 Who is this toolkit for?

This toolkit is aimed at two likely initiators of the dark sky process;

- Local Authority officers looking to improve and protect dark skies
- Members of the public and communities wanting to understand what they should be asking Local Authorities to do to help their own efforts.

## 1.2 Why are Local Authorities and communities relevant to dark skies?

Light pollution is caused by development, poorly installed lighting and a lack of awareness. Most sources of lighting will fall under some form of Local Authority responsibility such as street lighting, planning, environmental nuisance and community engagement. As such, Local Authorities and communities have a huge role to play in the impact of light pollution and are an integral part of protection from it. As all existing IDA places have shown, the adoption of appropriate principles within key areas of responsibility does reduce light pollution and help protect dark skies. Without Local Authority involvement, it is likely the loss of our dark skies will accelerate. The principles and advice in this toolkit are easy for a Local Authority to implement. They are understandable and offer easy wins for the wider environment and public health. Every Local Authority should be involved.



Credit @SDNPA

### **1.3 What are dark skies and why are they important?**

Dark skies are places where you can clearly see the Milky Way – our galaxy - unaided with the naked eye. Under these skies, you will see thousands of stars and the thin ribbon of the Milky Way arch clearly across the sky. There are plenty of places in the UK where you can access dark skies, but they are threatened by development and poorly installed lighting; they are slowly being eroded – death by a thousand bad lights. Just like any natural ecosystem that it is under threat, it is important to protect them.

Dark skies however aren't solely about the ability to see stars. There is a growing body of scientific evidence that artificial light – compounded by bad installations – will cause health and well-being problems, disrupt sleep, decrease energy efficiency and probably cost you excess money.

Darkness also provides an important function across many aspects of nature. Although artificial light can be necessary for safety and creating a sense of place, it is an intrusion upon nature. Whenever artificial light is introduced into natural spaces wildlife, farmland and the integrity of habitats will suffer. As Local Authorities look to conserve and enhance their own natural green spaces and wildlife sites, protecting dark skies is an essential part of this work.

But there is something more fundamental. The loss of a dark sky is a loss for humans to fully appreciate their place in the universe. Without the ability to see our galaxy and the infinite darkness beyond, we lose our ability to connect to our own existence. A dark sky makes you question your place in the universe – it is soul affirming. This is a connection with nature that exists nowhere else on Earth and is hugely important to protect. Once it's gone it is extremely difficult to get back.

### **1.4 What will this toolkit will show you?**

It will show the general steps to protecting a dark sky:

- The core principles of good and bad lighting
- How to identify and measure your dark skies
- How to use zoning to achieve better policies between the urban and rural environments
- How to embed core principles within a Local Authority key functions
- How to implement effective policies into Local Authorities and communities
- How to engage with residents and elected officials
- How to determine key threats and opportunities
- What you will need to consider for a dark sky place certification

### **1.5 Toolkit overview – journey to the skies**

This toolkit provides a rough step-by-step process for Local Authorities to improve their involvement in dark skies – it is a journey. Not every step on this journey is necessary and they generally increase in complexity and commitment the further you delve into the toolkit. It begins by providing a basic understanding of the issue and ends with the options of gaining an International Dark-Sky Association (IDA) certification. In that respect the toolkit offers Local Authorities a journey's guide – but it is a journey of increasing commitment and complexity. There is support available from organisations and there are dark sky experts and consultants who can take on work.

**The UK Dark Skies Partnership recommends that every Local Authority aims to adopt effective lighting policies as a minimum – the rest of the journey is up to you.**

For enthusiastic Community groups looking to engage with Local Authorities the journey is a little different. The UK Dark Skies Partnership recommends that communities start by understanding their local environment, encourage participation with residents and adopt policies. With enough diligent preparation and local interest, only then should the Local Authority be approached to join and complete the journey.

## LOCAL AUTHORITY MINIMUM STEPS

### **1: UNDERSTAND THE CORE PRINCIPLES**

Light Pollution  
Good Lighting Design Principles



### **2: FIND YOUR SKIES**

Use Satellites  
Measure the Sky Quality



### **3: ZONE YOUR SKIES**

Use the most effective zoning option



### **4: EMBED POLICIES**

Develop and adopt effective lighting policy



### **5: ENGAGE AND INSPIRE**

Use your policies to support your residents



### **6: START A LIGHTING AUDIT**

Conduct a threat analysis with a lighting audit



### **7: CONSIDER A DARK SKY PLACE CERTIFICATION**

Put all this work to good use and aim for designation

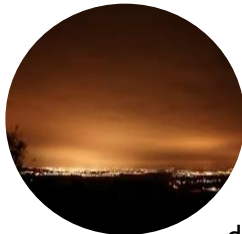
## 2 Understanding Core Principles

Protecting dark skies requires better understanding of the issues light pollution and adopting better lighting designs. The following sections describe the core principles to these two issues.

### 2.1 The three main types of light pollution

There are three well-established aspects of light pollution. Each requires individual consideration.

#### 1 - Sky glow



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

#### 2 - Glare



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

#### 3 - Light Intrusion



Sometimes called 'light trespass', this involves light spilling beyond the property or area being lit. Although this pollution generally relates to windows and intrusion into private property, the term 'light intrusion' also applies to natural habitats and areas of high species interest.

#### Presence – a fourth consideration



Even if a lighting scheme were designed that avoided sky glow, intrusion and glare, there still exists the possibility of significant impact on dark and sensitive landscapes and wildlife due to the mere presence of the lights. This applies to impacts from both exterior and interior lighting. When the presence of lighting itself creates negative impacts, alternatives and re-siting should be considered.

## 2.2 Dark sky design lighting principles

There are essential principles in good lighting design for dark skies. They are based – and are consistent with – the IDA’s 5 lighting principles and should form the very basic criteria of a lighting assessment. These principles will be found throughout the guidance for LAs throughout this document and the aim is to achieve the advice of the Institution of Lighting Professionals (ILP) in all lighting:

### ‘THE RIGHT LIGHT IN THE RIGHT PLACE AT THE RIGHT TIME, UNDER THE RIGHT CONTROL’.

- **USEFUL**
  - Any light should be justified with a clear purpose and benefit.
  - Overall lighting impact should be appropriate for its setting, regardless of the design.
- **DESIGNED**
  - For larger non-domestic installations, professional designers should be consulted to ensure that illuminance, and control of spill light and glare, are appropriate for the task. Use the minimum possible number of lights.
- **TARGETED**
  - Light should be directed to where it is needed and not spill into neighbouring spaces.
  - All light above the horizontal should be avoided. **Zero upward light is essential.**
- **LOW LIGHT**
  - Lux levels: lights should provide the right illuminance referenced against design standards. Do not use needlessly over-bright lights.
  - Glare: lights should be referenced against design standards and not produce unnecessary glare.
- **CONTROLLED**
  - When not needed: turn off with manual switches, timers or proximity (PIR) sensors.
  - Ensure lights are dimmed when activity is low, to reduce light and energy use.
- **COLOUR**
  - Lamps should be **3000K** or less. Lamps above 3000K (with increasingly blue spectral component) should be avoided.





## 2.3 Towards A Dark Sky Standard



The UK Dark Skies Partnership worked collaboratively to produce a signposting document [Towards A Dark Sky Standard](#) that helps planners and designers understand key issues in light pollution and how it relates to specific guidance notes. The document aims to establish the right narrative 'mind-set' by signposting to technical materials in four key theme areas;

- Designed Need
- Dark Sky Places
- Landscape and Wildlife
- Nuisance and Obtrusion

**This document is a good first step to understanding the basics of light pollution and how they relate to enhancing dark skies, nature and nuisance.**

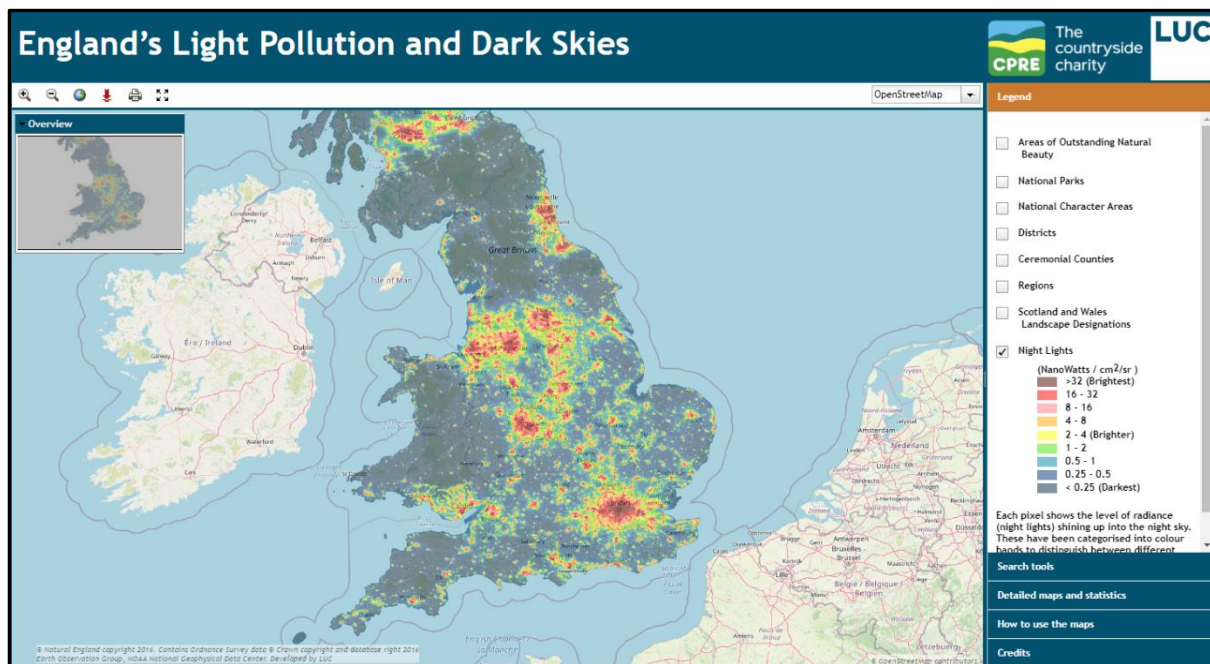


## 3 Finding And Mapping Your Dark Skies

### 3.1 Where to start

You will need to know where your dark skies and polluted areas are to protect and improve them fully. There are a number of ways to find darkness, but as a minimum:

It is recommended that Local Authorities initially use an easy and general method of sky quality determination by using satellite based mapping, such as the [CPRE Night Blight Maps](#).



These types of maps should be sufficient to develop broad lighting policies. In addition to maps, a simple and complementary method using Sky Quality Meters (SQM) can also be used to provide greater accuracy. SQM's are not absolutely necessary but their use is required in all IDA applications and are useful in ground truthing satellite data and in providing more detail. Photography is also useful, particularly on prominent hill tops.

To provide an effective and useful assessment of darkness, Local Authorities should aim to:

- Determine broad conditions with a baseline satellite map
- Ground truth darkest areas with an SQM meter
- Use photography to illustrate the prominent development from nearby view-points.
- Use astronomical objects to validate conditions at key sites

More complex methods such as False Colour photography and GPS-linked sky quality monitoring are described below but they are suited to places involved in an IDA accreditation or places that require greater accuracy in determination.

All of the methods are described below.

### 3.2 Satellite Mapping

For a general determination of where dark and light areas are, satellite maps are the best place to start. These maps will show the extent of darkness and pollution and help you locate key areas of interest.

Generally, satellite maps are derived from light that shines upwards and will show areas of high pollution. The light will also include illuminations of surfaces such as roads which is a slightly different use of light than stray pollution. As such, the satellite images can give you a good estimate of how bright an area is compared to other places, but there is an important distinction to be made in comparison to SQM meters. Due to the orbital height of the satellites, they won't give you a definitive measure of overhead sky quality looking up in a specific site – only an SQM will give this absolute measurement.

Problems arise when lights are not detected by the satellite. Some light can be pointing down and not have sufficient illuminance from the surface to be detected, but have a significant impact on your ability to see stars. A single, isolated high-mounted exterior light that points down would be a good example.

In that respect it is recommended that once you broadly identify areas of darkness that you ground truth using an SQM. Note that the measurement units used in satellite maps are not equivalent to SQM units and there is no conversion factor to do an accurate conversion. Although they generally show good agreement, they are measuring slightly different things.

Recommended satellite products are (in order of growing complexity);

- [CPRE Night Blight Maps](#)
- [The New World Atlas of Artificial Sky Brightness](#)
- [Visible Infrared Imaging Radiometer Suite \(VIIRS\)](#)

In most IDA designation applications, the New World Atlas is used, but the CPRE datasets add a valuable addition for UK based places.

### 3.3 Using a handheld Sky Quality Meter (SQM) to ground truth



The best way to get accurate and objective sky quality data is to use a Sky Quality Meter (SQM). The [Unihedron](#) SQM-L is the most used device in the IDA programme. [TESS](#) sky quality monitors are also available to use. SQMs are small handheld devices measuring the brightness from a small patch of sky. In the Unihedron model, the units are magnitude (brightness) per arcsecond<sup>2</sup> (area) and the meter measures the ability to see stars directly overhead. The higher the value, the darker the sky and the more stars you will see.

An SQM measurement will give an absolute measure of your sky quality. No other method will do this. Having this measurement will enable you to validate 'ground-truth' satellite mapping in your area and compare your skies to all other IDA places.

The SQM-L is the recommended IDA device (the 'L' stands for lens). The user just needs to point upwards into a clear, unobstructed sky and press the single button on the side. An average of 5 good readings is best provided a handful of initial 'warm-up' measurements are taken and then rejected as the sensor settles. The location, sky conditions and time should be recorded and you should hopefully find that the measurements become reasonably close. Measurements can only be taken under certain sky conditions such as time of night, moon phase and cloud conditions (see below – taking measurements).

Under typical UK skies, the Milky Way will become observable at around 20.5 magnitudes per arc second<sup>2</sup>, although skies between 20 to 20.5 will have important value as they are often a critical buffer zone and can provide good accessibility to urban centres. Care must be taken to select measurement locations, assessing the weather, moon phases, and time of year. Astronomy clubs

and local IDA places often have dark sky meters and can assist – they may even have some recent measurements.

### Taking ground truthing measurements

**Places:** Ground truth measurements should be initially taken where you think your skies are darkest. This will give you an upper boundary to the baseline satellite data. Measurements should be taken within and around these areas. They should give you a good estimation in comparison with the colours on satellite maps and the data. You can then infer the sky quality in other places on the satellite map and be reasonably confident that they are consistent with the rest of the area. Be careful that you have no lights in the immediate area that present a threat. A recce may be needed to check this.

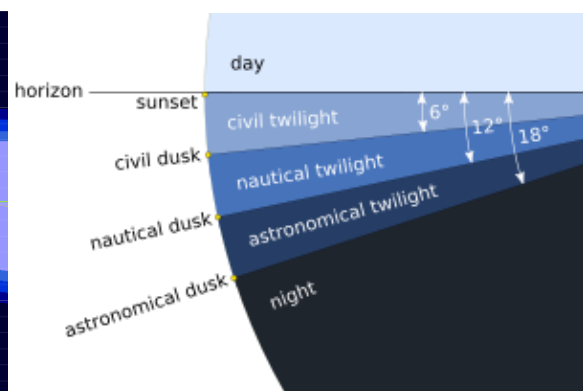
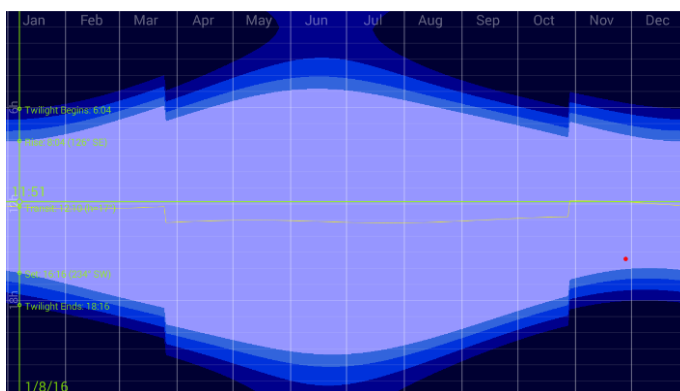
**Clouds:** SQM measurements should be taken under a clear sky with very few clouds, especially clouds directly overhead. This is because stray light will illuminate the clouds and lower your measurements. You need to pay close attention to a reliable 10-day forecast and anticipate last-minute changes to the conditions. The [Met office](#) forecast maps have a cloud cover option that is reasonably reliable 24 hrs in advance. [Metcheck.com](#) has a specific astronomy forecast that shows different cloud heights, types and air transparency that are also useful – if you're into that type of thing.

**Moon:** The brightness of the moon will also skew results as it will wash out natural darkness. Measurements should not be taken when the moon is in the sky. Inclement weather will also limit the number of nights when measurements can proceed.



You can determine the moon phases from websites such as <https://calendar12.co.uk/moon-phases/> but most astronomy apps for mobiles and tablets will have this function. It is recommended that you plan the moon phase windows for the entire optimum measurement season, which runs from when the clocks change in autumn to when they go back in spring. If you have a lot of volunteers helping you, make sure they know when these windows are well in advance. People will generally forget if it's not planned.

**Time:** You must also take SQM readings when the sky is sufficiently dark after sunset. The ideal time is after 'astronomical dusk'; the exact point varies throughout the year. The sky will also continue to darken throughout the night with the best conditions well after sunset and into the very early morning hours. While astronomy apps may tell you when astronomical darkness is, a good rule of thumb throughout winter is to wait



at least an hour after sunset to start. This [website](#) gives sunset times.

SQM measurements can – and should – be taken at other times of year. If you take measurements during summer, then you may have to wait longer after sunset to wait for astronomical darkness. Check the apps for this. In the UK during high summer, the sun does not set sufficiently low below

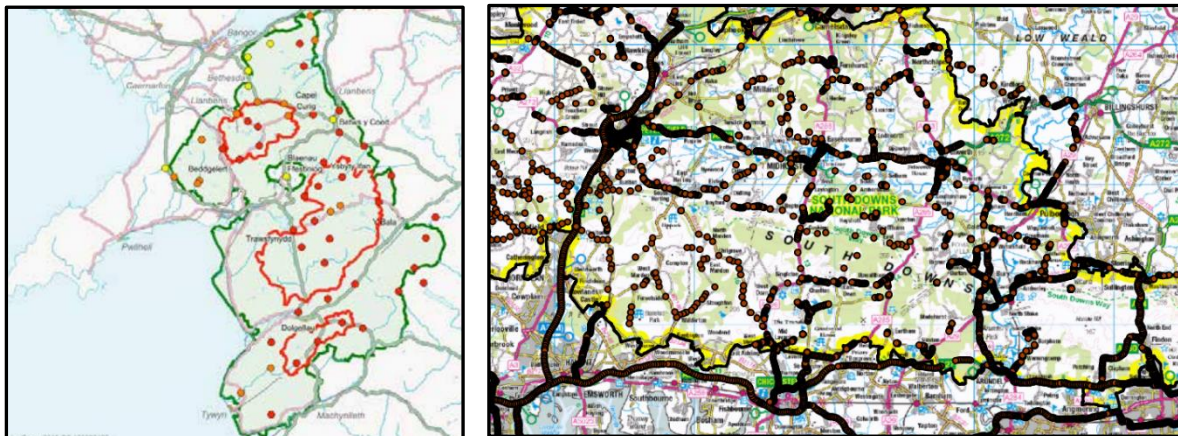
the horizon to bring on astronomical darkness. This is 'summer twilight' and it lasts throughout the night. It is best to avoid measurements during these times as it is very difficult to spot the Milky Way.

**Cost:** SQMs cost around £130, but astronomy societies may have one you could borrow.

### 3.4 Area SQM Measurements – IDA Places

If the satellite data show fairly consistent measurements or if you are considering an IDA designation you will need to collect sky quality data across a wider area rather than ground truthing at select dark locations – as shown in the SQM location point images below from Snowdonia and the South Downs. This method will give you a good determination of absolute sky quality across the area.

To create this you can continue to use an SQM-L, but now take readings in many more places across your area where you think you can easily get data from accessible sites. Hill tops, rural car parks, safe-to-stop roadside laybys or village greens are good places to collect data. It is important to ensure you collect sufficient data to ensure enough spatial density for it to be useful. This method is more time-consuming and you may need a number of winters or more volunteers to collect it. It is also recommended to consult with dark skies experts or consultants for advice or to undertake a survey.



You can go one step further and sync an SQM-LU (a data logging version of the SQM-L – 'U' stands for USB) to a GPS and collect sky quality data in much greater density. By attaching the SQM-LU and GPS to a vehicle you can drive and collect data at a timing interval of your choosing. Ensure that all exterior and interior vehicle lights are off when measuring. The [South Downs NP IDA Reserve application](#) used this approach (right image) but it is very time-consuming, more technical and will need specialised advice. Do not use this option unless you really need to!

You can also use the SQM-LU to install a permanent monitoring station that can track long term changes in sky quality in one location. This does require some additional IT and a secure location to install it. Some astronomy groups may have one installed on their buildings or observatories as they often collect weather and sky quality data.

### 3.5 Using the Milky Way, Orion and the Andromeda Galaxy to Ground Truth

One easier method to ground truth is to look for key astronomical objects with the naked eye. Though their 'truth' is based on the very subjective standard of the human eye, it will nevertheless give you an indication of sky quality. The benefit of these methods is that they can also be used to do some citizen science with your residents and is a great way to engage with the public. Make sure you give your eyes some time to adjust to the dark without phone screens – 20 minutes is best.

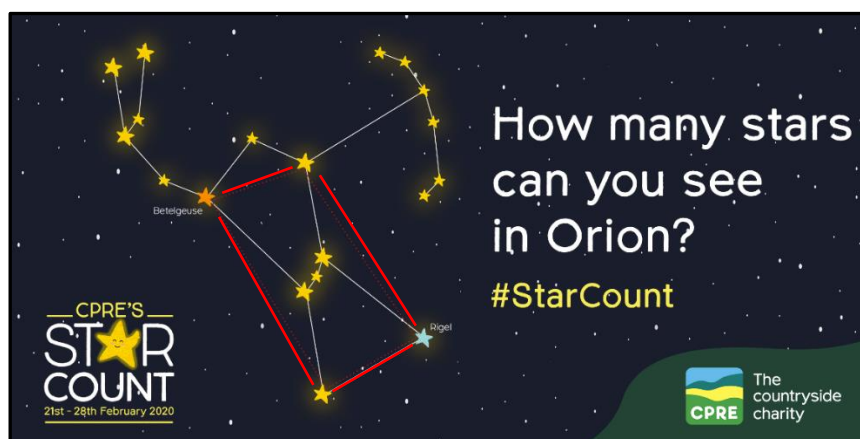
- **Milky Way:** A dark sky is defined as being able to see the Milky Way easily with the naked eye. A sky without the Milky Way is not the same – it appears as a random assemblage of

stars and loses its unique impact. Seeing the Milky Way shows that we live in a galaxy and we are part of something bigger. In the UK the Milky Way is observable throughout the year but its brightness varies with the season. Winter is the best time to observe it, and you should be able to see it arch across the sky in skies measuring 20.5 SQM and above. Under even dark skies, 21+, you should be able to make out 'dark lanes' within the Milky Way. This is the interstellar dust that obstructs our view as we look through the galaxy.

**Rule of thumb: If you can see the Milky way – the skies are important.**



- **Orion:** The constellation of Orion is prominent and easy to spot during winter in the UK southern sky. Observers can get a rough estimation of sky quality by counting the number of stars within the rectangle formed by the shoulders and feet. The number of stars you can see will give you the indication. The CPRE used this method for their [star count](#). In a city centre you will be lucky to make out 10 stars whereas under a good dark sky in the UK you should be able to see around 25-30. Theoretically, there are 40 stars visible to the naked eye within Orion, but you need to be in a very dark place and have very good eyes to see them all.



- **The Andromeda Galaxy.** This object is the Milky Way's neighbour galaxy and can only be seen under very good dark skies of 21+ SQM. Consisting of over a trillion stars at a distance of 2.5 million light years, this galaxy will appear as a faint elliptical fuzzy cloud in the

constellation of Andromeda, just below the prominent 'W' of Cassiopeia. It is tricky to find, so using some apps beforehand is recommended.



### 3.6 Landscape photography

Landscape photography taken from dark places towards polluted areas is an effective and easily understandable method to show the impact of development or poorly installed lighting. Normally taken from prominent view-points, a standard digital camera can be used to take wide field images and panoramas. Although they provide little detail on the level of darkness, they can help identify specific sources of light pollution and skyglow as the picture below shows. They are also good for publicity and communication.



Lights which can be directly seen that are below the camera position will show inappropriate installations - as all lights should point downwards.

Modern cameras will usually have a night mode which should be used. Good mobile phones have the same function, but in both cases a tripod should be used as the exposure length will be at least a few seconds and can be easily spoiled by hand shake or high winds. Beware of the cold though – it can drain batteries rapidly.

### 3.7 All-Sky Fish-Eye Digital Photography

A DSLR with a fish-eye lens is a cost-effective way to image the sky and locate threats. A sturdy tripod will also be needed to prevent shake. The ISO setting will need to be set correctly and a 30-

40 second exposure is recommended. Any longer than that and the stars will start to trail and appear fuzzy. For the UK, ISO of around 800-1600 at 30s is about right.

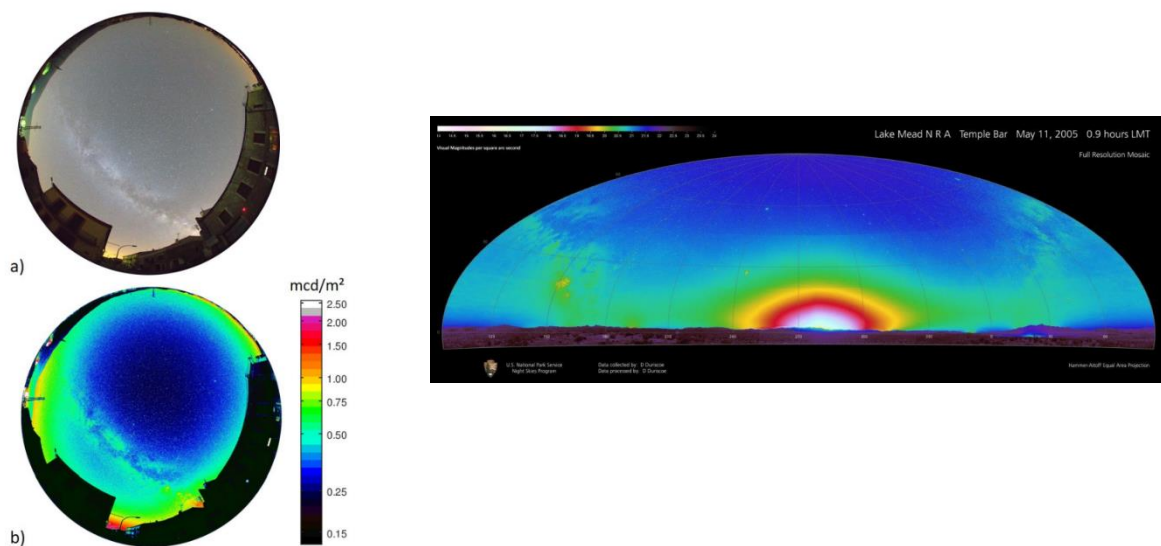
These types of images are useful when taken over a longer time frame to track changes at a particular point, e.g. hill tops. Bear in mind the weather will always make comparisons difficult.

### 3.8 False Colour Digital photography

This method usually employs a modified DSLR camera and some sophisticated processes to create an RGB or false colour images of the night sky luminance. It allows a more accurate method of determining threats on the horizon and the general darkness of the sky. It is however, more costly, more complicated and requires some expertise to implement. If you have an enthusiastic scientist or astronomy group nearby, they may well jump at the chance to do something a little more technical.

Images are either taken with fisheye lenses or stitched together as a mosaic – see images below. A fish eye lens can take a 360-degree view of the sky overhead in one image, but is prone to distortion. Mosaics have a more natural panoramic feel, but they can be fiddly to stitch together, so leave a good cross-over border between the images. The blue colours indicate better sky quality, the reds and yellows indicate sources of artificial light.

For further information, refer to the research paper [Measuring night sky brightness: Methods and challenges](#)





## 4 Lighting Zoning

Lighting zones are a recognised and effective instrument to apply lighting policies and reduce pollution. These zones have been used for many years within the lighting industry and organisations such as the C.I.E and the I.L.P. You will find 'E' zones (environmental) within the [European C.I.E](#) and I.L.P. documentation and often referenced in IDA places in the UK. These 'E' zones are graded from 0 to 4 – least to most pollution - and stipulate acceptable ambient lighting specifications, such as upward light and spill, that are relevant to those zones. Urban E3/4 zones tend to be more flexible in allowances whereas E0 dark sky zones are naturally more restrictive. E0 zones imply very little to zero light – which is hard to do in the UK- so you may have to be flexible within the zones to be realistic for your residents.

By setting zones you can precisely map where your high value dark skies areas are and apply targeted policies to ensure protection AND appropriate development. Zones can be created in a number of options (see brief descriptions below), using sky quality data from either SQM measurements or satellite maps, or by adopting common policies for the Local Authority as a whole. Sky quality data can be used and categorised between high brightness urban areas and darker rural areas where targeted lighting policy can be implemented.

Zoning is not essential, and may not be the most effective tool to accomplish policy aims. Be careful to understand what you are trying to accomplish before doing this – zoning should work for your area not be an inefficient burden for planners.

Regardless of the zoning method is it important that every zone is based upon best lighting practice.

Zoning will help you:

- Identify key dark areas within and around the local authority
- Communicate to your residents where high value skies are
- Support wildlife protection at key sites
- Promote areas which can be used for events and education
- Create media material for awareness

### 4.1 No-Zoning Option

Zoning might not be the right tool for your area. If your Local Authority area is all within an urban setting (or alternatively, all in the open countryside), you may find it useful to apply lighting policies consistently over the entire area without using zoning. For example, in a Unitary Authority which may be all urban, only the E3/4 zones may apply. In this case there is no real need to set zones. Similarly, if your area is completely rural, E3/4 urban zones may not be relevant. It may be easier for example, to set E1 policies throughout the entire landscape. Just ensure you use the basic lighting principles within this document.

You will need to ensure that the policies have a sufficient minimum standard to do the job you want them to otherwise they may be ineffective. For example, you do not want to use E4 city centre specifications for a rural E2 environment! Ensure that the highest possible level of protection is selected as the minimum.

There is a slight complication on the upward light ratio: In ILP and CIE literature, E3/4 zones allow slight amounts of upward light, 5-10%, which conflicts with the basic 0% principles laid out in this document. Some designers may then refer to these higher levels from habit without really realising or exploring the alternatives.

It is recommended that any lighting design strives to have **zero upward light** in all appropriate installations unless there is a clear and justifiable need. Most technological choices will have zero upward light options.

## 4.2 Using Ambient Lighting E-Zones

[ILP GN01 Guidance note for the reduction of obtrusive light](#) have linked sky quality data to ambient lighting zones which allows the landscape into further zones.

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

### 4.2.1 Simple Zoning



You can create a simple two-tier zone by demarcating the difference between urban (where the streetlights are) and rural or based on CPRE mapping. You could then apply more restrictive lighting requirements such as illuminance targets or maximum lumens per area in darker areas and allow more flexibility in urban places. Regardless of the differences between zones, good lighting principles should be followed in all cases. This example from the Norfolk Broads National Park show this method.

Buffer zones can also be added that compensate for a transitional area around the edges of urban settlements to give your policies and development options some additional flexibility.

By setting a simple zone you can also apply a range of policies and principles between the two. For example, you can allow longer times of operation in urban areas or avoid high illuminances, e.g. 20 lux, within rural environments. The drawback of a simple zoning is that it does not allow for more subtle changes in sky quality – especially in rural areas or important wildlife areas. In this respect it is more difficult to target and celebrate skies of much higher quality which is useful in IDA applications where education and promotion are key aspects.

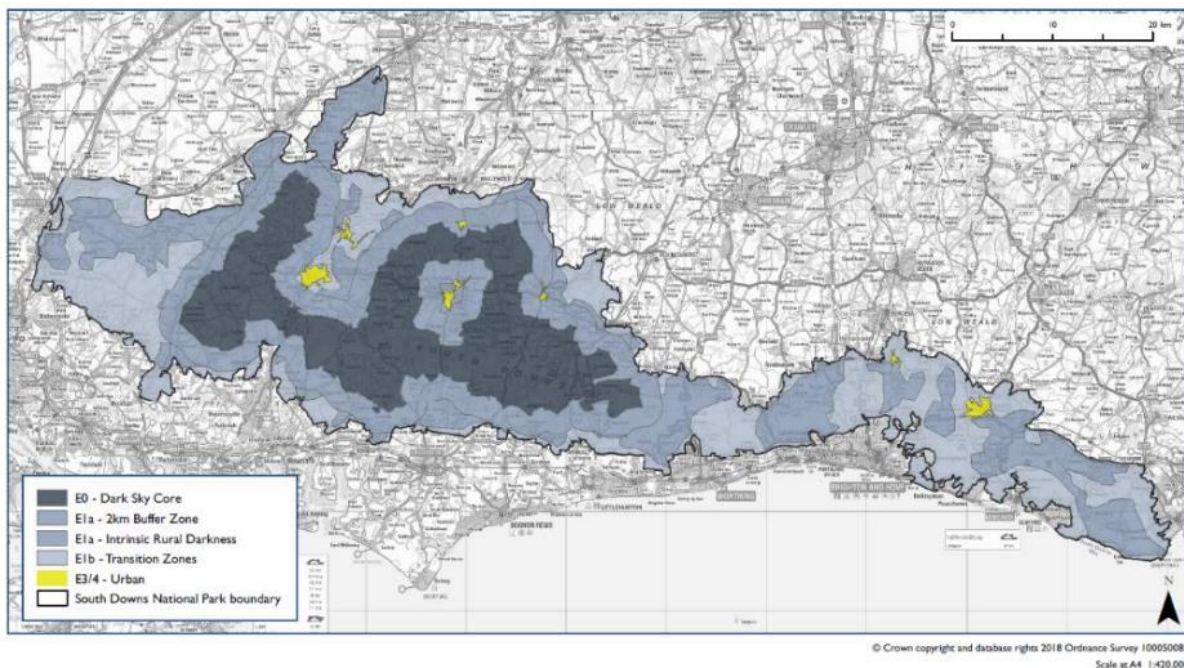
### 4.2.2 Multi and sub zoned ambient lighting zones (E0-4)

It is possible to add further granularity and policy detail to a zoned map by drawing boundaries along all E-zones that relate to area-based SQM data. A more detailed zoning map will enable you to implement more targeted policies and protect the darkest areas with distinct buffer zones. This method requires more detailed sky quality data around the landscape and a great deal more time.

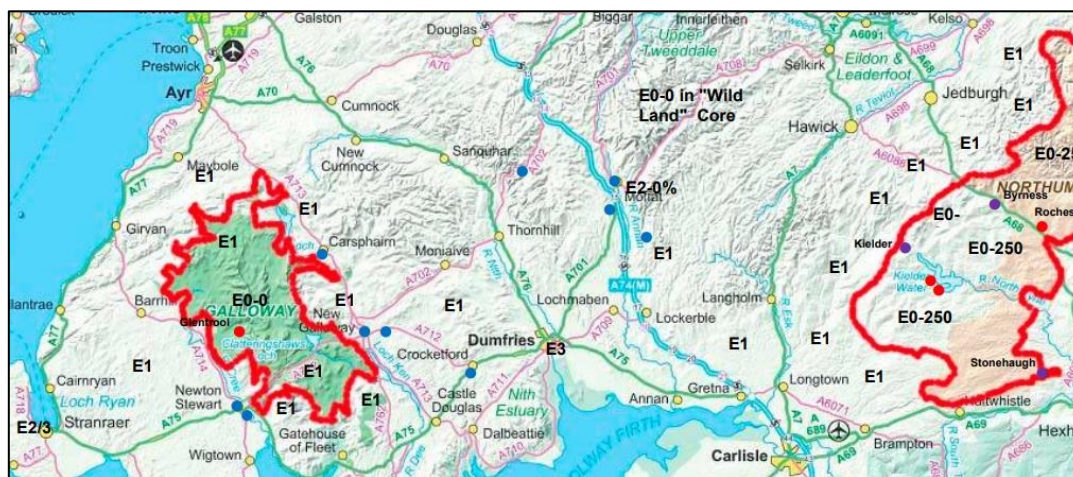
Generally, rural landscapes in UK will either use the E2 or E1/0 zones depending on if they are a protected landscape or not. It means that protected landscapes can prefer to use higher levels of protection E1 than those used in the general countryside irrespective of the sky quality (although the same option is open to rural environments with E1 levels of low ambient brightness). But, this can leave a large SQM difference between E1 and E3 zones if E2 is omitted: 5 points on the SQM scale is a significant difference in quality.

In these cases, it is useful to divide the E# zone into E#a and E#b zones. For example, E1a zones could encompass sky quality 20 and above, whereas E1b captures the rural landscapes up to the urban edge. This is the method used by the South Downs National Park. It allowed the park to identify and zone its darkest areas within an IDA core and provide all other sufficiently dark areas

outside the core – including a buffer zone - a consistent set of planning policies across its rural landscapes.



Similarly, there are other protected landscapes that have divided E-zones into sub zones which link to specific aspects of lighting relating to the proximity of residences. In other IDA places such as [Moffat](#), Scotland or [Yorkshire Dales](#), E0 zones have been differentiated into E0-0, E0-50 and E0-25 zones which relate to different distances of acceptable spill. This example shows [Galloway](#) and [Northumberland](#) maps.



The advantages of the multi zoned approach is that it can focus in on particular threats and large differences in sky quality. In this respect, the character of your area can be strengthened by tailoring zones to the landscape and its skies. This disadvantage is that it requires more work and analysis to produce.

A word of warning. Sub dividing zones may be useful in some cases, but it has to a) make sense to residents, b) be realistically enforceable for your organisation and c) be understandable to lighting designers. Simple Lighting zones with clear understandable criteria is key to effective policies.

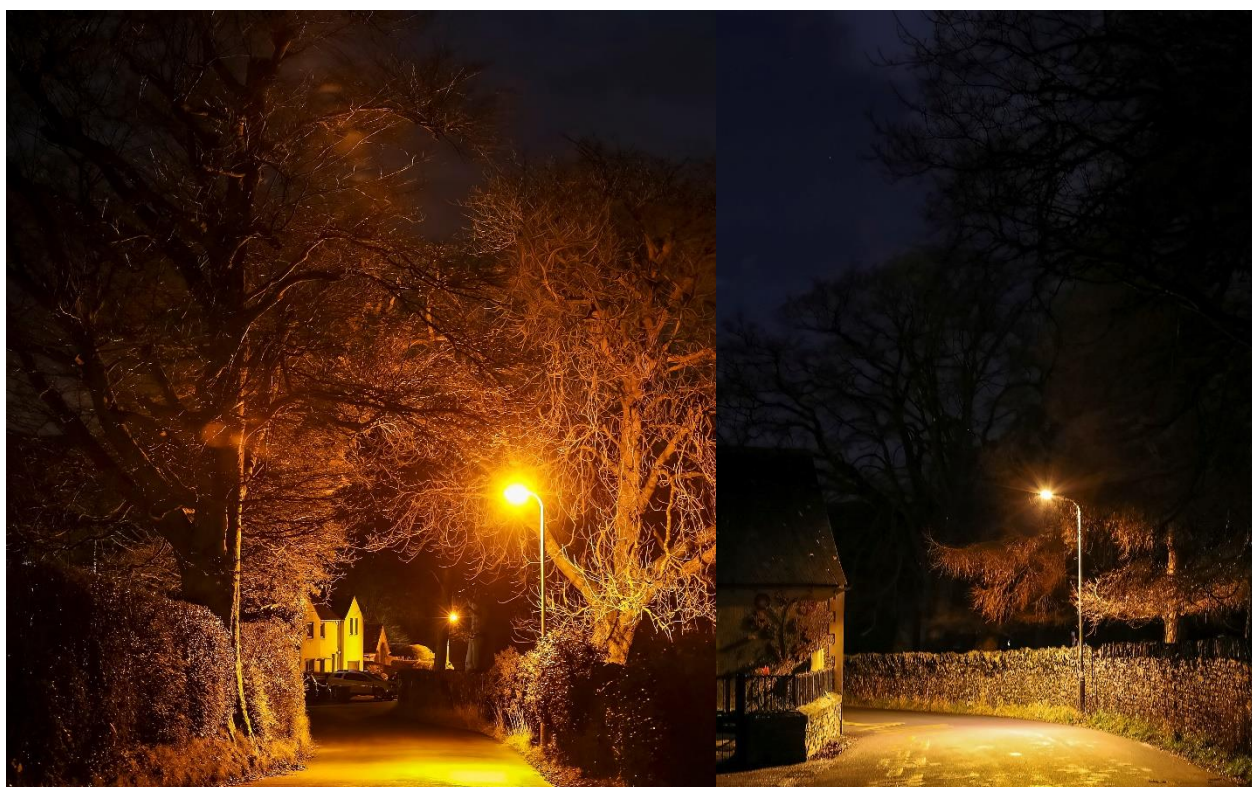
## 5 Embedding Dark Skies Policies into a Local Authority

Dark skies policies can be embedded within Local Authorities through three key areas of responsibility:

- **Street lighting** – which is the responsibility of the Local Lighting Authority.
- **Planning policy and development management** – which is the responsibility of the Local Planning Authority
- Other **Local Authority general functions**:
  - Environmental Health: Responsibility for light nuisance enforcement
  - Building Regulations: Responsibility for lighting and building regulations
  - Public Engagement:

Often the provision of lighting resides with County Councils, where they are the Local Lighting Authority. This will be separated from a Local Planning Authority, which is often a District Council, although sometimes may the responsibility of a National Park Authority or Broads Authority. Similarly, environmental health and building regulations reside with Districts, but are not delegated to National Parks or the Broads. Unitary and City Councils may act as all three authorities. Each Local Authority should determine where their responsibility resides.

It is recommended that an Authority establishes a dark sky ‘champion’ in the organisation to coordinate activities and develop a cultural change within.



*The beneficial impact of Local Authorities. This before (left) and after (right) image of Lorton in Cumbria shows how effective Local Authority action can reduce light pollution by installing better luminaires. Notice how there is zero upward light (shown in the trees), less glare while the illuminance and colour are roughly the same. Credit J Macfarlane.*

## 5.1 Local Lighting Authority – Streetlights

The Local Lighting Authority should seek to minimise the impact of public street lighting. Street lighting has a dominant impact on sky quality, not just by direct light pollution, but by the secondary scattering of light from illuminated surfaces. While street lights may be installed, the Local Authority should look to reduce the impact by adopting policies or committing to adopt future installations that incorporate the following lighting specifications:

- Adopting the IDA of colour temperature of 3000K or less
- Comply with Institution of Lighting Professionals guidance on obtrusive light
- Adopting the IDA zero upward light in luminaires
- Adoption of illuminances specified by British Standards

### [BS 5489-1:2020 Design of Road Lighting](#)

- Consideration of dimming or trimming schemes in CMS system
- Consideration of other forms of sympathetic street lighting, e.g. residential bollards, targeted lower CCTs, e.g. 2200-2700K for wildlife areas
- Adopting IDA Fixture Seal (FSA) of Approval lighting. There are some streetlights that are FSA compliant, for example the FSA compliant Thorn Plurio luminaire which has been used in the Lake District and wider Cumbria. It has adaptive colour technology that changes throughout the night, in combination with appropriate upward light specifications. This [video](#) and the image below shows the project.

These specifications are fully achievable with current technological options and most are becoming standard. A good example is Hampshire County Council [Technical Guidance Note 13](#), or [Lighting of Developer-Promoted Highway Schemes in West Sussex](#)

## CPRE Shedding Light

The CPRE report [Shedding Light](#) is a survey of English local authorities to find out how they approach lighting in their areas. The results presented in this report create a detailed picture of lighting issues in England, with the aid of a number of local case studies. The report also makes nine recommendations to help local authorities reduce light pollution and protect existing dark areas while saving energy.



## 5.2 Local Planning Authority

The Local Planning Authority should seek to minimise the impact of development by adopting planning policies that have a regard for dark skies. The lighting under planning control is diverse: it can relate to small scale domestic lighting to large scale commercial developments. Regardless of the size of scheme, common best practice principles can be applied to any proposed installation.

### 5.2.1 Starting with the National Planning Policy Context

Local Authorities policies will often be guided by national policy documents which may contain references to dark skies. The lighting recommendations should be adopted by LAs to meet these national policies.

For example, the National Planning Policy Framework 2021 used in England makes reference to lighting, in paragraph 185(c):

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

Similarly, for Wales within the Planning Policy Wales Documents (pp 159,160);

“There is a need to balance the provision of lighting to enhance safety and security to help in the prevention of crime and to allow activities like sport and recreation to take place with the need to:

- protect the natural and historic environment including wildlife and features of the natural environment such as tranquillity;
- retain dark skies where appropriate: Distinctive & Natural Places;
- prevent glare and respect the amenity of neighbouring land uses; and
- reduce the carbon emissions associated with lighting.”



## 5.2.2 Embedding a High-level Strategic Policy in a Local Authority

A Local Authority should set an overarching policy on dark skies on which to base specific lighting requirements – this is the hook from which all policies will flow. A strategic policy should firstly ask why the lights are needed in the first place and justify their purpose. Compliance to lighting requirements should then follow with reference to dark and bright areas. For example, this hierarchal approach could be adopted, supported by technical specifications for best practice in separate documents:

### Example Excerpt

#### Strategic Policy: Dark Night Skies

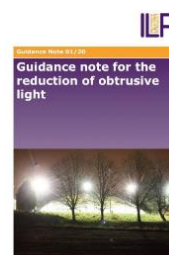
1. Development proposals will be permitted where they conserve and enhance the intrinsic quality of dark night skies.
2. Development proposals must demonstrate that all opportunities to reduce light pollution have been taken, and must ensure that the measured and observed sky quality in the surrounding area is not negatively affected, having due regard to the following hierarchy:
  - a) The installation of lighting is avoided; and
  - b) If lighting cannot be avoided, it is demonstrated to be necessary and appropriate, for its intended purpose or use:
    - i. Any adverse impacts are avoided; or
    - ii. If that is not achievable, then adverse impacts are mitigated to the greatest reasonable extent.
3. Lighting which is proposed to be installed must meet or exceed the level of protection appropriate to the environmental zone.

## 5.2.3 Adding Best Practice Planning Policies

Best practice planning policies do not need to be complicated but they do need to be useful to planners, developers and lighting professionals. They also need to reflect current working best practices for lighting which are referenced in existing standards and guidance. Best practice planning policies will reflect and include:

### Guidance and Existing Standards

- Ensure lighting complies with the Institution of Lighting Professionals' GN01 [ILP Obtrusive Light](#) with essential compliance on
  - Upward Light ratio
  - Light Spill
- Ensure lighting assessment complies with [CIBSE SLL LG6 The Exterior Environment](#)
- Ensure [CIBSE SLL guides](#) for other lighting uses are followed
- Illuminance Standards are used where appropriate to avoid over lighting, e.g.
  - [BS 5489-1:2020 Design of Road Lighting](#)
  - [BS EN 12464-1:2011 Lighting of Indoor Work Places](#)
  - [BS EN 12646-2: 2014 Lighting of Outdoor work places](#)
- Ensure that illuminated advertisements comply with current legislation and preferably ILP PLG 05 – The brightness of illuminated advertisements. [ILP Illuminated Advertisements](#)
- Specialist guidance is taken where appropriate, typically [Sports England Artificial Light](#)



## Important Lighting requirements

- 3000K or less CCT lamps should be used. Higher CCTs must be validated against references to specific standards (e.g. sports pitches) where appropriate
- Any lights above 500 lumens should be fully shielded (Fully-Cut-Off, FCO)
- Apply suitable mitigation measures, such as Proximity Infra-Red sensors or timed switching
- Advocate the use of IDA Fixture Seal of Approval lighting in applications
- Lamps with a high spectral content of blue light should be avoided

## Other best practices

- Encourage communities to adopt dark sky policies (see section 6.2)
- Consider policies involving light spill from interiors through glazing. See [South Downs Internal Light Appendix](#)

### 5.2.4 Examples of Lighting Policy Documents and Other Useful Guidance

Due to the complexity of lighting specifications, Local Planning Authorities should create supplementary documents to expand on the details. Fortunately, there are a number of well-established guidance developed within existing IDA Places which can be referenced to provide further information.

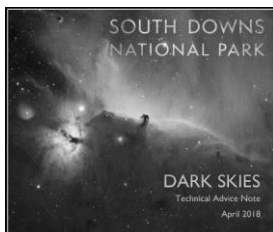
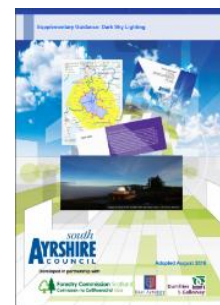
Depending on the country, different documents are used, e.g. Technical Advice Notes, Supplementary Planning Documents, Guides or even non-planning materials. They can be substantial documents as they need to provide sufficient detail for developers and designers to understand. While they share common principles you may wish to seek further advice if you require a more targeted document that reflects your area, landscapes and residents.

Some examples of different approaches include:



[Northumberland Outdoor Lighting Guide](#) - This is a quick, accessible guide to lighting within the park. It describes best practice guides and how this applies to the lighting zone approach. There are some examples of good light installations.

[Dumfries and Galloway Supplementary Planning Guide](#). From the first UK IDA accredited place, the SPG provides a more thorough guide to lighting that links to the Local Development Plan. It is a more formal document in line with existing planning policies.



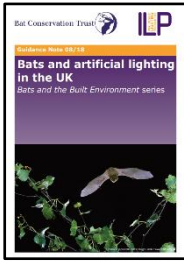
### [South Downs TAN DNS](#)

This technical advice note provides detailed planning advice that links to the Local Plan. It is complex in content but is written in a language that lighting developers can understand. This technical advice note also provides an appendix for internal glazing and light spill.

## Other useful guidance documents

Sometimes, specific guidance is needed where lighting presents unique challenges beyond the scope of more general planning documents. In addition to the [Towards A Dark Sky Standard](#) (section 2.3), some other useful inclusions are:





[Bats and artificial lighting in the UK](#) by the Bat Conservation Trust and the ILP.

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.

[Design Guidance for events, creative commissions and lighting festivals](#) by the South Downs NPA. This guidance was prepared after an analysis of the unique threats that the South Downs faces. This required a deeper understanding of lighting threats – advice on which can be found in section -

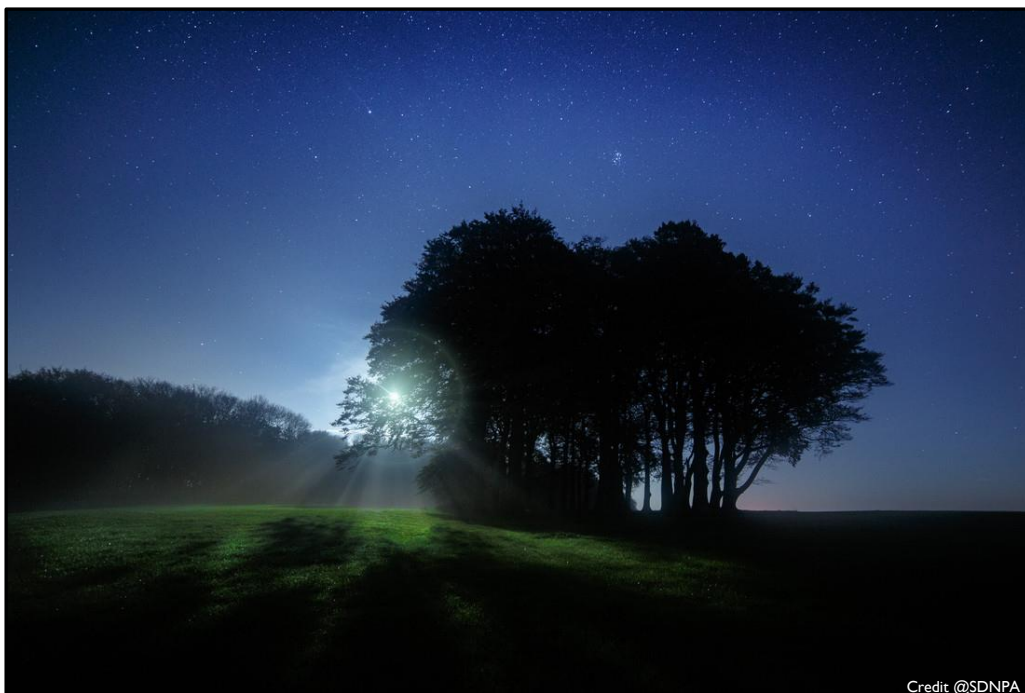


### 5.2.5 Permitted Development Rights

There are many places and facilities that will be allowed permitted development rights for lighting. Railway stations, aerodromes, prisons and farms are listed among places that can install lighting without the need for permission. As such, they are a significant risk to dark skies if they are inappropriate and installed badly.

It is recommended that any lighting design should have some assessment even within a Local Authorities' permitted development rights.

Being able to install a light without any consideration for design or intrusion is in direct conflict with professional lighting guidance, standards and best practice – let alone the impact on the sky.



Credit @SDNPA

### **5.3 Other Local Authority Functions Relating to Dark Skies**

There are other areas of Local Authority responsibility that should aid the delivery of dark skies. These will be in the general promotion and inclusion of residents to raise awareness, and also in empowering Environmental Health and Build Regulations Officers to deliver enhancements.

A Local Authority should;

- Seek to promote the protection of dark skies through relevant partnerships and organisations.
- Engage with the local astronomy groups – they can often provide a valuable volunteer resource and knowledge base.
- Engage local communities by providing accessible information to residents (see next section)
- Identify officer(s) to act as liaison officers with any surrounding or adjacent IDA dark sky place.
- Assess compliance on Local Authority owned buildings and develop a Facilities Lighting Management Plan to improve compliance.
- Inform and empower Environmental Health Officers to act on lighting nuisance
- Inform and empower Buildings Regulations Officers to act on inappropriate luminaires, i.e. energy efficiency and installation angle
- Identify and act on any significant and documented sources of lighting nuisance to both people and sky quality
- Promote dark skies and astro-tourism as part of economic development or tourism opportunities

### **5.4 Local authorities who are consultees to protected landscapes**

Nearly all IDA places reside in protected landscapes. They identify a dark sky as a ‘special quality’ within their management plans. This requires Local Authorities within and around a protected landscape to have a statutory ‘duty of regard’ for the special qualities. This duty is to ensure that relevant authorities show a regard for dark skies under their consultations or activities that are within protected areas, but it does not require the Local Authorities to specifically implement actions to safeguard these qualities. The policies described in this document will help Local Authorities to achieve an equivalent level of regard as used by IDA places.

To further strengthen the regard between protected landscapes and Local Authorities additional agreements could be sought. Agreements such as MOUs or Local Accords that specifically cover the policy recommendations in this document will help to solidify that longer term commitment to protecting dark skies.

## 6 Engaging and inspiring

Any work with dark skies will result in public interest – mostly good. It is a well-liked issue with plenty of tangible and practical steps that residents can understand and take action on. Well informed and enthusiastic residents will often ask for support and guidance. They will want ideas for developing their own work in protecting dark skies and reducing light pollution where they live.

Most IDA dark places will use specific material and advice targeted for their domestic audiences. They are designed to encourage residents to adopt supportive policies within their own neighbourhood plan documents. This section will involve:

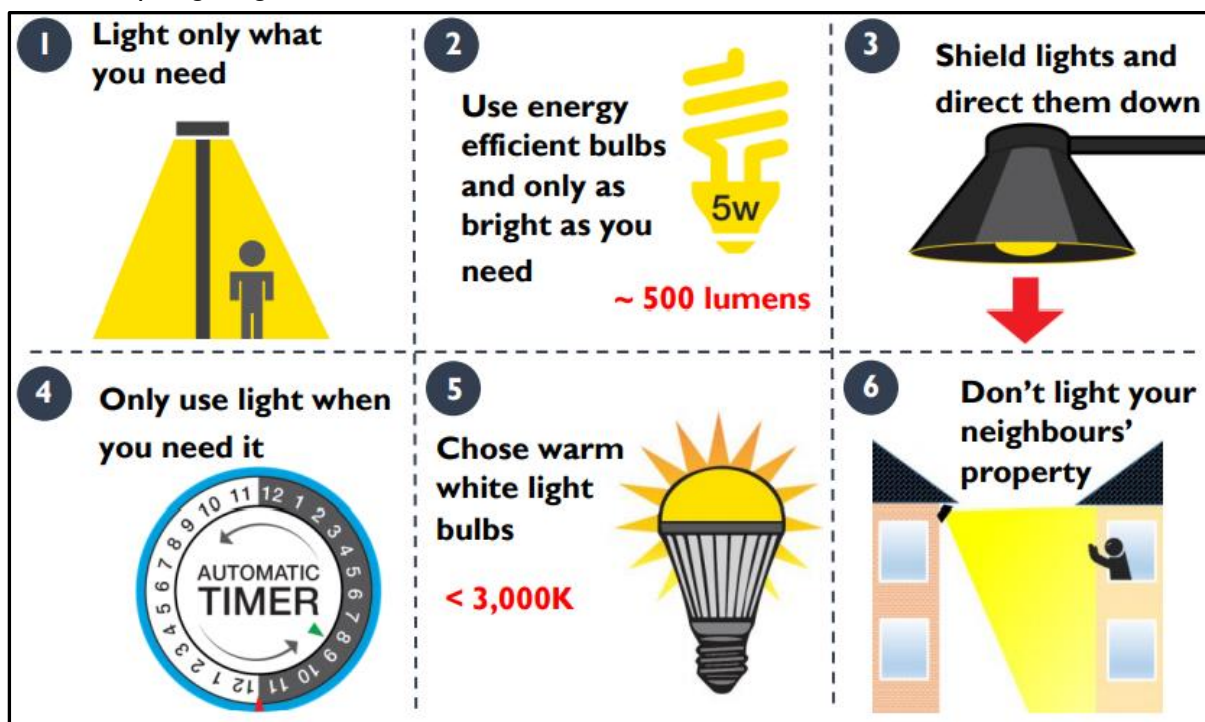
- How to give basic domestic advice
- Encouraging local communities to adopt their own planning policies
- Running star parties and wildlife walks
- Supporting the All-Party Parliamentary Group on Dark Skies.

### 6.1 Domestic advice

Planning Authorities don't usually formally comment on domestic lighting as it involves minor fittings. That does not mean that this level of lighting should be ignored. Poor domestic lighting can be highly intrusive, annoy neighbours and disrupt wildlife.

When a Local Authority starts working on dark skies, it is highly likely the public will want, and seek out, better advice. This is because they want to do the right thing or they don't understand the process. In this respect it is recommended that you have specific advice aimed for the domestic market. Fortunately, there is already good material available that you can use.

This is an example based on an [IDA template](#) that is presented on the back of a postcard – with a suitable inspiring image on the other side.



## 6.2 Community planning – Village Design Statements/Neighbourhood Plans

Communities have an important role to support Local Authority planning policies. If neighbourhood plans or village design statements can adopt dark sky policies then effective mitigation against light pollution can be implemented at every stage of local governance. Ideally, the community should apply similar dark skies policies with appropriate neighbourhood planning documents that reflect those being used by a Local Authority for reduction of light pollution. Residents may already view this as a key issue, and may approach the Local Authority to get further advice.

The following example is taken from a Village Design Statement (VDS) from small village within an International Dark Skies Reserve. The village – Buriton, Hampshire – lies in an important pinch-point within the core zone. As the residents understand the importance of preserving the integrity of this small area of darkness, they have acted to protect their skies by creating the following statements in support of those used by the Local Authority. The highlighted text has been added within this document to show how the 5 principles have been embedded into the policies text.

**Dark night skies and tranquillity**



The parish of Buriton has some of the most tranquil areas in the South Downs National Park and some of the darkest night skies.

Tranquillity and a sense of isolation in the parish provide inspiration and spiritual well-being for visitors and residents alike in one of the busiest and pressured regions of the country.

The tranquillity of the parish is influenced by things that people can both see and hear around them and part of the parish has been affected by noise from the A3 Trunk Road for a number of years. However, with the introduction of low-noise, 'whisper turbine' along the length of the A3 through the parish during resurfacing by Highways England in 2015-16, the main cause of noise disturbance in the parish has been removed.

In 2016 the National Park was awarded IDA International Dark Skies Reserve status – one of only eleven places in the world to be so accredited. Although the Reserve covers the entirety of the National Park, the status is dependent upon conditions in a continuous dark sky core area and a 2km buffer zone. Any erosion of dark skies conditions in these areas can threaten the International Reserve status.

The parish of Buriton sits in the core zone of the International Dark Skies Reserve but forms a narrow pinch-point within the Reserve – with more widespread darker areas to the west and to the east (see map opposite). Buriton provides a vital part of the core area, sitting between the brighter lights of Petersfield and Clarendon to the north and south. Any deterioration in the quality of night-time darkness in the parish of Buriton could, therefore, threaten the International Reserve status and the National Park. Authority has identified Buriton as an area which would be particularly vulnerable to change lying between larger urban settlements to the north and south.

Buriton Parish Council is very keen to work with developers, lighting authorities and the Local Planning Authority to conserve and enhance the intrinsic quality of the dark night skies above the parish for the benefit of people and wildlife.

The parish is also working towards IDA Dark Sky Community status so as to minimise the range of effects of light pollution: wasting energy, costing money, impacting upon wildlife and affecting human health as well as preventing people from enjoying the night skies. The community will be seeking a fully-shielded or full-cutoff standard for all lighting fixtures over 1500 lumens and a threshold of 3,000 kelvins for the allowable correlated colour temperature of all lighting fixtures.

Extra attention must therefore be paid to any proposals which involve the installation of external lighting and where the design of developments may result in light spill from internal lighting. Roof lights can be particularly intrusive and damaging.



The parish of Buriton forms an important pinch-point in the South Downs International Dark Skies Reserve

**Design guidelines**

T1: Due regard should be given to the SDNPA's 'dark skies' policies in respect of lighting throughout the parish for both public and private areas so that lighting is (a) kept to the minimum necessary for safety whilst (b) preventing lightspill or glow by incorporating fixtures such as downlighters and timing switches

T2: Because of the critical, 'pinch-point' location of this parish in the South Downs International Dark Skies Reserve, developments, redevelopment and alterations should refrain from using roof lights unless it can be proven to be absolutely necessary. Any areas of glazing and roof-lights in new developments and in redevelopments or alterations must also include measures to prevent light pollution (such as specially treated glass)

T3: Light pollution from Petersfield already affects the night-time tranquillity of the parish. New development should not exacerbate this problem

T4: Development which is detrimental to the amenity value and tranquillity of public rights of way should not be permitted

T5: The sense of peace and tranquillity in the parish can also be destroyed by noise and air pollution. Very careful consideration should be given to any new uses which may bring harmful effects. In some cases it may be possible to reduce adverse effects to acceptable levels by design and layout considerations.



The main audible intrusions affecting the parish are now noisy recreational activities such as off-road vehicles and motorcycles using parts of the rights-of-way network (DOAs) in the parish.

- T1: Due regard should be given to the SDNPA's 'dark skies' policies in respect of lighting throughout the parish for both public and private areas so that lighting is (a) kept to the minimum necessary for safety whilst (b) preventing lightspill or glow by incorporating fixtures such as downlighters and timing switches
- T2: Because of the critical, 'pinch-point' location of this parish in the South Downs International Dark Skies Reserve: developments, redevelopment and alterations should refrain from using roof lights unless it can be proven to be absolutely necessary. Any areas of glazing and roof-lights in new developments and in redevelopments or alterations must also include measures to prevent light pollution (such as specially treated glass)
- T3: Light pollution from Petersfield already affects the night-time tranquillity of the parish. New development should not exacerbate this problem

### 6.3 Star Parties



There is nothing quite like being under a starry sky to make a real lasting impact. Being able to show kids and adults the Milky Way, constellations, planets or just the Moon can really give people the opportunity to connect with nature and understand the issue of light pollution first hand. In fact, events are a necessary part of any IDA designation as they are a key component in engaging with communities and promoting messages. In that respect a star party must link the observation of the sky with the messages of reducing light pollution.

You can do the most basic of star parties with very little equipment under some of the most light-polluted sky or use large telescopes in the darkest of settings. Some IDA places hold events in the middle of large cities where the event is much more accessible to the public rather than have them driving to more remote rural locations. Even viewing the Moon from a small telescope in a city can have just the same long-lasting impact as seeing the faintest of Galaxies with a large telescope in the countryside.

The best advice is to find your local astronomy club or an astronomical experience provider. They will already do public events and will be more than happy to use their equipment and their knowledge to make the evening a success. They know the best times of year to hold events and possibly some good locations. Astronomers want darker skies as well, so they will normally want to work with you.

Star parties are best run in winter when the days are shortest and families have the best opportunity to attend. Having a quarter moon is useful as it provides a nice easy object to look at without the light of a full moon blotting out the view of the rest of the stars - you don't need a fully dark sky. It is also useful to observe at the same time as astronomical events such as when planets are nice and visible, or during regular meteor showers like the Perseids in August.

[GoStargazing](#) is a website that collates UK star parties. You may want to check this to see what is going on in your local area.

### 6.4 Wildlife Walks – Nature experiences



Instead of running star parties, wildlife walks offer a different experience for the public. Many conservation-based organisations with property, like the RSPB or Wildlife Trusts, may already hold night walks and wildlife events like bat walks or moth trapping. Don't be worried about trying to fixate on difficult-to-find species, often the experience of just looking, and hearing the sounds of a dark place is enough to inspire your visitors.

A wildlife walk will often need an expert. As with star parties, there is plenty of opportunity to do events in city centres and the success is dependent upon promoting key messages.

## 6.5 Supporting the APPG for Dark Skies



Local Authority officers and residents should encourage elected officials to take light pollution seriously. Members of Parliament within your Local Authority should be encouraged to join and participate in the activities of the [All-Party Parliamentary Group \(APPG\) for Dark Skies](#).

The UK Parliament's All-Party Parliamentary Group for Dark Skies exists to fight light pollution to protect our dark skies for future generations. They provide a forum for parliamentarians and organisations across the public, private and third sectors to work together to discuss issues regarding the visibility of the night sky and promote the adoption of dark sky friendly lighting and planning policies. They principally focus on efforts to preserve the night sky within the UK but also include international issues within their remit.

The group was founded in January 2020 by Andrew Griffith, MP for Arundel & South Downs, and co-chair Lord Martin Rees of Ludlow, the Astronomer Royal and former President of the Royal Astronomical Society.



*Light Pollution to the south of Angle Tarn looking towards Kendal, Windermere, Ambleside and beyond. Credit Rob Fraser*

## 7 Enhanced threat analysis – lighting audits



It is recommended that Local Authorities take the extra step and understand their lighting threats in greater detail. There may be a large planning development or existing sources of light that pose a specific threat that needs special attention or more targeted policies. Understanding where key threats are will help a Local Authority protect dark skies by asking for more mitigation or alternatives with planning.

Alternatively, a community may want to understand their local neighbourhood's lighting footprint in more detail with a desire to use this for an IDA Designation. A lighting audit and threat analysis are necessary requirements of an IDA designation.

Due to the complexity and the time involved, lighting audits and policy development are sometimes undertaken by dark sky experts and consultants.

### 7.1 Public lighting and urban places lighting audit

Urban places can be identified using satellite data. They will stand out as red/orange blobs over known urban places. However, not all the light pollution may be from similar light sources. There may be unique buildings (stadiums, schools, churches, industrial greenhouses) or old street lighting that adds to light pollution that is lost in the ambient light. Follow these tips for:

- **Street Lighting:** Most street lighting is now captured on G.I.S. systems and held by the Local Authority or a delegated company, e.g. Southern Scottish Electric (SSE). Datasets can be requested by the public and should show the exact location and type of luminaire within an area. Knowing the types of luminaires used within a Local Authority will help identify older fittings with inefficient lighting and opportunities for upgrades. It will also help show where part-night lighting dimming schemes could be established. Once you have the relevant data, either as a G.I.S shape-file or spreadsheet, you can plot this over a map, e.g. OS Maps.
- **Unique buildings:** Buildings with a high lighting presence will stand out visibly, particularly on the horizon from a distance. Panoramic photography from hill tops will help identify these developments such as this example below from the Lake District. They may also show up as identifiable 'blobs' on satellite data. Targeted engagement with the owners of these developments may be required to proactively reduce the light pollution. If an area has a number of similar developments the authority should consider specific advice and guidance for improvement. For example, churches are often lit up at night for purely aesthetic reasons – this may need specific advice and design recommendations.



Credit @Cundall

- Special Events:** It is also advisable to pay attention to temporary events that have lighting footprints. These can be highly intrusive and some consideration should be made to mitigate the impact. These usually need photography from the nearby countryside to show the impact. You should aim to take a photo from the furthest distance that it is visible from the naked eye. For example, sky tracker search beams can be seen from over 10 miles away. The [Design Guidance for events, creative commissions and lighting festivals](#) should be used to reduce the impact.



## 7.2 Domestic lighting audit – enhancing community action

An on-the-ground lighting audit is designed to precisely show the type, number and installation details of lights. The information will help understand how a community can reduce their own lighting impact and take community action on dark skies. It is an intensive process and should only be attempted either as part of an IDA designation or for a small population willing to take part, e.g. a village. Some lighting knowledge will be useful.

The information you can take will depend upon the owners' participation but if you have willing residents you can take information on;



- Number of lights on a building
- Location
- Type of light (carriage, modern, spot light, tube, etc)
- Installation (upward light)
- Output (lumens and colour temperature)
- Controls (PIR, timers)
- Image of light (if you have permission to do so!)
- Compliance with IDA requirements (only for IDA applications)


There are a few ways to do an audit depending on the amount needed to be surveyed and how involved you want to be with residents. But it is best to involve the community as much as possible before hand.

- **Door-to-Door:** This audit method relies on going door-to-door and directly engaging with residents to tell you of their external lighting. The information will be of the highest accuracy but not everyone will want to do this. You must work in a transparent and open manner with the community to do this. It may need some dialogue with the community and uptake before the audit.

This is the method most used by IDA Parks with a small number of lights (<100).

The [IDA Community Isle of Sark](#) is a good example of this where they used a self-audit template with an external expert to help residents confirm their data.

Exterior Lighting Management Plan  
Version 02.2010



**Table 5.1 Internal Audit carried out – April / May 2010**

**Total number of luminaires: 582      Total number compliant: 436      Percentage compliant: 75%**

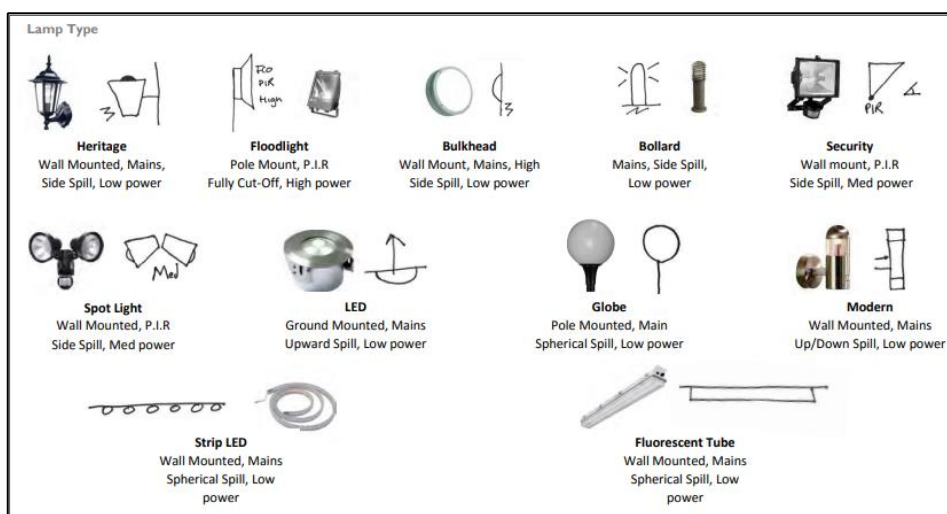
ID	Building		District	ID	Luminaire			Lamp			Purpose	Fully Shielded	Quantity	Compliant
	Name	Type			Type	Elevation	Adjustable	Wattage	Duty Cycle					
001	La Cloture	Residence	Little Sark	001	Bulkhead	90	n	40	switch	Residential	n	1	1	
002	La Cloture Barracks	Residence	Little Sark	002	Bulkhead	90	n	40	switch	Residential	n	1	1	
				003	Bulkhead	90	n	40	switch	Residential	n	1	1	
				004	Heritage	90	n	40	switch	Residential	n	1	1	
				005	Heritage	90	n	40	switch	Residential	n	1	1	
		Shed			Bulkhead	90	n	60	switch	Residential	n	1	1	

- **Roadside:** This audit method relies on taking information from the roadside without knocking on doors. It is best for large numbers of lights (100+). Without trespassing on boundaries, general luminaire information can be taken by roughly estimating the type of light. This will give a general indication of the types of luminaries used (and the likely lumen output) and how they are installed. While you can quickly do this from the roadside, it is still advisable to inform residents you are doing it – someone normally asks what you’re doing.

The accuracy is less but it will nevertheless provide a good indication of typical lights and dominant threats. Assessing the lumens is almost impossible from the roadside but you can categorise the lights as broad risk categories, low/medium/high. This would help show where action may be more appropriate.

CCT can be assessed by using a colour temperature app on a phone. The accuracy can be a little different between apps but it will help you distinguish the really white lights from the warmer lights. This can also be done by eye, but only when the colours are significantly different.

This was the method used by the South Downs as there were many lights within a village and many villages in the landscape. An extrapolated audit was undertaken that gave a rough snapshot of the average lighting footprint of a dwelling. Light notations were drawn onto paper maps to show location and type – the notations shown below. More details can be found in the [SDNPA IDA](#) designation application.



A word of warning. A domestic survey can be considered intrusive by some residents. They may get defensive or annoyed that you're surveying their property. There is also a perception that information taken can be used to inappropriately single out prominent polluters. Care must be taken to ensure that this is avoided. Data should not be publicly available and locations of prominent polluters should not intentionally be made available. While it is important to engage with the owners of these sources, singling out residents as polluters may back-fire when it comes to engagement and outcome. Residents should feel empowered and encouraged to make changes, not bullied or harassed.

### 7.3 Commercial lighting audit

Commercial lighting can be very intrusive. Car parks, yards or the buildings themselves may have lighting installations that by their design are very bright as they have to meet certain illuminance standards. For example, a public car park will require an illuminance of anywhere from 5 to 100 lux depending upon the level of light and precision work needed. Ideally a lighting designer or dark sky expert would have been consulted to ensure the levels of light are compliant. Unfortunately many commercial places do not use lighting designers which means the lights might be inappropriate. Doing a commercial audit will help you identify these places.

The basic method of the domestic audit can be applied to do a commercial audit of businesses. You can either work with the owners or do a roadside survey without the need for permission provided they are in public places – do not trespass!

It is useful to record;

- The general purpose of the space being lit. This will help you estimate the compliance with existing guidances and standards. However, there may be specific work that is undertaken in the space that requires high levels of illuminance which isn't obvious from standing there. Bear this in mind when developing recommendations.

- **Illuminance:** Illuminance is the level of light falling onto a surface and is measured in lux. Illuminance levels are recommended by professional organisations to ensure enough light is being provided to do certain tasks, for example, 20 lux for a farmyard.

**CASE STUDY:** The Friends of the Lake District used this method to record illuminance in their Cumbria [Lighting Audit and Lighting Plans](#). A lighting consultant was commissioned to undertake the survey. SQM data were taken at the site as well as collecting as much data as possible.

Survey Data	Data Recorded on : 10/02/21 22:22
Type of Area / Building	retail_building
Type of Installation	wall_side_
Type of Light Fitting	square_flood_light
Type of Lamp	
Estimated Wattage	
Perceived or Known CCT	4000K
Aiming Angle	sideways
Estimated Upwards Light Spill	26%_to_50%
Age of Light Fitting(s)	
Condition of Light Fitting(s)	
Type of Control	
Notes	

Survey Data	Cont...
SQM Reading (magiarsec <sup>2</sup> )	13.66
Horizontal Reading (Lux)	33.9
Vertical Reading (Lux)	29.8

**Map Location**

## 7.4 Cross-referencing sensitive sites

It is worthwhile to identify sensitive or important wildlife sites within a Local Authority. Evidence shows that light pollution is detrimental to individual species, habitat integrity and ecosystem functions. More restrictions can be placed on development near sensitive areas.

Look for nearby:

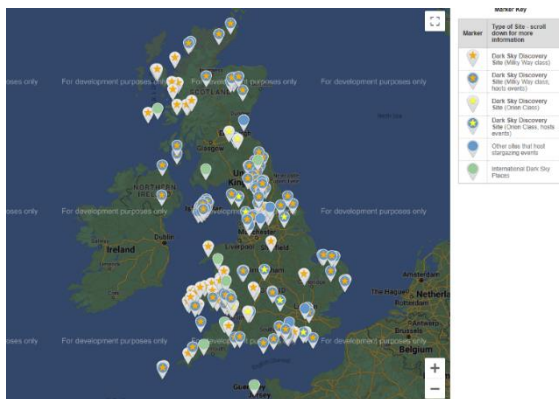
- Open green spaces, and amenity land.
- Local assets such as village greens, ponds.
- Managed nature reserves, e.g. RSPB, National Trust or Wildlife trust sites.
- National Nature Reserves.
- Local Authority wildlife sites, such as Sites of Interest to Nature Conservation (SINC).
- Nationally important and designated sites, such as SSSIs, SPAs, Ramsar sites.

Once they are identified you can ask for greater mitigation by:

- Pointing lights away from direct visibility in sensitive areas
- Use of lower colour temperatures, 2700K
- Adaptive proximity controls – best used along wildlife corridors
- More restrictive curfews
- Directly engaging with the owners for a bespoke plan

# 8 Getting Designated

## 8.1 Dark Sky Discovery Sites



The [Dark Sky Discovery](#) scheme is a UK-based project that certifies places that are accessible and have a certain level of experience of visitors. They are similar in principle to the IDA process but are significantly simpler to develop. An applicant must show that the prospective site satisfies accessibility, has the necessary landowner permissions and has a measured sky quality – usually measured with an SQM. There are two classes - ‘Orion’ and ‘Milky Way’ that indicate the expected level of experience for the visitor. ‘Milky Way’ class will begin around the 20.5 SQM level.

Dark Sky Discovery Sites are very popular and there are many across the UK, in and outside of IDA places. With large areas designated under the IDA process, they are useful in signposting public observers to safe, quality sites to view the sky.

There is a map of current sites in the UK. You may want to check this to see if you have a site in your area.

## 8.2 IDA Designations

After doing all that work in improving dark skies, you may want to take this to the ultimate step and pursue a designation with the [International Dark-Sky Association](#) conservation programme. It is a thorough, complex process that requires time, resources and above all...**commitment** to protecting dark skies. There are many IDA places in the UK to inspire your application and they come in a number of options:

- International Dark Sky Communities: Communities are legally organized cities and towns that adopt quality outdoor lighting ordinances and undertake efforts to educate residents about the importance of dark skies.
- International Dark Sky Parks: Parks are publicly- or privately-owned spaces protected for natural conservation that implement good outdoor lighting and provide dark sky programmes for visitors.
- International Dark Sky Reserves: Reserves consist of a dark “core” zone surrounded by a populated periphery where policy controls are enacted to protect the darkness of the core.
- International Dark Sky Sanctuaries: Sanctuaries are the most remote (and often darkest) places in the world whose conservation state is most fragile.
- Urban Night Sky Places: UNSPs are sites near or in large urban areas whose planning and design actively promote an authentic night-time experience in the midst of significant artificial light at night. They otherwise may not qualify for designation within any other International Dark Sky Places category.

An applicant will have to complete all the steps in this toolkit, plus more steps to comply with the IDA guidelines. For example, most IDA designations will need to show examples of good lighting – this usually involves a specific lighting installation of sufficient magnitude.

The IDA or a local IDA advocate should be consulted to introduce and initiate the application. The IDA-UK have members who have completed IDA applications and currently work in IDA places. They can offer advice, inspiration and collaboration opportunities.

## 9 A few other little tips

Here are some little tips and advice that often go missed when doing dark skies work.

- Working outside in the dark is cold. Don't underestimate how quickly you can get cold standing still. You'll start to feel the cold faster than you realise.
  - Wrap up warm – base layers
  - Don't rely on the temperatures in the weather forecast – it always feels colder
  - If you have winter clothing – (even ski gear) – wear it.
  - Move around to keep warm.
  - Buy some hand/feet warmers.
  - Heavy or winter boots are useful – with a second pair of socks.
- Electronics don't like the cold either.
  - Charge up everything before you go out.
  - Take some spare batteries.
  - Take a cloth to wipe away condensation on cameras.
- Avoid going out on windy nights – you'll lose heat faster and the wind will shake tripods, telescopes and cameras.
- Buy a sturdy tripod and a shutter release remote – it prevents camera shake.
- Don't forget the camera SD card. It's very annoying to walk to a remote hilltop, set up a camera, press the shutter button then realise you've left the SD card in the laptop at home, 3 hours away.
- Let your eyes adjust to the dark. It takes 20 minutes to achieve a dark sky adapted eye.
- Use the buddy system when out – you may have to hop between the clouds and change your initial driving plans – so let people know where you're going.
- Write a risk assessment.
- Think about establishing a Dark Sky Champion – the more enthusiasm, the better.
- Use phone apps and other planetarium software to learn about the sky before going out. [Stellarium](#) is a PC/Mac application that is free and the most popular with astronomers.
- Share your SQM data with the [Globe at Night Project](#).
- Learn how to use telescopes – you'll understand getting around the night sky much easier.
- Don't take risks at night – tempting as it is to drive a little faster to get home after a long night, beware that tiredness impacts decision making and can kill.
- Learn about Orion. There's so much going on in that constellation you could talk about it for ages – particularly good for events.
- Learn some facts about the moon.
- Have a go at landscape astro-photography. It's fairly easy to start, you can incorporate your landscape and you get very satisfying results quickly. If you become proficient, there are plenty of competitions to enter. Most of the pictures in this toolkit have been competition submissions.

**Have fun with it.**

**Working towards dark skies is a very enjoyable  
endeavour – who doesn't want to see more stars?!**

## 10 Support, Advice and Contacts

Embedding dark skies and pursuing a prospective IDA designation is a daunting process. Fortunately, there are a couple of organisations within the UK Dark Skies Partnership that can help with advice on light pollution and dark skies. You can also seek out independent dark sky experts or consultants or even lighting designers with experience in dark skies.



### 10.1 Commission for Dark Skies (CfDS)

The CfDS has been advocating darker skies for decades. Additional resources and lighting guides can be found on the [Commission for Dark Skies](#) website. With links to the British Astronomical Association you can find your local astronomy group. The CfDS are also available for assistance on developing IDA applications.

### 10.2 IDA-UK

The [IDA-UK](#) chapter remit is to support IDA members and prospective designations. They can provide support on starting applications and provide some advice throughout the process.



### 10.3 IDA

The [IDA](#) itself has a well-established website with good resources. They should be a first point of contact when considering an IDA application or [IDA advocacy](#).

### 10.4 CPRE – The Countryside Charity

Supplementary reports and evidence for LA's and resources can be found on the CPRE website, [Night Blight](#)



### 10.5 Protected Landscapes and IDA Places

There are already a number of approved IDA places that can give advice on dark skies. Although they may be some distance from your own place, they can provide some excellent sources of information. Having been through the process, they will fully understand what is expected of organisations. The list of UK places (Parks, Reserves, Communities) can be found on the IDA places website. [Find an IDA Site.](#) [UK National Parks](#)

### 10.6 GoStargazing

The [GoStargazing](#) website lists many astronomy events in the UK for the year and may mention your local astronomy club. They also have some resources on light pollution.



### 10.7 The UK Dark Skies Partnership

The UK Dark Skies Partnership (UKDSP, [ukdarkskies.org.uk](#)) is a collaborative forum of UK dark-sky places, including those with International Dark-Sky Association designations; relevant professional organisations; the Commission for Dark Skies; CPRE, the Countryside Charity; the Institution of Lighting Professionals and the Society of Light and Lighting. The Partnership supports the work of the APPG of MPs for Dark Skies co-chaired by Andrew Griffith MP and the Astronomer Royal Lord Rees ([appgdarkskies.co.uk](#)). The primary aim of the UKDSP is to improve sky quality by reducing unnecessary and inappropriate light pollution through effective behavioural change, education and promotion of environmentally sensitive lighting.



# 11 Glossary

## 11.1 Places and Organisations

AONB: Area of Outstanding Natural Beauty

APPG: All-Party Parliamentary Group

BSI: British Standards Institution, the UK's national standards body

CfDS: Commission for Dark Skies

CIBSE SLL: Chartered Institution of Building Services Engineers, Society for Light and Lighting

CIE: Commission Internationale de l'Eclairage (International Commission on Illumination)

CPRE: CPRE, The Countryside Charity

DNS: Dark Night Skies

HSE: Health and Safety Executive

IDA: International Dark-Sky Association

IDSP: International Dark Sky Place

ILP: Institution of Lighting Professionals

LIA: Lighting Industry Association

LLA: Local Lighting Authority

NPA: National Park Authority

NPPF: National Planning Policy Framework

## 11.2 Technical Jargon made simple

CCT (K): Correlated Colour Temperature. Defines the colour, not brightness of a light source and is measured in kelvin (K)

FCO: Fully Cut-Off. Shielding that cuts off any upward light

LED: Light-Emitting Diode

Lumen: a measure of the total amount of light visible to the human eye from a lamp or light source

Lux: The measure of Illuminance of an area, or how bright a lit surface is

PIR: Proximity Infra-Red. Typically used to detect motion with a sensor

ULR: Upward Light Ratio. The fraction of light emitted above the horizontal

VLT: Visible Light Transmission. The amount of light passing through glazing