

Report for:

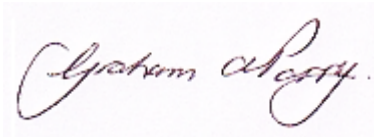
Stuart Henley and Partners

Dukesbridge House, Reading

Outline Lighting Strategy

Status: FINAL

Date: 08.10.2020

Author	 Graham Parry Aff. M.ILP Managing Director
Report For	Steven Thomas Stuart Henley and Partners
Date	08.10.2020
Version Number	A4081/OLS/001
Status	Final

This report has been prepared by ACCON UK Limited with all reasonable care and diligence within the terms of the contract with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. We accept no responsibility to third parties to whom this report, or any part, thereof is made available. Any such party relies upon the report at their own risk.

CONTENTS

1. INTRODUCTION	5
1.1. Scope.....	5
1.2. The Proposed Development.....	6
2. THE NATURE, MEASUREMENT AND EFFECT OF LIGHTING.....	7
3. LEGISLATION, PLANNING POLICY AND GUIDANCE.....	9
3.1. Environmental Protection Act 1990	9
3.2. The Clean Neighbourhoods and Environment Act 2005	9
3.3. National Planning Policy Framework.....	9
3.4. Planning Practice Guidance	9
4. LIGHTING GUIDANCE.....	11
4.1. Institution of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light (GN01:2011)	11
4.2. Reading Borough Council.....	13
5. OUTLINE LIGHTING STRATEGY.....	14
5.1. Introduction	14
5.2. Environmental Zones.....	14
5.3. Target Light Levels	14
5.4. Artificial Lighting Design	15
6. LIGHTING ASSESSMENT	17
6.1. Baseline Conditions	17
6.2. Development proposals	19
7. CONCLUSIONS	20

LIST OF TABLES

Table 2.1: Typical illuminance levels	8
Table 4.1: Environmental Zones.....	11
Table 4.2: Obtrusive Light Limitations for Exterior Lighting Installations – General Observers	12
Table 5.1: Lighting Specification – Light Intrusion (into windows).....	14
Table 5.2: Operational Phase Target Light Levels	15
Table 6.1: Baseline Vertical and Horizontal Illuminance	18

LIST OF FIGURES

Figure 1.1: Site location 5

Figure 6.5.1: Light measurement positions 17

Figure 6.2: Proposed repositioning of luminaires 19

LIST OF APPENDICES

Appendix 1 Glossary of Lighting Terminology 22

1. INTRODUCTION

1.1. Scope

This Outline Lighting Strategy (OLS) has been commissioned by Stuart Henley and Partners in respect of the proposed change of use development of Dukesbridge House, Reading into residential units. The OLS sets out the artificial lighting principles and design targets for the proposed development. The OLS draws upon frequently used standards and guidance documents.

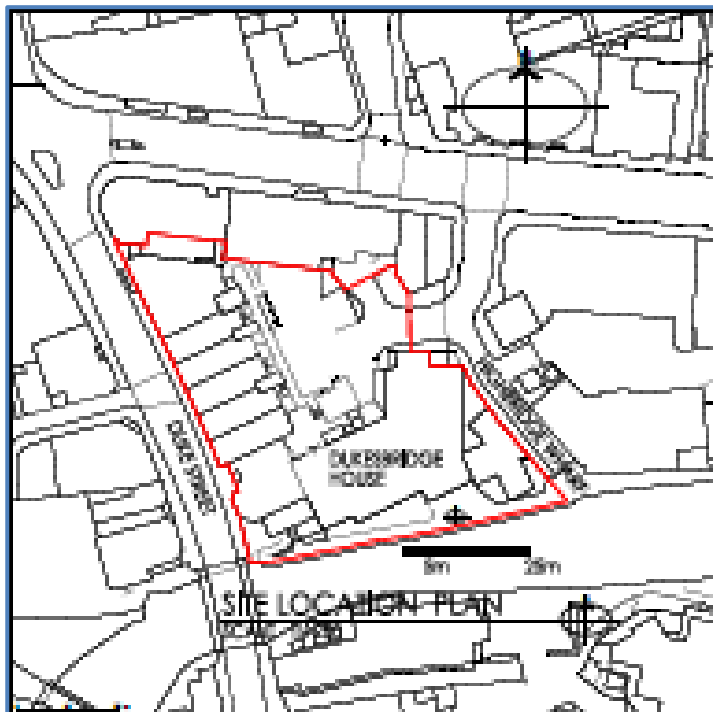
The OLS categorises the light environment at the site and where appropriate proposes measures that would control the effects of the proposed development on the local environment and new occupiers of the development. These potentially include design principles, lighting level design targets, and advice on applicable lighting techniques and luminaire formats.

1.1.1. The Site

The site (See **Figure 1**) is located within Reading City Centre to the north of the River Kennet adjacent to High Bridge to the immediate east of Duke Street. Dukesbridge House is an existing building with established external lighting within a car park area which is located to the north of Dukesbridge House.

The Site is located within the administrative boundary of Reading Borough Council (RBC).

Figure 1.1: Site location



1.2. The Proposed Development

The proposed development site is a change of use of part lower ground floor, part ground floor, first, second and third floors from Class B1(a)(offices) to Class C3 (dwelling houses) to comprise 76 dwellings (4 x studio, 70 x 1 bed, 2 x 2 bed). The proposals allow for a change of use of the building from Class B1(a) (offices) to Class C3 (dwelling houses) to comprise 76 dwellings. The proposal is under prior notification under Class O, Part 3 of Schedule 2 of the Town and Country Planning (General Permitted Development) Order 2015.

The development would be accessed from Duke Street and there is no parking allocation associated with the development.

2. THE NATURE, MEASUREMENT AND EFFECT OF LIGHTING

The problems and issues associated with the provision of outdoor lighting are becoming more recognized as a source of pollution. Obtrusive lighting can be damaging and be both an environmental and intrusive visual nuisance.

Light pollution can occur in three ways:

Sky glow: The orange glow around urban areas resulting from the scattering of artificial light by dust particles and water droplets in the sky;

Glare: The uncomfortable brightness of a light source when viewed against a dark sky; and

Light trespass: light spillage beyond the boundary of the property on which a light is located.

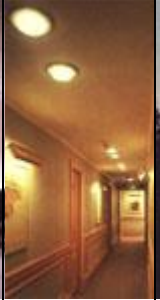
Problems are generally associated with the levels of light produced, poor direction of lights and excessive hours of use. Poorly designed lighting in streets, car parks and shopping centres, sports facilities and motorway service areas; and poorly angled domestic security lights are the main contributors and causes of complaint. An increasing amount of exterior lighting is being allowed to shine above the horizontal, and a significant proportion of this artificial light ends up in the sky where it does nothing to increase vision or security.

As well as causing a nuisance, inconsiderate lighting schemes have also been attributed to a number of ecological impacts. A number of plant functions, such as photosynthesis, are controlled by the amount of light a plant receives and the length of the day; therefore, additional lighting can adversely impact and disrupt these functions. Lighting can also impact upon other living creatures such as mammals and birds, and in particular upon sleep patterns and their behaviour.

A great deal of concern is often expressed with respect to the ecological consequences of night-time light pollution. This concern is mainly focussed on the extent to which artificial light results in light spillage into areas which were previously unlit during the night-time environment. However changes in the spectral composition, duration and spatial pattern of light are also considered to have ecological effects. The principal aim should be to reduce light spillage into areas that are not intended to be lit (including the night sky). Disturbance of foraging or roosting sites may occur to estuarine birds as a result of increased light pollution. Light pollution can have adverse impacts and can effect both breeding and foraging behaviour in a number of species of bird. Hill (1992) observed that seabirds were disorientated by street lights on cloudy nights and that redshank and oystercatchers were observed feeding with 50 metres of artificial light at night, while flocks of dunlin were observed roosting near to a large roundabout lit with flood lighting.

Lighting can be measured and expressed in lux, which is a unit of illuminance, i.e. the amount of light falling on an object. Lux range can be from over 100,000 lux on a bright summer day; to below 10 lux on an urban residential street at night and down to below 1 lux at night in a rural location. **Table 1.1** below identifies typical levels of illuminance.

Table 1.1: Typical illuminance levels

Outdoors on a sunny day	Outdoors on an overcast day	Typical office	Typical corridor	Outdoors at dusk	Street at night time	Outdoors with full moon	Outdoors with star light
							
100,000 lux	10,000 lux	500 lux	100 lux	50 lux	10 lux	0.5 lux	0.2 lux

3. LEGISLATION, PLANNING POLICY AND GUIDANCE

3.1. Environmental Protection Act 1990

The Environmental Protection Act 1990 defines the statutory nuisance from artificial lighting. It includes guidance on suggested controls for Local Authorities for exterior lighting, depending on context.

3.2. The Clean Neighbourhoods and Environment Act 2005

The Act made “*artificial light emitted from premises such as to be prejudicial to health or nuisance*” a statutory nuisance under the Environmental Protection Act 1990. The provision came into force in April 2006.

3.3. National Planning Policy Framework

The revised National Planning Policy Framework (NPPF, February 2019) supersedes the 2012 and 2018 versions of the NPPF. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, make effective use of land, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.

One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser value, where consistent with other policies in the Framework. The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

Paragraph 180 of the NPPF states:

“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:

...

- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”*

3.4. Planning Practice Guidance

The Planning Practice Guidance for Light Pollution (PPG-LP) was published in March 2014. The document provides advice on when light pollution is relevant to planning and states:

“Artificial light provides valuable benefits to society, including through extending opportunities for sport and recreation, and can be essential to a new development. Equally, artificial light is not always necessary, has the potential to become what is termed ‘light pollution’ or ‘obtrusive light’ and not all modern lighting is suitable in all locations. It can be a source of annoyance to people, harmful to wildlife, undermine enjoyment of the countryside or detract from enjoyment of the night sky. For maximum benefit, the best use of artificial light is about getting the right light, in the right place and providing light at the right time.”

The PPG-LP outlines the factors which should be considered when assessing whether development might have implications for light pollution, the factors that are relevant when considering when, where and how much light shines and the relevant factors to consider when assessing the impact of light on ecological receptors.

4. LIGHTING GUIDANCE

4.1. Institution of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light (GN01:2011)

The degree to which an artificial lighting installation is likely to have an effect on an environment is in part dependent on visual context. A new lighting installation that integrates appropriately into the local area is less likely to create a highly visible or obtrusive alteration to the nightscape. Therefore, by categorising areas according to appropriate environmental zones' and selecting the right type of environmental zone, design decisions can ensure that appropriate artificial lighting choices limit potentially adverse effects.

The Institute of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light (GN01:2011) define the types of obtrusive light which artificial lighting can generate. Obtrusive light can comprise the following:

- Sky glow: the brightening of the night sky as a result of upward lighting and upward reflected lighting, for example;
- Glare: the uncomfortable brightness of a light source when viewed against a darker background;
- Light intrusion: the spilling of light beyond the boundary of the property or area being lit.

GN01:2011 outlines a range of good practice design guidance aimed at minimising the above obtrusive lighting effects.

Environmental Zones are identified for different surroundings and lighting environments and are recommended for Local Authorities to specify when determining their Local Development Plans in order to control exterior lighting and to ensure appropriate obtrusive light limitations are applied to new installations. **Table 4.1** presents the recommended Environmental Zones.

Table 4.1: Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	Natural Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations

Zone	Surrounding	Lighting Environment	Examples
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

The following design guidance (**Table 4.2**) is recommended for the Environmental Zones. However, it is noted that these may be supplemented or replaced by a Local Planning Authorities specific guidance.

Table 4.2: Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

Zone	Sky Glow ULR Max % ⁽¹⁾	Light Intrusion (into windows) E_v (lux) ⁽²⁾		Luminaire Intensity I (cd) ⁽³⁾		Building Luminance Pre-Curfew ⁽⁶⁾ Average L (cd/m ²)
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	
E0	0.0	0	0	0	0	0
E1	0.0	2	0 (1 ⁽⁵⁾)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15.0	25	5	25,000	2,500	25

Notes: (1) ULR is the Upward Light Ratio of the installation. This is the maximum permitted percentage of luminaire flux that goes directly into the sky. Some lighting schemes will require deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights, festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

(2) E_v is the vertical illuminance, measured in lux, flat on the glazing at the centre of the window. The values for light intrusion (into windows) are suggested maxima and need to take into account the existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complain has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.

(3) Luminaire intensity is measured in candelas (cd). The luminaire intensity applies to each luminaire in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.

(4) Building luminance should be limited to avoid over lighting and is related to the general district brightness. In this reference, building luminance is applicable to buildings directed illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

(5) Permitted only from public road lighting installations.

(6) Curfew is the time after which stricter requirements (for the control of obtrusive light) will apply. This is often a condition of use of lighting applied by the Local Planning Authority. If not otherwise stated, 2300 hrs is suggested.

4.2. Reading Borough Council

Reading Borough Council within the Reading Borough Local Plan adopted November 2019 identify at Policy CC8 that artificial lighting should not result in detrimental impacts at existing residential.

CC8: SAFEGUARDING AMENITY

Development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties, in terms of:

- ▣ *Privacy and overlooking;*
- ▣ *Access to sunlight and daylight;*
- ▣ *Visual dominance and overbearing effects of a development;*
- ▣ *Harm to outlook;*
- ▣ *Noise and disturbance;*
- ▣ *Artificial lighting;*
- ▣ *Vibration;*
- ▣ *Dust and fumes;*
- ▣ *Smell;*
- ▣ *Crime and safety; or*
- ▣ *Wind, where the proposals involve new development of more than 8 storeys.*

Reading Borough Council have indicated that a Lighting Strategy is required for the proposed change of use development and have provided the Table below to identify the general requirements for an assessment.

9. External lighting details
When Required All proposals involving the provision of publicly accessible developments, in the vicinity of residential property, a Listed Building or a Conservation Area, Local Wildlife Site, green link or watercourse where external lighting would be provided or made necessary by the development
Guidance Details should include the following as relevant: • hours of operation; • an isolux contour map showing light spillage to 1 lux; • light levels; • column heights; layout plan with beam orientation, • a schedule of equipment • a description of the measures such as hoods and cowls that have been provided to avoid glare; • impact on nearby dwellings or roads and use of planting to mitigate effect .
Policy Core Strategy Document (2008 & altered 2015) Policy CS7: Design and the Public Realm Policy CS36 - Biodiversity and Geology Sites and Detailed Policies Document (2012 & altered 2015) Policy DM4: Safeguarding Amenity Policy DM17: Green network

5. OUTLINE LIGHTING STRATEGY

5.1. Introduction

The overarching objective for the approach to artificial lighting within the Proposed Development is to maintain the existing development lighting in order to:

- Provide a safe environment for vehicles, cyclists and pedestrians; whilst
- Reducing impact upon local sensitive receptors, which comprise residential receptors to the immediate east of the development.

5.2. Environmental Zones

A baseline lighting survey has been carried out at the site within the courtyard area in order to determine what lighting is presently in place and whether light trespass from the development would result in significant changes in light levels or effects at relevant receptors. The site is considered to be within Environmental Zone E4 as defined by GN01:2011. Zone E4 is described as 'High district brightness within town/city centres with high levels of night-time activity'.

5.3. Target Light Levels

The principal design objective for the OLS will be for the luminaires and the overall lighting design to achieve the limitations set for obtrusive lighting for Environmental Zone E4. The achievement of these limitations should ensure that the development does not have significant additional light impacts beyond its site boundaries and should also ensure that a statutory nuisance does not result from such lighting.

There are no new lighting proposals for the site although three existing luminaires within the courtyard area would be moved to facilitate other requirements of the development.

Table 5.1 indicates the design parameters for permanent lighting (as identified in GN01:2011) that the proposed development should continue to achieve in order to allow for the limitations listed for Environmental Zone E4.

Table 5.1: Lighting Specification – Light Intrusion (into windows)

Metric	Parameter	Target
Light Spill/Light Intrusion	E average (lux)	Pre-Curfew – 25 lux Post-Curfew – 5 lux

All new lighting arrangements are expected to provide light levels and uniformity to satisfy statutory requirements, where applicable, as defined by British Standards with regard to vehicular and pedestrian safety.

The general operational phase light level targets and light uniformity requirements are provided in **Table 5.2**. These qualitative lighting metrics are in accordance with the British Standards for various areas and uses that would have a requirement for permanent lighting.

Table 5.2: Operational Phase Target Light Levels

Area Use	E (average, maintained lux)	Uniformity
Site Access	10	0.40
Internal Roads	5 ⁽¹⁾	0.25 ⁽¹⁾
Car Parking	5	0.25 (min)
Building Entrances	50	-
Pathways	5	0.20

Note (1) Road illumination to follow recommendations within BS EN 13201:1 to 4 (2003) with a view to providing the minimum classification required for the application.

5.4. Artificial Lighting Design

The majority of the potential effects created by a new lighting installation can be controlled through the appropriate selection of equipment and careful design and planning. Consideration of how light is distributed from the luminaire as well as encouraging the use of lighting techniques such as casting illumination inward and avoiding placement of luminaires too close to the site boundary will minimise the potential impacts of artificial light on sensitive receptors. As the proposal is to maintain the existing luminaires with very minor relocation of three luminaires within the courtyard area there should not be any significant impacts in respect of light trespass to existing sensitive receptors or the new occupiers of the change of use development.

The lighting of car parks and building entrances in the public realm are likely to form the largest component of exterior lighting. The design of public realm lighting and any other exterior building lighting will have regard to the recommendations of GN01:2011 in order to limit light spill, sky glow and glare through the use of controlled optics, such as baffles, shields and louvres for reducing the impacts of obtrusive light. Recommendations are also made within GN01:2011 for directing light into the required area to avoid uncontrolled and excessive amounts of light.

The strategy for artificial lighting design should adhere to the following overall design principles:

- Utilise 'full-cut' optic luminaires and ensure tilt angles are minimised;
- Utilise luminaires with fully shielded optics (pointing downward) to minimise glare and light trespass;
- Wherever possible, reduce the height of luminaires to restrict light spillage off site;
- Where not required for access or safety at night, all visible external lighting should be turned off and controllable via digital timeclock and/or photocell control;

- Where external lighting is not able to be turned off entirely, e.g. regulatory roadway lighting stipulated and designed by RBC, then dimming should be considered during times of low area or space use;
- Design installations to be no brighter than necessary, i.e. design to the minimum guidance document recommendations required;
- Only light the elements and areas that need illumination for safety and security;
- Ensure correct beam angles are used for floodlights when commissioned, if required;
- Use lighting controls such as photocells and timeclock devices to respect curfew hours, thus adapting lighting to usage and need of the local community and visitors; and
- Minimize blue spectrum light emissions to be more conducive to scientific observations of the dark sky and to provide a better environment for light sensitive species.

5.4.1. Building Lighting – Internal Lighting

The internal lighting installations of change of use buildings would follow conventional good practice design guidance documents. It is anticipated that internal lighting installations would utilise a high degree of lighting controls such as presence/occupancy detection and programmed time clocks to ensure that internal lighting is only 'on' when required.

The placement of the internal lighting would be carefully designed to assist in avoiding light being distributed directly outward through windows to the exterior environment.

6. LIGHTING ASSESSMENT

6.1. Baseline Conditions

A baseline lighting survey was carried out during the evening of the 6th October 2020 in order to record the existing lighting baseline conditions within the courtyard area. The lighting survey was carried out between 2000hrs and 2030hrs. The weather conditions during the lighting survey were very light wispy cloud, mostly a clear sky with visible stars and a temperature of 13°.

Illuminance readings were recorded at thirteen locations around the courtyard area. The light measurements were carried out using a Tecpel 536 Light Meter which complies with the photopic curve referenced by the International Commission on Illumination (CIE). The light meter was further cross calibrated on site with an RS 180-7133 light meter. The light meter was set at a number of maximum lighting levels in order to ensure accurate readings were obtained. Where light level readings were obtained further away from any illumination a maximum Lux level of 20 Lux was set which increases the sensitivity at low Lux levels. Notes were made of the existing sources of artificial light within and around the courtyard site. The monitoring positions were chosen in order to provide a good cross-section within the courtyard area. The vertical illuminance readings (E_v) were obtained at a height of approximately 1.5 m and orientated north, east, south and west, and the horizontal illuminance readings (E_h) were obtained at a height of 1 m.

The monitoring positions can be identified in Error! Reference source not found..

Figure 6.5.1: Light measurement positions

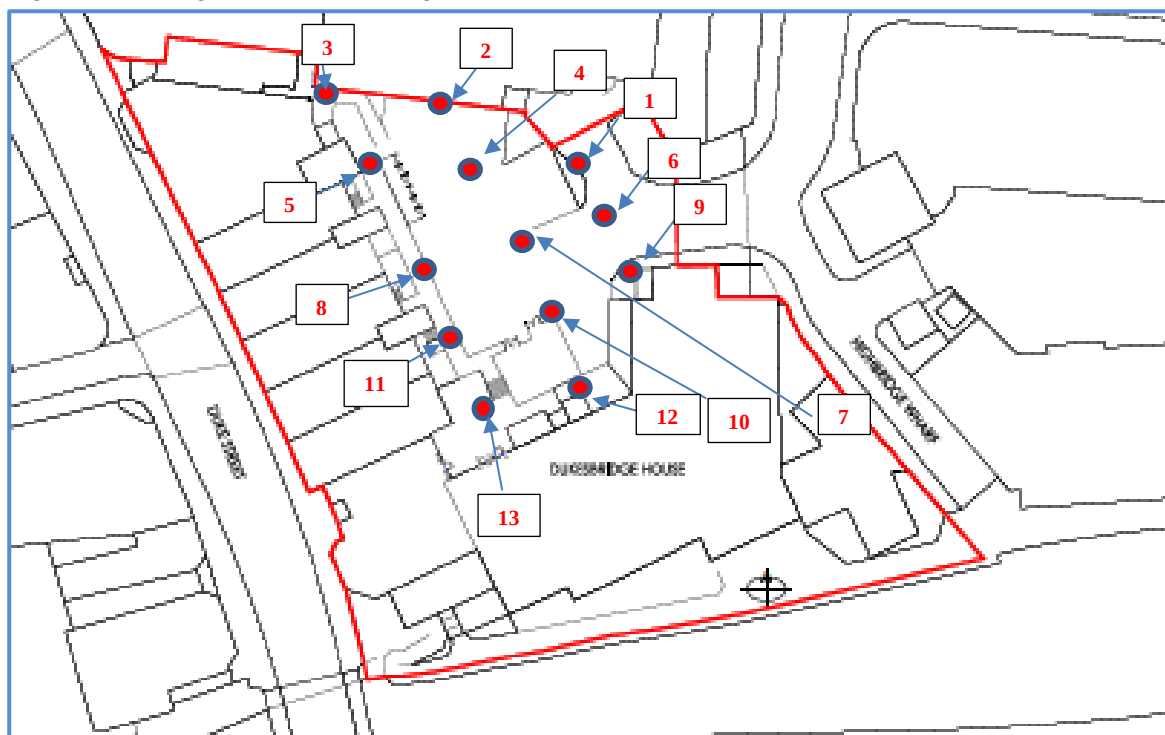


Table 6.3 presents the illuminance readings for the eleven monitoring positions.

Table 6.3: Baseline Vertical and Horizontal Illuminance

Monitoring Position	Vertical Illuminance E_v (lux) at height 1.5 m				Horizontal Illuminance E_h (lux) at height of 1 m
	North	East	South	West	
1	0.98	0.62	0.2.72	3.27	5.18
2	0.90	2.06	5.31	6.70	2.35
3	2.56	2.14	8.17	10.48	7.31
4	3.11	2.23	4.31	8.48	4.14
5	2.02	1.85	11.95	10.03	13.97
6	3.26	3.96	3.50	4.32	2.37
7	2.76	2.46	3.34	7.74	3.69
8	4.26	2.40	4.95	28.1*	20.1*
9	2.99	2.95	3.14	3.69	6.46
10	2.87	3.20	2.64	5.41	3.69
11	4.67	2.90	3.30	0.70	4.76
12	3.08	1.58	5.71	8.47	9.92
13	4.68	4.13	1.04	4.94	8.48

Notes: * Lighting levels dominated by security lighting on rear of commercial premises.

The baseline survey results identified a non-diffuse field of lighting which is dominated by globe luminaires at heights of 2 metres to 4 metres.

In general, the site and the immediate surrounding environment is considered to be within Environmental Zone E4 (refer to Error! Reference source not found.) which reflects its city centre location and as evidenced by the measured light levels.

7. CONCLUSIONS

The proposed change of use proposals have been considered in respect of relevant guidance with respect to lighting and whilst there will be a minor relocation of the existing courtyard area lighting there will be no increased light trespass at sensitive receptors outside of the development.

It is also the case that where a cut-off curfew mechanism is put in place to control the existing luminaires there will be no exceedance of the E4 Environmental Zone guidance levels at any of the change of use properties facing into the courtyard area.

APPENDICES

Appendix 1

Glossary of Lighting Terminology

Term	Description
Illuminance E_v and E_h (lux)	Illuminance is the total luminous flux incident on a surface, per unit area. Illuminance is measured in lux, the unit of measurement of the intensity of light as perceived by the human eye. 1 lux equals 1 lumen per square metre.
Luminous Flux (lumen)	Luminous flux is the measure of the perceived power of light, the luminous energy per unit of time. It is measured in lumen.
Luminous Intensity (candela)	Luminous intensity is the measure of the wavelength-weighted power emitted by a light source in a particular direction per unit solid angle. It is measured in candela, a measure of luminous flux per unit solid angle.
Luminance L_v (cd/m ²)	The measure of luminance intensity per unit area. Luminance is measured in candela per square metre.
Luminaire (lighting fixtures)	A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light.

Examples of lighting levels

Illuminance (lux)	Source of Light
1	Moonlight
10	Subsidiary roads with medium traffic flow
20	Parking area for shopping centre
50	City centre or family living room
100	School circulation halls
200	Railway waiting room
300	Office reception areas
Luminance/Source Intensity	Source of Light
1 candela (cd)	Candle
80 cd	100 Watt incandescent lamp
15,000 cd	Car head lamp



Email: enquiry@accon-uk.com

Reading Office:

Unit B, Fronds Park,
Frouds Lane, Aldermaston,
Reading, RG7 4LH
Tel: 0118 971 0000 Fax: 0118 971 2272

Brighton Office:

Citibase, 95 Ditchling Road,
Brighton, East Sussex, BN1 4ST
Tel: 01273 573 814

www.accon-uk.com