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ENERGY REDUCTION · LIGHTING IMPACT

4777.01 - 354 Barkham Road, Wokingham RG41 4DE

DESIGN SUMMARY REPORT

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1. INTRODUCTION

1.1. Scope of Works

1.1.1. DFL have been commissioned to create a lighting layout drawing and report to support the planning application and the concerns raised on the external building lighting within the proposed development.

1.1.2. Please refer to **Figure 1** for an overview of the site.

Figure 1: Site Plan

2. LEGISLATIVE FRAMEWORKS AND NATIONAL POLICIES

2.1. Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

2.1.1. Since 2005, artificial light has been incorporated as a potential statutory nuisance. An amendment to section 79 of the Environmental Protection Act 1990, contained within the Clean Neighbourhoods and Environment Act 2005 states:

"The following matters constitute "statutory nuisances" for the purposes of this Part, that is to say— [....]

[....] artificial light emitted from premises so as to be prejudicial to health or a nuisance;

[....]and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint".

2.2. National Planning Policy Framework 2024 (Amended 2025)

2.2.1. The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how they are expected to be applied and provides a framework for local plans. With regard to light pollution, the NPPF was updated in February 2025 and states that the following elements are to be considered:

"198. 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 impacts 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; and*
- *limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

2.3. Planning Practice Guidance

2.3.1. Guidance for assessing the effects of proposed artificial lighting is outlined in the planning practice guidance (PPG). The guidance states:

"The following questions indicate matters that may need to be considered in relation to managing the effects of light pollution:

- *Does an existing lighting installation make the proposed location for a development unsuitable, or suitable only with appropriate mitigation? For example, this might be because:*
- *the artificial light has a significant effect on the locality; and/or*
- *users of the Proposed Development (e.g., a hospital) may be particularly sensitive to light intrusion from the existing light source.*

Where necessary, development proposed in the vicinity of existing activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme, reflecting the agent of change principle. Additional guidance on applying this principle is set out in the planning practice guidance on noise.

- *Will a new development, or a proposed change to an existing site, be likely to materially alter light levels in the environment around the site and/or have the potential to adversely affect the use or enjoyment of nearby buildings or open spaces?*
- *Will the impact of new lighting conflict with the needs of specialist facilities requiring low levels of surrounding light (such as observatories, airports and general aviation facilities)? Impacts on other activities that rely on low levels of light such as astronomy may also be a consideration but will need to be considered in terms of both their severity and alongside the wider benefits of the development.*
- *Is the development in or near a protected area of dark sky or an intrinsically dark landscape where new lighting would be conspicuously out of keeping with local nocturnal light levels, making it desirable to minimise or avoid new lighting?*
- *Would new lighting have any safety impacts, for example in creating a hazard for road users?*
- *Is a proposal likely to have a significant impact on a protected site or species? This could be a particular concern where forms of artificial light with a potentially high impact on wildlife and ecosystems (e.g. white or ultraviolet light) are being proposed close to protected sites, sensitive wildlife receptors or areas, including where the light is likely to shine on water where bats feed.*
- *Does the Proposed Development include smooth, reflective building materials, including large horizontal expanses of glass, particularly near water bodies? (As it may change natural light, creating polarised light pollution that can affect wildlife behaviour.)"*

Paragraph 002 Ref ID: 31-002-20191101 revision 01 11 2019

3. LOCAL POLICIES

3.1. Introduction

3.1.1. The relevant Local Planning Authority (LPA) for the Proposed Development is Wokingham Borough Council. Woking Borough Council have published a document that contains policies relevant to the Application Site, these are:

3.2. Document Title: Wokingham Borough Local Development Framework - Adopted Core Strategy Development Plan Document January 2010

3.2.1. This document is from Wokingham Borough Council and explains where development will go within the borough to 2026. Below are

CP1 – Sustainable Development

Planning permission will be granted for development proposals that:

1) Maintain or enhance the high quality of the environment;

2) Minimise the emission of pollutants into the wider environment;

3) Limit any adverse effects on water quality (including ground water);

4) Ensure the provision of adequate drainage;

5) Minimise the consumption and use of resources and provide for recycling;

6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;

7) Avoid areas of best and most versatile agricultural land;

8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;

9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);

10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;

11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and

12) Contribute towards the goal of reaching zero-carbon developments41 as soon as possible by:

a) Including appropriate on-site renewable energy features; and

b) Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

CP3 – General Principles for development

Planning permission will be granted for proposals that:

a) Are of an appropriate scale of activity, mass, layout, built form, height, materials and character to the area together with a high quality of design without detriment to the amenities of adjoining land users including open spaces or occupiers and their quality of life;

b) Provide a functional, accessible, safe, secure and adaptable scheme;

c) Have no detrimental impact upon important ecological, heritage, landscape (including river valleys) or geological features or water courses.

d) Maintain or enhance the ability of the site to support fauna and flora including protected species;

e) Use the full potential of the site and contribute to the support for suitable complementary facilities and uses;

f) Contribute to a sense of place in the buildings and spaces themselves and in the way they integrate with their surroundings (especially existing dwellings) including the use of appropriate landscaping;

g) Provide for a framework of open space in secure community use achieving at least 4.65 ha/1,000 population provision together with recreational/sporting facilities in addition to private amenity space;

h) Contribute towards the provision of an appropriate sustainable network of community facilities;

i) Do not lead to a net loss of dwellings and other residential accommodation

or land; and

j) Do not lead to a loss of community or recreational facilities/land or infrastructure unless suitable alternative provision is available.

Development proposals will be required to demonstrate how they have responded to the above criteria through the submission of Design and Access Statements, clear and informative plans, elevations and streetscenes and where required Masterplans, Development Briefs, Concept Statements and Design Codes.

CP7 – Biodiversity

Sites designated as of importance for nature conservation at an international or national level will be conserved and enhanced and inappropriate development will be resisted. The degree of protection given will be appropriate to the status of the site in terms of its international or national importance.

Development:

A) Which may harm county designated sites (Local Wildlife Sites in Berkshire), whether directly or indirectly, or

B) Which may harm habitats or, species of principle importance in England for nature conservation, veteran trees or features of the landscape that are of major importance for wild flora and fauna (including wildlife and river corridors), whether directly or indirectly, or

C) That compromises the implementation of the national, regional, county and local biodiversity action plans will be only permitted if it has been clearly demonstrated that the need for the proposal outweighs the need to safeguard the nature conservation importance, that no alternative site that would result in less or no harm is available which will meet the need, and:

i) Mitigation measures can be put in place to prevent damaging impacts;

or

ii) Appropriate compensation measures to offset the scale and kind of losses are provided

4. BRITISH STANDARDS

4.1. BS 5489-1:2020 - Lighting of Roads and Public Amenity Areas - Code of practice.

4.1.1. This standard gives recommendations on the general principles of road lighting, its aesthetics and technical aspects and provides guidance on operational maintenance. It also provides guidance on means of minimising energy consumption and limiting the impacts on the environment and adjacent properties.

5. GUIDANCE

5.1. Guidance Notes for the Reduction of Obtrusive Light (Institution of Lighting Professionals GN01:2021)

5.1.1. This Design Summary Report is informed by industry guidance notes, which aim to reduce the potential for obtrusive light to occur, which is typically caused by poorly designed and installed exterior artificial lighting. It is informed by the most relevant sections of GN01:2021 that has recently been published to reduce the potential for obtrusive light from a wide range of exterior lighting applications.

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA Dark Sky Parks.
E1	Natural	Intrinsically dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty[1], 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 or suburban locations.
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity.

Table 1: Environmental Zone Descriptions

Environmental Zones	Sky Glow ULR[2] (Max %)	Light Trespass (Into Windows) E_v (lux)		Building Luminance Average, Pre-curfew
		Pre-Curfew	Post-Curfew[3]	Average L (cd/m^2)
E0	0	0	0	0
E1	0	2	0 (1[4])	0
E2	2.5	5	1	5
E3	5	10	2	10
E4	15	25	5	25

Table 2: Obtrusive Light Criteria

1 Areas of Outstanding Natural Beauty (AONBs) have been redefined as National Landscapes. References within ILP GN01:2021 to AONBs should therefore be interpreted accordingly. This documentation will be updated in line with this change in future ILP guidance revisions as they are published.
2 ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky.
3 Curfew refers to a time when the local planning authority has agreed that the lighting installation should be switched off; this typically refers to 23h00 – 07h00
4 If the installation is for public (road) lighting, then this may be up to 1 lx

5.2. GN08:2023 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals

5.2.1. This document is aimed at lighting professionals, lighting designers, planning officers, developers, bat workers/ecologists and anyone specifying lighting. It is intended to raise awareness of the impacts of artificial lighting on bats, and mitigation is suggested for various scenarios. However, it is not meant to replace site-specific ecological and lighting assessments, which states the following.

"It is acknowledged that, especially for vertical calculation planes, very low levels of light (<0.5 lux) may occur even at considerable distances from the source if there is little intervening attenuation. It is therefore very difficult to demonstrate 'complete darkness' or a 'complete absence of illumination' on vertical planes where some form of lighting is proposed on site despite efforts to reduce them as far as possible and where horizontal plane illuminance levels are zero. Consequently, where 'complete darkness' on a feature or buffer is required, it may be appropriate to consider this to be where illuminance is below 0.2 lux on the horizontal plane and below 0.4 lux on the vertical plane. These figures are still lower than what may be expected on a moonlit night and are in line with research findings for the illuminance found at hedgerows used by lesser horseshoe bats, a species well known for its light adverse behaviour (Stone, 2012)."

"A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component."

*"A buffer zone subdivided to into smaller zones of increasing illuminance limit further away from the Supporting Habitat would ensure light levels (illuminance - measured in lux) do not exceed certain defined limits. This has the effect of a gradual decrease in lighting from the developed zone, rather than a distinct cut-off, which may provide useable area for the project which also limits lighting impacts on less sensitive species, or less well-used habitat." (see **Figure 2**).*

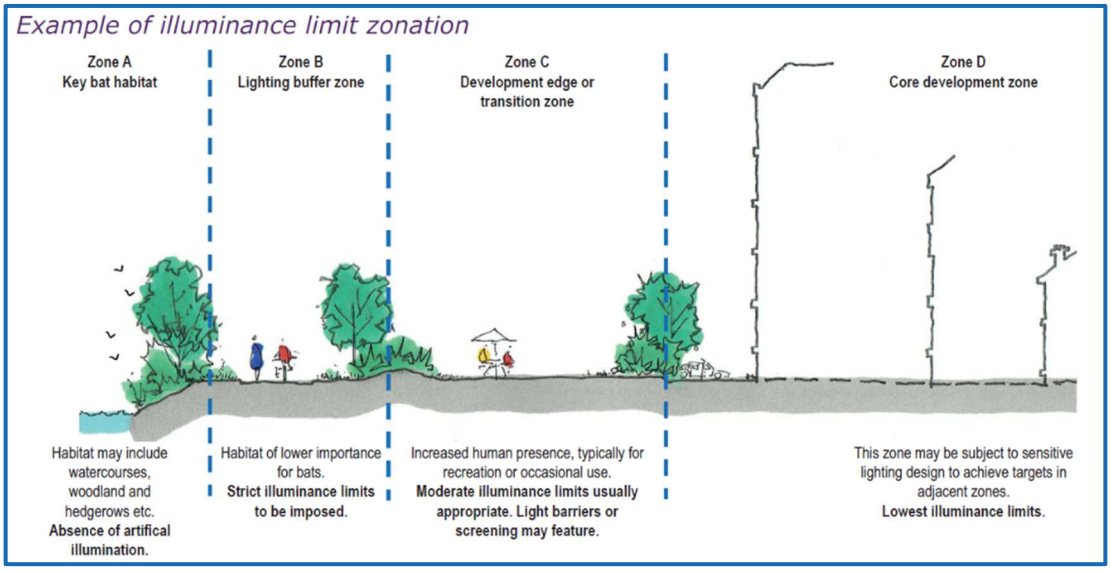

Figure 2: Example of Lighting Zonation near Sensitive Boundaries and Known Ecological Habitat

6. DESKTOP ASSESSMENT

6.1. Site Description and Context

6.1.1. The proposed development is located within Barkham, Wokingham. The Proposed Development is located to the south of Barkham along Barkham Road (B3349). Surrounding the site you will predominantly find residential developments, with some fields to the south of the Proposed Development.

6.2. Environmental Zone Classification

6.2.1. The Environmental Zone criteria detailed within **Table 1** and **Table 2** informs the basis of the Design Summary Report.

6.2.2. The Application Site is considered to be located within an E3 environmental zone. This is because of the Application Sites location within a well inhabited suburban development.

6.2.3. The lighting classes used within the Proposed Development, and the limitation placed on the lighting in terms of its environmental effect, is informed by the requirements for an E3 zone environmental zone (**Error! Reference source not found.**).

Zone	Surrounding	Examples	Limitations		Sky Glow ULR (Max)
			Pre-curfew	Post-curfew	
E3	Suburban	Well inhabited rural and urban settlements, small town centres or suburban locations.	10 lux	2 lux	5%

Table 3: Limitations of the Environmental Zone

6.3. Wokingham Borough Councils Comments On Proposal

6.3.1. Woking Borough council have raised concerns with external lighting within the proposed development. These concerns will be addressed within the lighting calculations and report. Below are their comments on the proposed development.

6.3.2. "External Lighting Plan 251532/10 does not include contour plans and no details of which Avalon Wall Pack is proposed. The inset states "All External light fittings to have sensors fitted for light levels and time period activations". Avalon Wallpack lights are not flat glass downlighters and reeded curved diffuser are specified but no plans are provided to show the light spill, particularly on boundary vegetation, foraging corridors and the impact on the bat roost recorded in the house to the north.

6.3.3. The Architect has not taken account of the bat roost recorded to the north, the proximity to the Oak T5 and the need to retain dark corridors for bats and wildlife. The plan does not demonstrate that a second wall light installed as a downlight is necessary for health and safety. I request that the light on the east of the front door is omitted unless contour plans are provided to demonstrate this would not impact the dark corridor and foraging in the Oak canopy. I request that the light proposed on the east side elevation is reconsidered

6.3.4. The Product Specification and Lighting Plan make no reference to PIR controls. The submitted Product Specification and plan don't specify which Avalon Wallpack luminaires are proposed, and what the impact of using a clear or curved diffuser would have on lighting contours and the spill on to vegetation. In the absence of further details and proposals for PIR controls this does not clearly demonstrate that dark corridors for bats would be protected and could inappropriately suggest that external lighting would not be illuminated from dusk until dawn.

6.3.5. In order to recommend approval of an External Lighting Plan and discharge of condition 8, the details of which Avalon Wallpack LED is proposed must be provided. These must include confirmation that warm light bulbs will be specified, and details of the controls such as PIR set on a timer not more than 1 minute which would not be triggered by bats or birds, and omission of the light on the east of the front elevation should be shown on the revised drawing."

7. LIGHTING STRATEGY

7.1. Summary

7.1.1. The Proposed Development will require lighting for safety and amenity at limited times during the hours of darkness. Lighting will be fit for purpose and sensitive to nearby human and ecological receptors.

7.1.2. Amenity lighting for the Proposed Development will be applied sensitively to account for the receptors identified bounding the Application Site and within the Proposed Development.

7.1.3. Luminaires will be used with integral LEDs and only where the luminaire photometry is available from the manufacturer. This is to ensure the photometric footprint of the luminaires can be modelled to ensure the potential effects of light spill are minimised or mitigated.

7.1.4. Luminaires will distribute light downwards only to reduce the potential for light spill onto the boundaries surrounding the buildings and upwards towards the sky and have an upward light ratio of 5% or less in line with GN01.2021 guidance for an E3 environmental zone.

7.1.5. All lighting, unless otherwise stated, is to emit a warm white colour temperature light (2700k Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.

7.1.6. All sensitive receptors will be identified, and calculations will be carried out to ensure that light spill is controlled and does not result in adverse effects on nearby sensitive receptors.

7.1.7. Comments from Wokingham Borough Council will be addressed to ensure that the lighting does not have an adverse effect on nearby sensitive receptors.

7.2. Consultation

7.2.1. Consultation has been carried out to determine the location of all proposed external lighting within the development and the general specification of equipment to be proposed.

7.3. Equipment Specification

Equipment Specification	
Application Area	354 Barkham Road, Wokingham RG41 4DE
Correlated Colour Temperature (Kelvin)	≤2700k
Lumen Output (lm)	≤ 200
Height (m)	≤2.0m
Mounting Arrangement	Surfaced Mounted
Luminaire Tilt (°)	0
Upward Light Output Ratio (%) **E3 < 5%**	1
Luminaire Manufacturer	Ligman
Luminaire family	Gino 2
Example Luminaire Image	
Light Spill Diagram reference	Type B
Controls[5]	External PIR Sensor – Set to a timer of no more than 1 minute which will not be triggered by bats or birds.

5 Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

8. IDENTIFIED RECEPTORS

8.1. Ecological

8.1.1. No ecology report has been supplied, therefore, the Design Summary Report seeks to ensure the lowest possible lighting levels are applied.

8.1.2. Concerns have been raised by Wokingham Borough Council regarding a bat roost which has been identified close to oak tree T5 and the need to retain dark corridors for the bats and wildlife. There is also concern for light spill on the boundary vegetation.

8.1.3. It has been assumed based on the available topographic view, that the areas to surrounding the proposed development are likely to be ecologically sensitive. The visual location of these areas can be seen in **Appendix 1 – Sensitive Receptors.**

8.1.4. A description of the potential ecological receptors can be seen in **Table 4**.

Receptor Type	Receptor No. (Error! Reference source not found.)	Description
Ecology	PSER 001 A - East of development	This receptor covers boundary vegetation that has been identified as potentially ecologically sensitive.
Ecology	PSER 001 B - East of development	This receptor covers boundary vegetation that has been identified as potentially ecologically sensitive.
Ecology	PSER 002 - West of development	This receptor covers boundary vegetation that has been identified as potentially ecologically sensitive.
Ecology	PSER 003 - South of development	This receptor covers all southern trees that have been identified as potentially ecologically sensitive.
Ecology	PSER 004 - Northern Tree	This receptor covers all northern trees that have been identified to have bat roosts.

Table 4: Potentially Sensitive Ecological Receptors (PSER)

9. LIGHTING DESIGN

9.1. Overview

9.1.1. The Light Spill Diagram shown in **4777-DFL-ELG-XX-LD-EO-13001** shows that horizontal light spill does not significantly impact ajacent sensative ecological receptors.

9.1.2. The Vertical Light Spill Calculations shown in **4777-DFL-ELG-XX-CA-EO-13001** shows that vertical light spill does not significantly impact ajacent sensative ecological receptors.

9.1.3. To ensure the worst-case scenario has been modelled, the highest potential light levels have been modelled / presented in the light spill diagram, with the project maintenance factors set at MF = 1.0. This demonstrates the light levels at their highest (initial light levels at the start of luminaire life).

10. SUMMARY OF RESULTS

10.1. Ecology

10.1.1. As demonstrated in lighting calculation **4777-DFL-ELG-XX-CA-EO-13001**, the following results have been achieved (**Table 5**). Where grids are non-compliant, the reason for non-compliance/departure from standard has been given. Please see **Appendix 1 –** for sensitive receptor locations.

10.1.2. Where ecological receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in Error! Reference source not found.. The light levels based on the modelling do not exceed 0.4 Lux, keeping the light levels within the guidance given within GN08/2023.

10.1.3. In line with section 4.56 of GN08/2023, the vertical grids will be mounted at a height of 1.5 metres above the ground level to simulate the likely flight path of a light sensitive bat.

Receptor No	GN08:2023 requirements	Maximum vertical Illuminance (Lux)	Notes
PSER 001 A - East of development	0.40 Lux	0.31 Lux	
PSER 001 B - East of development	0.40 Lux	0.27 Lux	
PSER 002 - West of development	0.40 Lux	0.11 Lux	
PSER 003 - South of development	0.40 Lux	0.01 Lux	
PSER 004 - Northern Tree	0.40 Lux	0.20 Lux	

Table 5: PSER Results Table, Maximum Illuminance

11. CONCLUSION

11.1. Overview

11.1.1. Lighting associated with the Proposed Development shall be designed in accordance with the planning conditions outlined in **Section 3**.

11.1.2. This Design Summary Report has been written in accordance with the relevant British Standards, industry guidance and local policies to ensure it is unlikely to give rise to obtrusive light with the potential to affect human, environmental and ecological receptors.

11.1.3. Through the application of this Design Summary Report sensitive receptors will not be adversely affected by obtrusive light.

11.1.4. Vertical illuminance calculations have ensured that dark corridors of 0.40 lux or below are maintained to the east and west of the proposed development, to reduce the impact on nearby foraging.

11.2. Wokingham Borough Council's Comments

11.2.1. In response to **6.3.2,** a contour plan has been calculated (Please see calculation **4777-DFL-ELG-XX-LD-EO-13001)** to show light spill from the proposed luminaires. Avalon Wallpack lights are not being proposed, instead flat glass downlighters have been proposed to help reduce uneccesary light spill, propsoed to be controlled via a PIR sensor.

11.2.2. In response to **6.3.3,** A vertical illuminance grid (**PSER 004** on calculation **4777-DFL-ELG-XX-CA-EO-13001)** has been calculated demonstrating that vertical light spill does not exceed 0.40 lux as per GN08.2023 guidance, onto Oak T5. With this in mind, the light on the east side of the front door has not been omitted.

11.2.3. In response to **6.3.4,** a clear flat glass downlighter has been proposed, with all downlighters being controlled via a PIR sensor set to a timer of no more than 1 minute. A flat glass downlighter helps to reduce light spill onto ecologically sensitive areas. The implementation of a PIR sensor ensures that the lighting is only turned on when necessary.

11.2.4. In response to **6.3.5,** the Ligman Gino 2 being proposed as a suitable alternative luminaire. The luminaire will be specified with a 2700k (Warm White) led to help minimise the effects of lighting on nearby sensitive ecological receptors. The external PIR can been specified to be set on a timer not more than 1 minute which will not be triggered by bats or birds. The luminaire to the east of the front elevation has not been omitted on the basis that calculation results show GN08.2023 compliance in all areas.

12. ASSUMPTIONS

12.1. Overview

It is assumed that the property can accommodate a 2m mounting height for the luminaires.

APPENDIX 1 – SENSITIVE RECEPTORS

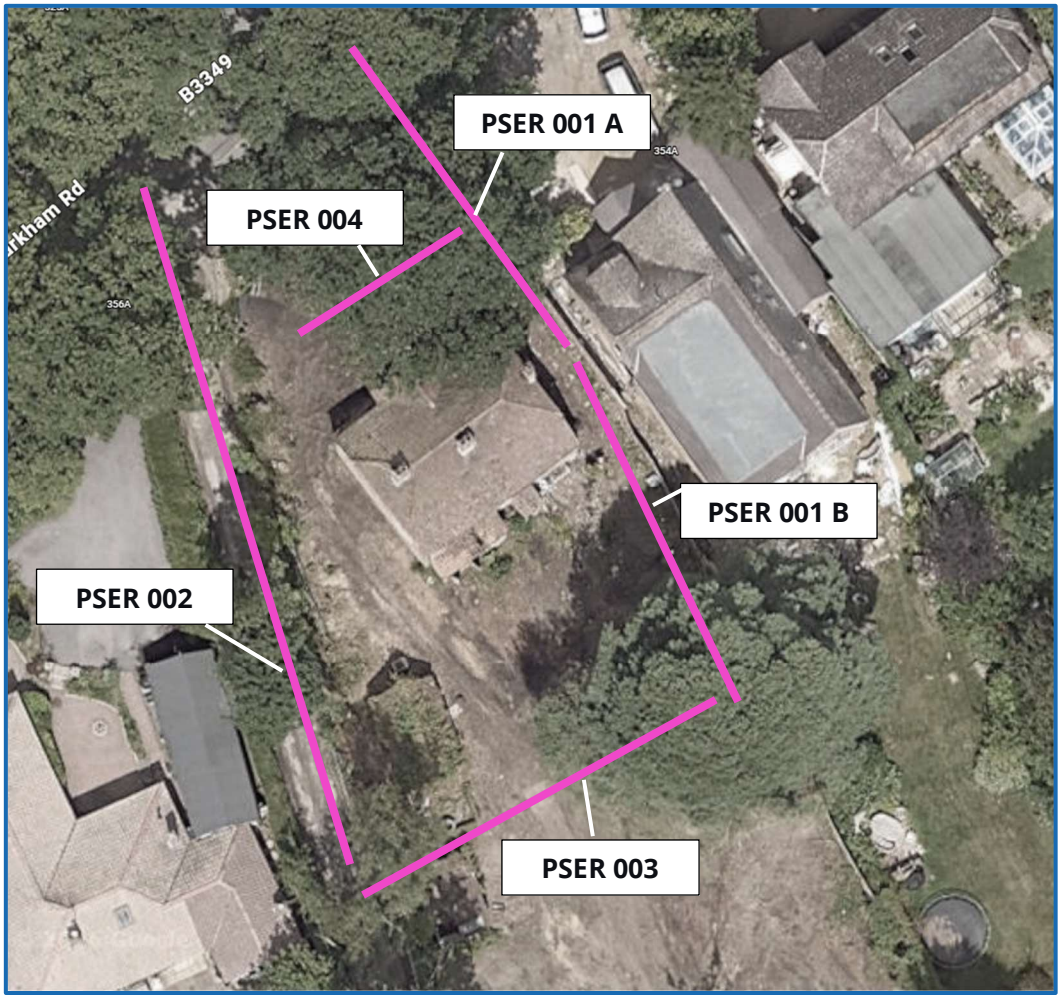

Figure 3: Lighting Class Map

Lighting Colours	Colour Coding
PSER (GN08 Receptors)	

Table 6: Lighting Class Colour Coding

TECHNICAL DESCRIPTION, DEFINITIONS & ABBREVIATIONS

PHAR: is an abbreviation for a potential human amenity receptor, a location where an observer could have the potential to be affected by the proposed lighting to be installed *Abbreviation used by DFL LI&P.*

PSER: is an abbreviation for an area identified as or treated as a location that may host a potentially sensitive ecological receptor. This is generally used where light sensitive bats have the potential to live, forage or use as a flight path, other ecologically sensitive receptors such as (but not limited to) the Great Crested Newt may also be identified by this term. *Abbreviation used by DFL LI&P.*

PSR: is an abbreviation for an area where an individual maybe susceptible to light brightness (Light intensity) which may have the potential to cause a hazardous situation. *Abbreviation used by DFL LI&P.*

Obtrusive Light: refers to excessive or bothersome artificial light that goes where it shouldn't, causing discomfort and disruption. *Spill light which because of quantitative, directional or spectral attributes in a given context gives rise to annoyance, discomfort, distraction or reduction in the ability to see essential information.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Sky glow: When lights are directed upwards or light is scattered by particles in the air, like dust or water droplets, it creates a glow that makes it hard to see stars. *The increase in diffuse illuminance of the night sky above that produced by natural sources such as the moon and visible star.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Vertical Illuminance: is how much light lands on upright surfaces like walls. It's measured in lux or footcandles and matters for places where the view from a vertical angle is important. *Lighting of vertical surfaces such as walls, windows, statues, sculptures and people's faces*. CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Correlated colour temperature (CCT): the appearance of light emitted by a light source measured in Kelvin (K), Lower CCT values such as 2700K represent warmer, more yellowish light, *similar to the light from older incandescent lamps. (Tcp)The temperature of the Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions, measured in absolute temperature on the kelvin (K) scale.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Lux: measures the brightness of light as perceived by the human eye at a specific point on a surface. *The SI derived unit of illuminance, measuring luminous flux per unit area (1 lux =1 lumen/m2).* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Lumens: measure how bright a light appears to our eyes. *The SI derived unit of luminous flux; a measure of the total quantity of visible light emitted by a source or received by a surface (unit: lumen).* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Glare: refers to an excess of bright light that makes you uncomfortable or hinders your vision. It happens when there's a big difference between a bright light and the rest of the surroundings. *Glare: condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or by extreme contrasts.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.1.8

Luminous intensity: is light brightness or how intense the light source is. light intensity is how intense a light source is emitted or received in a particular direction, this is measured candelas and is termed as luminous intensity *Iv <of a source, in a given direction> quotient of the luminous flux, dΦv, leaving the source and propagated in the element of solid angle dΩ containing the given direction, by the element of solid angle (unit: cd =lm · sr -1.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

Candela: is a measurement for the brightness of a light source, taking into account the direction in which the light is emitted. *Base unit of luminous intensity in the International System of Units (SI); the luminous power per unit solid angle emitted by a point light source in a particular direction.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Uniformity (Uo): is an explanation for the even distribution of light across an area or surface. *The overall uniformity shall be calculated as the ratio of the lowest luminance, occurring at any grid point in the field of calculation, to the average luminance.* BS EN 13201-3-2015, Calculation of Performance Section 8.3.

Luminance: is how bright a surface appears to our eyes. It considers the light coming from or reflected by an object. *Lv <in a given direction, at a given point of a real or imaginary surface> quantity defined by the formula (unit: cd · m-2 = lm · m-2 · sr-1)* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.3.

Illuminance is how much light lands on a surface per square meter. It's measured in lux. More lux means a brighter area. *Ev (unit: lx = lm · m-2) 1. <at a point of a surface> quotient of the luminous flux dΦv incident on an element of the surface containing the point, by the area dA of that element 2. <at a point of a surface> equivalent definition: integral, taken over the hemisphere visible from the given point, of the expression.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.10.

Luminaire: a light fixture, this is also sometimes referred to as a lantern or a light fitting, is a product that produces artificial light. *apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.3

ULOR: upward light output ratio or ULOR refers to the amount of light the light fixture will produce upwards as a percentage of its total light output. *RULO <of a luminaire> ratio of the upward luminous flux of the luminaire, measured under specified practical conditions with its own lamp(s) and equipment, to the sum of the individual luminous fluxes of the same lamp(s) when operated outside the luminaire with the same equipment, under specified conditions* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.12.

Maintenance factor (MF): is an allowance for how well the lights keep working overtime. It considers things like dirt on the light fittings and "wear and tear". *DEPRECATED: light loss factor ratio of illuminance produced by the lighting installation after a certain period to the illuminance produced by the installation when new Note 1 to entry: The term depreciation factor has been formerly used to designate the reciprocal of the above ratio. Note 2 to entry: The maintenance factor takes into account light losses caused by dirt accumulation on luminaires and room surfaces (in interiors) or other relevant surfaces (in exteriors, where appropriate), and the decrease of the luminous flux of lamps*. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.5.18.

***Tilt**: is how much the luminaire is lifted based on the fitting facing flat to the ground.*

***Outreach:** how far away the fitting is from the column/wall its mounted on to the light source*.

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