Land and Partners

LAND AT LONG COPSE LANE, EMSWORTH

Lighting Strategy – Residential Use Development

70052250-WSP-GSC-XX-RP-LI-0001
AUGUST 2021

PUBLIC

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Lighting Strategy – Residential Use Development

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CONTENTS

APPENDICES

1 STRATEGY OVERVIEW

1.1 LIGHTING STRATEGY OVERVIEW

1.1.1. This lighting strategy demonstrates how sufficient lighting for the safe and convenient use of the roads, cycle routes, walking routes and parking places can be achieved, whilst also putting in place mitigation measures for protected species living in the adjoining woodland such as Bechstein's bats and the nearby Dark Night Sky Reserve of the South Downs National Park.

1.1.2. The applicants have worked closely with the Council's ecologist since 2016 after the Housing Statement established the principle of around 260 dwellings in the allocation, subject to detailed technical work. The masterplan concept was structured around bat buffers from the very start, informed by a comprehensive set of bat surveys, including radio tracking. The resulting planning application is supported by detailed technical work that includes an Ecological Impact Assessment that incorporates best practice on mitigation for Bechstein's bats. Not only has this been prepared in dialogue with the County ecologist, but it also benefits from formal pre-application advice with Natural England which has shaped the masterplan including an increased landscape buffer to the north and east of the site as a direct result of their involvement.

1.1.3. To address the Dark Night Sky Reserve of the South Downs National Park, direct dialogue has taken place with the South Downs National Park Authority and both this strategy and the LVIA have had regard to this as well as the specific lighting policies of the South Downs National Park's Local Plan and best practice on reducing light pollution. The bat buffers are to the north and east of the site and these will of course jointly benefit the Dark Night Sky Reserve which lies in this direction. In this way, the site is able to effectively mitigate both the protected species and protected landscapes beyond the site.

1.1.4. The lighting strategy will be implemented by way of a S106 legal agreement to control the management and maintenance of the common parts of the whole site, which will involve setting up a management company and agreement of a management plan to the satisfaction of the Council. This is an increasingly common arrangement where more bespoke development solutions are required and will not only cover lighting but also SUDS (including nutrient removal), foul drainage, public realm and open spaces. The management plan will be funded by the service charges of occupiers. All new residents will be provided with information on purchase of their property setting out their responsibilities, including the costs, for the future management of the common parts of the development. In this way, the Council can have confidence that the mitigation to be agreed as part of the planning application can be secured in perpetuity.

1.2 PROTECTED SPECIES MITIGATION

1.2.1. The key ecological objective of the scheme has been to protect the adjoining habitats of Southleigh Forest/Hollybank Woods and the use of these areas by most protected and notable species found on site from the effects of the scheme. Bechstein's bats use the northern and eastern boundaries as commuting and foraging habitat. They have also been recorded roosting in Colman's Copse within the site.

1.2.2. The main approach to achieving this objective is through the provision of large buffers on the northern, eastern and western boundaries which will reduce lighting impacts to a level which will not affect the continued use of the area by nocturnal species such as bats and dormice. The buffer

zones will build on the woodland edge habitat that currently exists, providing for further predominantly woodland planting with a grassland/scrub mosaic (for public use) and siting of treelines and hedgerows to screen the buffers from artificial lighting from the main development area. There will also be specific biodiversity areas of 0.3ha that will be non-accessible, primarily on the northern buffer (see Landscape Plan/Strategy, ARC 2021). They have been designed primarily to provide dark vegetated flight corridors for Bechstein's bats to ensure their existing commuting and foraging habitat are not affected.

1.2.3. The principles of the Trowbridge Bat Mitigation Strategy (John's Associates 2020) which were developed specifically to address Bechstein's bat and bats species, have been used a guide in the design concept for the buffers. The are shown at an average of 30-35m width. The attached image from the guidance indicates the buffer design and the final design for this scheme will be addressed as part of the landscaping reserved matters.

2 INTRODUCTION & PROJECT DESCRIPTION

2.1 BACKGROUND

2.1.1. WSP has been appointed by Land and Partners Ltd to prepare an external lighting strategy in consideration of the requirements of external lighting at Long Copse Lane, Emsworth, to minimise any potential obtrusive lighting to surrounding property owners and any light pollution issues.

2.1.2. This exterior lighting strategy has been undertaken to accompany the outline planning application for the proposed residential development of the land off Long Copse Lane, Emsworth, Hampshire (grid reference SU 749 079).

2.1.3. The application is for residential development expected to be around 210 dwellings and associated parking, open space and surface water drainage on a 14.6 ha site. This site forms part of wider masterplan area which proposes approximately 260 dwellings to correspond with a proposed housing allocation in the emerging Havant Local Plan. Following pre-application advice and a Development Control Forum, it was agreed with Council officers to prepare a masterplan for the proposed allocation area to demonstrate how the application site related to this.

2.1.4. This strategy addresses the light emitted from the public areas and the external parts of residential properties. There are no commercial buildings within the scheme therefore lighting within buildings is not considered to require mitigation.

2.2 SITE LOCATION

2.2.1. The site, highlighted by the red boundary in Picture 1 below, lies approximately 1km north of the A27 at Emsworth on the northern edge of the New Brighton area. It abuts Long Copse Lane to the south. To the north and east of the site is existing greenfield land used for agricultural purposes, a stream/tributary of the river Ems and woodland. Further woodlands, farms and residential properties are located along the western boundary.

2.2.2. The site is predominantly undeveloped agricultural land, except for an isolated existing residential property in the south and some wooded areas to be retained. Existing ditches run around the perimeter of the site.

Figure 2-1 – Proposed Application site highlighted in red

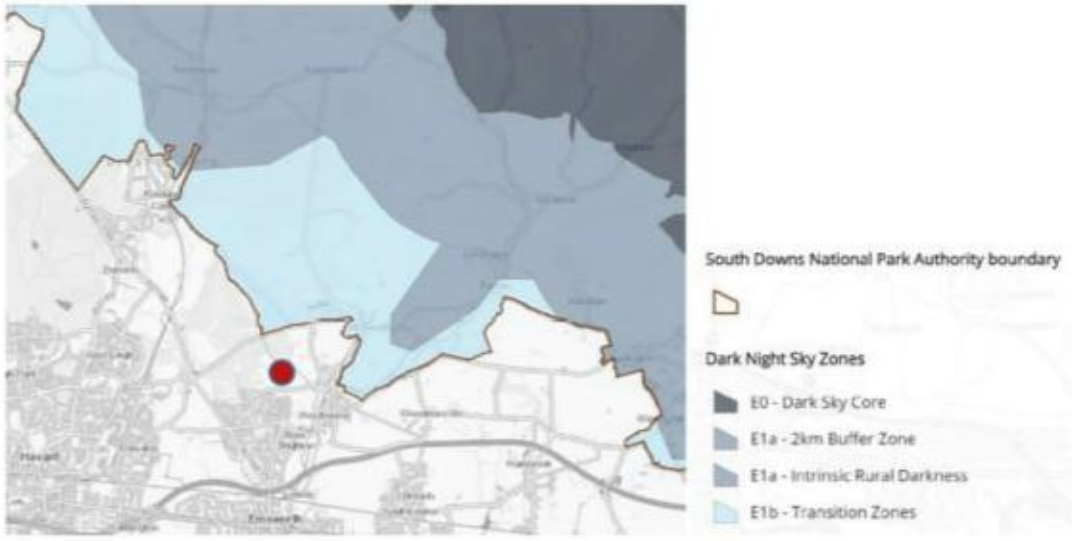
2.3 SOUTH DOWNS DARK NIGHT SKY RESERVE

2.3.1. The application site lies approximately 0.5km from the South Downs National Park. The site is separated from the National Park by extensive areas of mature woodland. When standing within ther site, there are some view in an easterly direction above the boundary trees to higher ground within the National Park but the LVIA demonstrates there are no public vantage points from the National Park back towards the site.

2.3.2. In May 2016 the South Downs National Park became an International Dark Sky Reserve (IDSR). A Technical Advice Note was published in 2018 that sets out guidance on lighting within the National Park.

2.3.3. There are approximately 2,700 streetlights in the South Downs National Park. Local lighting authorities are gradually replacing these over time to comply with Dark Night Sky Reserve standards. So even within the Dark Night Sky Reserve, lighting is appropriate but has to meet specific lighting requirements.

2.3.4. The application site is not in the Dark Night Sky Reserve, nor is it in the defined 2km Buffer Zone or Transition Zone beyond that. It lies some distance from the Transition Zone, on the edge of an existing town immediately next to existing development. There are residential properties and business uses within the site itself and alongside the site is the adopted Long Copse Lane fronted onto by suburban housing and with adopted streetlights along it.



Extract (not to scale) from the South Downs Dark Night Skies mapping showing Dark Zones with approximate location of the site highlighted by the red dot.

Figure 2-2 – Proximity of development to SDNP

2.3.5. The LVIA submitted with this application concludes that the site makes no contribution to the Dark Sky Core or its Buffer Zone, though it may make a limited and localised contribution to the outer Transition Zone. For these reasons, this Lighting Strategy proposes measures to mitigate any impacts on the outer Transition Zone whilst also providing sufficient lighting on the roads and footpaths to meet British road lighting standards.

2.3.6. As reference, Strategic Policy SD8 (Dark Night Skies) of the South Downs Local Plan (adopted 2019) provides guidance in terms of the Sky Quality Measurement (SQM) for each environmental zone and sets maximum lighting levels in terms of Lux. The policy is focused on the integrity of the Dark Sky Core and specifies for this area a SQM minimum of 20.5. For this area an astronomical darkness curfew is required. The 2km Buffer Zone around the Dark Sky Core is required to achieve a SQM range of 20-20.5 and a preferred lights-off curfew. The Transition Zone and areas outside this are required to achieve a SQM range of ~ 15 to 20 SQM and only urban zones can go below 15 SQM. For all areas, a maximum of 10 lux is set.

2.3.7. This report will give due consideration to the impact of artificial lighting on the natural and human environments in general and set out appropriate measures to mitigate potential impacts caused by exterior lighting at the proposed development site.

3 IMPACT OF ARTIFICIAL LIGHTING

3.1 POTENTIAL NEGATIVE EFFECTS

3.1.1. A well-designed lighting installation may transform a space after dark; allowing it to be used safely, effectively and for uses that may not be otherwise possible. While road lighting tends to be the dominant type of lighting in a residential-led development, there may also be public amenity lighting in core spaces, lighting at sports facilities and decorative features.

3.1.2. There is a general correlation between the complexity of a task, or how hazardous that task is, and the level of illumination required to safely undertake the task. Owners with more complex and hazardous spaces will generally provide greater levels of illumination, in-line with national, international and industry standards and guidance.

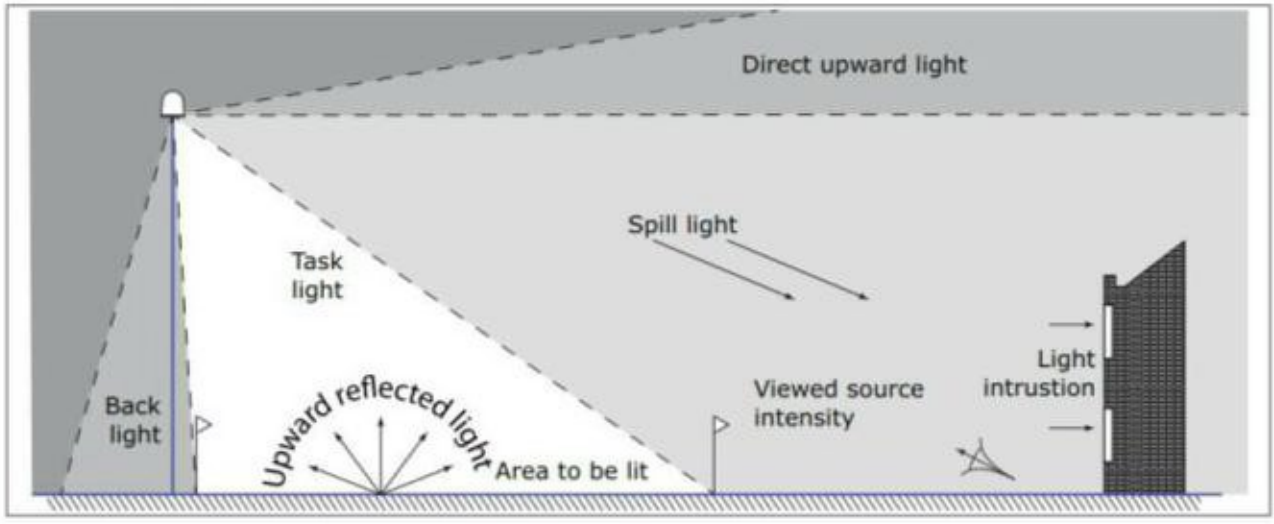
3.1.3. The correct level of lighting must be carefully selected to suit the task being undertaken, while ensuring that only the light necessary for the task is brought to bear. Excessive lighting is not only energy inefficient but can also negatively impact the local environment and ecology. In extreme cases poor lighting may make the task it is provided for more difficult to accomplish.

3.1.4. The incorrect application of lighting can have a negative effect on the local environment, in the form of pollution and nuisance. Light pollution is defined as emitted light that is serving no useful purpose as it falls outside of the area required to be illuminated. This can take the form of spill light outside the extents of a site, building or event, but also includes 'sky glow' – the emission of light into the atmosphere because of poor control. The cumulative effects of sky glow are most noticeable above urban areas, where a variety of poorly controlled sources combine to create a brightening of the horizon and night sky. In addition to poorly controlled light, a component of sky glow will be formed from upward reflected light.

3.1.5. Nuisance lighting may take the form of localised spill light or glare. Glare occurs where the light source itself proves a distraction or disability to normal vision. Poorly orientated lighting units may exhibit glare and, while the disabling effects of glare diminish with distance, lighting may still provide a nuisance over several hundred metres.

3.1.6. A graphical representation of types of light nuisance is provided in Figure 3-1.

Figure 3-1 - Types of light nuisance



GN01 (ILP, 2021)

3.2 STATUTORY REQUIREMENTS AND POLICIES

3.2.1. Details of pertinent statutory requirements and policies relevant to the Proposed Development are included within this section. These requirements and policies are considered further in Section 4 & 5, which details the existing lighting scenario and lists limitations appropriate for the site of the Proposed Development, and Section 6 & 7 which provides lighting proposals and mitigation measures which aim to limit the effects of lighting to the immediate and wider environment.

3.2.2. The following information is not exhaustive and further statutory requirements and polices may be applicable.

Legislation

3.2.3. The Clean Neighbourhoods and Environment Act 2005 (the 'CNEA') gives local authorities powers to deal with artificial lighting by classifying artificial light emitted from defined premises as a statutory nuisance. The CNEA amends Section 79 of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include light spill and glare (emitted from certain premises) defined as, 'artificial light emitted from premises so as to be prejudicial to health or a nuisance.' Several defined types of premise are exempt from this provision, including premises where higher levels of light are to be expected for the purposes of safety, such as airports and lighthouses.

3.2.4. Guidance produced on Sections 101 to 103 of the CNEA by the Department of Environment, Food and Rural Affairs (DEFRA) extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances, including situations where a nuisance arises from the use of artificial lighting. It should be noted that a highway is not deemed to be a premise under the CNEA, therefore light emitted from a highway lighting installation cannot be deemed a nuisance.

National Policies

3.2.5. The Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF), July 2021 states that, '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:

3.2.6. c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.' (NPPF, Paragraph 185, 2021)

3.2.7. The Ministry of Housing, Communities and Local Government provides guidance on light pollution on the gov.uk website (https://www.gov.uk/guidance/light-pollution) and details the following:

- What light pollution consideration does planning need to address?
- What factors can be considered when assessing whether a development proposal might have implications for light pollution?
- What factors are relevant when considering where light shines?
- What factors are relevant when considering when light shines?
- What factors are relevant when considering how much the light shines?
- What factors are relevant when considering possible ecological impacts of lighting?
- What other information is available that could inform approaches to lighting and help reduce light pollution? (gov.uk, 1 November 2019)

3.3 LOCAL POLICIES

Emerging Havant Borough Local Plan (Updated Submission Version June 2021)

3.3.1. Policy IN3 (Transport and parking) states that development proposals will be permitted, provided that the site is designed so that:

> *g) Sufficient visibility and lighting is provided for the safe and convenient use of the roads, cycle routes, walking routes and parking places.'*

3.3.2. Policy H8 (Land north of Long Copse Lane) states that residential development of about 260 dwellings will be permitted where sufficient information is submitted to address the site-specific planning considerations. This is to be agreed at the pre-application stage and is expected to include a Lighting Assessment. Criteria in the policy include:

> *e) Appropriate mitigation measures, including a sufficient woodland buffer, are put in place for Bechstein's bats in line with Policy E15;' and*
>
> *i)The proposal considers and positively responds to the special qualities of the South Downs National Park, including consideration of the Dark Night Sky Reserve.'*

3.3.3. Policy E15 (Protected Species) sets out criteria for development proposals which are likely to affect protected species, and/or their supporting habitats, with mitigation and compensation required where avoidance is not possible. If the presence of Bechstein's bat is established on site and/or nearby, planning permission will only be granted where:

> *c) Impacts on Bechstein's bat breeding habitat (i.e. net loss of/significant disturbance to woodland or trees containing roosts) are avoided;*

d) Proposals include appropriate buffers to woodlands, trees, hedgerows and other flight corridors, considering the location of roosts and foraging/commuting habitats; and

e) Review and monitoring plans are put in place.

Where the above measures cannot be met planning permission will be refused, unless the applicant can show, subject to meeting the tests of the Habitats Regulations, that there would not be an adverse effect on the population of the relevant protected species.'

3.3.4. The supporting text in paragraph 5.202 states that:

'Robust mitigation for impacts to bat species is likely to require the provision of new habitat linkages, including off-site where this offers increased chances of success. This could include buffering, maintenance of flight corridors, and sensitive lighting.'

3.3.5. Policy E22 (Amenity and pollution) states that development proposals will be permitted where:

a) projected levels of light do not have a likely significant negative effect on the amenity of existing and future users of the site, nearby occupiers or the wider environment; or

b) measures are provided which are suitable for the purposes intended and will ensure that any likely significant negative effect on receptor(s) are mitigated to an acceptable level.

3.3.6. Policy IN5 (Future management and Management Plans) states that:

'When granting planning permission for development that includes new 'common parts' a legal agreement will be required that provides for their sustainable management and maintenance.'

Emsworth Neighbourhood Plan (Post-Referendum Version 2021)

3.3.7. This has been through a referendum so can be given a high degree of weight. Policy D7 (Mitigate Light Pollution) states:

a) In any new development, light pollution shall be minimised by use of the lowest light levels compatible with safety, fittings that emit no upward light, low reflectance ground surfaces and use of spillover lighting where possible. This will particularly apply for developments on sites on or adjacent to the Emsworth waterfront and in areas adjacent to the open countryside.

b) Lamp columns and other street furniture related to lighting shall be designed to respond in an appropriate manner to the heritage and conservation context of Emsworth.

c) The use of movement responsive lighting will be encouraged to minimise any unnecessary light pollution.

3.4 GUIDANCE FOR IMPLEMENTATION

3.4.1. Applicable guidance for lighting designers about obtrusive light is predominantly covered by the following international documents:

- CIE 150:2017 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (International Commission on Illumination, 2017)
- CIE 126:1997 Guidelines for Minimizing Sky Glow (International Commission on Illumination, 1997)

3.4.2. National guidance is produced by the Institution of Lighting Professionals (ILP) in the following documents:

- Professional Lighting Guide 04, Guidance on Undertaking Environmental Lighting Impact Assessments (PLG04) (ILP, 2013)
- Guidance Note 01/21 Guidance Notes for the Reduction of Obtrusive Light (GN01) (ILP, 2021) *(this document supersedes and improves on the guidance provided in the 2020 version)*
- Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018)

4 ENVIRONMENTAL CONSIDERATIONS

4.1 GENERAL

4.1.1. There are various environmental parameters that need to be considered when assessing exterior lighting. These include direct energy usage, the visual impact of the lighting equipment during the day, the effect of light spillage on surrounding areas, the spill of light into the night sky, and the effects on animal and plant life.

4.1.2. The above-mentioned factors vary depending on the location of the proposed lighting installation.

4.1.3. The Institution of Lighting Professionals (ILP) document Guidance notes for the reduction of obtrusive light (2021) and International Commission on Illumination CIE 150:2017, establish five Environmental Zones (refer to Table 1 below). Each zone has a different approach to the provision of external lighting. These zones establish 'Obtrusive Lighting Limitations for External Lighting Installations' and include the effects of 'Sky Glow' and light into windows. The document also includes 'source intensity', the potentially obtrusive direction of light outside the area being lit.

Note: ILP GN01 is in the process of being rewritten to align with CIE150. CIE150 parameters of measurement/calculation have altered slightly to those currently indicated in GN01. Luminaire intensity is the most notable change which has not yet been fully adopted by the industry. Until such time that a clear calculation programme/package is made available, for completeness and being the most widely recognised and used guidance note, GN01 has been used to establish the base parameters throughout this strategy.

Table 4-1 – ILP GN01 Obtrusive light limitations for exterior lighting installations (compressed version of tables contained in GN01).

Environmental Zone	Sky Glow ULR [Max %]	Light Intrusion (into windows) Ev [lux]		Luminaire Intensity I [cd]		Building Luminance Pre-curfew
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average L [cd/m2]
E0	0	0	0	0	0	0
E1	0	2	0(1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Where ULR (Upward Light Ratio) = Maximum permitted percentage of luminaire flux that goes directly into the sky.

EV = Vertical Illuminance in Lux

I = A measure of light intensity in Candelas (cd)

* Acceptable from public road lighting installations only

4.1.4. The limits published within these documents set upper performance levels above which the lighting would be considered as a nuisance within each environmental zone. Curfews are normally applied

after an hour agreed with the local authority, when the lighting levels may be reduced or switched off.

In general, the effect of distance from the lighting source / installation has the effect of reducing the lighting levels falling on a surface, but has little effect regarding source intensity which tends to be more affected by the background against which it is viewed. In basic terms a bright torch shining towards an observer will appear brighter when the background it is viewed against is darker than it would, say, in a town or city centre which is likely to have high background lighting levels.

The five environmental zones are defined as detailed in Table 4-2 below.

Table 4-2 – ILP Environmental Zones Classification

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

4.1.5. The environmental zones are normally grouped as E1/E2 and E3/E4 and are considered as rural and urban respectively.

4.1.6. The desktop study carried out for the proposed development to determine the environmental zone classification revealed that there is very little in the way of lighting installations present in the vicinity of the proposed development and surrounding area, other than minimal highway lighting installations which are discussed in greater detail in Section 5.

4.2 WILDLIFE AND LIGHTING

4.2.1. From the point of view of the impact of artificial lighting on wildlife, there have been a number of reports published over the years with the main focus being on bats. A key document is 'Wildlife and Roads, The Ecological Impact' which incorporates a section regarding 'The ecological effects of road lighting on wildlife' by A. Outen. He has investigated the general impact of artificial lighting on wildlife and in conclusion has found that the colour of the light source used is significant to its impact on the wildlife.

4.2.2. Outen's research shows that the use of:

- Low Pressure Sodium (SOX) light sources, an orange monochromatic source, has a negligible affect;
- High Pressure Sodium (SON) lighting, a more golden light source, has minimal effect and attracts insects;
- White Lighting (Metal Halide, CDO, CPO, PLL) has a significant effect on wildlife, disrupting its 24 hour cycle in part due to the high ultra violet content of the light to which insects in particular are very sensitive.

4.2.3. Additional research carried out by other recognised individuals and bodies has shown that the disturbance of insects in relation to the use of artificial lighting has a knock-on effect to the 24 hour patterns of other wildlife such as birds and bats.

4.2.4. Research tends to direct us to avoiding the use of white light sources, with a preference towards SOX sources or SON with good light / optical control.

4.2.5. It should be noted that the SOX lamp gives no colour rendering, is large in size and therefore makes good light control through the use of reflectors and louvres difficult and is one of the main causes of sky glow within the UK. The current British Standards for road and amenity lighting preclude its use.

4.2.6. The increasing pressure on local authorities to demonstrate year-on-year energy savings, due to decreasing energy budgets, has led to the emergence of LEDs as an energy efficient alternative to other conventional light sources more commonly associated with highway lighting installations. LED technologies with higher energy efficiencies, long life and colour rendering properties are a viable and cost effective alternative. However, research into the effects of such light sources on bats is in its infancy and no definitive answers can be formed as to how light produced by an LED light source affects bats. It is known that bats are affected by light sources that have high UV (Ultra Violet) levels and broad spectrum lights, particularly those with high blue light content, and these should be avoided or their use kept to a minimum where practicable to minimise the effects on flora and fauna.

4.2.7. It should be noted that very few light sources utilised in exterior lighting emit UV, UVa or UVb. Those that may have some low content are normally filtered out by the lamps' glass envelop or the glazing on the lantern / optics. Focus is therefore being considered from the point of view of the blue content within the spectrum of a light source and what effect this may have. Other research carried out by many others has indicated that the disturbance of insects in relation to the use of artificial lighting has a knock-on effect to the 24 hour patterns of other wildlife, such as birds and bats.

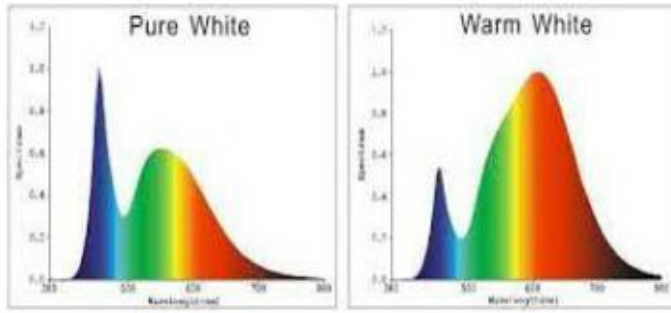


Figure 4-1 - Colour spectral charts for cool and warm LEDs (note the difference in blue content)

4.3 BAT-SPECIFIC REQUIREMENTS

4.3.1. The Bat Conservation Trust (BCT) references a technical paper 'Bats and lighting, Overview of current evidence and mitigation'. This report makes reference to the potential impacts of lighting on various species of bat. These are based on current knowledge and may change as more evidence emerges, so are given as guidance only and specific levels of impact will vary on a site by site basis. Low impact does not mean there is no impact, but suggests that impact is likely to have a negligible effect on the population.

4.3.2. Table 4-3, Table 5.2 extracted from the report and shown below, is a summary of the predicted impacts of lighting for each species/group according to bat behaviour. Further research is required to have high confidence in many of these predictions and they should therefore be used as guidance only.

Table 4-3 - Table 5.2 extracted from 'Bats and lighting, Overview of current evidence and mitigation'

Impact / Behaviour	High	Medium	Low
Maternity roost	All species	-	-
Night roost	*Rhinolophus hipposideros* *Rhinolophus ferrumequinum* *Myotis* spp. *Plecotus* spp.	*Pipistrellus* spp. *Nyctalus* spp. *Eptesicus serotinus* *Barbastella barbastellus*	-
Emergence	All species	-	-
Foraging	*Rhinolophus hipposideros* *Rhinolophus ferrumequinum* *Myotis* spp. *Plecotus* spp.	-	*Pipistrellus* spp. *Nyctalus* spp. *Eptesicus serotinus* *Barbastella barbastellus*
Commuting	*Rhinolophus hipposideros* *Rhinolophus ferrumequinum* *Myotis* spp. *Plecotus* spp.	-	*Pipistrellus* spp. *Nyctalus* spp. *Eptesicus serotinus* *Barbastella barbastellus*
Swarming	All species	-	-
Hibernation	All species	-	-

LIGHTING DESIGN CONSIDERATIONS WHEN CONSIDERING BATS

4.3.3. We live in a 24/7 environment and artificial lighting has become an essential part of modern life. The provision of sufficient information to undertake the task safely and be aware of the surrounding environment is of importance.

4.3.4. Artificial lighting does however come with concerns and these mainly relate to the use of energy and carbon from an operator's point of view but the potential of its effect with respect to light pollution, obtrusive light and its effect of flora and fauna must also be considered.

4.3.5. The first question is, does the task need lighting? If the answer is yes then the aim of any good lighting installation is to provide the right light, in the right place, at the right time and controlled by the right system, as previously highlighted in this report.

4.3.6. A key element to be taken into consideration in the design of a location that has been identified as having bats present is the type of light source being utilised to illuminate the task area. Lighting professionals have a pallet of sources available to them ranging from the 'old' Low Pressure Sodium (orange) lamps through to mercury lamps, metal halide and now LEDs. These are only four options; many more exist. These sources all have different spectra and thus, from a human perspective, different abilities to render colours. This is described as their colour rendering index, or denoted Ra, and is on a scale of 0 to 100 indicating how well that source replicates colours based upon day lighting conditions: a score of 0 being no colour rendering through to 100 being daylight.

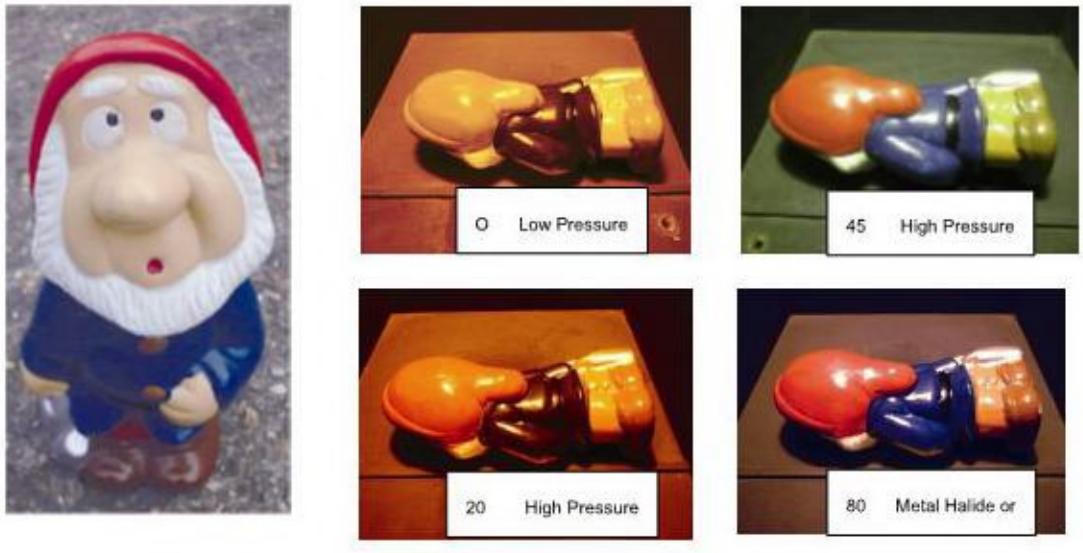


Figure 4-2 - Images showing the colour rendering of various light sources. Courtesy of DW Windsor.

4.3.7. When considering exterior lighting the various Standards tend to advise as follows regarding colour rendering recommendations:

- Roads: Ra ≥ 20;
- Civic centres, shopping streets, amenity areas, high night time pedestrian use: Ra ≥ 60; and
- High street crime areas, CCTV present: Ra ≥ 80 can be useful

4.3.8. A greater use of white light sources (Ra > 60) is being seen in residential areas and cycleways, led by energy conservation measures whilst providing the right lighting levels with good colour rendering.

4.3.9. With the introduction of LED light sources we also need to understand Colour Temperature, which is a measure of how warm (2700 to 3000k) or cool (4000 to 6000k) the colours appear. This is rated in degrees Kelvin with the higher colour temperatures appearing cooler, as shown in Figure 4-3 below. The higher colour temperature sources appear cooler with a higher blue light content.

Figure 4-3 – Colour rendering examples; cool white to warm white

4.3.10. Research across Europe, as reported at the BCT Conference in London in 2014, is showing that amber light has a negligible effect on wildlife. We are therefore starting to see certain suppliers of LED products presenting a more wildlife-friendly product in which the blue wavelength is minimised and the light has a more golden / amber feel to it, whilst still providing good colour rendering and performance.

SUMMARY OF IMPACTS OF LIGHT TYPES ON BATS

4.3.11. When considering any lighting scheme in areas where bats or bat flight routes are identified or suspected, the lighting designer must give due consideration to National Guidance as published by bodies such as the Bat Conservation Trust and the ILP, with regard obtrusive light and the application of lighting. More recently the BCT and ILP have released a joint publication Guidance Note 08/18 'Bats and artificial lighting in the UK – Bats and the Built Environment Series' which advises on the legal protection of bats, the use of artificial lighting and the application of suitable mitigation measures when considering bats as part of any type of development that requires the use of artificial lighting.

4.3.12. It should be noted that spill light onto bat roosts is entirely prohibited, constituting as it would an offence under the legal protections afforded to bats in England and Wales.

4.3.13. 'Right light' is also a matter of understanding the task to be lit and ensuring that the right lighting levels are provided such that the task can be undertaken safely. For this purpose, not only is the application of the appropriate Standards required, but also the appointment of a competent lighting designer within the process who, as part of the design site visits, understands the requirements from the point of view of the clients, the tasks to be lit and environmental factors. Where environmental concerns exist then it would be beneficial for an environmentalist / landscape specialist to be involved.

4.3.14. At present there is little solid evidence of the comparative impacts of different light types on different bat species and behaviours. However, Table 4-4 below (extracted from Bats and Lighting – Overview of Current Evidence and Mitigation) provides a good summary of where current research has led and what is known of existing light sources and the likely effects on bats and their behaviours. This table should be used as a guide and general summary.

Table 4-4 – Extracted from 'Bats and Lighting – Overview of Current Evidence and Mitigation'.

Table 5.3. Summary of current evidence of the impacts of different light types on each UK bat species/group

Light type	Species	Impact	Evidence
White LED	*Rhinolophus hipposideros* and *Myotis* spp.	Reduced activity and spatial avoidance of commuting routes	Stone *et al.*, 2012
Warm white LED	Unknown at present	Unknown - though likely to have less impact on light sensitive species than white light types	
Low pressure sodium	*Nyctalus noctula*	Increased activity and foraging	Rydell & Baagoe 1996
	Pipistrellus spp.	No significant increase in activity compared to dark areas	Blake *et al.*, 1994
High pressure sodium	*Rhinolophus hipposideros and Myotis* spp.	Reduced activity and spatial avoidance of commuting routes; delayed commuting time	Stone *et al.*, 2009; 2011
	Pipistrellus spp., *Nyctalus noctula, Eptesicus serotinus*	Increased activity and foraging	Rydell & Baagoe 1996
Compact fluorescent	Unknown at present	Unknown - though likely to have a similar impact on light sensitive species as other white light types	
Mercury vapor lamps	*P. pipistrellus and Pipistrellus* spp. *Eptesicus* spp.	Increased activity (Rydell (1991) recorded increased activity of *Eptescius nilssoni* (a species not present in the UK) at mercury vapor lamps in Sweden in spring April – May)	Haffner & Stutz 1985; Blake *et al.* 1994, Rydell & Racey 1995.

Figure 4-4 below extracted from *Bats and Lighting – Overview of Current Evidence and Mitigation* can be utilised as a guide for the relative impacts of light types on bats, as identified in Table 5.3 previously.

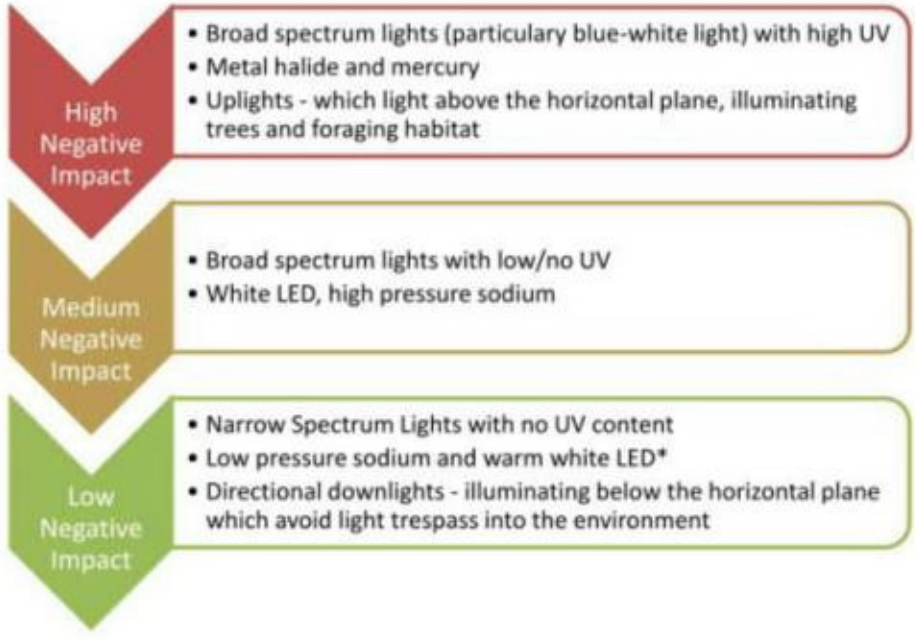


Figure 4-4 – Relative impact of types of lights on bats (guidance only)

5 DESKTOP STUDY

5.1 DEVELOPMENT SITE AND SURROUNDING AREA

5.1.1. The site of the proposed development is currently open land of mainly agricultural use bounded by Long Copse Lane and residential dwellings to the south, a small farm and woodland to the west, woodland and the Ems tributary to the north, and Long Copse Lane and woodland and fields to the east.

5.1.2. The site is located on the outskirts of the New Brighton area of Emsworth and can be considered to be on the rural-urban divide. The proposed development will essentially be an extension of Emsworth with the addition of further residential dwellings.

5.1.3. Emsworth is small town with limited highway lighting, which appears to be of various types and potentially not conforming to any current standards. Existing residential and highway lighting within the immediate vicinity of the proposed development site is typically mounted on post top or hockey stick type columns, as shown in Figure 5-1 below (Wraysbury Park Drive). Typical light sources present include PL (Fluorescent) or SON (High Pressure Sodium) – both types of fittings have been observed within mapping imagery.

Figure 5-1 – Typical post top mounted type lighting in residential areas

5.1.4. Lighting located along the section of Long Copse Lane which immediately abuts the proposed development site has lighting present, but is infrequent in terms of the number of columns installed and is unlikely to have been designed to present or previous lighting design standards. Columns along Long Copse Lane are typically 5 or 6 metres in height, post top or hockey stick type columns with PL, SON or CPO lamped luminaires, as shown in Figure 5-2 below.

Figure 5-2 – Typical lighting installed along Long Copse Lane

5.2 ENVIRONMENTAL ZONING

5.2.1. In general, the area surrounding the proposed development site is predominantly residential dwellings with Long Copse Lane to the west, a small industrial unit and open fields to the north, woodland and the River Blackwater to the east, and Long Copse Lane with two residential properties on the southern boundary.

5.2.2. The proposed development site could therefore be considered rural and of low district brightness in nature. In accordance with ILP GN01 guidance, the site can be classed as an E2 environmental zone.

5.2.3. The current immediate surrounding environment, particularly to the south of the development, can be considered as being rural in nature and of a low district brightness site and in accordance with ILP GN01 guidance can be classed as an E2 environmental zone.

5.2.4. Overall the site and immediate surrounding environment can be considered to be an E2 environmental zone.

5.2.5. Every effort should be made during the design process to ensure that as far as is practicably possible the design criteria of an E2 zone are complied with.

5.2.6. Due to the presence of Bechstein bats in the surrounding woodland, it is recommended that the requirements of an E1 zone are applied in those parts of the scheme adjoining the woodland buffers within the site, as outlined below.

5.3 ECOLOGY

5.3.1. An Ecological Impact Assessment dated August 2021 has been prepared by Davidson Watts Ecology. This includes extensive ecological surveys that been undertaken on the site since 2016, including radio-tracking of bats.

5.3.2. The primary ecological importance of the site is the presence of a breeding population of Bechstein's bats, that predominantly use Hollybank Woods/Southeligh Forest on the northern boundary of the site for roosting and foraging. They have also been previous records of them roosting in the south-west part of the site to be retained as woodland (Colman's Copse). The eastern boundary of the site provides an important connection to other roosting, foraging and commuting habitats that this population uses to the east and south. Dormice also use the woodland boundaries of the site and there are other bat species of local importance using the site.

5.3.3. The Ecological Impact Assessment requires a Lighting Strategy to mitigate the impact of light on Bechstein's bats and dormice known to be living in the surrounding woodland and as a precaution to address Colman's Copse within the site. Therefore, the buffer zones in these areas have been designed primarily to provide dark vegetated corridors for Bechstein's bats to ensure their existing commuting and foraging habitat are not indirectly affected by lighting from the site.

6 LIGHTING STRATEGY

6.1 THE NEED FOR LIGHTING THE PROPOSED DEVELOPMENT

6.1.1. The owners/operators of the proposed development site are right to consider the use of artificial lighting during the hours of darkness to adequately illuminate the development for the safety of residents and visitors.

6.1.2. This section of the report will look to outline design principles and recommended target lighting levels and equipment performance specification. Exact types and styles of luminaires will not be put forward in this document and are subject to further discussion at the detailed design stage; with the exception of areas of the development where it is known that Hampshire County Council (HCC) will be adopting the lighting. Such areas will conform to a fixed equipment specification in accordance with the HCC specification. HCC has a set luminaire for use on residential developments, however, specific luminaire selection should be discussed with HCC at the detailed design stage, but this strategy will outline the current preferred and listed luminaire.

6.1.3. Such lighting should be implemented with due consideration for the use of best practicable means to prevent, or to counteract the effects of, the artificial light on the surrounding area. The outline lighting design has been designed by competent designers as defined by the Institution of Lighting Professionals (ILP).

6.1.4. All lighting should be designed under the principal of Ultra Efficient Lighting (UEL) which means that the right light will be provided at the right time, in the right place, controlled by the right system. This is effectively broken down as follows:

- Right light - look to the correct application of the lighting standards which define the required lighting levels dependent upon the tasks being undertaken and the level of activity. This also looks to the use of the right light source which should be as energy efficient as possible and will include due consideration of LED lighting whilst also taking due consideration of the mitigation requirements for the impact of the light source on bats and wildlife as previously identified.
- Right time - the standards permit light levels to be changed dependent upon use, i.e. when traffic levels fall then the light class can be redefined. With respect to this development the lighting will be in situ for residents and visitors to the development during the hours of darkness to ensure safe navigation within the site. The scheme could be considered by the adopting authority, and by the developer in respect to the private area lighting, for part-night lighting e.g. the lighting will be switched off between the hours of midnight and 5.30am. Further discussions would have to be held with Hampshire County Council as the maintaining authority to determine if the scheme will be considered for part-night lighting.
- Right place - ensuring that only the tasks required are illuminated thus reducing spill and obtrusive light and is achieved through the careful consideration of luminaires and how they are mounted / installed.
- Right system - the most energy efficient lighting installation requires a suitable control system that could also permit monitoring and the operation of the lighting dependent on the operating parameters.

6.2 DESIGN RECOMMENDATIONS – ENVIRONMENTAL

6.2.1. As described earlier, the area has been classed as an E2 Environmental Zone. Therefore, the limitations given in the Table 6-1 should be applied where practicable, with the more stringent requirements of an E1 being designed to as the upper limits where possible.

6.2.2. However, given the sensitivity and ecological importance of areas of the site as previously mentioned, it would be appropriate to apply the requirements of an E1 zone for parts of the site adjoining the woodland buffers. Special lighting arrangements to strike a balance between safety and minimising, reducing or removing the effects of artificial lighting, in line with mitigation measures recommended within the various ecology reports would be appropriate and should be considered at the detailed design stage.

Table 6-1 – ILP GN01 Environmental Zone Criterion

Environmental Zone	Sky Glow ULR [Max %]	Light Intrusion (into windows) Ev [lux]		Luminaire Intensity I [cd]		Building Luminance Pre-curfew
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average L [cd/m2]
E0	0	0	0	0	0	0
E1	0	2	0(1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

6.3 DESIGN RECOMMENDATIONS – RESIDENTIAL LIGHTING

6.3.1. Based on a number of recent designs undertaken on residential areas to meet HCC lighting policy and requirements, HCC require all adoptable lighting installations to be designed in accordance with BS 5489-1:2020 and BS EN13201-2:2015.

6.3.2. HCC's preferred lighting class for use within residential developments is as follows:

- Main access and spine roads – Class S3/P3; and
- Residential roads – Class S4/P4

6.3.3. The stated lighting classes essentially have the same target lighting levels as shown in Table 6-2 below:

Table 6-2 – P Class Lighting Levels extracted from BS EN13201-2:2015.

Class	**Horizontal illuminance**		**Additional requirement if facial recognition is necessary**	
	E in lx (minimum maintained)	Emin in lx (maintained)	EV, min in lx (maintained)	Esc, min in lx (maintained)
P1	15 (22.5)	3	5.0	5.0
P2	10 (15)	2	3.0	2.0
P3	7.5 (11.25)	1.5	2.5	1.5
P4	5 (7.5)	1	1.5	1.0
P5	3 (4.5)	0.6	1.0	0.6
P6	2 (3)	0.4	0.6	0.2
P7	Performance not determined	Performance not determined		
To provide for uniformity, the actual value of the maintained average illuminance may not exceed 1.5 times the minimum E value indicated for the class (figure shown in brackets).				

6.3.4. Due to the ecological sensitivity of the site and presence of Bechstein bats, a relaxation and reduction in target lighting levels could be considered as part of the package of mitigation measures and discussed with HCC prior to the commencement of the detailed design stage.

6.3.5. To put the lighting levels mentioned previously into context, the following comparable examples can be used:

Illuminance

1 Lx	Bright moonlight
10 Lx	Subsidiary roads with medium traffic flow
20 Lx	Parking area for shopping centre
50 Lx	City centre / family living room
100 Lx	School circulation halls
200 Lx	Railway waiting room
300 Lx	Office reception areas
1,000 Lx	Overcast day

Luminance / source intensity

Candle	1 cd
100 W incandescent lamp	80 cd
Car head lamp	15,000 cd

6.3.6. HCC prefers column heights within residential developments to be limited to 5 or 6 metres, with exception on main spine or feeder roads which may intersect the development. That is not the case with regard to the proposed Long Copse Lane development, therefore the detailed lighting design should only consider the use of 5 or 6 metre columns, where practicable.

6.4 DIMMING AND/OR MNSO (MIDNIGHT SWITCH OFF)

6.4.1. As can be seen from Table 5 above, figures are given both before and after curfew. At this stage of the development application no indication has been given if a curfew will be applied to any proposed lighting installations within the proposed development. However, it should be noted that HCC utilises a CMS (Central Management System) to monitor and control highway lighting throughout the County.

6.4.2. The dimming regime to be applied to the operational site should be discussed with HCC at the detailed design stage, but consideration should be given to the following as an outline:

- Dusk to 20.00 hrs – 100% operational light output
- 20.00 to 01.00 hrs – 50% operational output
- 01.00 to 0.400 hrs – switch off
- 04.00 hrs to sunrise – 100% operational output

6.4.3. Seasonal daylight/night time hours will affect the duration of illumination.

6.4.4. Whilst a lighting curfew is not a requirement within the Transition Zone of the Dark Sky Zone, but it is something that should be explored for this development as part of the detailed lighting design, so as to take all reasonable steps to minimise light pollution.

6.4.5. Consideration could also be given to apply the same switching regime to any non-adoptable private area lighting.

6.4.6. It is recommended that, during the detailed design phase in all areas for which artificial lighting is to be proposed, the recommendations of the identified environmental zones are adhered to as far as is reasonably practicable, without compromising health and safety.

6.4.7. Special attention shall be given to minimising the spill of light on to boundary hedges of the proposed development to ensure that disruption to bat foraging routes is minimised or eliminated. Appropriate mitigation measures such as selection of appropriate equipment, colour temperature of selected light source, shields or louvres etc. shall be considered.

6.4.8. Where practicable, LED lighting with a neutral to warm colour temperature (2,700 to 4,000 Kelvin) shall be utilised. As outlined in Section 3, LED light sources have no UV content which reduces the effects of such light on flora and fauna. However, some species of bat such as Bechstein, are prone to the effects of blue light, which is present to varying degrees in LED light sources. However,

warmer colour temperature LEDs have a decreased level of blue light content and should be utilised where practicable to minimise the effects of artificial lighting on bats.

6.5 DESIGN RECOMMENDATIONS – PRIVATE AREAS

6.5.1. At present the Masterplan does not provide a clear distinction between those areas which are to be offered for adoption by HCC and those which are to remain private and maintained by a management company post-completion.

6.5.2. It has also not been indicated if any remaining private areas are to be designed in accordance with Secured by Design (SBD) 2019. It is therefore recommended that any private areas are designed in accordance with SBD 2019 Section 1 Paragraph 18, which relates to lighting.

6.5.3. SBD 2019 has been aligned with BS 5489. Therefore, it would be prudent to carry through the target adoptable lighting levels to the private areas of the proposed development. This will not only maintain a level in consistency and approach to lighting but would also offer a level of security throughout the various areas of the development. It is proposed that the following areas of the development are designed to the same principles as the adoptable areas:

- Private roads;
- Private car parking areas;
- Footpaths linking residential dwellings and car parking areas; and
- Footpaths to and surrounding bin stores and other communal areas.

6.5.4.

6.6 PREFERRED HCC LIGHTING EQUIPMENT

6.6.1. HCC's highway lighting policy reflects the current trend within the industry for a move away from more traditional light source such as HIDs to the more efficient, popular and rapidly developing LED technology.

6.6.2. HCC currently has only one luminaire listed within their specification for use on adoptable roads, the Urbis Axia 3.

Figure 6-1 – Urbis Axia 3 LED luminaire

6.6.3. HCC require a 4000K (Kelvin) neutral white LED light source to be utilised. However, by negotiation and recommendation of this report, a warmer white (2700 to 3000K) should be utilised as part of the detailed design to reduce or mitigate the known effects of artificial lighting on bats, which have been identified as using the site for commuting, foraging and potential roost sites.

6.6.4. Prior to commencing the detailed lighting design, the designer shall discuss lighting levels to be achieved and equipment to be utilised with the HCC lighting engineer, with a view to selecting the most appropriate equipment to achieve the most efficient lighting solution for the development in terms of number of lighting points utilised, energy efficiency and appropriate illumination of the task.

6.7 LUMINAIRE G CLASS

6.7.1. The G rating of a luminaire relates to the luminous intensity of light emitted at angles of 70, 80 and 90 degrees when the luminaire is mounted at a tilt of zero degrees to the finished surface that it is lighting. The classification ranges from G1 to G6, with G6 being the most stringent of the class. The G6 compliant luminaire is more commonly utilised for motorway lighting and where light pollution from a high number of sources could potentially be an issue. **Table 6-3** (Table A1) below has been extracted from BS EN13201-2:2015 to show the levels of luminous intensity at specified angles for a luminaire to be compliant with the six levels of G Class.

Table 6-3 – Table A.1 extracted from BS EN13201-2:2015.

Table A.1 — Luminous intensity classes

Class	Maximum luminous[a] intensity in directions below the horizontal in cd/klm of the output flux of the luminaire.			Other requirements
	at 70° and above[b]	at 80° and above[b]	at 90° and above[b]	
G*1		200	50	None
G*2		150	30	None
G*3		100	20	None
G*4	500	100	10	Luminous intensities above 95°[b] to be zero[c]
G*5	350	100	10	Luminous intensities above 95°[b] to be zero[c]
G*6	350	100	0[c]	Luminous intensities above 90°[b] to be zero[c]

[a] Luminous intensities are given for any direction forming the specified angle from the downward vertical with the luminaire installed for use.

[b] Any direction forming the specified angle from the downward vertical, with the luminaire installed for use.

[c] Luminous intensities up to 1 cd/klm can be regarded as being zero.

6.7.2. G1 to G3 are generally considered to be semi cut-off, with G4 to G6 being full cut-off. However, it should be noted that many manufacturers' luminaires rated as G1 to G3 emit zero light above 90 degrees.

6.7.3. Where there is a contiguous lighting network within E1 and E2 environmental zones, luminaires shall conform to Class G4 or a higher class; and

6.7.4. Where there is a contiguous lighting network within E0 environmental zones, luminaires shall conform to Class G6.

7 RECOMMENDATIONS & MITIGATION MEASURES

7.1 PROPOSED LIGHTING MEASURES & MITIGATION

7.1.1. As previously outlined within this report, lighting for the adoptable and potential private areas shall be designed in accordance with the identified guidance and standards within this strategy document.

7.1.2. It is essential that people feel safe during hours of darkness, but lighting will be designed to minimise any light pollution. The lowest light levels compatible with safety will be achieved and fittings will be used that emit no upward light. The proposed lighting for all areas will meet the recommendations of the ILP guidance on Obtrusive Light (GN01:2021) and the Bat Conservation Trust (Bats and Artificial Lighting in the UK: Bats and the Built Environment Series Guidance Note 08/18).

7.1.3. To minimise light pollution, lighting will only be installed where it is essential such as next to dwellings and along streets and pedestrian/cycle routes connecting the development to the surrounding town. The layout will ensure community safety is designed into the scheme to minimise the need for lighting e.g. doors and windows facing onto the street and secure, private backs.

7.1.4. The following basic principles and outline mitigation measures shall be applied to the detailed design where practicable and developed further with the scheme ecologist to ensure that sensitive habitats are not affected the possible effects of artificial lighting:

- Levels of illumination shall be suitable to adequately light the task area and in keeping with the surrounding environment;
- Column and luminaire optimal mounting height not to exceed 6 metres;
- LED shall be the preferred light source with a Ra equal to or greater than 60;
- LEDs shall have a neutral to warm colour temperature (2,700k to 3,000k);
- Luminaires shall be full cut-off with as high a G rating as practicable, i.e. G4 to G6 preferable in sensitive areas such as boundary hedgerows and planned planting areas which have potential to provide foraging opportunities for bats;
- CMS and variable levels of lighting shall be considered to adapt the lighting in accordance with the level of usage of an area throughout the hours of darkness. Where practicable, variable lighting in residential areas shall be aligned with HCC's adaptive lighting regime to provide a level of consistency between the adopted and private areas of lighting; and
- Light spill to the surrounding area and to residential dwellings shall be kept to the levels identified within this strategy i.e. environmental zone E1/E2 requirements such as 2 lux maximum light intrusion into windows pre-curfew.
- Consideration of special measures to ensure existing sensitive habitats are not directly illuminated, such as introducing additional screening or dark buffer zones/corridors to ensure that existing commuting routes are retained or new ones can be created. An example of illuminance limit zonation is shown in **Figure 7-1**, extracted form ILP GN08/18.
- The landscaped buffer zones to the west, north and east of the development - which face the open countryside and National Park – will essentially remain unlit. Special lighting solutions

are proposed for the development next to these areas, in addition to the extensive landscaping within the buffers which will provide a barrier to light. Bollards rather than lighting columns are proposed for streets in this part of the masterplan, again with downward spill only.

- Where lighting is required, it shall be focused to illuminate the task area only. Spill light shall be kept to a minimum and where practicable eliminated through use of shields, louvres and baffles.

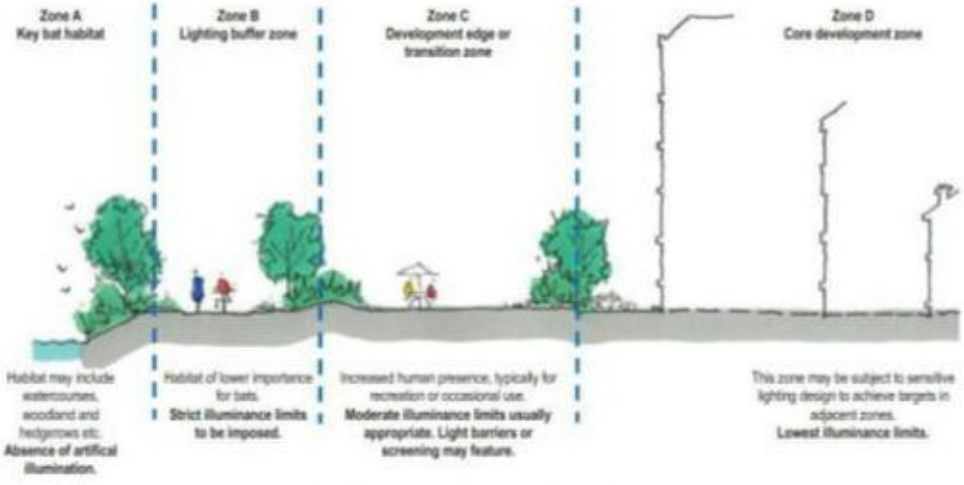


Figure 7-1 – Example of illuminance limit zonation

7.1.5. The design aspect is not sufficient alone and too many good designs fail when they are not installed correctly. It is therefore important that the lighting is installed to the design requirements and checked / signed off on site by the designer. All fittings should be carefully installed, visually checked and any required adjustments made at the time of commissioning where practicable.

7.1.6. Whilst development on the boundaries of existing towns has to be lit to provide safe navigation of residential streets and security to residential and commercial/retail premises, the application of appropriate design guidance should ensure that lighting impacts are minimised and acceptable.

7.1.7. As has been outlined within this strategy document, the selection and application of the most appropriate light source is needed to achieve the required illumination for adoptable standards whilst minimising the effects of the artificial light source on the surrounding environment and associated flora and fauna.

8 GLOSSARY OF TERMS AND ABBREVIATIONS

8.1 GLOSSARY OF TERMS

Term	Definition
Colour rendering	Colour rendering (as per BS EN 12665:2002) - Effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant.
High intensity discharge lamp	An electric discharge lamp in which the light producing arc is stabilised by wall temperature and the arc has a bulb wall loading in excess of 3 watts per square centimetre. HID lamps include high pressure mercury, metal halide, high pressure sodium and cosmopolis lamps.
High Pressure Sodium lamp	A high intensity discharge lamp in which the major portion of the light is produced, directly or indirectly, by radiation from sodium operating at a partial pressure in excess of 10 kilopascals. Note: The term covers lamps with clear or diffusing bulbs.
Illuminance	Quotient of the luminous flux (dϕ) incident on an element of the surface containing the point, by the area (dA) of that element. Equivalent definition: Integral, taken over the hemisphere visible from the given point, of the expression Unit: L x cos ∘ x dΩ. Where L is the luminance at the given point in the various directions of the incident elementary beams of solid angle dΩ; and ∘ is the angle between any of these beams and the normal to the surface at the given point. Unit Lx (lux) or lumens per metre2 (lm/m2)
Illuminance Uniformity	Ratio of minimum illuminance to average illuminance on a surface. Note: Use is also made of the ratio of minimum illuminance to maximum illuminance, in which case, this should be specified explicitly.
Lamp	Source made in order to produce optical radiation, usually visible. Note: This term is also sometimes incorrectly used for certain types of luminaires.
Light Pollution	The spillage of light into areas where it is not desired.
Luminaire	Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries togtheer with the means for connecting them to the electric supply. Note: The term 'light fitting' is deprecated.
Maintained illuminance (Em or Eav)	Value below which the average illuminance on the specified area should not fall. It is the average illuminance at the time during which maintenance should be carried out. Unit: Lx (Lux) or lm/m2
Minimum illuminance	Lowest illuminance at any relevant point on the specified surface. Unit: Lx or lm/m2 Note: The relevant points at which the illuminances are determined shall be specified in the appropriate application standard.
Obtrusive / Nuisance Light	Light, outside the area to be lit, which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information, e.g. at signal lights.

8.2 ABBREVIATIONS

Abbreviation	Definition
ACPO	Association of Crime Prevention Officers
ADT Flow	Average Daily Traffic flow
CIBSE	Chartered Institution of Building Services Engineers
CIHT	Chartered Institute of Highways and Transportation
CPO-TW	Cosmopolis Lamp
CMS	Central Management System
CRI	Colour Rendering Index
CSS	County Surveyor's Society
DMRB	Design Manual for Roads and Bridges
DNO	Distribution Network Operator
HA	Highways Agency
ILE	Institute of Lighting Engineers
ILP	Institution of Lighting Professionals
KCC	Kent County Council
LED	Light Emitting Diode
PECU	Photo Electronic Cell Unit
SON-TPP / SON-T+	High Pressure Sodium Lamp
SOX	Low pressure Sodium Lamp

Appendix A

MASTERPLAN

Drawn by :
Checked by :

Date:

Revision:

Rev	Date	Drawn	Checked

Project:
LAND NORTH OF LONG COPSE LANE
EMSWORTH

Drawing Title:
SKETCH MASTERPLAN

LAND & PARTNERS

carlton
design partnership

Scale: 1:1000 @ A1

Drg No: 170116/SL/SK1

Rev: H

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