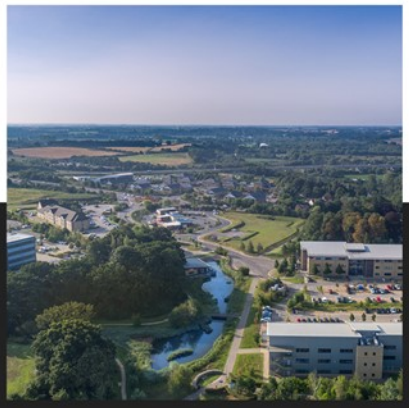

Welbeck Strategic Land II LLP

LAND AT COOMBE FARM, SAYERS COMMON

Lighting Assessment

Revision A

Independent, multidisciplinary engineering and environmental consultants

LAND AT COOMBE FARM, SAYERS COMMON
Lighting Assessment

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DOCUMENT AND QUALITY CONTROL

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APPENDICES

1.0 INTRODUCTION

1.1 This lighting impact assessment and strategy document has been prepared for the outline application for construction of up to 210 residential dwellings arranged across multiple parcels of land and includes clusters of housing blocks with internal roadways, landscape areas, and attenuation ponds. The scheme is predominantly surrounded by woodland and open green space, with a notable central parcel excluded from the boundary. Primary vehicular and service access from the west, which will serve as the main entry point.

1.2 The report has been prepared to assess, based on information available, in terms of artificial lighting, the likely effects of the proposed development. The lighting assessment includes information on the baseline lighting conditions within the area and considers possible mitigation measures to reduce potential light spill into neighbouring properties and ecology receptors, upward light (which can create sky glow), and visual source intensity (glare). The lighting class proposals will be included as part of this assessment.

1.3 To ensure safety, security and usability of the proposed residential development, external lighting will be required to the access and site entrance, play areas, footpaths and pedestrian routes. No external lighting is currently proposed for the remainder of the site, including residential zones. If any other lighting is needed elsewhere on site it would be agreed under condition and follow the recommendations and findings of this report. This approach reflects low anticipated night-time activity in these areas and design considerations focused on minimising light spill, safeguarding local amenity, and protecting ecological receptors.

1.4 Create Consulting Engineers have been commissioned by Welbeck Strategic Land II LLP, to provide a lighting impact assessment for the proposed development at Land at Coombe Farm, Sayers Common.

1.5 Create Consulting Engineers accepts no responsibility or liability for:

- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned.
- The issue of this document to any third party with whom approval for use has not been agreed.

2.0 SITE DESCRIPTION

Existing site

2.1 Located within West Sussex, the Site is approximately 200m south of Sayers Common, 4.7km west of Burgess Hill, approximately 14km north of Brighton and 23km south of Gatwick Airport. The nearest postcode is BN6 9HY and Site can be centred at National Grid reference 526800, 117700

Figure 2.1: Site Location Plan (Ordnance Survey, 2025)

Proposed Development

2.2 The site was irregular in shape, accessed via a single lane track off the B2118. The site comprised four fields and an area of woodland. The fields were given over for grazing, although no livestock has been observed. The fields were divided by barbed wire fencing and hedgerows with mature oak trees. The area of woodland was located within the southwest section of the site and comprised mature deciduous trees.

2.3 The site was bound to the north by woodland with residential properties beyond, to the east by a woodland strip adjacent to the A23, to the south by a combination of woodland and scrubland and to the west by the B2118, with rural land beyond.

2.4 External lighting to other areas, including residential streets, is not currently proposed. If it is required it will be agreed under planning condition following the recommendations and findings of this report, reflecting low anticipated night-time use and the need to minimise light spill, protect local amenity, and safeguard ecological receptors.

Figure 2.2: Proposed Site Plan (Drawing Ref: P24-2029_DE_002_F_05)

3.0 POLICY & GUIDANCE

Environmental Protection Act 1990/Clean Neighbourhoods and Environment Act 2005

3.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of statutory nuisance under the Environmental Protection Act (the 'EPA', 1990), states: "artificial light emitted from premises so as to be prejudicial to health or nuisance."

National Planning Policy Framework

3.2 The National Planning Policy Framework (NPPF), published in December 2024, sets out the governments planning policies for England and how they are expected to be applied and provides a framework for local plans. 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:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
- Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Relevant British Standards

3.3 The most applicable British Standards for lighting that relates to the proposed development are:

- BS5489-1:2020 Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas
- BS EN 13201 2015 – Road Lighting. Performance Lighting
- BS EN 12464-2:2014 – Light and Lighting. Lighting of Work- Places. Outdoor Lighting.
- The West Sussex County Council local plan 2025/2026

Institution of Lighting Professionals, Bat Conservation Trust Lighting Guidance (August 2018)

3.4 The Bat Conservation Trust and the ILP produced a paper in 2018, "Bats and Lighting in the UK", and more recently Guidance Note 08/23 (GN08) discussing the appropriate lighting levels, types of lamps, colour temperatures etc. which are suitable for lighting areas adjacent to bat houses.

Bat Conservation Trust 2014 Interim Guidance

3.5 The Bat Conservation Trust 2014 interim guidance provides recommendations to help minimise the impact of artificial lighting.

Guidance Notes for the Reduction of Obtrusive Light; 2021 Institution of Lighting Professionals (ILP)

3.6 Guidance notes produced by the Institution of Lighting Professionals are among the most commonly referenced guidance notes for good practice within the lighting design industry.

3.7 Obtrusive light (or sometimes referred to as light pollution) refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users. The assessment has been carried out in accordance with the published guidance documents from the ILP.

3.8 Light intrusion refers to the spilling of light beyond the boundary of the area to be lit. This includes the intrusion of light into bedroom windows.

3.9 Sky glow refers to the brightening of the sky above towns cause by direct or reflected upward light.

3.10 Glare refers to the uncomfortable brightness of a light source when viewed against a dark background. Figure 3.1: illustrates the different types of intrusive light taken from Guidance Notes for the Reduction of Obtrusive Light; 2021 Institution of Lighting Professionals (ILP).

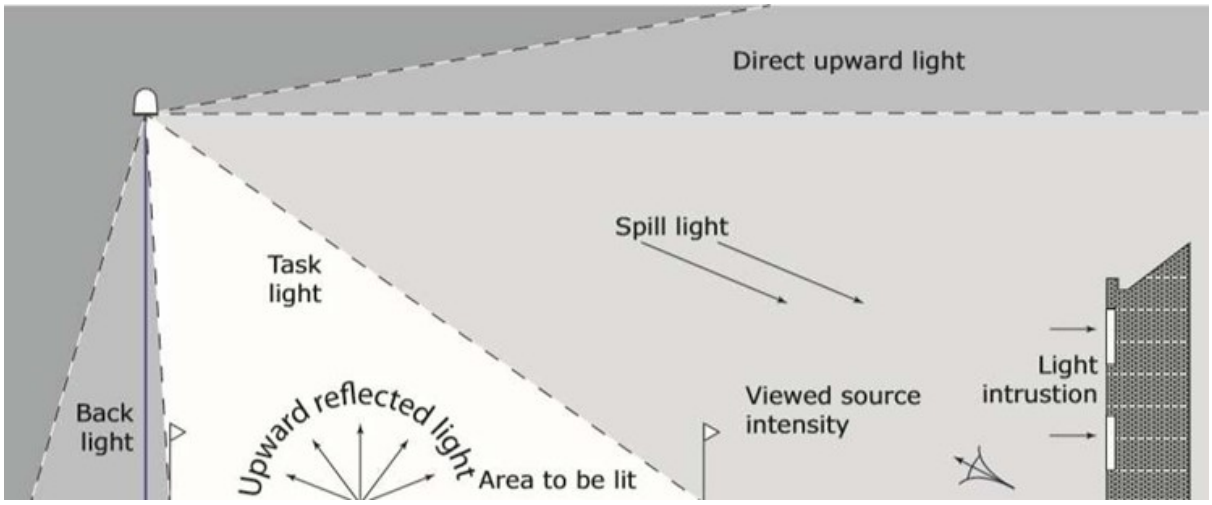

Figure 3.1: Light Obtrusion characteristics

4.0 ASSESSMENT METHODOLOGY

4.1 A desk-top study has been undertaken to identify relevant legislation, planning policy and good practice guidance in relation to lighting. The methodology takes guidance from the Institution of Lighting Professionals PLG04 document "Guidance on Undertaking Environmental Lighting Impact Assessments". This sets out good practice which was followed during the assessment.

4.2 The scope of the assessment shall cover the effects of artificial lighting as a result of the proposed development. The assessment will consider the following:

- Assess the existing baseline lighting conditions on the immediate surroundings.
- Assessment of the proposed lighting performance requirements for the various components of the proposed development site, with reference to the Environmental Zone Criteria set out in the Guidance Notes for the Reduction of Obtrusive Light (ILP, 2021)
- To limit light pollution and sky glow.
- To limit obtrusive light, spill light and glare to neighbouring land and properties.
- To limit potential light spill to vegetation.
- To limit the effect of artificial light on local wildlife.

5.0 BASELINE CONDITIONS

5.1 The route is accessed via B2118 and runs north into Sayers Common. This public road is owned and maintained by West Sussex Highways and is currently lit as shown in figure 5.1:

Figure 5.1: B2118 Access Road

5.2 The existing lighting surrounding the development along B2118 consists mainly of 5m high lamp columns with light-emitting diode (LED) luminaires.

5.3 The existing lighting at the access point appears to be designed and installed to comply with BS5489-1:2020 & BS EN 13201-2:2015.

5.4 The environment surrounding the application site is 'Low District Brightness', categorised as an E2 Environmental Zone in accordance with the ILP Guidance Notes.

5.5 The existing lighting in the surrounding area has been designed using the West Sussex Highways standard specification document and is considered appropriate to its context, with no significant adverse effects on the local environment or neighbouring receptors.

6.0 RECEPTOR SENSITIVITY

6.1 There are currently no specific guidance documents or papers available to determine the sensitivity of a receptor in terms of lighting impact. When considering natural resources/receptors such as the effect on an area in terms of sky glow, it is deemed appropriate to assign sensitivity based on the current baseline conditions and Environmental Zone as detailed in the GN01: 2021 Table 2 – Environmental Zone and the ILP 'Guidance Notes for the Reduction of Obtrusive Light' GN01. This document defines the highest sensitivity being applied as an E0 intrinsically dark zone, and the lowest sensitivity to an E4 urban zone. The Environmental Zones are defined in figure 8.1 (Section 8) below and the classification of sensitivity of natural resources/receptor will correspond to each Environmental zone as detailed below. For other receptors such as residential receptors the description will be used to determine sensitivity.

6.2 For the purpose of this assessment receptor sensitivity descriptions and criteria have been based on the descriptions shown below.

High Sensitivity

- The receptor/environment is fragile and has limited capability to accommodate change in artificial light conditions without fundamentally altering its present state or character or is of international or national importance. Recovery would be difficult or impossible.
- Human (Amenity) – receptors which are sensitive to a change in lighting such that the quality of life would be affected (i.e. lighting is designated a statutory nuisance)
- Human (Safety) - receptors where a change in the lighting has the potential to either dramatically improve or reduce safety (for pedestrians, drivers, or workers).
- Natural Receptors i.e., Artificial Sky Glow – Sensitivity of receptor based on assigned Environmental Zone – E0 or E1
- Ecological – where a change in the lighting affects the habitats, breeding or feeding of fauna (e.g., protected habitats or other special areas) or growth patterns of fauna/crops.

Medium Sensitivity

- The receptor/environment has moderate ability to accommodate change in artificial light conditions without significantly altering its present state/character. The receptor/environment has a degree of adaptability and resilience and is likely to accommodate the changes caused by an impact, although there may still be some residual modification as a result.
- Human (Amenity) – receptors which are sensitive to a change in lighting however not such that the quality of life would be affected.
- Human (Safety) - receptors where a change in the lighting has the potential to either improve or reduce safety (for pedestrians, drivers, or workers).
- Natural Receptors i.e., Artificial Sky Glow – Sensitivity of receptor based on assigned Environmental Zone – E2
- Ecological – where a change in the lighting affects the movement or feeding patterns of fauna but the receptor can adapt.

Low Sensitivity

- The receptor/environment is tolerant of and can accommodate change in artificial light conditions without detriment to its character or is of low or local importance. The

receptor/environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.

- Human (Amenity) – receptors which would not noticeably be aware of a change in lighting. (i.e., in areas of medium to high luminance)
- Human (Safety) - receptors where a change in the lighting has limited potential to affect safety (for pedestrians, drivers, or workers).
- Natural Receptors i.e., Artificial Sky Glow – Sensitivity of receptor based on assigned Environmental Zone – E3 or E4
- Ecological – area with limited wildlife.

7.0 ECOLOGY

7.1 Create Consulting engineers has taken ecology into consideration for this development site and considered sensitive receptors to any proposed lighting to be extremely important. In doing so the findings of Ecology reference has been considered as detailed below.

7.2 The site is dominated by arable land, which is of generally low ecological value. However, there are several ecologically important features both within and adjacent to the site, including woodlands, grassy banks, and mature tree lines. These habitats provide opportunities for nesting birds, roosting and foraging bats, and a range of other wildlife. Areas of cleared willow scrub, ruderal vegetation, and hedgerows along the site boundaries further enhance habitat diversity. Notably, ancient woodland lies along the eastern boundary of the site, and this area requires particular consideration and protection.

7.3 Protected and priority species are likely to occur in the local area. Nesting birds are expected to utilise woodland edges, and hedgerows, with skylark potentially nesting within arable habitats. Numerous mature trees along B2118 may provide roosting opportunities for bats, while commuting and foraging bats are expected to make regular use of tree lines, grassy banks, and green corridors connected to the site. The ancient woodland and adjacent habitats on the eastern edge are of especially high importance for bats, and maintaining dark corridors here will be essential. Other species of conservation concern, such as great crested newt and hedgehog, may also use parts of the site.

7.4 Targeted ecological surveys are recommended during the 2024–25 survey seasons to confirm the presence and distribution of protected species. In the meantime, the site's lighting strategy must be designed to avoid impacts on sensitive habitats. In particular, woodland edges, hedgerows, tree lines, and especially the ancient woodland to the east, must be kept free from significant illumination. Light spill should be minimised to 0.45 lux or below along these boundaries to ensure the protection of bat commuting and foraging routes and to retain dark corridors. Mitigation measures should include directional, low-spill lighting, use of warm-spectrum LEDs, reduced column heights, and careful placement of fittings to maintain habitat connectivity and minimise ecological disturbance.

7.5 In order to minimise the impact of light spill onto the site boundary and any ecologically sensitive areas,

- All external lights will be fitted with hoods or cowls to reduce lateral and upward light pollution, and focus the light precisely onto the areas it is needed.
- External lights will be positioned to face directly downwards. This will reduce overspill of light and sky glow, which otherwise disrupt the nocturnal behaviours of bats and insects.
- External lights will use Light-Emitting Diodes (LED) rather than other bulb types. LEDs lack ultra-violet (UV) light elements, which have been shown to be the parts of the spectrum most disruptive to bats. In addition, a warm, white light source should be used, at 2,700 Kelvin or lower. Light sources should feature peak wavelengths higher than 550nm to avoid the component of light which is most disturbing to bats.
- Where possible, motion-sensor activated lights should be used, to illuminate areas only when people are present, and for one to two minutes at a time. This will ensure lighting is not on and causing light pollution throughout the night.
- The heights of any external lights should be carefully designed so that light pollution does not illuminate areas that would be in the shadow of surrounding features if lower light heights were used. For example, if installing streetlights next to buildings, ensuring the height of the lights is at or below the heights of the buildings will ensure the areas behind the buildings are

not light-polluted. This is especially important where there are green-spaces 'behind' shading features.

- The retained woodlands must be retained as dark habitats. There must be no street-lighting or other external illumination within or in close proximity to these features.
- Retained hedgerows must also be retained as dark habitats. If any lighting is essential in certain areas, such as pedestrian footpaths close to these features, it will use the minimum lux level acceptable and preferably external lighting should be spaced well apart from these areas, so they are at the furthest (and weakest) extent of the illuminated area.
- The potential for light pollution from car headlights affecting key bat foraging habitats will also need to be considered when designing the main roadways into and through the site. This may require the use of landscaping or screening bordering the retained areas of woodland/country park so that light spills from vehicles do not illuminate the woodland/country park as cars drive past.

7.6 Lighting should be minimised or avoided across the site wherever possible, with illumination limited only to essential areas. Where lighting is necessary, it must be sensitively designed to prevent unnecessary light spill onto habitats of ecological importance. A designated lighting strategy will likely be required as a planning condition; however, the principle of minimal lighting should be adopted from the outset to ensure ecological protection is embedded in the development proposals.

8.0 LIGHTING DESIGN REQUIREMENTS

8.1 The lighting design of this site should be carried out by a competent person governed by the Institution of Lighting Professionals.

8.2 It is proposed that lighting will be provided to the access and site entrance, play areas, footpaths and pedestrian routes. No external lighting is currently proposed for the remainder of the site, including residential zones. The lighting design for this site shall be developed in accordance with BS5489-1:2020 & BS EN 13201-2:2015. In addition, the Institution of Lighting Professionals Guidance Note for Reduction of Obtrusive Light (GN01:2021) should be followed to ensure that the lighting scheme is both appropriate and sensitive to its surroundings.

8.3 Institution of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light (GN01: 2021) should be adhered to. This will ensure that lighting designs produced are suitable and sensitive to their surroundings.

8.4 All external lighting should be designed to focus illumination only where required, with no upward light above the horizontal plane, thereby minimising light spill and potential obtrusion.

8.5 Selected luminaires shall prevent upward light spill and should have a colour rendering index (Ra) greater than or equal to 60Ra. Colour rendering index relates to the accuracy of colours perceived, relative to daylight.

8.6 The site shall be classed as a "P Class" in accordance with BS 5489-1:2020, BS EN 13201-2:2015.

8.7 Guidelines for the environmental zones published by the Institution of Lighting Professionals, provides Guidance Notes for the Reduction of Obtrusive Light (GN01: 2021). The environmental zone for this site is considered to be an E2 Zones as shown in Figure 8.1 below:

Obtrusive light limitations for exterior lighting installations – general observers – ILP UK Recommendations 2011						
Environmental zone	**Sky glow ULR (Max) %**	**Light intrusion (into windows) Ev (lux)**		**Luminaire intensity I candelas (cd)**		**Building luminance L (cd/m²)**
		Pre-curfew	**Post-curfew**	**Pre-curfew**	**Post-curfew**	**Pre-curfew**
E0 IDA Dark Sky Parks, UNESCO Starlight Reserves	0	0	0	0	0	0
E1 Intrinsically dark landscapes National Parks, Areas of Outstanding Natural Beauty etc	0	2	0 (1*)	2,500	0	0
E2 Low district brightness Rural, small village, relatively dark urban location	2.5	5	1	7,500	500	5
E3 Medium district brightness Small town centres or urban location	5	10	2	10,000	1,000	10
E4 High district brightness areas Town/city centres with high night-time activity levels	15	25	5	25,000	2,500	25

ULR Upward light ratio of installation (maximum permitted percentage of luminaire flux that goes directly into the sky

Ev Vertical illuminance in lux (Lumens/m²) – measured flat on glazing at centre of window

I Light source intensity in candelas (cd)

L Luminance in candelas per square metre (cd/m²)

Curfew Time after which stricter requirements for the control of obtrusive light will apply

* Permitted only from public road lighting installation

See Institution of Lighting Professionals *Guidance Notes for the Reduction of Obtrusive Light* 2011 – www.theilp.org.uk

Figure 8.1: Obtusive light limitations for exterior lighting installations guidance

8.8 Any lantern specified for the new development/scheme will be supplied with DALI enabled drivers to enable dimming to be undertaken at set times.

8.9 All proposed luminaires should have a minimum IP rating of IP65 which is the recommended minimum requirement for Ingress Protection.

8.10 Five-degree tilts should **NOT** be applied to the lantern in the lighting design calculations, as tilting the lantern encourages light to spill above the horizontal plane and other light ingress issues.

8.11 Road offered for adoption shall have a Central Management System (CMS) or SMART Lighting, so that any installed lighting in sensitive areas can be significantly reduced during the hours of darkness or lights switched off entirely. This type of solution could further assist with minimising the potential impact of any proposed lighting on the local wildlife in the surrounding area to the site. Another advantage of CMS or SMART Lighting is the financial gain in reducing electricity consumption across times when lighting systems are dimmed or switched off.

8.12 Final CMS dimming or trimming profiles should be directed by the local authority lighting engineer.

8.13 As directed by the local authority and general street lighting design guidance, all external lighting shall produce only UV-free, narrow spectrum, low-intensity light output, with a wavelength of 550nm or more.

8.14 Until such times that constant lumen output systems become the 'norm', deterioration of light source flux over time, together with dirt accumulation on fittings, must be taken into account in the design by using the appropriate Maintenance Factor (MF). Where obtrusive lighting calculations are required a MF of 1.0 should always be used to present a worst-case scenario perspective.

9.0 PROPOSED LIGHTING LEVELS

9.1 Artificial lighting will be required as part of amenity, safe passage, security and health and safety requirements during periods of darkness. The associated potential obtrusive light effects toward surrounding light-sensitive receptors would be minimised through the controlled application of lighting in accordance with current best practice.

9.2 The indicative lighting criteria adopted for the purposes of this assessment are taken from relevant British Standards and recognised national guidance documentation. All criteria adopted for the final scheme of lighting shall be subject to appropriate risk assessment and technical approval by the adopting local authority where required.

9.3 For the purposes of this assessment, the development has been identified as a 'subsidiary access road', within an 'E2' Environmental Zone (Figure 8.1 above) with normal usage by pedestrians and cyclists. In line with BS 5489-1:2020 Table A.5 a 'P' lighting class has been deemed to be suitable for this context, as shown in Figure 8.1 below:

9.4 This classification applies to areas such as footways, cycleways, and other road areas lying separately or adjacent to the carriageway of a traffic route, as well as residential roads, pedestrian streets, and parking places, ensuring the proposed lighting design is both appropriate and proportionate to the setting.

Lighting classes for subsidiary roads

Traffic flow	Lighting class		
	E1 to E4[A)]	E1 to E2[A)]	E3 to E4[A)]
	Pedestrian and cyclists only	Speed limit $v \leq 30$ mph	Speed limit $v \leq 30$ mph
Busy [B)]	P5	P4	P3
Normal [C)]	P5	P5	P4
Quiet [D)]	P6	P5	P4

NOTE 1 Table A.5 assumes no parked vehicles; see risk assessment in A.3.3.2.

NOTE 2 An EV lighting class using vertical illuminance, from BS EN 13201-2:2015, Table 6, can be specified in addition to the general lighting class when there are particular concerns about crime and personal safety. EV is calculated at the typical height of a human face (1.5 m) and in relevant viewing orientations.

NOTE 3 To ensure adequate uniformity, the actual value of the maintained average illuminance is not to exceed 1.5 times the value indicated for the class.

NOTE 4 The actual overall uniformity of illuminance, U_o, needs to be as high as reasonably practicable (see 7.2.6).

NOTE 5 The ambient luminance descriptions E1 to E4 refer to the environmental zone as defined in ILP GN01 [N2].

NOTE 6 The illuminance classes are suggested minimum levels. A risk assessment needs to be carried out to ensure that the light levels are adequate, particularly for pedestrians and cyclists.

Figure 9.1: Table A5 – Lighting classes for subsidiary roads

9.5 Where the proposed lighting Class of 'P5' has been selected for the footpath, horizontal lighting illuminance levels are set out in the British Standards, these would be required as a minimum and are detailed below: -

Average maintained illuminance (Eav) = 5 Lux
Minimum illuminance (Emin) = 1 Lux
Overall Uniformity = 0.40 Uo

9.6 This standard ensures adequate visibility for pedestrians and cyclists, providing a safe and comfortable nighttime environment on roads with low vehicle traffic.

10.0 IMPACTS

During Construction

10.1 During construction phase, it is likely that the site will be affected through the use of temporary site lighting either for health and safety purposes, site security, or both. It is assumed that the main impacts will be spill light and luminous intensity. These levels relate to residential areas.

10.2 Lighting for health and safety will be needed where work is required to take place during the hours of diminishing ambient lighting levels which is likely to occur if the construction works are carried out in the winter months or if night-time working is required.

10.3 Any and all temporary lighting installed within the site should meet all requirements set out in the above 'Section 8.0 Lighting Design Requirements'.

Post Construction

10.4 The site is classified as Environmental Zone E2, with the proposed lighting for the site being assessed in accordance with the limiting criteria for that zone, Figure 9.1 illustrates GN01:2021 Table 2 – Obtrusive light limitations for exterior installations.

Table 3 (CIE 150 table 2): Maximum values of vertical illuminance on properties.

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

Figure 10.1: GN01:2011 Table 3 – Obtrusive light limitations for exterior installations

Notes to table:

- Ev is Vertical illuminance in Lux measured flat on the glazing at the centre of the window.
- Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply subject to the conditions of the local planning authority.

10.5 The effect of artificial light associated with the site is predicted to have a minor adverse effect on the environment if unmitigated. Modern road lighting luminaires, when mounted with 0° tilts, do not typically produce significant upward light, therefore the effects of upward light/ULR (upward light ratio) are predicted to be negligible.

10.6 Any and all temporary lighting installed within the site should meet all requirements as set out in the above 'Section 8.0 Lighting Design Requirements'.

11.0 MITIGATION MEASURES

During Construction

11.1 Mitigation of the effects of the lighting installation during the construction phase will include the following:

- During construction, specifying working hours, use of lighting, location of temporary floodlights in the construction compound and agreeing these with the local council. Lighting to be switched off when not required specifically for construction activities or required health and safety or security.
- Adhere to best practice measures as recommended by the Institution of Lighting Professionals (ILP), Health & Safety Executive (HSE) and CIE (International Commission on Illumination) guidance. Lighting solutions will be selected to reduce light pollution.
- Specifically, designed luminaires will be selected to minimise upward spread of light. The optics in the lanterns will control the distribution of light to avoid overspill, sky glow and glare.
- Glare will be kept to a minimum by ensuring the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare.
- Restrict lighting to the task area using horizontal cut-off optics and zero tilts.
- Operate curfew and minimise the duration of any lighting (switch off or part-night dimming).

Post Construction

11.2 The detailed lighting design shall be designed to use current best practice and technology. The impacts of external lighting will be minimised by the installation of lighting to the minimum specification required to provide a safe night-time environment for residents, therefore lighting will be designed to comply with the minimum illuminance levels given within the appropriate guidance. The detailed lighting design will satisfy any requirements of the ecologist to maintain the integrity of habitats for wildlife around the site if any.

11.3 Designing out and minimising the need for lighting to be installed is always the best method of reducing light pollution. However, where this is not possible, the careful choice of illuminance and luminance criteria is key to successfully limiting the impact that light may have on its surrounding environment.

11.4 Care should be taken to minimise glare from all luminaires installed, by ensuring the correct luminaires are selected and suitably installed, in line with the recommendations within the ILP Guidance Notes for the Reduction of Obtrusive Light.

11.5 Restriction of luminaire mounting heights would be one of the key means of mitigating the environmental impact of external lighting. Luminaires that are column mounted can be restricted to a maximum height of 6 metres to all adoptable and non-adoptable roads. It should be noted that if the mounting height is reduced there may be the requirement for the number of luminaires to be increased.

11.6 Lighting would need to be provided in the form of column mounted luminaires. Luminaires would be pointed directly into the development and away from the adjacent sites. The optics in the lanterns would be specified to control the distribution of light avoiding overspill, sky glow and glare.

11.7 Where lighting is installed within the site it should meet all the requirements as set out in the above 'Section 8.0 Lighting Design Requirements'.

12.0 CONCLUSION AND SUMMARY

12.1 In conclusion, subject to the implementation of the proposed design measures, a compliant lighting design scheme can be delivered with minimal impact on nearby residential properties and sensitive boundaries. Lighting will be limited to the access and site entrance, play areas, footpaths and pedestrian routes. No external lighting is currently proposed for the remainder of the site and is not required currently across the entire site. Any further lighting will be designed and agreed under planning condition following the findings and recommendations of this report. The cumulative effect of artificial lighting may result in a slight increase in sky glow, however, given the existing baseline conditions, in the surrounding area, the overall visual effects are expected to be negligible.

12.2 During the construction phase, the lighting impacts are likely to be associated with the requirements for temporary lighting to illuminate the contractor's compound and work areas. Installed lighting will involve the use of well located, modern light fittings which are directionally controlled and will be in accordance with current best practice standards and the developers' requirements. Overall, where an effect arises the effect on sensitive receptors during the construction phase will be short term and temporary in nature and considered to be of minor negative significance. However, as lighting would be temporary and mobile, units can and should be relocated if recognised as having a negative impact on sensitive receptors.

12.3 During the operational phase, the likely impacts include the introduction of artificial light sources as part of the proposed development, which will result in changes to the current baseline conditions. The proposed lighting design will comply with all relevant British Standards and the Institution of Lighting Professionals lighting guidelines and will serve to ensure that the safety and security of all areas of the development can be effectively maintained.

12.4 Potential effects would be managed such that the potential increase in the general ambience of the area would be balanced against the overall existing illuminance to minimise sky glow.

12.5 The effects on sensitive receptors will be mitigated through following all the principles set out in this report and by the implementation of the stringent final detailed lighting design.

12.6 Suitable detailed designs should meet all standard criteria as set out in the current local authority standard specification documents, current guidance documents from all appropriate and relevant institutes and all relevant British Standards that are appropriate to lighting.

12.7 All final detailed designs should be subject to a design check by the adopting local authority. Once detailed designs are checked and agreed then technical approval will be provided by the local authority. No lighting should be installed on site unless technical approval has been granted by the local authority.

12.8 This report has been prepared to the best of our knowledge, the lighting designs proposed have been carried out by a competent lighting person in accordance with the Institution of Lighting Professionals guidance and recommendations.

APPENDIX A
Lighting Terminology

Glossary of Terms

For the purpose of this report, the definitions given below apply. For further definitions the International Lighting Vocabulary (ILV), published by the CIE, can be found at

Colour Rendering Index (CRI): A scale of the colour appearance of an object under a particular light source compared to its colour appearance under a reference light source. Expressed on a scale of 1 to 100 Ra, where 100 Ra represents the colour rendering of natural daylight i.e. perfect colour.

Curfew: The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by a government controlling authority, usually the local government (CIE, 2003).

Disability Glare: Glare which impairs the vision of objects but may not cause discomfort.

Discomfort Glare: Glare causing discomfort which may not impair the ability to see objects.

Environmental Zones: Area where specific activities take place or are planned and where specific requirements for the restriction of obtrusive light are recommended. Zones are indicated by the zone rating (E1… E4) (CIE, 2003).

Illuminance: Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m^2).

Horizontal Illuminance: Illuminance incident on a horizontal surface or calculation plane.

Vertical Illuminance: Illuminance incident on a vertical surface or calculation plane.

Isolux Diagram: A diagram showing lines joining points of equal illuminance. Sometimes also referred to as Isolines.

Light Pollution: The spillage of light into areas where it is not required.

Light Intrusion: Light that impacts on a surface outside of the area designed to be lit by a lighting installation.

Obtrusive Light: Spill light 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 (CIE, 2003).

Photocell: A unit which senses light to control luminaires.

Residential Property: Land upon which a dwelling exists (CIE, 2003).

Sky Glow: The brightening of the night sky caused by artificial lighting resulting from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter), in the direction of observation. It comprises two separate components as follows:

- Natural sky glow - That part of the sky glow which is attributable to radiation from celestial sources and luminescent processes in the Earth's upper atmosphere.
- Man-made sky glow - That part of the sky glow which is attributable to man-made sources of radiation (e.g., outdoor electric lighting), including radiation that is emitted directly upwards and radiation that is reflected from the surface of the Earth (CIE, 2003).

Spill Light (Stray Light): Light emitted by a lighting installation which falls outside the boundaries of the property for which the lighting installation is designed (CIE, 2003).

Upward Light Ratio: The maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

Abbreviations

CIBSE Chartered Institute of Building Services Engineers

CIE International Commission on Illumination

CNEA Clean Neighbourhoods and Environment Act

ILP Institute of Lighting Professionals

SLL Society of Light and Lighting

Welbeck Strategic Land II LLP

LAND AT COOMBE FARM, SAYERS COMMON

Lighting Assessment

Independent, multidisciplinary engineering and environmental consultants

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