



Dark Skies of the North Wessex Downs

*A Guide to Good
External Lighting*



This guide is intended to be used alongside national resources, in particular:

- ▶ *Guidance Note 1 for the reduction of obtrusive light* – The Institution of Lighting Professionals (ILP)
<https://theilp.org.uk/resources/>
- ▶ *Good Lighting Guide* and *Blinded by the Light (updated 2020)* – The Commission for Dark Skies (CfDS)
<https://britastro.org/dark-skies>

To navigate through this guide:

- ▶ Part One – Information for Everyone:
 - 1 sets the dark skies scene.
 - 2-3 cover light pollution and the principles of good lighting. They are for anyone replacing or installing external lighting, such as householders, businesses, and those responsible for sports grounds and/or community buildings.
 - 4 is a summary of good and bad lighting for different applications.
- ▶ Part Two – Technical Guidance:
 - For those wanting more information regarding planning and/or setting the framework for development, such as neighbourhood planning groups and local authority teams.
- ▶ Appendices list local authorities' policies on lighting, suggested policy wording for authorities, and provide links to dark sky organisations.

For Local Authorities this guide can be adopted as lighting policy or used to develop lighting policy.



Acknowledgements

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Introduction

protecting our dark skies

Dark skies add to the beauty, tranquillity and sense of remoteness of a place. In the North Wessex Downs you can find areas as dark as any in the country. Looking up at a starry sky or across a moonlight landscape in this special place is a memorable and magical experience.

The North Wessex Downs are designated as an Area of Outstanding Natural Beauty (AONB) for their distinct landscape, rich in biodiversity and cultural heritage. While the AONB has legal protection on the ground, the sky above it is not protected in the same way.

We all rely on artificial light to live our lives; but wasting light, wastes energy, money and adds to climate change. Unfortunately, unintended light pollution is taking a silent toll. Increasingly, it is eradicating our access to the wonder of beautiful night skies – more than 90 per cent of the population are denied sight of starry skies. Excessive artificial light can also disrupt our sleep and potentially lead to serious health issues. It does not just affect us, it also plays havoc with the feeding and breeding cycles of bats, birds, insects and nocturnal animals.

By increasing our awareness and following some simple principles, we can all help to minimise light pollution and protect dark skies:

- ▶ Install lights only **IF** needed
- ▶ Shine lights only **WHERE** needed
- ▶ Use only **AS MUCH** light as needed
- ▶ Use lights only at times **WHEN** needed

This guide provides good practice on external lighting, primarily on buildings, but also mentions internal lighting and street lighting. Anyone considering external lighting in and around the North Wessex Downs AONB can use it to play their part in minimising light pollution and preserving beautiful dark skies.

Part One is for anyone installing lighting and wanting to help preserve dark skies. Part Two contains information for those setting the framework for development, such as neighbourhood planning groups and local authority policy and planning teams.



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Part one

information for everyone

1 Dark skies in the North Wessex Downs

The North Wessex Downs are designated as an Area of Outstanding Natural Beauty (AONB) for their distinct landscape, rich in biodiversity and cultural heritage. While the AONB has legal protection on the ground, the sky above it is not protected in the same way.

Dark skies are one of the defining characteristics of the area, so the *North Wessex Downs AONB Management Plan 2019-2024* includes protection for dark skies and policies to minimise light pollution, such as:

“Avoid and reduce light pollution, including control of lighting schemes or other developments that threaten the integrity of dark night skies over the North Wessex Downs.” Page 81, Policy DE 08

The Countryside Charity (CPRE) campaign to raise awareness about light pollution. In 2015, with support from the North Wessex Downs AONB Partnership and others, they used Land Use Consultants (LUC) to create a Night Blight map showing

the relative darkness of the night sky across England at an effective resolution down to 500 m (**Figure 1**). This scale makes it valuable at a local level, as well as at regional and national levels, and provides a consistent baseline mapping of the issue across the country. The mapping was based on satellite images showing light pollution from the sky; not light meter readings taken at ground level.

As the map shows, the North Wessex Downs AONB suffers with light pollution from some rural towns, motorway services and economic hubs. Light is an issue from the surrounding urban areas in the ‘setting’ (adjacent areas) of the AONB.

However, almost 15 per cent of the sky over the AONB is as dark as any in the country, and another 57.9 per cent falls into the next darkest category (there are nine categories altogether). This represents significant areas of quality dark skies worth protecting now; it is very difficult to regain dark areas once they are lost to light pollution.

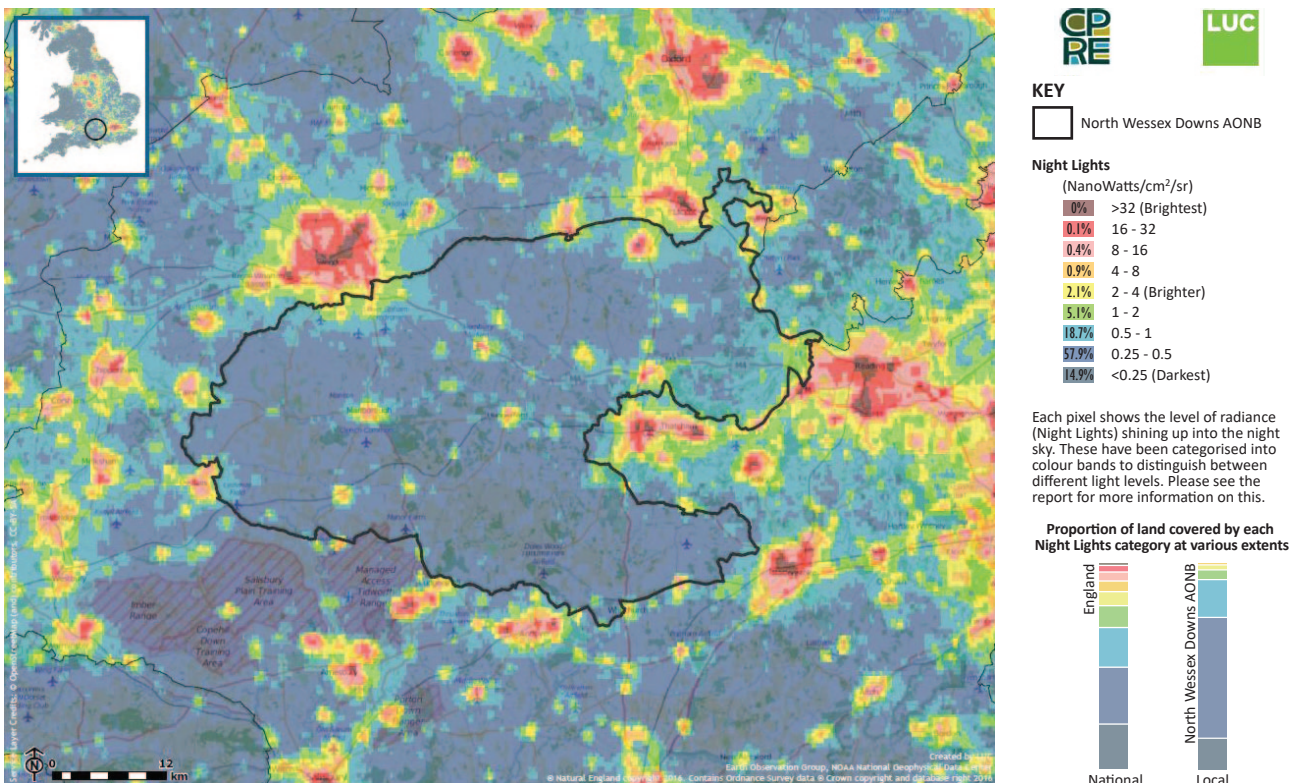


Figure 1: Light pollution and dark skies in the North Wessex Downs AONB. To expand the map and find more information about the Night Blight mapping go to: <https://www.nightblight.cpre.org.uk/>

2 Light pollution

2.1 Types of light pollution

Light pollution (or 'obtrusive light') is light that is wasted upwards, and/or unwanted light that causes a nuisance to others. With ever-increasing levels of development, light pollution is likely to get worse unless action is taken to address this issue. According to a team of biologists from the University of Exeter, human illumination of the planet is growing in range and intensity by about 2 per cent per year.



Light glare (by North Wessex Downs AONB)

Light pollution is often caused by poorly designed lighting schemes, with inappropriate, excessive or poorly installed lighting equipment. Yet, it can easily be reduced while still having enough light for the task.

Light pollution comes in several forms and is generally categorised as:

- ▶ **Glare** – when a light is uncomfortably bright against a dark background.
- ▶ **Light intrusion** (or 'trespass') – when light spills into neighbouring properties and creates a nuisance.
- ▶ **Sky glow** – when towns or other brightly lit areas cause an overall brightening of the night sky.

The human eye can see light from a great distance (many miles) because light never stops, it just looks dimmer the further away you are. So, light can have far-reaching visual effects beyond that which is intended.

In a protected landscape, such as the North Wessex Downs, the overall effect of artificial light on the landscape is called 'scenic intrusion'. This is when the light source, glare or glow interferes with the character of a place after dark and adversely affects its scenic quality.

2.2 The impacts of light pollution

From nature and wildlife, to crime and culture, there are many aspects of our world that suffer from the consequences of light pollution (Figure 2).

Nature and wildlife

In a paper published in *Nature Ecology and Evolution* (Nov 2020), biologists from the University of Exeter conclude that artificial light pollution is impacting the hormone levels, breeding cycles, activity patterns and predator-prey interactions of a broad range of species.

Their study-of-studies brought together 126 previous papers to assess the extent of the impact. This included such aspects as reduced pollination by insects, trees budding earlier in spring, seabirds flying into lighthouses, and sea turtles mistakenly wandering inland to bright hotels in search of the dawn sun.

From their research, they argue that artificial light should be treated like other forms of pollution because its impact on the natural world has widened to the point of systemic disruption.

Light impacts wildlife in many ways:

- ▶ **Songbirds** – lighting at night triggers their dawn response, so they become exhausted, affecting their feeding and breeding.



Figure 2: The damage caused by light pollution (adapted from Surrey Dark Skies Matter – darkskiesmatter.org.uk)



Common frog (by Andy Fairbairn)

- ▶ **Frogs and toads** – having artificial lights where amphibians live can disrupt their nocturnal activity, interfering with reproduction and reducing populations.
- ▶ **Bats** – artificial light on a bat roost disturbs bats and may lead them to desert it. Light falling on the access point of a roost delays bats from emerging, shortening the time they have for feeding and, in turn, reducing their reproductive rates. Light on the flightpath of bats can also lead to them deserting their roost. Because artificial light is a particular issue for bats, the Institute of Lighting Professionals (ILP) and Bat Conservation Trust have produced *Guidance Note 8 Bats and artificial lighting* <https://theilp.org.uk/resources/>
- ▶ **Insects** – it is estimated that a third of insects attracted to artificial lights will die because of their encounter. Reflected light can also be a problem because illuminated shiny surfaces look like water. This attracts aquatic insects, such as egg-laying female dragonflies, and can lead to unsuccessful breeding.
- ▶ **Trees** – have evolved with a regular, predictable transition from day to night, following the natural patterns of the sun and moon. Artificial light extends the natural day, changing the flowering patterns of trees and promoting continued growth. This prevents them from having dormant periods, which they need to thrive.

Health and well-being

Lights shining directly into windows can cause obvious disruption such as finding it difficult to get to sleep. However, there are other less obvious health issues that light pollution can cause.

Humans have evolved with the natural cycle of light and dark that comes from the sun, so adhere to a circadian rhythm or body clock. Light – especially natural daylight – is very important to maintaining this rhythm. Artificial light at

the wrong time of day or night disrupts the production of a hormone called melatonin. Melatonin is important as it induces sleep, boosts the immune system, lowers cholesterol, and helps with the function of the thyroid and pancreas, among other things.

When our natural cycle is disrupted, it can lead to lower immunity, increased risk of disease, mood instability and increased risk of mental illness. It is important to maintain bright light during the day and relative darkness at night.

Lighting and its impact on health is explained further in an infographic produced by BRE, who work on raising the standards of the built environment: <http://www.bre.co.uk/filelibrary/Briefing%20papers/Lighting-and-health-infographic2.pdf>

Safety

To road users, glare can be highly dangerous. Glare and insensitive lighting can cause accidents when motorists are distracted or blinded by artificial light spilling out on to the road.

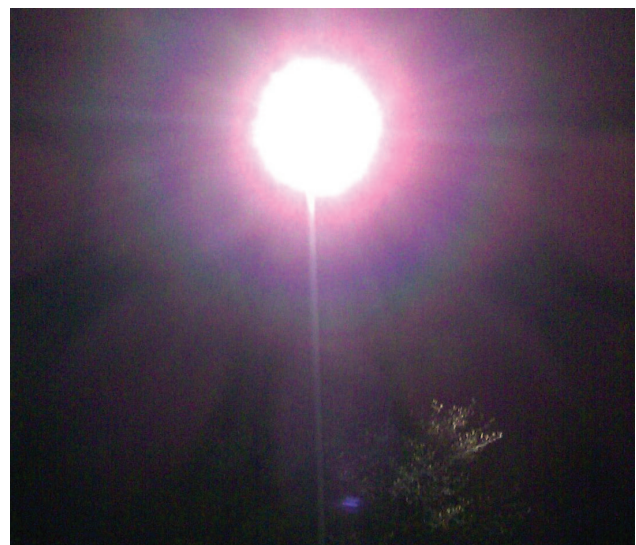
Crime

It is not a given that installing a light for ‘security’ will deter crime. There is no proven link between lighting levels and crime rates. In trials where street lighting has been switched off, there has been no increase in crime rates.

In fact, bright exterior lights may create contrasting dark spots that criminals can hide in.

Cost

It costs lots of money to power the grid system to provide lighting. Wasted power through badly designed, installed or used lighting is an unnecessary cost to businesses, homes and public utilities.



Light in a car park at Lockeridge creating dark spots (by North Wessex Downs AONB)



The Milky Way over Avebury (courtesy of www.greatwestway.co.uk)

Energy and carbon emissions

Wasted energy from the power used for excessive lighting contributes to carbon emissions and climate change. LED lighting can reduce energy consumption significantly and, therefore, the amount of carbon dioxide (CO₂) emitted. However, low-energy bright lighting is often achieved by using a blue-white LED which can be very damaging to human and wildlife health.

Landscape, cultural value and science

Artificial lighting is degrading the character of rural landscapes, eroding and destroying their tranquillity and sense of remoteness.

Many people love the natural beauty of the skies and seeing the various wonders of our galaxy. Yet, the number of places we can see truly dark skies is reducing, making it increasingly difficult to view the sky at night, particularly in urban areas. These differences are clearly shown in the Bortle Dark Sky Scale below (Figure 3).

Light pollution is also seriously undermining the ability of British-based astronomers, both professional and amateur, to take the lead in this continually expanding field of science.

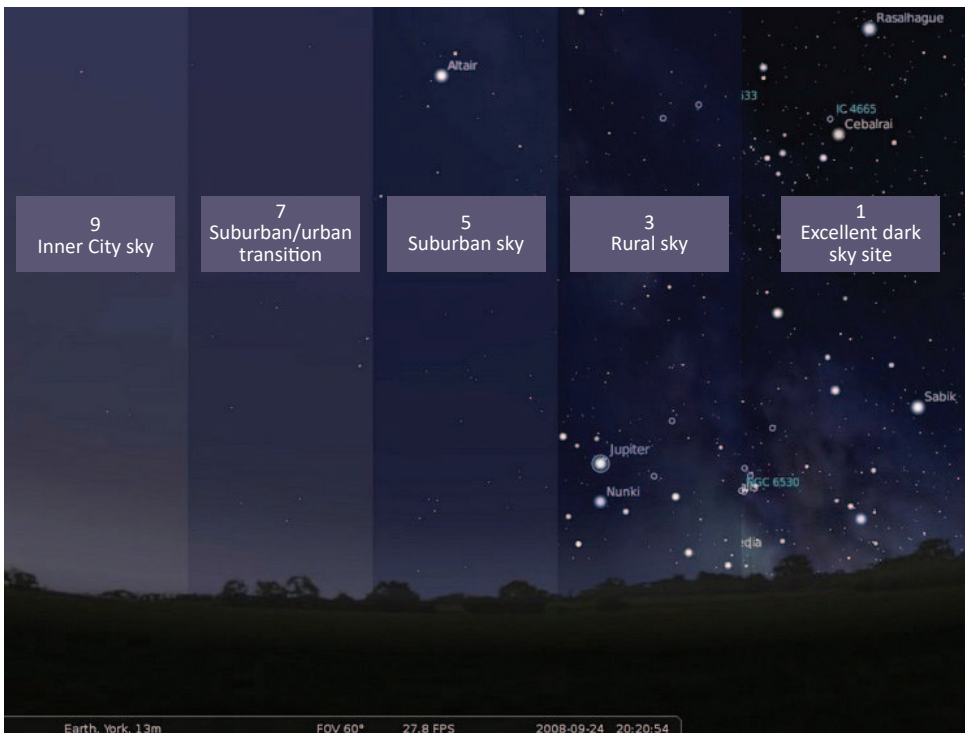


Figure 3: The Bortle Dark Sky Scale shows the effect of light on our ability to see a night sky. The scale is named after John E. Bortle, who published it for the first time in the February 2001 issue of the *Sky and Telescope* magazine.

“Light pollution is seriously undermining the ability of British-based astronomers to take the lead in this continually expanding field of science.”

3 Achieving good lighting

“Good lighting delivers the right light, at the right time, in the right place, controlled by the right system.”

By considering a few factors when installing lighting and/or specifying lights, we can save energy and money, while minimising light pollution and its harmful effects on people and wildlife.

3.1 Measuring light

To specify appropriate lighting according to the need and situation, it is helpful to understand the different measures of light – Lumens, Kelvins, Lux and Candela:

- ▶ **Lumens** is a measurement of how much light is emitted from a light source in all directions.
- ▶ **Kelvins** measures the colour temperature of the light.
- ▶ **Lux** measures the amount of light that falls on a surface.
- ▶ **Candela** is the intensity of light as visible to the human eye in a specific direction.

Lumens

Bulbs used to be sold according to their ‘watts’, which was the amount of energy **input** to the bulb or light fitting; the light **output**, however, is measured by ‘lumens’. Today, light bulbs are categorised by their lumen output. **Figure 4** shows the approximate levels of lumen output from different types of bulbs, and the amount of energy that can be saved in comparison with a standard bulb.

Although many DIY retailers sell domestic lights up to 1500 lumens, a light of 500 lumens is enough for most domestic external needs.

		BRIGHTNESS (lumen)	220+	400+	700+	900+	1300+	
LEAST EFFICIENT	Standard Bulb		25 W	40 W	60 W	75 W	100 W	
	Save up to 28%	Halogen Bulb		18 W	28 W	42 W	53 W	70 W
	Save up to 75%	CFL Bulb		6 W	9 W	12 W	15 W	20 W
	MOST EFFICIENT	LED Bulb		4 W	6 W	10 W	13 W	18 W

←500 is best

Figure 4: Bulb output in lumens

Kelvins

Manufacturers describe light bulbs using phrases such as ‘cool white’ and ‘warm light’. A temperature measure known as the Kelvin scale (K; **Figure 5**) is used to determine the colour of the light.

The lower the kelvin, the warmer the light. Cool light – higher on the Kelvin scale – is known to increase glare which can be harmful to human vision and health. Cool light can also negatively affect wildlife behavior and reproduction.

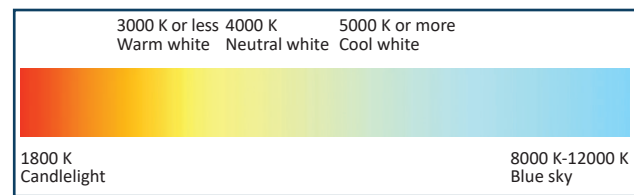


Figure 5: The Kelvin scale

Lux

Lux is the measurement of illuminance – the amount of light on a surface to do a particular task. A single lux is equal to one lumen per square metre. The lux level will change with any change in distance or bulb type.

As a comparison, a sunny day can be 10000 lux, a cloudy day 1000 lux and a full moon 0.3 lux. 15 lux is sufficient for a rural car park, 5 lux for rural domestic lighting.

Candela

Candela is the base measurement for describing luminous intensity. It states how bright the light source is and, therefore, how far away an object can still be seen. It is the light intensity from any point in a single direction from the light source.

3.2 Principles of good lighting

To minimise light pollution, first ask yourself, 'is lighting really needed at all?' If it is, then follow these four main principles:

Principle 1: How MUCH light is needed?

- ▶ Choose only enough lighting for the task and no more.
- ▶ Choose light fittings and bulbs carefully, selecting ones that are sufficient for the task in hand and no more.
- ▶ A light of 500 lumens is enough for most domestic external needs.

Principle 2: WHEN is light needed?

- ▶ Ensure that lights are turned off when not needed. A timer switch or movement sensor will reduce the time lights are on and save money.
- ▶ Consider the difference in lighting needed during the summer and winter.

Principle 3: How WARM is the light?

- ▶ Look for warm light bulbs of less than 3000 K.
- ▶ Avoid the cool-white light higher on the Kelvin scale.
- ▶ Be aware that to achieve energy efficiency some brands sell higher kelvin (4000-5000 K) bulbs with lower lumens to make them appear brighter.

Principle 4: Is the light WHERE it is needed?

- ▶ Choose lights and fittings that can be directed only where light is wanted to minimise light pollution.
 - Use downward lighting, keeping the main beam angle below 70 degrees to reduce the effect of glare and unwanted light spilling out on neighbouring dwellings, passing motorists, pedestrians and wildlife (Figure 6).
 - Avoid up-lighting whenever possible.

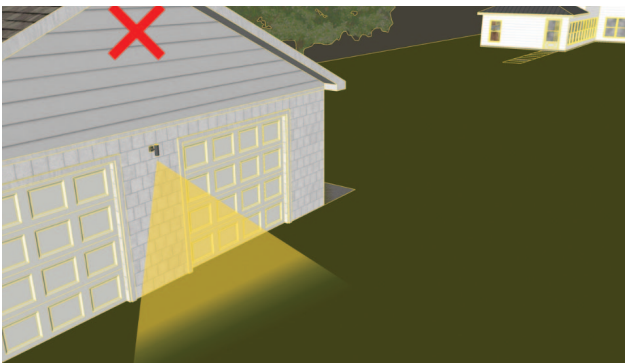


Figure 6: Avoid up-lighting whenever possible

- ▶ If there is no alternative to up-lighting, reduce the spill of light around and over the structure by:
 - Angling the beam as low as possible.
 - Shielding the light fitting.
 - Aiming the beam so that it cuts off at the top of the building, under an overhanging cornice or the eaves.
- ▶ Use floodlights only where there is no suitable alternative, such as sports pitches. Use sensors to turn them off when they are not needed. Use floodlights with double asymmetrical beams, which provide a narrow vertical beam that minimises the unnecessary spread of light (Figure 7).



Figure 7: A Levanter floodlight from Whitecroft Lighting, designed for the glass face to be set horizontally, with the optics throwing the light beam forwards (from Chasing Stars factsheet)

- ▶ Avoid the following light fittings that give you no control over the direction of the light:
 - LED floodlight (Figure 8).
 - Combined up and down lights (Figure 9).
 - Globes and bulkheads (Figure 10).

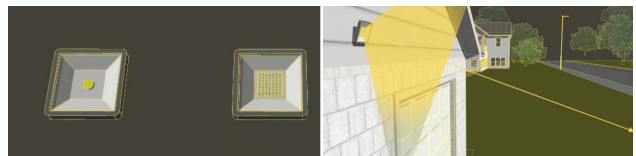


Figure 8: Avoid LED floodlights with no control over direction of light

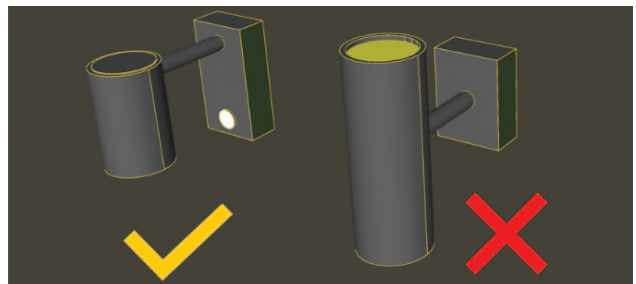


Figure 9: Avoid combined up and down lights, which provide no control over the direction of light



Figure 10: Avoid globes and bulkheads, which provide no control over the direction of light

Dark-sky approved lighting

In the USA, there is a recognised dark-sky approved lighting mark, but there is currently no equivalent in this country. The terms 'dark-sky friendly' and 'no light pollution' may be used; however, it is important to check exactly what is meant, and to fit them correctly.

Cranborne Chase AONB Partnership have a helpful factsheet giving examples of dark-sky friendly light fittings, along with manufacturers and distributors (last updated in February 2019): *Examples of Dark-Sky compliant lighting units* <http://www.chasingstars.org.uk/good-lighting-advice-2.html>



This Luceco LED Exterior wall light is just 120 lumen and 3000 Kelvin (from Chasing Stars factsheet)

3.3 Shielding and barriers

A well-designed, well-installed, dark-sky friendly lighting unit will not need any shielding. In certain circumstances, however, a shield may be useful, such as when lights can be seen from surrounding viewpoints or up-lights cannot be avoided.

Shielding usually takes the form of cowls, louvres (or baffles), and/or shields (**Figure 11**).

When selecting a shield, choose types that are sympathetically designed to their surroundings.

In situations where lights will be seen from surrounding viewpoints, it may be possible to add a physical barrier, such as a hedge, tree line or fencing, to soften the impact of the lighting. Existing woodland or wildlife areas should not be used as a barrier, as light shining into these can be harmful. Any new planting should be in keeping with the character of the local landscape.



Figure 11: Light fitting with cowl, shield and louvre (from ILP Guidance Note 1 for the reduction of obtrusive light; <https://theilp.org.uk/resources/>)

3.4 Other considerations

Check if planning permission is needed

Although planning permission is not usually needed to add external lights to domestic properties, it is always good to check with your local planning authority. Many have a simple web questionnaire to assess whether planning permission is needed or not. For more information see Section 6.7.

Know the law

Lights shining into neighbouring properties can be considered a 'statutory nuisance' under the Environmental Protection Act 1990. Wildlife has protection from disturbance, including lighting, under the Wildlife and Countryside Act 1981. By following good lighting principles, the risk of disturbing neighbours or wildlife will be greatly reduced. For more information see Section 6.5.

Consider low-level pathway lighting

Paths do not always need bright lights. In fact, bright lights can be uncomfortable or dazzle. Consider low-level bollards with shielded lights, but make sure they do not shine upwards or sideways (**Figure 12**).



Figure 12: This Hawthorne Pathlight from Landscape Forms, has 'Zero up-light' and is International Dark-Sky approved (from South Downs AONB)

“Allowing daylight into a building is crucial for our circadian rhythm. However, light spilling from inside buildings can add significantly to light pollution.”

Unintended impacts

An extract from the Bristol Live website in July 2017 shows the unintended impact pathway lighting can have on declining wildlife. Fortunately, lights had been installed that could be controlled centrally:

“Lights on the popular Bristol to Bath cycle path are being turned off – to provide a more romantic setting for amorous glow worms looking for love. A series of lamps that normally illuminate the old railway path in the east of Bristol have been switched off for the summer, because otherwise the male glow worms can’t see the light given off by females.” (<https://www.bristolpost.co.uk/news/local-news/street-lights-bristol-bath-cycle-182389>)



Female glow worm (by Andy Fairbairn)

Upgrade existing lighting

Planning new lighting may also provide an opportunity to reduce the light pollution of existing lights. Relocating, adjusting direction, and installing sensors are all ways to improve existing stock. It may also be an opportunity to upgrade your existing lights to match the standards of the new lighting being installed.

If the street lights outside your house are causing a nuisance, you can request the council to put a shield on them to prevent the light shining into your home. Many councils provide this free of charge.

Choose your surface

Different surfaces reflect light differently, so the type of surface required for an installation should be considered carefully. Darker colours, such as dark greens or asphalt greys and blacks, will reflect less light, cause less glare, and reduce the visibility of the installation.

White or mirrored surfaces, including water, will reflect more light. This can be a problem for some wildlife, such as dragonflies, who can mistake a reflected surface for water.

In most cases, a darker surface will be preferred. But there may be applications where a lighter surface will reduce the number of light fittings needed.

Garden lighting

Remember that decorative garden lights also add to the overall impact of lighting. Use the same principles as for larger light fittings: low-level, warm lighting, operated with a timer, and directed where it is needed and not on neighbouring land or property.

Think about windows and internal lights

Allowing daylight into a building is crucial for our circadian rhythm as, with our busy lives, most of us do not get enough daylight. However, light spilling from inside buildings can add significantly to light pollution. In general, internal lights shine horizontally and, in the case of sky lights, directly upwards.

In order to reduce light pollution from buildings:

- ▶ Ensure windows have curtains or blinds that stop the light spilling out, and that they are used.
- ▶ Use electronically timed lighting and blinds/shutters. These can be linked to ‘smart home’ systems to allow flexible operation.
- ▶ Face glazing into courtyards or nearby associated buildings, rather than towards green spaces or neighbours.
- ▶ Try ‘smart glass’, which is made by passing electrical current through the material to change its transparency.

Visual impact of lighting equipment

During the day, the visual impact of lighting equipment, such as poles, brackets and cabling, should be considered, especially in a protected and/or historic landscape. For instance, tall columns may give less glare at night because the floodlights have a steeper downward angle, but they may be more intrusive by day.

Look for new technology

It is always worth investigating any new technology that may help meet your lighting requirements. Innovations are constantly becoming commercially viable. New technologies, such as glow-in-the-dark pathways, are already being used, and may reduce or even replace the need for lighting, helping to lower the overall impact of light pollution.

On the other side of the coin, any new technology has to be assessed against all lighting criteria to ensure that, by solving one problem, it is not creating another.

4 Good and bad lighting

4.1 Domestic



Poorly directed DIY floodlight (by Bob Mizon)

Although most domestic lighting does not require planning permission (see Section 6.7), it is a common contributor to light pollution because many of the cheap light fittings sold in DIY shops are poorly directed and over-powered.

Most domestic LED floodlights have a 120-degree symmetrical beam, spilling light far wider than is needed. If possible, find floodlights that are double asymmetrical to reduce the beam to 45 degrees. On some domestic lights, the movement sensor is integrated, so may prevent the light from being tilted down. Having a separate movement sensor helps with this problem. For more information on domestic exterior lighting, see the ILP Guidance Note *GN09: Domestic exterior lighting: getting it right!* <https://theilp.org.uk/resources/>

As well as directing lights correctly, there are many other ways to minimise light pollution from domestic lighting (Figure 13).

Apply these key points for external domestic lighting:

- ▶ Use lights 500 lumens or less
- ▶ Use proximity sensors or timers
- ▶ Angle lights downwards
- ▶ Use curtains and blinds

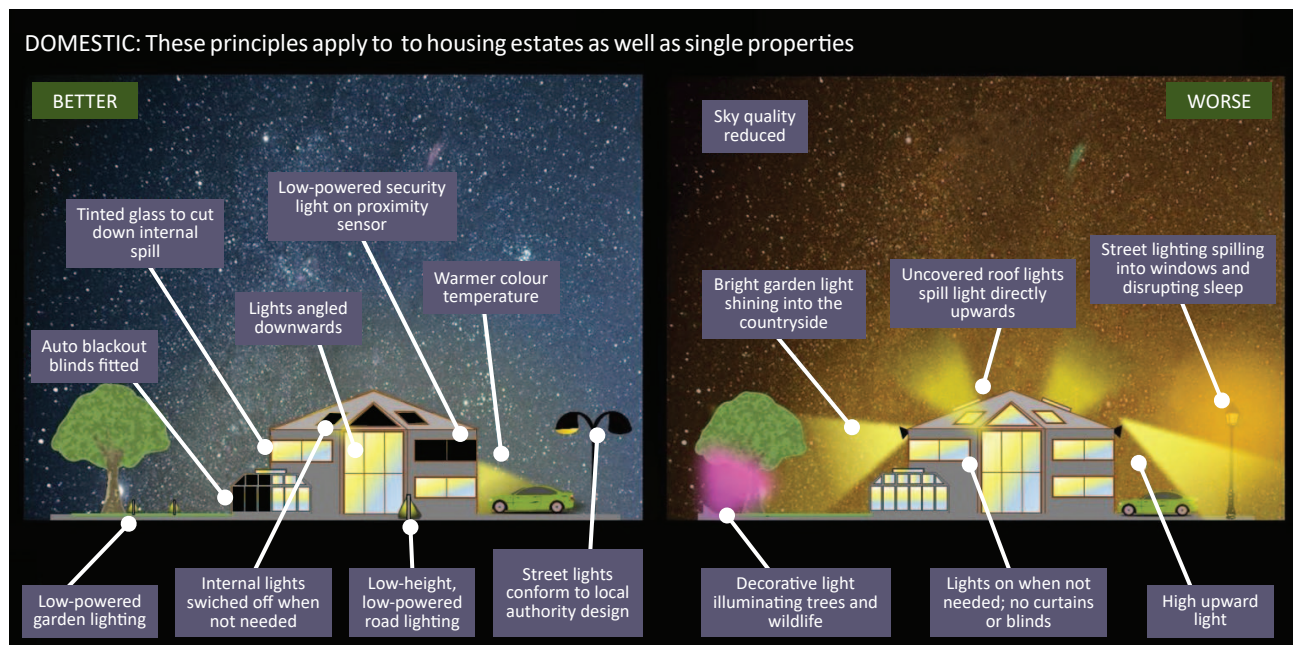


Figure 13: Minimising light pollution from domestic lighting (adapted from South Downs National Park Authority: Dark Skies Technical Advice Note 2018)

“Most domestic lighting does not require planning permission, but it is a common contributor to light pollution.”

4.2 Commercial and industrial

Many of the key points for reducing light pollution from businesses apply to both smaller businesses (Figure 14) and larger industrial uses (Figure 15), but there are also some differences.

Apply these key points for small business lighting:

- ▶ Shield lights above 500 lumens
- ▶ Use proximity sensors or timers
- ▶ Angle lights downwards
- ▶ Turn off at close of business
- ▶ Avoid uncontrolled decorative lighting

Apply these key points for industrial lighting:

- ▶ Design scheme in accordance with best standards
- ▶ Turn off when not needed
- ▶ Angle lights downwards
- ▶ Situate further away from rural locations
- ▶ Avoid tall lighting columns in open areas

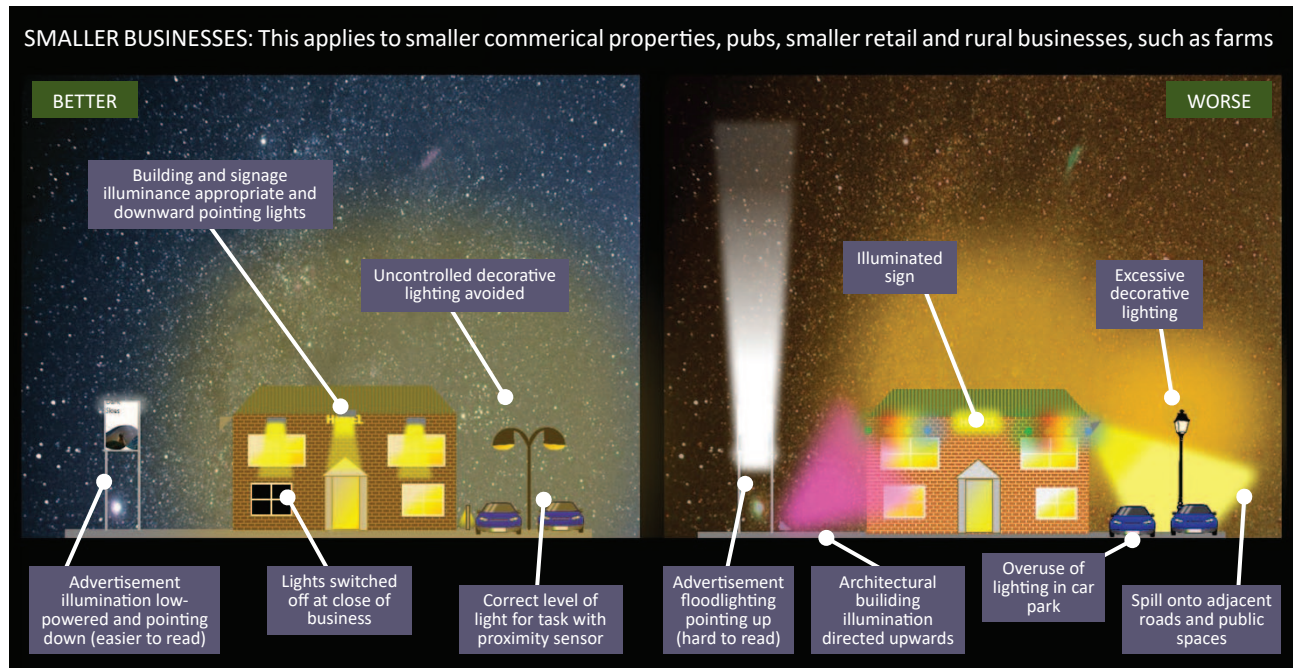


Figure 14: Minimising light pollution from commercial lighting (adapted from South Downs National Park Authority: Dark Skies Technical Advice Note 2018)

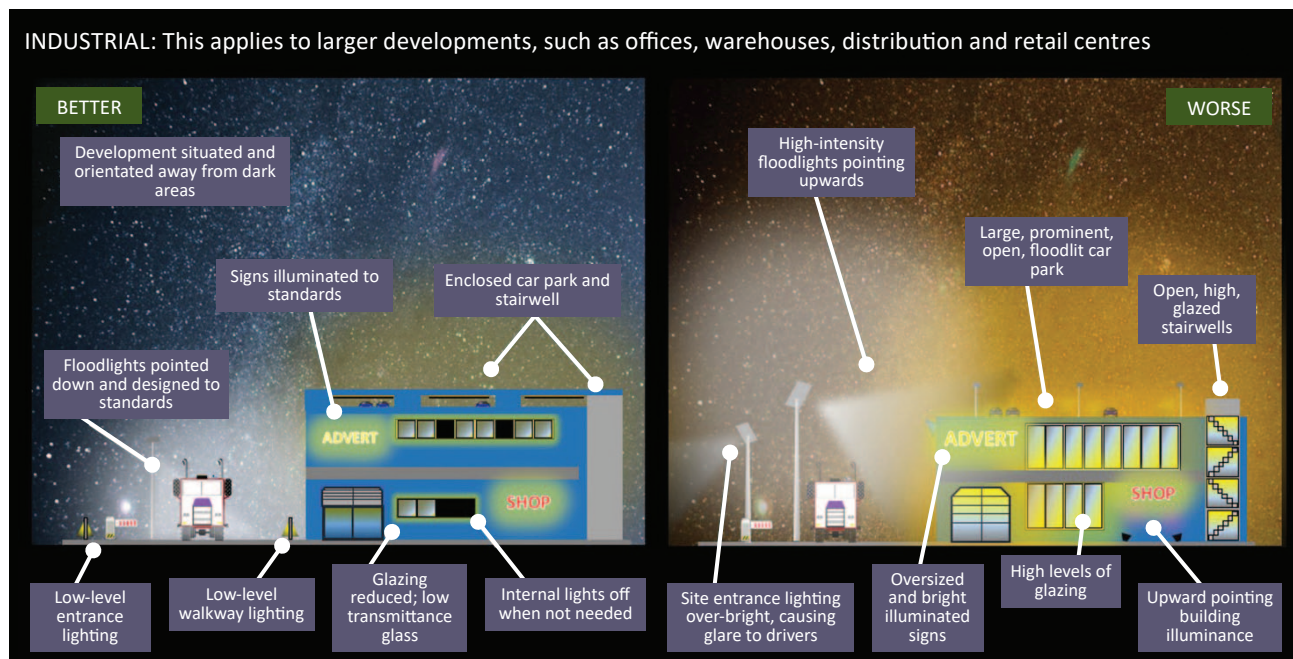


Figure 15: Minimising light pollution from industrial lighting (adapted from South Downs National Park Authority: Dark Skies Technical Advice Note 2018)

Illuminated advertisements

Illuminated advertisements are discouraged in all areas of the North Wessex Downs. However, if you wish to install an illuminated advertisement, it is likely to need planning permission. If the planning authority considers the advertisement necessary, then it should:

- ▶ be no higher than the property;

- ▶ not face towards areas of darkness;
- ▶ use lights that point down;
- ▶ use low-powered lights;
- ▶ and be switched off at the close of business.

Where an advertisement sign does not need illuminating, the local planning authority may make this a condition of the planning approval, so that lighting cannot be added later on.

4.3 Sports

Amenity floodlighting, particularly at sports pitches, is one of the biggest threats to dark skies. Ideally, there should be no external lighting of sports pitches in the countryside. However, if you are planning lighting for an outdoor amenity, first consider the following:

- ▶ is lighting absolutely needed, or could play be restricted to daylight hours;
- ▶ are there any other existing facilities nearby that could accommodate your needs; and
- ▶ could you combine with another club for a shared facility, to plan one rather than two lit facilities.

If you decide that new external lighting is essential, choose high quality, well-directed lights that are no brighter than needed, and that can be switched off when not in use and at a 'curfew' time. Local planning authorities may also put a condition on the hours the sports lighting can be in use.

Sports England provide information on lighting, including minimising pollution. See their artificial lighting guidance: <https://www.sportengland.org/how-we-can-help/facilities-and-planning/design-and-cost-guidance/artificial-lighting>

As well as directing lights correctly, there are many other ways to minimise light pollution from sports lighting (Figure 16).

Apply these key points for sports lighting:

- ▶ Design scheme in accordance with best standards
- ▶ Limit hours of use
- ▶ Situate closer to urban locations
- ▶ Use low reflective surfaces
- ▶ Turn off when not needed

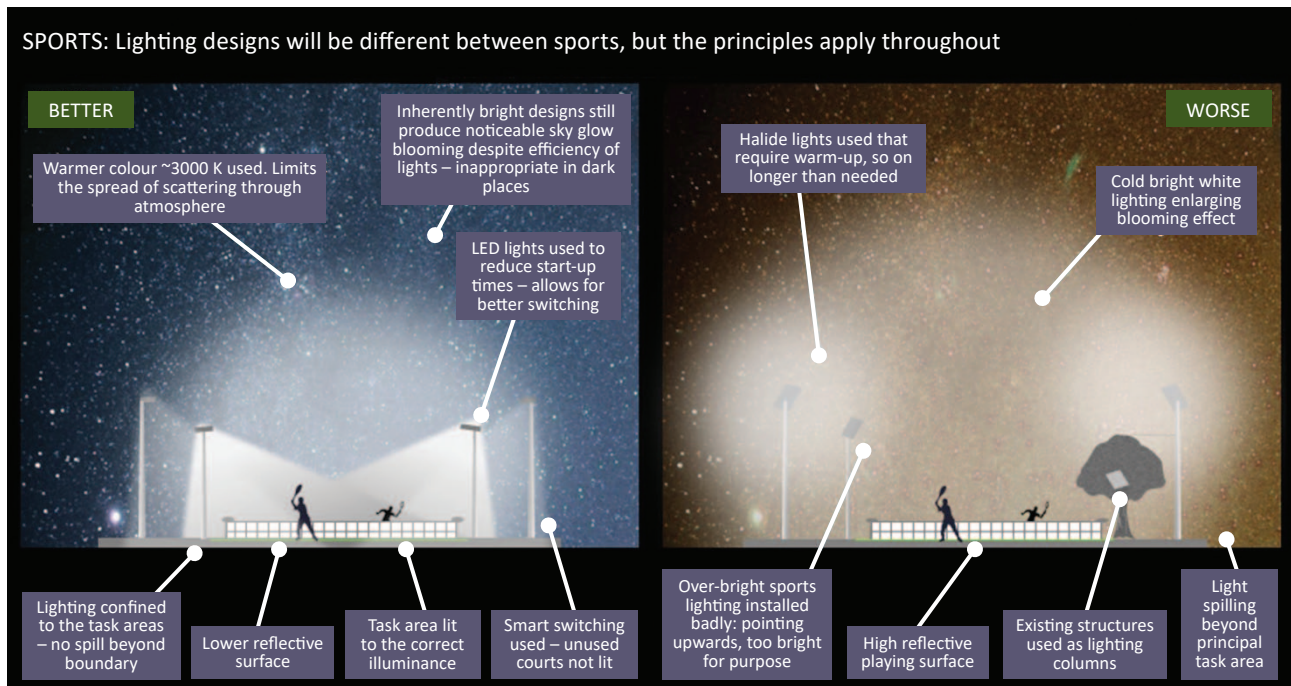


Figure 16: Minimising light pollution from sports lighting (adapted from South Downs National Park Authority: Dark Skies Technical Advice Note 2018)

4.4 Temporary lighting

Temporary lighting includes the illumination of such things as temporary car parks, events, and construction and engineering projects. Generally, temporary lighting with a duration of less than 28 days does not require planning permission. However, the impact of such lighting should be part of the core planning for any temporary project. Apply good lighting principles and practice to minimise the light pollution and potential nuisance to others:

- ▶ Ensure that the power and installation of the equipment are appropriate for the task.
- ▶ Use lights with 3000 K or less.
- ▶ Switch off the lighting when not in use.
- ▶ Avoid temporary lighting in the winter when the impact is greatest due to the longer, darker nights, and the lack of vegetation acting as a barrier.
- ▶ Avoid using sources of light that penetrate deep into the sky, such as scanners or lasers.
- ▶ Where possible, use existing lit access routes to reduce the need for additional lighting.
- ▶ Keep light festivals to urban areas where there is already a high level of sky glow.

“If external lighting is essential, choose high quality, well-directed lights that can be switched off when not in use.”

Stargazing in Avebury (by Paul Howell/www.pictorimages.com)





Part two

technical guidance

5 Environmental light control zones

While all the principles in Part One should be adhered to, appropriate lighting will differ according to the surroundings and setting of the lighting scheme.

The Institution of Lighting Professionals (ILP) recommends using 'light control zones' to determine the appropriateness

of proposed lighting schemes within different surroundings. The ILP guidance sets out zones and the limitations of light parameters for each zone. They base the information on the International Commission on Illumination CIE150.

5.1 Light control zones

The ILP *Guidance Note 1 for the reduction of obtrusive light* <https://theilp.org.uk/resources/> recommends the following light control zones:

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	Designated Dark Sky Reserves and astronomical observable dark skies
E1	Natural	Dark	Rural areas, National Parks, Areas of Outstanding Natural Beauty
E2	Rural	Low district brightness	Rural settlements or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres/suburban locations
E4	Urban	High district brightness	Town centres with high levels of night-time activity

Table 1: ILP light control zones

Refer to the guidance note to see tables with the recommended limitations or maximum values of light parameters in each zone for:

- ▶ The illumination on surrounding properties
- ▶ Brightness of luminaires (light fittings)
- ▶ The effects on transport systems
- ▶ Sky glow
- ▶ The effect of over-lit building façades and signs
- ▶ Upward light ratio (ULR) of luminaires

5.2 Light control zones for the North Wessex Downs

To help protect the dark skies of the North Wessex Downs, the AONB Partnership has mapped light control zones for the area using a combination of the Night Blight mapping and the ILP's recommendations (see Section 5.1).

By mapping light control zones for the North Wessex Downs, we aim to help others to:

- ▶ Prevent light pollution from surrounding towns in the setting of the AONB encroaching on the AONB.
- ▶ Minimise light pollution from rural settlements, economic hubs and infrastructure within the AONB.
- ▶ Reduce existing light pollution from all sources within the AONB, through:
 - the removal of lighting where possible;
 - the reduction of lighting (e.g. of intensity or duration, using sensors and timers where practical);
 - and the improvement of lighting (e.g. better designed and installed luminaires and warmer lights).

The North Wessex Downs light control zones (**Figure 17**) have been drawn using the following criteria. They have been specified according to the general after-dark nature of the area, not to the presence of existing levels of light.

E0 Dark sky zone

This is based on the darkest areas of the Night Blight map plus a buffer of 500 m, or less where the buffer meets the AONB boundary or a rural settlement. The ILP E0 parameters should be used for this zone.

E2 Rural settlements and economic hubs zone

These are rural settlements and economic hubs where lighting enables activities. These are drawn tight to the built boundary of the settlement. The ILP E2 parameters should be used for this zone.

E1 Rest of AONB zone

The rest of the North Wessex Downs AONB should be treated as E1. The ILP E1 parameters should be used for this zone.

The setting of the AONB

The setting is not drawn on the map as there is no definitive area for the setting. See Section 5.4 for an explanation. The ILP zone parameters used for the setting should be whatever the adjacent zone is within the AONB.

Using the North Wessex Downs AONB zones

We recommend using these zones and their corresponding ILP parameters when considering any policy framework, new development or lighting requirement. Where an area covers two or more zones lighting designs and existing lighting effects should be assessed against the more stringent limitations as far as possible.

Lighting designers, consultants and engineers can find the parameters for specifying new lighting in each zone in the ILP *Guidance Note 1 for the reduction of obtrusive light* <https://theilp.org.uk/resources/>

5.3 Map of light control zones

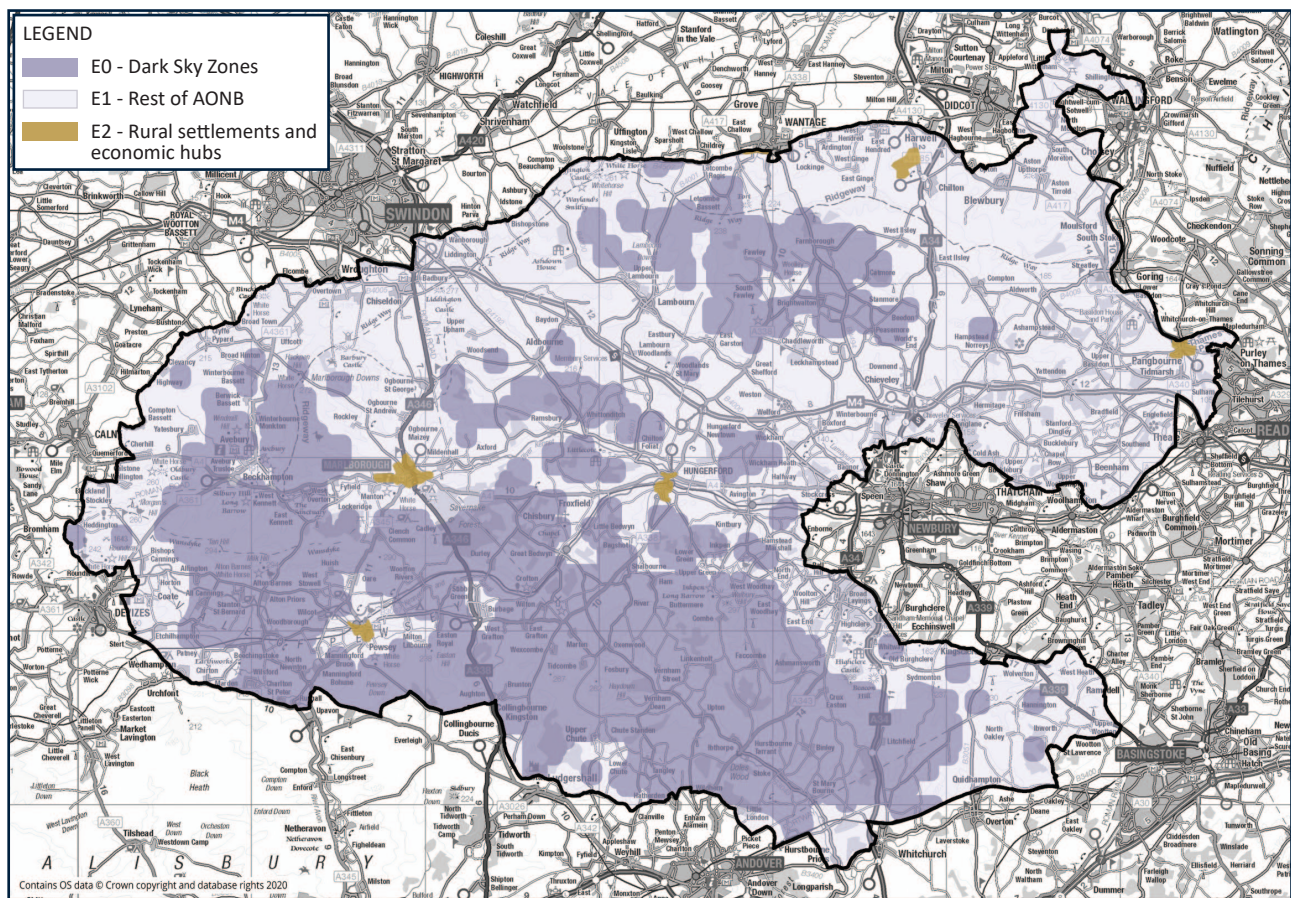


Figure 17: The North Wessex Downs AONB's light control zones

“We recommend using the NWD light control zones when considering any new policy, development or lighting plan.”

The map shown in **Figure 18** is the CPRE Night Blight map shown in Section 1 of this guide. When comparing this with the light control zone map on the previous page (**Figure 17**), the pressure of light pollution on the AONB becomes obvious.

of light pollution, as well as the minimising light pollution from any new sources. This is especially true for lighting in the setting of the AONB causing pollution within the AONB.

To reduce the impact of light pollution on the AONB, the AONB Partnership needs to work with others to reduce existing levels

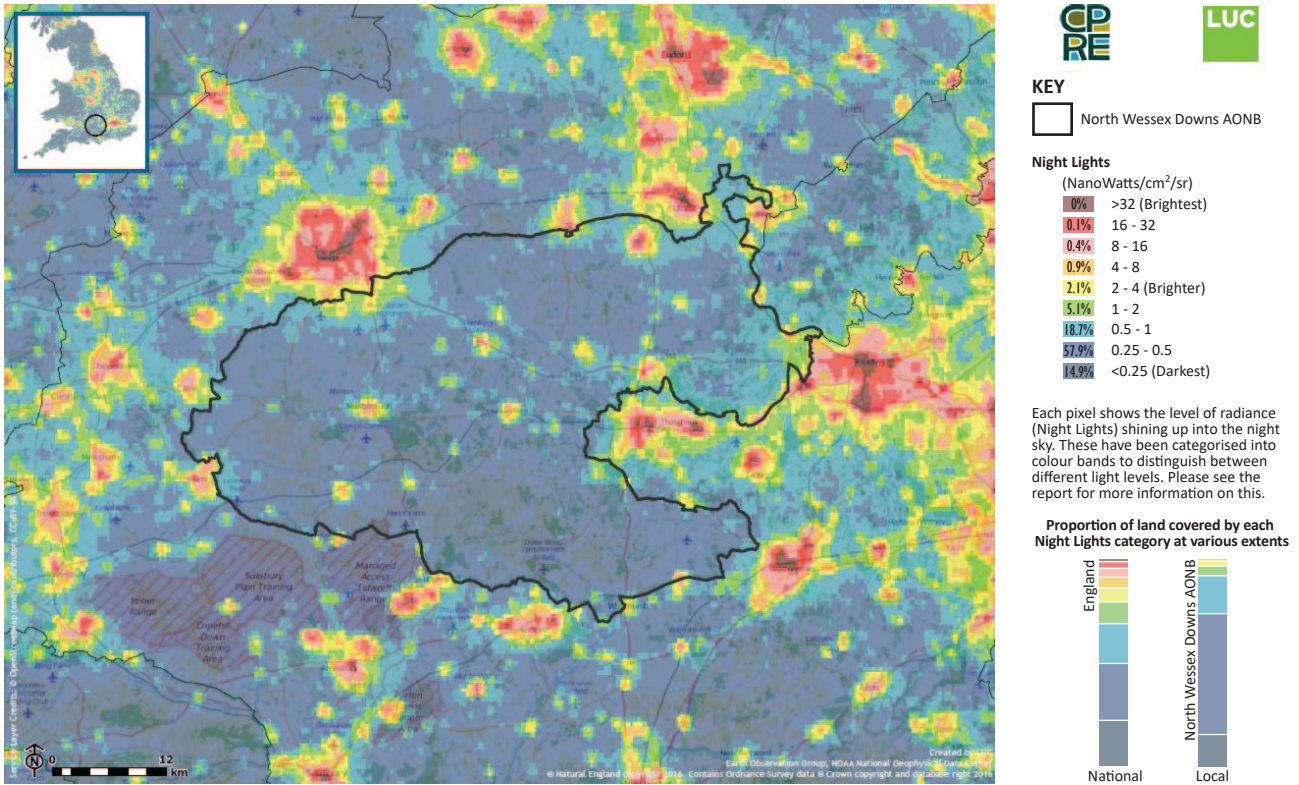


Figure 18: Light pollution and dark skies in the North Wessex Downs AONB. To expand the map and find more information about the Night Blight mapping go to: <https://www.nightblight.cpre.org.uk/>

5.4 The setting of the North Wessex Downs AONB

The **setting** of the AONB is not formally defined, but is any area adjacent to its boundary. When dealing with such areas, consideration should be given to the impact any lighting will have on the AONB itself.

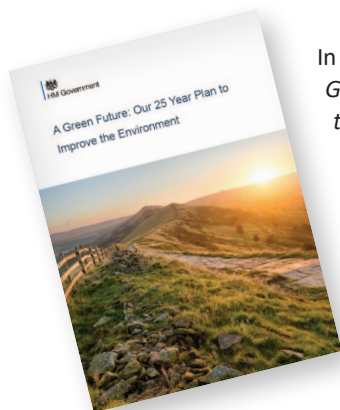
Proposals for changes in the setting should consider the relationship of the setting with the protected landscape of the AONB, its landscape character and its special qualities. See the North Wessex Downs AONB position statement on setting: <https://northwessexdowns.org.uk/publications-resources/>

The setting of the North Wessex Downs does not have a delineated geographical boundary. It is defined by the area surrounding the AONB where proposed development could negatively impact on the natural beauty and special qualities of the North Wessex Downs. With regards to lighting, the impact on the AONB will vary in each case, but will particularly depend on the topography of the area (a light on top of a hill will be seen from much further away than one in a valley), and the design and use of the lighting.



Stars over Silbury Hill (courtesy of www.greatwestway.co.uk)

6 Policy and planning



In 2018, the Government produced *Green Future: Our 25 Year Plan to Improve the Environment* (<https://www.gov.uk/government/publications/25-year-environment-plan>). In respect of AONBs and National Parks, it states that: “Over the next 25 years, we must significantly cut all forms of pollution and ease the pressure

on the environment. We must ensure that noise and light pollution are managed effectively.”

A key part of the plan is to establish **Nature Recovery Networks**, which will provide both new habitats and link existing habitats through landscape-scale conservation. Increasing the connectivity of habitats for the benefit of key species is an essential part of a Nature Recovery Network, and the continuity of darkness is an important element within this.

6.1 AONBs, natural beauty and dark skies



The primary purpose of an AONB partnership with regard to its designated landscape is “to conserve and enhance natural beauty”. Government policy specifically recognises dark skies as a key aspect of natural beauty that should be enhanced, not degraded.

qualities are recognised in development decisions within in the setting of the AONB, so that the natural beauty of the North Wessex Downs is protected.”

Within the Plan, dark skies and minimising light pollution form part of several Strategic Objectives and Policies, with the most specific being in Development – DE08:

“Avoid and reduce light pollution, including control of lighting schemes or other developments that threaten the integrity of dark night skies over the North Wessex Downs.”

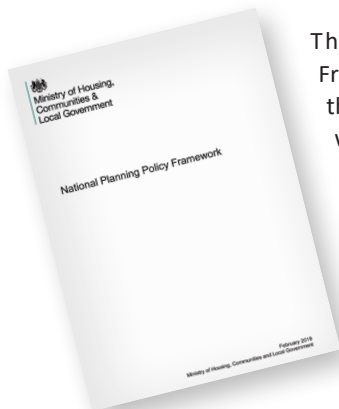
The Countryside and Rights of Way Act 2000 states that every AONB partnership must publish a Management Plan every five years. *The North Wessex Downs AONB Management Plan 2019-2024* includes dark skies as one of the defining characteristics of the area. One of the goals is for the AONB to be a place:

“Where a sense of remoteness and tranquillity predominates and where vast night skies can thrill the eye, unaffected by light pollution; where these special

All local authorities in the North Wessex Downs AONB Partnership have adopted the Management Plan (and, therefore, its Strategic Objectives and Policies), which now forms part of their own development plans.

To see the full AONB Management Plan, go to: <https://www.northwessexdowns.org.uk/publications-resources/>

6.2 National Planning Policy Framework



The National Planning Policy Framework (NPPF) 2018 provides the baseline for local authorities when developing planning policy; paragraph 180 deals with pollution, including light:

“180. 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: ... limit the

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

More in-depth guidance on several topics raised in the NPPF is provided in the *National Planning Policy Guidance (NPPG)*, <https://www.gov.uk/guidance/light-pollution#contents> Under ‘What light pollution considerations does planning need to address?’ it states:

“it is important to get the right light, in the right place and for it to be used at the right time ... Artificial light is not always necessary. It has the potential to become what is termed ‘light pollution’ or ‘obtrusive light’, and not all modern lighting is suitable in all locations. It can be a source of annoyance to people, harmful to wildlife and undermine enjoyment of the countryside or the night sky, especially in areas with intrinsically dark landscapes.”

6.3 Historic environment

The historical use of a landscape will have shaped its fields, woods, tracks, lanes, villages and hamlets, defining its present-day character. It is important to consider both the impact of light pollution and the design of light fittings on this historic landscape character, as well as on Listed Buildings, Registered Parks and Gardens, and other sites of historical interest.

Conservation Areas are designated for their special architectural or historic interest and are given a broader protection than Listed Buildings. Conservation Area designation requires planning decisions to address the quality of the landscape in its broadest sense, including protection from light pollution.

The following resources are useful:

- ▶ The AONB's website on Historic Landscape Characterisation: <http://www.historicnorthwessexdowns.org.uk/>

- ▶ Historic England's technical guidance on lighting for historic buildings: <https://historicengland.org.uk/images-books/publications/external-lighting-for-historic-buildings/>
- ▶ Natural England's MAGIC website: <https://magic.defra.gov.uk/>
- ▶ Information from local historic environment records centres.

Of particular historical note within the North Wessex Downs AONB is the UNESCO World Heritage Site of Avebury, which is home to important stone monuments and tombs from the Neolithic Period and Bronze Age. Light pollution impacts on the heritage and historical character of this world-famous site. Minimising such impacts is an element of the site's management: <http://www.stonehengeandaveburywhs.org/>

6.4 International Dark Sky Reserves

The International Dark-Sky Association (IDA; <https://www.darksky.org/>) defines an International Dark Sky Reserve as "a public or private land possessing an exceptional or distinguished quality of starry nights and nocturnal environment." It awards areas Dark Sky status based on their scientific, natural, educational, cultural or heritage value, and/or their value to public enjoyment.

Dark Sky Reserves consist of a core area meeting minimum criteria for sky quality and natural darkness, and a peripheral area that supports dark-sky preservation in the core. They set higher standards and planning requirements for preventing

light pollution and place a 'duty of regard' on everyone to protect them.

The IDA also awards other types of Dark Sky Place designations, such as Dark Sky Community/Town; see their website for more information.

Currently, there are no Dark Sky Reserves in the North Wessex Downs AONB, but there are Reserves nearby in Cranborne Chase AONB (<http://www.chasingstars.org.uk/>) and the South Downs National Park (<https://www.southdowns.gov.uk/dark-night-skies/>).

Rising moon (by Peter Orr/www.peterorrphotography.com)



“When developing a planning application that includes lighting, it is important to be aware of any designated wildlife sites and protected species nearby.”

6.5 Light pollution and the law



Robin singing at dawn (by Pete Beard/www.flickr.com)

There are limited laws dealing with the impact of light pollution. The main ones deal with environmental nuisance and the illegal disturbance of wildlife.

Environmental nuisance

In 2005, the Environmental Protection Act 1990 (Paragraph 79-fb) (<https://www.legislation.gov.uk/ukpga/1990/43/section/79>) was extended to include light nuisance:

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

Therefore, local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists, or may occur or recur, they must issue an abatement notice requiring that the nuisance cease or be abated within a set timescale.

The following resources are useful:

- ▶ Swindon Council’s light nuisance information leaflet: https://www.swindon.gov.uk/downloads/file/4622/light_nuisance_information_and_diary_pack
- ▶ Wiltshire Council’s light nuisance webpage: <http://wiltshire.gov.uk/env-health-light>
- ▶ Government guidance on light nuisance: <https://www.gov.uk/guidance/artificial-light-nuisances-how-councils-deal-with-complaints>

Wildlife sites and species

The Wildlife and Countryside Act 1981 is the principal mechanism for the protection of wildlife in Great Britain. Under the Act, it is illegal to disturb certain species, including bats, and artificial light can constitute an offence.

While some species are particularly sensitive to artificial light, all wildlife and their habitats can be disrupted by artificial light. When developing or assessing a planning application that includes lighting, it is important to be aware of any designated (statutory and non-statutory) wildlife sites and protected species nearby. An assessment of any potential impacts should be undertaken, and a plan made to remove or mitigate these.

To find out what sites and species are nearby, use:

- ▶ OrdnanceSurvey(OS) maps: <https://osmaps.ordnancesurvey.co.uk/>
- ▶ Natural England’s MAGIC website: <https://magic.defra.gov.uk/>
- ▶ Your local environment/biological records centre.

Wildlife crime issues are usually dealt with by the local police force, most have Wildlife Crime Officers.

6.6 Local planning authorities

The local planning authority is usually the planning department of the district or borough council. In Oxfordshire and Hampshire, strategy and strategic planning developments are dealt with at the county level; all other planning developments are dealt with at the district level.

Every local authority is required to have an up-to-date Local Plan. A Local Plan provides a vision for the area and a framework for addressing housing needs and other economic, social and environmental priorities. Part of the Local Plan is a

Core Strategy that sets out the spatial planning requirements, i.e. the infrastructure for the area.

There are nine local authorities with a legal responsibility to conserve and enhance the natural beauty of the North Wessex Downs AONB: Basingstoke and Deane Borough Council; Hampshire County Council; Oxfordshire County Council; South Oxfordshire District Council; Swindon Borough Council; Test Valley Borough Council; Vale of White Horse District Council; West Berkshire Council; and Wiltshire Council (**Figure 19**).

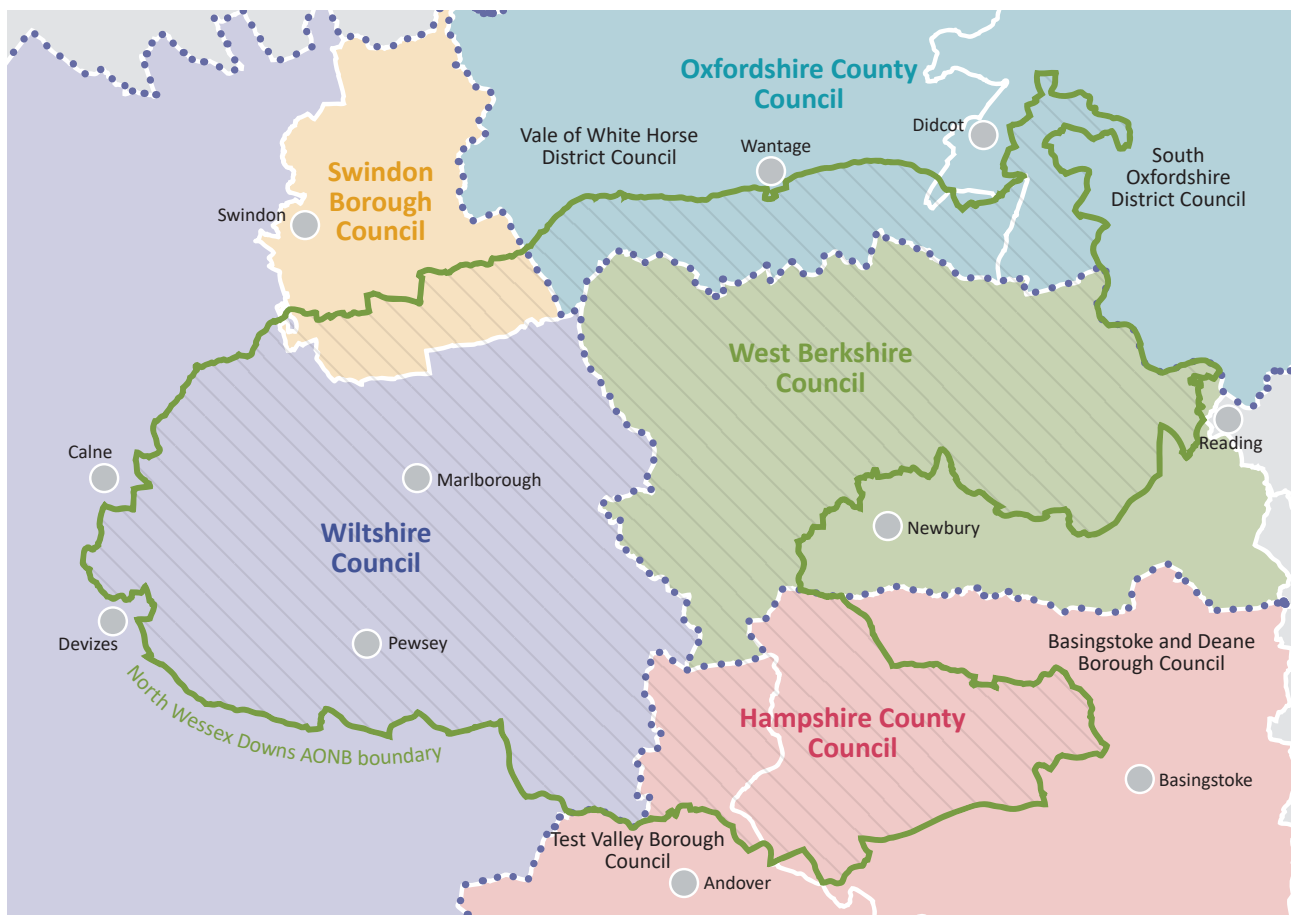


Figure 19: The nine local authorities with a legal responsibility to conserve and enhance the natural beauty of the North Wessex Downs AONB. Illustrated by Helen Walsh. Contains OS data © Crown Copyright and database rights 2019. Ordnance Survey 100051200.

Lighting is mostly included within Local Plan and Core Strategy policies dealing with landscape, biodiversity, design and sometimes pollution. Some authorities have a policy specifically for minimising light pollution or enhancing dark skies.

Local planning authorities (LPAs) can adopt Supplementary Planning Documents (SPDs) for specific topics. Basingstoke and Deane Borough Council has an SPD on Landscape, Biodiversity and Trees that provides consideration of the impact of lighting on dark skies and wildlife. West Berkshire Council has an Area Delivery Plan specific to the AONB that mentions dark skies.

This guide can be used to develop policy for a Local Plan or can be adopted as a Supplementary Planning Guidance (SPG).

More information:

- ▶ See Appendix 1 for a table providing the policies in each LPA Core Strategy, Local Plan or SPD that are relevant when considering lighting in planning developments. Policies are reviewed regularly, and new ones developed; always check with your LPA for the latest versions.
- ▶ See Appendix 2 for suggested wordings for LPAs when setting lighting policies.

6.7 Lighting planning permission



New residential developments need approval for lighting plans (by North Wessex Downs AONB)

Before installing a lighting scheme, check with your LPA to ensure compliance with their policies or guidance. Many have a simple web questionnaire to assess whether planning permission is needed or not.

External lights require planning permission in certain situations:

- ▶ Existing domestic buildings – do not usually require planning permission for the addition of external lights, unless a condition removing Permitted Development Rights is included within a decision notice relating to the building or site.
- ▶ Listed Buildings – domestic or otherwise do require planning permission and will also require Listed Building Consent.
- ▶ New residential developments – need approval for lighting plans as part of the planning permission.
- ▶ Non-domestic buildings – need planning permission if the installation of a lighting scheme represents a material change in appearance of a structure or an engineering operation.
- ▶ Advertisements – illuminated or otherwise may require planning permission. The Town and Country Planning (Control of Advertisements) Regulations 2007 set out when consent is required from the LPA.

6.8 Neighbourhood planning

Developed by the community of an area, a Neighbourhood Plan can make a very positive contribution to the conservation and enhancement of an AONB, including dark skies. Equally, an AONB can offer a level of landscape protection to plans where the aim is to conserve and enhance the character of the parish/neighbourhood. Local authorities often look to a Neighbourhood Plan to direct the development of an area. Guidance on the neighbourhood planning process is provided by organisations such as ACRE (<https://acre.org.uk/>), your LPA and local community councils.

Communities within, or in the setting of, the North Wessex Downs AONB preparing a Neighbourhood Plan should refer to the AONB Management Plan and other publications: <https://www.northwessexdowns.org.uk/publications-resources/>

If the lighting scheme requires planning permission, a lighting assessment will be required, and possibly a lighting plan. This may need the services of a qualified lighting design engineer (see Section 7).

There is useful advice from the Government on how to consider light within the planning system: <https://www.gov.uk/guidance/light-pollution>. There is also a national online planning guidance resource that helps planners to decide if and when lighting pollution concerns should be considered in planning applications.

Planning decisions and conditions

It is possible for planning applications to be refused if the impact of lighting has not been given sufficient consideration.

For example, an appeal by planning applicants in the Chilterns AONB, South Oxfordshire, was dismissed due to the amount of glazing facing an adjacent woodland. In the appeal decision, the inspector wrote:

“In the absence of mitigation, such opening would give rise to significant light pollution. In this regard, the National Planning Policy Framework states that decisions should limit the impact of light pollution from artificial light on intrinsically dark landscapes and nature conservation.”

When determining planning applications, the LPA may seek to minimise light pollution through planning ‘conditions’, such as limiting the hours of illumination. Planning authorities should also be aware that giving permission for certain uses, such as sports facilities, community halls, or the reuse of farm buildings, can give rise to lighting demands later on.

It is important to note that a planning authority cannot influence existing lighting unless there is a planning variation and they can add a condition, especially if policy has changed since the original lights were installed.

In summary, Neighbourhood Plans that lie wholly or partly within the AONB should consider and acknowledge:

- ▶ The North Wessex Downs AONB Dark Skies and Artificial Light Position Statement.
- ▶ The North Wessex Downs AONB and its legal landscape designation enshrined within planning policy.
- ▶ The North Wessex Downs AONB Management Plan and its objectives, policies and actions.
- ▶ The primary purpose of AONB designation: for “conserving and enhancing natural beauty”.
- ▶ The duty on all relevant authorities to consider the AONB status in any land use/environment decisions (Section 85 of the Countryside and Rights of Way Act 2000).
- ▶ The Integrated Character Assessment (2002) and specific Landscape Character Areas that are relevant.

To check if your parish or district falls within, or partly within the AONB and its setting, use the Definitive Mapping for the North Wessex Downs available on the publications webpage.

Always think about lighting when preparing or refreshing a Neighbourhood Plan. While street lighting is often considered, external and internal lighting is not. Ensure lighting is included in questionnaires and consultation; use the Environmental Zones in Section 5 of this guide to help with your approach. Remember that continuity of darkness and dark corridors are important for wildlife and landscape integrity, as well as rural character.

Include policies relating to both street lighting and external lighting (domestic, community, sports and commercial) in your plan or separate lighting policy, referring to both the AONB Management Plan and local authority policies.

As well as minimising any additional light pollution, you may want to measure existing light levels and agree 'Lighting Improvement Zones' for the neighbourhood, concentrating on improving those areas where light pollution is at its worst. There are a number of apps for mobile devices to measure light levels, for instance, Loss of the Night: <http://lossofthenight.blogspot.com/2020/06/loss-of-night-app-video-tutorials.html>. However, for more accurate readings, it is best to use a light meter; see the *ILP Guidance Note 7/17 Choosing the right photometer/illuminance meter* <https://theilp.org.uk/resources/> for advice.

If the neighbourhood already has some good dark areas, the Plan could identify and protect these, for example, by establishing 'Dark Sky Discovery Sites' – places that provide great views of dark skies that are accessible to everyone. Below are extracts from some Neighbourhood Plans that consider lighting and light pollution:

Blewbury parish, in the Vale of White Horse, is within the AONB and adopted its Neighbourhood Plan in December 2016. <http://www.whitehorsedc.gov.uk/services-and-advice/planning-and-building/planning-policy/neighbourhood-plans/blewbury-neighbourhood>. The plan includes lighting as part of a policy on Amenity: New Development. All new development must satisfy the following wherever relevant:

"Result in no significant adverse impact on the amenities of neighbours by reason of noise, odour and light. Light pollution in particular is to be minimised wherever possible and security lighting, if required, must be appropriate, unobtrusive and energy efficient."

Plus, in regard to street lighting, the Blewbury Plan states:

"Any introduction of street lighting would be contrary to a valued characteristic of the public realm and would significantly change the experience of living in the village."

Accordingly, the use of street lighting is not supported in any location within the parish."

St Mary Bourne parish, in Basingstoke and Deane, is within the North Wessex Downs AONB and adopted its Neighbourhood Plan in March 2018. In keeping with the importance of conserving and enhancing the AONB, the Plan includes lighting as part of the policy on Design Requirements:

"Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and biodiversity."

The full plan can be found here: <https://www.basingstoke.gov.uk/content/doclib/2509.pdf>

Stratfield Mortimer parish, in West Berkshire, is close to the North Wessex Downs AONB and adopted their plan in June 2017. The Plan includes a policy relating to street lighting, but the overall impact of light pollution with the risk of urbanising the village is stated as a concern: https://www.stratfield-mortimer.gov.uk/Stratfield-Mortimer-PC/Neighbourhood_Development_Plan_3873.aspx

Marlborough Neighbourhood Plan includes a policy on Achieving Dark Skies, which sets out to ensure that only essential external lighting is approved and that it is located and designed in such a way to conserve the dark skies of the North Wessex Downs AONB: <https://www.marlborough-tc.gov.uk/neighbourhood-plan>. The Plan also references this guide.

Public consultation (by Action for the River Kennet)



"Developed by the community of an area, a Neighbourhood Plan can make a positive contribution to the conservation and enhancement of an AONB, including dark skies."

6.9 Street lighting

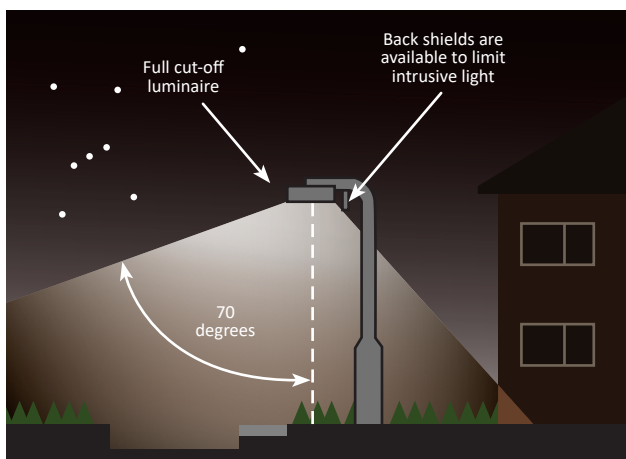


Figure 20: A diagram of a street light directing light where it is needed (adapted from the Commission for Dark Skies, CfDS)

It is not always necessary to have street lighting on a development. Where larger developments within urban settlements require street lighting, you can still design it to minimise light pollution, including features like dimming or part-night schemes. In some situations, the use of full cut-off, low-level bollards may be more appropriate than tall, brighter columns. This will limit the total lumen output and possible glare, scattering and reduce the impact of lighting on the surrounding area.

The ILP *Guidance Note 1 for the reduction of obtrusive light* <https://theilp.org.uk/resources/> references British Standards on road lighting. **Figure 20** shows a street light directing light where it is needed https://britastro.org/dark-skies/pdfs/CfDS1703_E5_Good_Lighting_Guide.pdf.

Street lighting becomes the responsibility of the local Highways Authority if it is to be adopted by them once the development is finished. The local highways authorities have street lighting designs or use the planning authorities design guide. If you are designing a lighting scheme that will be later adopted by Highways, take opportunities to reduce lighting levels and pollution further than the minimum required.

An example of a good road lighting scheme just outside the AONB can be found at the A420 services in Buckland, adjacent to the garage and Mollies Diner. The lighting covers new bus stops and a road crossing in a predominantly dark landscape. It has minimum upward glow or glare on approach, but creates a short section of well-lit road.

The ever-increasing cost of electricity has caused councils to reconsider keeping inefficient street lights on all night, and many are now turning them off. As a result, large amounts of money have been saved, and councils' CO₂ footprints have been reduced. Trials have shown that energy-saving dimming (to over 30 per cent) is hardly noticed by residents (CfDS, https://britastro.org/dark-skies/pdfs/CfDS1703_E5_Good_Lighting_Guide.pdf).

Concerns are often expressed that turning off street lights could lead to an increase in crime. However, a study published in the *Journal of Epidemiology and Community Health* in 2015 found little evidence of harmful effects of switch-off, part-night lighting, dimming or reducing the colour temperature (kelvin) on road collisions or crime in England and Wales: <https://jech.bmj.com/content/69/11/1118>

Dimming or switching off street lights via remote control is becoming a more widespread practice. Technology also enables lighting to be off or dimmed until movement is registered and the brighter light needed.

Therefore, try to use fully cut-off, energy-efficient street lighting to minimise energy usage, and significantly reduce light pollution, nuisance to neighbours and harm to wildlife. Low-energy LED lights should be 3000 K or below (warm white) to prevent any adverse effects on animals and humans (see Principle 3 in Section 3.2).

Worcestershire County Council have installed bat-friendly, red streetlights along a 60 m stretch of the A4440, near to Warndon Wood (**Figure 21**).



Figure 21: Red, bat-friendly streetlights along the A4440 have less adverse impacts than white lights (by Worcestershire County Council)

The road is a flight path for bats and white street lights disrupt their feeding, especially the rarer, slower-flying species. Yet, red lights are proving to have little or no adverse impact on them.

Wiltshire street lighting project

There are almost 45,000 streetlights on Wiltshire Council's highway network. Energy costs have risen sharply in recent years and are likely to continue to rise in the longer term.

By the end of 2021 all Wiltshire Council street lighting will be LED units: <https://www.wiltshire.gov.uk/highways-improvements-led-lighting> The cost of the project is estimated to be £12.3 million, with expected payback in 11.88 years, although this could be considerably sooner depending on



The flight paths of rare lesser horseshoe bats are disrupted by poor street lighting (courtesy of the Bat Conservation Trust)

future energy costs. Regarding street lighting within its AONBs, Wiltshire Council states:

“In Areas of Outstanding Natural Beauty (AONBs) the lighting will have the 2,700 K warmer appearing light. Most units will be installed at 0° inclination to reduce light spill, with lighting levels dimmed later in the evening. The new lighting will reduce light spill and contribute to improving the dark skies.”

The total number of lanterns to be replaced in the North Wessex Downs AONB is 2,726. The new units will be dimmable and may be switched off entirely (**Figure 22**).



Figure 22: Axia 3 new street light units have been installed in the AONB (by Urbis Schreder)

Swindon street lighting project

The annual cost of energy for street lighting in Swindon is currently more than £1.3 million. The Council is investing £7.2 million to convert roughly 28,000 of its street lighting units to LEDs with a warm white light of 3000 K: https://www.swindon.gov.uk/info/20136/transport_strategy/1133/led_street_lighting_upgrade_scheme

The upgrade is expected to deliver a substantial reduction in the amount of energy purchased and used by the Council, who are aiming for a 61 per cent improvement and a saving of approximately £800,000 per year.

Other councils in the AONB

Hampshire County Council have a Street Lighting Design Guide and Department Standard Specification 2010 for their current street lighting maintenance contract. The document was updated in 2016.

Oxfordshire County Council has a policy to use the newest technology available to reduce the energy consumption of, and maintenance visits to, street lighting; this includes changing old lights to LED lanterns within column-replacement schemes, new housing developments and maintenance schemes (e.g. when a new lantern is required). The policy also includes dimming all new lanterns to 50 per cent output on residential roads from 10pm to 6am, and 75 per cent output on traffic routes from 12am to 6am.

West Berkshire Council completed an LED Street Lighting Project in 2016. The majority of street lights are now centrally controlled and dimmed from 75 per cent output to 30 per cent between the hours of 10pm and 6am.

7 Lighting assessment and plan

Whether a lighting scheme requires planning permission or not, it may need a lighting assessment and/or plan. These are created by professional lighting engineers and/or designers.

When choosing an engineer or designer, it is good to ask them about their experience of lighting schemes that minimise light pollution.

ILP *Guidance Note 1 for the reduction of obtrusive light* <https://theilp.org.uk/resources/> lists relevant British Standards and publications from The International Commission on Illumination (CIE). BRE, who provide standards for the built environment, also have a download available: *Obtrusive light from proposed developments (DG529)* <https://www.brebookshop.com/details.jsp?id=327145>

Lighting assessment

Local planning authorities may require environmental lighting assessments to be carried out as part of any planning applications proposing to install lighting. Information can be found in the ILP *Professional Lighting Guide 04: Guidance on Undertaking Environmental Lighting Impact Assessments* <https://theilp.org.uk/resources> and in Appendix 1 and 3 of the Commission for Dark Skies' *Blinded by the Light?* <https://britastro.org/dark-skies/pdfs/HANDBOOKTEXT.pdf> (Note that an update version is available in print on request).

A lighting assessment focuses on the lighting aspects of new development applications and includes design and assessment methodology. Light control zones (see Section 5) should be adhered to, and light parameters (see ILP *Guidance Note 1*) given.

In addition to light parameters, a lighting assessment needs to evaluate the spectral power distributions (the amount of blue light) and the polar intensity (the light distribution), to ensure that the scheme is not emitting unnecessary harmful light nor light beyond the area intended.

Any assessment must consider the effects of artificial light on flora and fauna, as well as the effects on people and their perception of the surroundings, including upward sky glow.

Light measurements

To specify appropriate lighting according to the need and situation, it is helpful to understand the different measures of light. Lumens, Lux and Candela all measure a different aspect of light (see Section 3.1):

- ▶ Lumens is a measurement of how much light is emitted from a light source in all directions.
- ▶ Lux measures the amount of light that falls on a surface.
- ▶ Candela is the intensity of light as visible to the human eye in a specific direction.

Lighting plan

Applications for external lighting installations are often presented to local authorities in formats that make it difficult to appraise the overall design, both visually and technically.

In 2007, the Scottish Government developed a 20-point plan to standardise the process *Controlling light pollution and reducing lighting energy consumption, 2007*.

Although some of the technical details of the 20-points have been superseded, the principles are still very relevant (see **Table 2**). The design process follows the chronological order usual to a lighting designer's methodology. The essential stages are the minimum that should be undertaken. Additional requirements may be needed, such as an ecological assessment.

When asking a lighting engineer for a lighting plan, you might find it helpful to ask them to use this approach.

Stage	Requirement	Stage Name	Stage	Requirement	Stage Name
1	Essential	Statement of Client Needs/ Operational Statement	11	Essential	Obtrusive Light Calculation
2	Essential	Site Survey	12	Essential	Comparing Design with Baseline Values
3	Essential	Critical Viewpoints	13	Desirable	Designer's Critique
4	Desirable	Existing Lighting Conditions	14	Desirable	Viewpoint Visualisation
5	Desirable	Baseline Conditions	15	Desirable	Virtual Walkthrough
6	Essential	Task Analysis	16	Desirable	Surface Colour Schedule
7	Essential	Establishment Environmental Setting	17	Essential	Luminaire Schedule
8	Essential	Lighting Design Objectives	18	Essential	Energy Usage
9	Essential	Lighting Design Methodology	19	Essential	Schedule of Luminaire Profiles
10	Essential	Calculated Predictions	20	Essential	Layout Plan

Table 2: The Scottish Government's 20-point plan for standardising applications for external lighting installations

Appendices

1 Local authority policies relating to lighting

Table 3 below lists the policies in each LPA Core Strategy, Local Plan or Supplementary Planning Document (SPD) that are relevant when considering lighting in planning developments.

Planning Authority	Links	Policies
Basingstoke and Deane	https://www.basingstoke.gov.uk/content/doclib/1592.pdf https://www.basingstoke.gov.uk/supplementary-planning-documents	Local Plan Policies: Policy EM12: Pollution Policy EM1: Landscape Policy EM4: Biodiversity, Geodiversity and Nature Conservation Landscape, Biodiversity and Trees SPD
South Oxfordshire	https://www.southoxon.gov.uk/south-oxfordshire-district-council/planning-and-development/local-plan-and-planning-policies/forthcoming-planning-policies/our-forthcoming-local-plan/	Objective 8 Climate Change Policy STRAT 10: Berinsfield Garden Village Policy ENV11: Pollution - Impact from Existing and/or Previous Land Uses on New Development (Potential Receptors of Pollution) Policy ENV12: Pollution - Impact of Development on Human Health, the Natural Environment and/or Local Amenity (Potential Sources of Pollution) Policy DES6: Residential Amenity Policy DES7: Efficient Use of Resources
Swindon	https://www.swindon.gov.uk/info/20113/local_plan_and_planning_policy/635/swindon_borough_local_plan_2026	Local Plan Policies: SD1: Sustainable Development Principles DE1: High Quality Design DE2: Sustainable Construction IN4: Low Carbon and Renewable Energy EN4: Biodiversity and Geodiversity EN5: Landscape Character and Historical Landscape EN7: Pollution Policy
Test Valley	https://www.testvalley.gov.uk/planning-and-building/planningpolicy/local-development-framework	Local Plan Policies: E8: Pollution E2: Protect, Conserve and Enhance the Landscape Character of the Borough E5: Biodiversity
Vale of White Horse	http://www.whitehorsedc.gov.uk/services-and-advice/planning-and-building/planning-policy/local-plan-2031	Local Plan 2031 Part 1 Core Policy: 37: Design and Local Distinctiveness. 44: Landscape Part 2 Development Policy: 21: External Lighting 22: Advertisements
Wiltshire	http://www.wiltshire.gov.uk/planning-policy-core-strategy	Core Policies: 41: Sustainable construction and low-carbon energy 51: Landscape 57: Ensuring high quality design and place shaping 58: Ensuring the conservation of the historic environment 59: The Stonehenge, Avebury and Associated Sites World Heritage Site and its setting
West Berkshire	https://info.westberks.gov.uk/corestrategy	Core Policies: CS14: Design Principles CS17: Biodiversity and Geodiversity CS19: Historic Environment and Landscape Character Area Delivery Plan Policy 5 – North Wessex Downs Area of Outstanding Natural Beauty (AONB)

Table 3: Local authority policies relating to lighting. Policies are reviewed and developed regularly; check with your LPA for the latest versions.

2 Lighting policy suggested wording for LPAs

This appendix contains suggested wording for local planning authorities within and around the North Wessex Downs AONB for inclusion in policies and conditions on lighting.

Justification for a Lighting Policy

1.1 Artificial light is essential in our modern society and we all use it for many different things including helping to prevent road accidents, as a security measure, to increase access to sport and recreation facilities outside daylight hours, for enhancing and enlivening our towns at night and for enhancing historic and architecturally important buildings. It has become an accepted feature of day to day living and is clearly something that can be beneficial.

1.2 Light in itself is not a pollutant. It is only when it is obtrusive, finding its way into areas not intended to be lit, that it starts to have an adverse and unreasonable impact. Light pollution (or obtrusive light) can have a profound negative impact, changing the character of a locality, a landscape, affecting human health and altering wildlife habitats and ecological patterns. On the widest scale, dark skies and unimpeded views of the stars are now in danger of becoming a thing of the past except in the most remote of rural areas.

1.3 The consequences of light pollution are extensive:

- ▶ Wildlife growth, development, reproduction, eating and movement all depend on the balance between day and night. Any amounts of artificial light can seriously alter the natural cycles and operations of birds, amphibians, bats, insects and even trees.
- ▶ Like wildlife, humans have evolved with the natural cycle of light and darkness. When the natural cycle is disrupted it can lead to lower immunity, increased risk of disease, mood instability and increased risk of mental illness. Artificial light at the wrong time of day disrupts the production of a hormone called melatonin. Melatonin is important as it induces sleep, boosts the immune system, lowers cholesterol and helps with the function of the thyroid, pancreas and more.
- ▶ Glare and insensitive lighting can cause accidents when motorists are been distracted or blinded by glaring lights spilling out on to the road.
- ▶ Bright exterior lights on a building can create dark spots for criminals to hide in, instead of deterring crime as intended.
- ▶ Artificial lighting is degrading the character of rural landscapes, eroding and destroying the tranquillity and sense of remoteness.
- ▶ Wasted energy from the power used for excessive lighting contributes to carbon emissions and climate change, and wastes money.
- ▶ The number of places we can see truly dark skies is reducing, meaning fewer people are experiencing the magic of looking up at a starry night sky.
- ▶ It is seriously undermining the ability of British-based astronomers, both professional and amateur, to take the lead in this continually expanding field of science.

1.4 Problems can arise from many different artificial light sources, such as:

- ▶ floodlit sports facilities, for example golf driving ranges or football pitches which bathe neighbouring land in unwelcome brightness;
- ▶ floodlights on buildings, illuminated shop windows and advertising signs which are not switched off overnight;
- ▶ overpowered and poorly directed domestic security lighting affecting neighbours and wildlife;
- ▶ poorly directed street lighting which throws light upwards into the sky rather than downwards onto the road or pavement it is supposed to illuminate;
- ▶ proliferation of road lighting, extending further out from towns and villages into the countryside; and
- ▶ temporary lighting associated with construction and engineering projects.

1.5 All relevant authorities down to parish council level have a duty to consider the AONB status in any land use/ environment decisions (Section 85 of the Countryside and Rights of Way Act 2000).

1.6 Local planning authorities have a responsibility to support the protection of human health, nocturnal wildlife habitats, public enjoyment of the night sky and its heritage, and/or areas ideal for professional and amateur astronomy. Local planning authorities should have a lighting policy with the aim of preventing or minimising light pollution to the area.

Suggested wording for a Lighting Policy

Light Pollution and Promoting Dark Skies

1.7 Proposals for lighting schemes will be permitted where it is demonstrated that the development could not proceed without lighting, and the scheme is appropriate to its surroundings by ensuring:

- ▶ it is the minimum necessary for its intended purpose;
- ▶ the measured and observed sky quality in the surrounding area is not reduced;
- ▶ lighting is not unnecessarily visible in nearby designated and key habitats;
- ▶ the visibility of lighting from surrounding landscape is avoided;
- ▶ building design avoids increased light spill from internal lighting;
- ▶ it will have no significant adverse effects (individually or cumulatively) to the character of the area, the safety of vehicle users and pedestrians, the amenity of local residents, or the diurnal/seasonal rhythms of the biodiversity, and;
- ▶ any adverse impacts that cannot be avoided are mitigated with suitable measures.

1.8 The correlated colour temperature (CCT) of outdoor lighting (including street lighting) should not exceed 3000

Kelvins in order to limit the effects of known environmental hazards associated with short-wavelength visible light.

1.9 Proposals where external lighting is required should include a full lighting scheme that provides information about its purpose, hours of use, layout and beam orientation, and a schedule of the light equipment proposed including luminaire type, mounting height, aiming angles and lumen unit levels.

2.0 All proposals will be expected to demonstrate clear regard to the guidance set out in *Dark Skies of the North Wessex Downs – A Guide to Good External Lighting (2021)*.

2.1 Schemes must meet or exceed the level of protection appropriate to the environmental light control zones of the North Wessex Downs AONB in which an application is proposed. Specifications for the zones are contained in the Institute of Lighting Professionals (ILP) *GN01 Guidance note for the reduction of obtrusive light*.

Suggested conditions in support of a Lighting Policy

2.2 Planning conditions can help ensure policy is adhered to, good lighting design is used, and light pollution is minimised from a lighting scheme on a new development or when there is a planning variation to an existing scheme.

2.3 The need to apply conditions and the precise wording will depend on the proposed development, such as location and intended use. Below are some suggested conditions and wording that can be adapted as needed:

- ▶ No building or use hereby permitted shall be occupied or use commenced until a report detailing the lighting scheme and predicted light levels has been submitted to, and been approved in writing, by the local planning authority. Artificial lighting to the development must conform to requirements to meet the obtrusive light limitations for exterior lighting installations for

environmental zones – E0/E1/E2 [*delete as appropriate*] see Section 5 of this guide and the ILP *GN01 Guidance note for the reduction of obtrusive light*.

Reason: In order to preserve the special qualities of the North Wessex Downs AONB including dark skies and tranquillity.

- ▶ No external lighting shall be installed on site unless details of such lighting, including the intensity of illumination and predicted lighting contours [*insert extra requirements*], have been first submitted to, and approved in writing by, the local planning authority prior to first occupation/use of the site. Any external lighting that is installed shall accord with the details so approved.

Reason: In order to preserve the special qualities of the North Wessex Downs AONB including dark skies and tranquillity.

- ▶ No development shall take place until a Construction Environmental Management Plan has been submitted to, and been approved in writing, by the local planning authority. The plan must demonstrate the adoption and use of the best practicable means to reduce the effects of noise, vibration, dust and site lighting.

Reason: In order to minimise light pollution and other disturbance to people and wildlife during the construction.

2.4 Other conditions might include:

- ▶ Not permitting any form of external lighting. Especially appropriate to developments in environmental light control zone E0 areas.
- ▶ Specifying the hours of illumination.
- ▶ Requiring non-domestic facilities to install electronically controlled blackout blinds that operate automatically to prevent internal light spilling outside at night.
- ▶ Specifying the height and/or number of lighting columns.

3 Dark skies websites

- ▶ British Astronomical Association (BAA): workshops, tutorials, and information – britastro.org
- ▶ Commission for Dark Skies (CfDS): campaign and promote good lighting – britastro.org/dark-skies
- ▶ CPRE Night Blight: maps of light pollution and dark skies – nightblight.cpre.org.uk
- ▶ Dark Skies Discovery: star maps, information and tips – darkskydiscovery.org.uk
- ▶ Go Stargazing: promote events and astronomy widely – gostargazing.co.uk
- ▶ International Dark-Sky Association (IDA): protecting night skies for future generations – darksky.org
- ▶ Institute of Lighting Professionals (ILP): information about lighting principles – theilp.org.uk
- ▶ Science and Technology Facilities Council: a worldleading multi-disciplinary science organisation – stfc.ukri.org
- ▶ Skymaps: see what's happening to the sky each month – skymaps.com
- ▶ Society of Light and Lighting: covering many aspects of lighting and its applications – cibse.org/society-of-light-and-lighting
- ▶ Society for Popular Astronomy: information, news and updates on the night sky, helping beginners of all ages to get started in astronomy – popastro.com
- ▶ Stellarium: open source planetarium for computer and mobile – stellarium.org

Contacts:

- ▶ Local astronomical societies are a great source of advice, find your nearest one: Wiltshire, Newbury, Swindon Stargazers, Reading, or Friends of the Marlborough Telescope.



Dark Skies of the North Wessex Downs

A Guide to Good External Lighting

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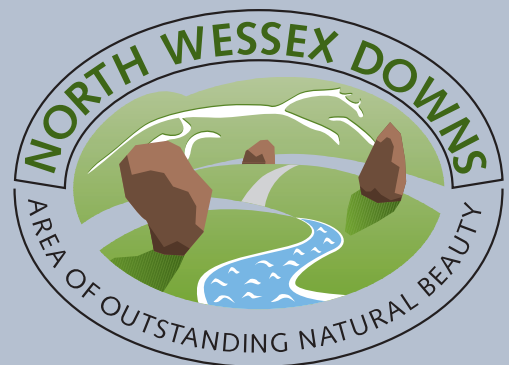
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