2720 | WOODSTOCK EAST | Lighting Masterplan | 27 November 2014

CONTENTS:

1. INTRODUCTION

Woodstock East is a proposed development of up to 1,500 dwellings including affordable housing and a 116 unit care village with associated publicly accessible ancillary facilities. The site is located on arable land to the south east of Woodstock town. The site boundary has mature trees and hedgerows which create a sense of enclosure.

The proposed development includes a site for a new primary school; up to 930 sqm of retail space; up to 7,500 sqm of locally led employment (B1, B2, B8) space; site for a Football Association step 5 football facility with publicly accessible ancillary facilities; public open space; provision of site for new "link and ride" facility; and associated infrastructure, engineering and ancillary works, with vehicular access provided from Upper Campsfield Road (A4095), Shipton Road and Oxford Road (A44). The site is adjacent to Blenheim Palace, a World Heritage Site. In addition, the site contains a Scheduled Monument, a Roman Villa, which is a completely buried archaeological site located centrally within the site boundaries. London Oxford Airport is also located to the immediate south east of the site.

This lighting masterplan identifies the proposed uses of the site as shown on the West Waddy ADP masterplan, and details the lighting strategy that should be adopted in each area of the development. The lighting masterplan considers the potential environmental impact of electric light on the site, describes how best practice guidlines should be adopted and illustrates ways in which lighting can enhance the amenity of the development with minimal impact on the surrounding area.

The lighting masterplan clearly identifies the character and scale of the roads and footpaths within the development. Details of appropriate illuminance levels and uniformity for all types of road and pedestrian access routes are included, together with illuminance calculations for typical sections of road. Detailed lighting strategies are included for other proposed uses of the site, including the relocated football stadium, commercial area and "link and ride". The intention of the lighting masterplan is to ensure that lighting schemes which are sympathetic to the architectural design and the character of the local area are properly implemented at the detailed design stage of the project .

Illustration: Woodstock East Masterplan superimposed onto a satellite photograph of the area
(Source: West Waddy ADP)

2. RELEVANT LEGISLATION & GUIDANCE

The lighting masterplan for Woodstock East has been developed taking into account relevant design standards, guidelines and best lighting practice.

The following documents were consulted in the preparation of this report:

Code of Practice for Road Lighting:

British Standards Institution, BS 5489-1:2013
"Code of practice for the design of road lighting. Lighting of roads and public amenity areas"

Best Practice Guidelines:

Society of Light & Lighting (formerly CIBSE) Lighting Guides:
LG4 "Sports" 2006;
LG6 "The Outdoor Environment" 1992
LG9: "Lighting for Communal Residential Buildings" 1997
SLL Guide to Limiting Obtrusive Light, 2012

Institution of Lighting Professionals
"Guidance Notes for the Reduction of Obtrusive Light" GN01:2011
"Guidance on Undertaking Environmental Lighting Impact Assessments" PLG04 2013

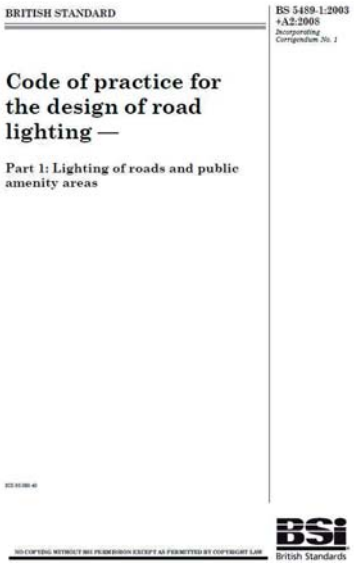
Guidance for Lighting Effects on Bats:

The Bat Conservation Trust
"Landscape & Urban Design for Bats & Biodiversity" August 2012.
Institution of Lighting Professionals/Bat Conservation Trust
"Bats and Lighting in the UK" May 2009.

3. CALCULATION SOFTWARE

The sample illuminance calculations contained in this report were prepared using DIALux "evo 3" (Version 5.3.3.18310 published 2014) which is a widely used proprietry lighting calculation software.

The software is designed to carry out detailed street lighting calculations. Evidence of compliance with BS/EN is embedded in the calculation outputs, and detailed valuation fields are provided to enable the lighting design to be verified.

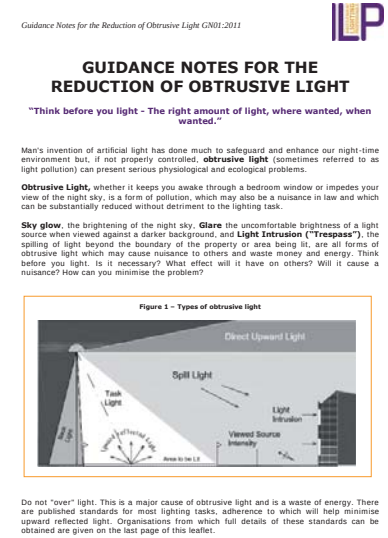

BRITISH STANDARD

BS 5489-1:2003
+A2:2008
Incorporating Corrigendum No. 1

Code of practice for the design of road lighting —

Part 1: Lighting of roads and public amenity areas

BSI British Standards


Guidance Notes for the Reduction of Obtrusive Light GN01:2011

GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

"Think before you light - The right amount of light, where wanted, when wanted."

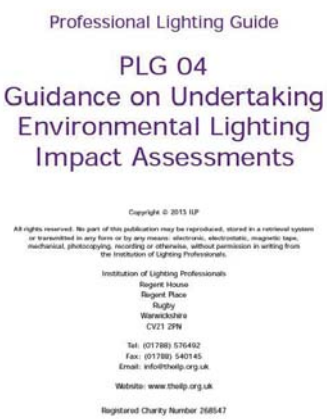
Man's invention of artificial light has done much to safeguard and enhance our night-time environment but, if not properly controlled, **obtrusive light** (sometimes referred to as light pollution) can present serious physiological and ecological problems.

Obtrusive Light, whether it keeps you awake through a bedroom window or impedes your view of the night sky, is a form of pollution, which may also be a nuisance in law and which can be substantially reduced without detriment to the lighting task.

Sky glow, the brightening of the night sky, **Glare** the uncomfortable brightness of a light source when viewed against a darker background, and **Light Intrusion ("Trespass")**, the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive light which may cause nuisance to others and waste money and energy. Think before you light. Is it necessary? What effect will it have on others? Will it cause a nuisance? How can you minimise the problem?

Figure 1 – Types of obtrusive light

Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light. Organisations from which full details of these standards can be obtained are given on the last page of this leaflet.


Professional Lighting Guide

PLG 04
Guidance on Undertaking Environmental Lighting Impact Assessments

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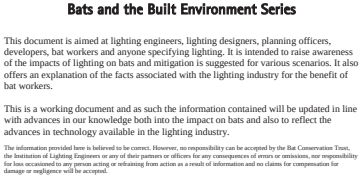
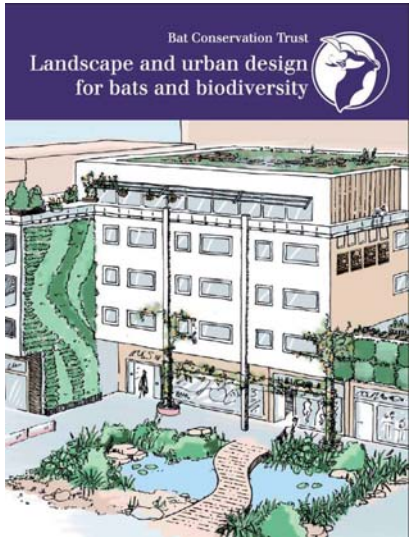
Bat Conservation Trust


BATS AND LIGHTING IN THE UK
Bats and the Built Environment Series

This document is aimed at lighting engineers, lighting designers, planning officers, developers, bat workers and anyone specifying lighting. It is intended to raise awareness of the impacts of lighting on bats and mitigation is suggested for various scenarios. It also offers an explanation of the facts associated with the lighting industry for the benefit of bat workers.

This is a working document and as such the information contained will be updated in line with advances in our knowledge both into the impact on bats and also to reflect the advances in technology available in the lighting industry.

The information provided here is believed to be correct. However, no responsibility can be accepted by the Bat Conservation Trust, the Institution of Lighting Engineers or any of their partners or officers for any consequences of errors or omissions, nor responsibility for loss occasioned to any person acting or refraining from action as a result of information and no claims for compensation for damage or negligence will be accepted.



4. LIGHTING IMPACT ASSESSMENT

A Lighting Impact Assessment (LIA) was carried out at the outset of the project, as part of the overall environmental impact assessment required for the planning application.

The requirement for Environmental Impact Assessments as part of any significant development application such as Woodstock East followed the introduction of EU Directive 85/337/EEC amended in 1997 by EU Directive 97/11/EC. In the UK this is incorporated in the Town & Country Planning Act 1999.

The scope of the assessment for planning purposes includes landscape, ecological, heritage, transport and other elements. There is a specific requirement within the legislation to assess existing and future lighting impacts.

The Lighting Impact Assessment considered the baseline lighting conditions in and around Woodstock town and on the site itself.

The baseline lighting survey was undertaken on Tuesday 12th August 2014 to record existing artificial lighting installations in the area surrounding the development. The survey confirmed the locations of receptors and enabled the local topology, landscape features and built structures to be identified.

The study area was visited during daylight hours and again in the evening. Weather conditions were good, there was partial cloud cover and general visibility was good. The moon and stars were visible.

Taking the centre of the site as a starting point, potential receptors in close proximity were confirmed using information previously prepared during the desk based study. The survey team then prepared a photographic record of the baseline condition on the site and in the surrounding area. Existing lighting types were identified and illuminance (Lux) and luminance measurements (Candelas/m2) were taken of typical areas using calibrated light meters.

Details of the baseline assessment, evaluation of existing lighting in and around Woodstock town and recommendations for mitigation are included in the Lighting Impacts chapter of the Woodstock East Environmental Impact Assessment prepared by West Waddy ADP on behalf of the client.

Daytime view of the site looking towards London Oxford Airport

Daytime view of the site looking towards Shipton Road

Neighbouring dwellings in Churchill Gate

Daytime view of the Oxford Road looking east towardsThe Punchbowl.

4. LIGHTING IMPACT ASSESSMENT

During the night time Lighting Impacts survey, illuminance levels in the streets surrounding the site and in Woodstock town were recorded. The adjacent diagram shows areas that are illuminated and areas that are currently dark.

The existing site is in use as farmland and is a dark landscape surrounded by trees and hedgerows.

The proposed development will necessarily need electric light for reasons of safety, security and public amenity.

This lighting masterplan has therefore been developed to ensure that any adverse lighting impacts are mitigated through the application of best lighting practice and good design.

The intention of the lighting masterplan is that the Woodstock East development should be an exemplar of best lighting practice which incorporates energy efficient lighting controlled by "state of the art" web-based lighting control systems which adapt light levels on the site to traffic patterns and the time of day in order to mitigate possible adverse impacts.

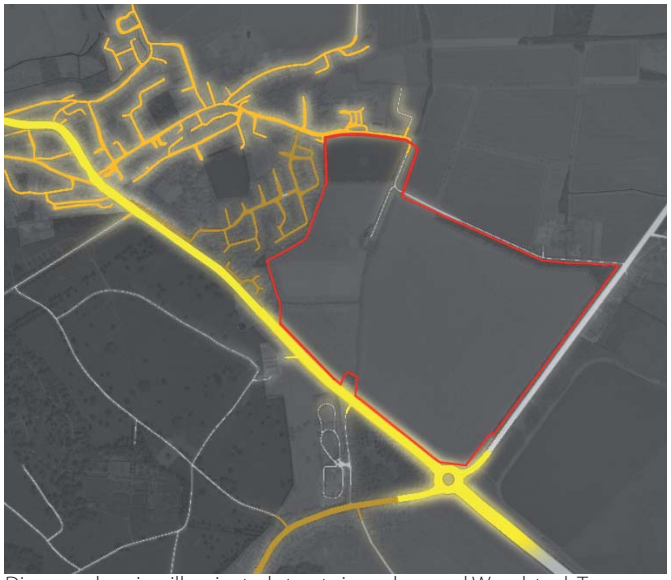


Diagram showing illuminated streets in and around Woodstock Town

Night time view of the site looking towards London Oxford Airport

Neighbouring dwellings in Churchill Gate at night

Night time view of the Oxford Road looking east towardsThe Punchbowl.

5. LIGHTING DESIGN PRINCIPLES

The following principles should be adopted by lighting designers during the design stages of the project:

- Provide light appropriate for the task
- Avoid light spill and light pollution
- Consider the identified hierarchy of illuminance levels
- Use efficient luminaires and light sources
- Respect the dark areas of the site identified in the masterplan
- Use intelligent lighting control systems
- Avoid potential hazard to the adjacent airport
- Consider ecological impacts

Electric light should only be used where necessary on the site in order to provide lighting for safety, security and amenity.

Amenity areas and roads with a greater amount of traffic should be lit to higher levels of illuminance than the quieter residential areas. A hierarchy of illuminance levels is defined in Section 8.

High efficiency optically efficient pole top luminaires with a shielded downward light distribution should be utilised throughout the development. The use of opalescent luminaires or luminaires which have light distribution above the horizontal plane should be avoided.

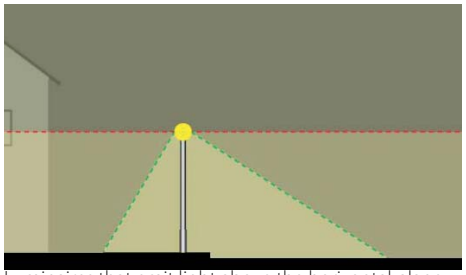
The scale of the street lighting columns specified should be significantly smaller than the existing street lighting columns used on the adjoining "A" roads and in keeping with the rural character of the development as a whole.

Good colour rendering LED light sources (Ra80 and above) mounted within optically efficient reflectors should be specified. The luminaires should have an appropriate light distribution for each application and avoid light spill into surrounding areas.

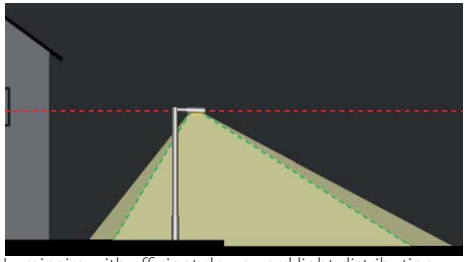
The task area should be lit to suitable levels of illuminance and uniformity as detailed in the following sections of the lighting masterplan.

Flat glass luminaires should be specified and anti-glare cowls and louvres use where necessary.

Significant parts of the site should remain unlit at night in keeping with intrinsically rural character of the development on the surrounding area.



Luminaires that emit light above the horizontal plane should not be used.



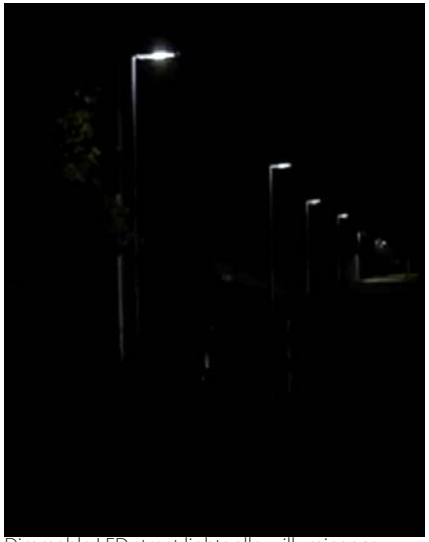
Luminaire with efficient downward light distribution

Luminaires utilise optically efficient street lighting optics to minimise light spill and maximise efficiency

Dimmable LED street lights wall mounted in commercial areas to miminise street furniture

Dimmable LED street lights provide higher levels of illuminance when traffic flow is greater.

Dimmable LED street lights with controlled downward light distribution.



Dimmable LED street lights allow illuminance levels to be reduced later in the evening.

6. ECOLOGICAL CONSIDERATIONS

The project ecologist has identified existing bat foraging and commuting routes across the site as part of the Environmental Impact Assessment.

There is a primary route running from the south to the north along existing hedgerows and a secondary route running from east to west as shown on the adjacent diagram. These routes must remain dark in order to avoid disturbance to bat foraging activity. Ideally levels of illuminance should not exceed illuminance levels acheived under a full moon i.e. no greater than 0.5Lux.

For the north/south corridor it is suggested that a continuous dark zone should be created on the site. This could be acheived by planting a hedgerow which would shield light spill from the surrounding areas of the site. The introduction of berms and other landscape features can assist in maintaining a dark zone for the commuting and foraging bat population.

The existing commuting routes crosses the primary road through the development near the retail development and the care home.

A detailed study has been undertaken to ascertain the levels of illuminance in the vertical plane above the illuminated road surface.

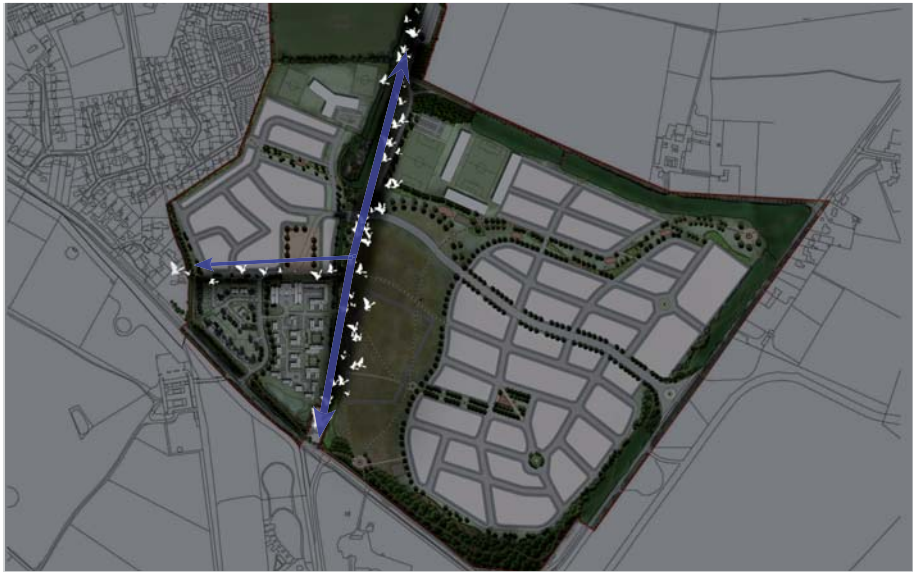
5 metre tall lighting columns utilising LED luminaires with an efficient street lighting optics are proposed to illuminate the primary road. The columns are mounted in a staggered arrangement 15 metres apart.

The horizontal illuminance levels acheived on the road surface are in accordance with BS5489.

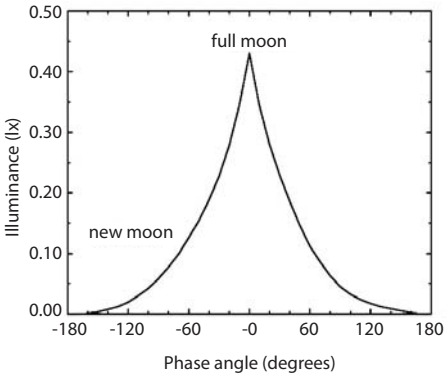
A vertical calculation surface was inserted in the computer model of the primary road, extending across the full width of the road up to a height of 15 metres from ground level. Illuminance values in the vertical plane were measured. It is estimated that levels of illuminance at 4-5 metres from ground level at the mid point between lighting columns are similar to that of the the full moon. This is likely to be the height of the tree canopies adjacent to the main road.

Contd/....

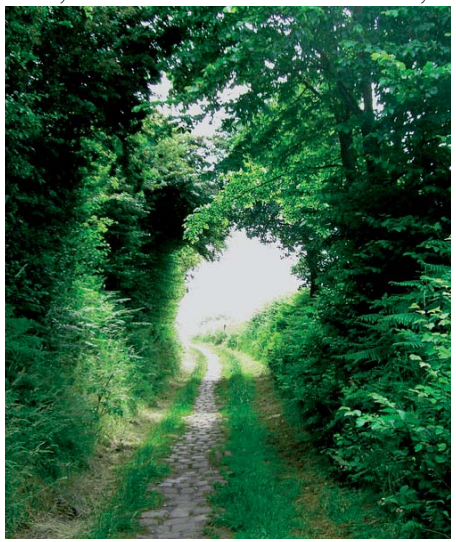
A Common pipistrelle bat in flight



The location of existing bat commuting routes identified in the Environmental Impact Assessment. Primary route in North - South direction. Secondary Route



Earth surface illuminance from the moon.



Overhanging tree canopies encourage bat foraging

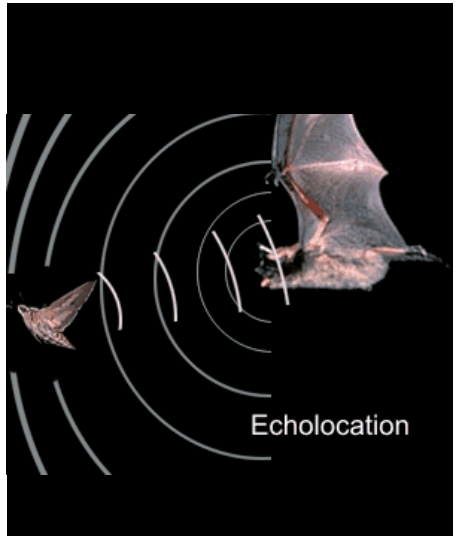


Diagram showing echo location technique of bats.

6. ECOLOGICAL CONSIDERATIONS

It is therefore recommended that clusters of trees should be planted at the intersection of the bat commuting route and the main road and that the street lighting columns should be set out such that the mid-point between two lighting columns is aligned with the intersection with the bat comuting route.

The diagram opposite illustrates the vertical calculation surfaces used in the computer model and shows the height above the road surface at which acceptably low levels of vertical illuminance are acheived.

In addition, encouraging the tree canopies to grow over the carriageway will further assist in reducing light spill into the bat commuting route.

An alternative strategy which is often adopted in Europe is to simply not illuminate the affected areas of the site. However, initial calculations indicate that it is possible to illuminate the carrriageway and achieve acceptably low levels of illuminance on the bat foraging route.

Key to Illuminance Values:

Bright Areas

Acceptable Areas

Dark Areas

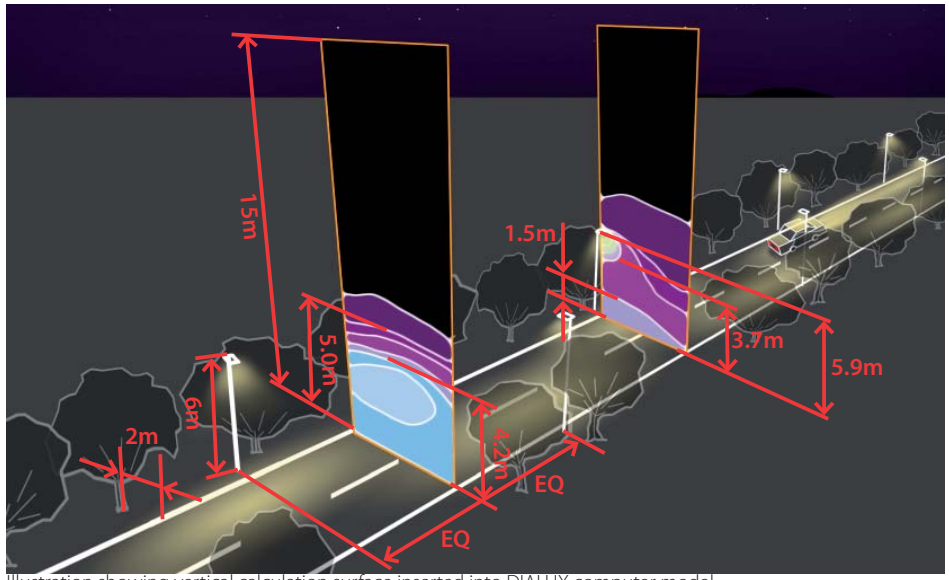
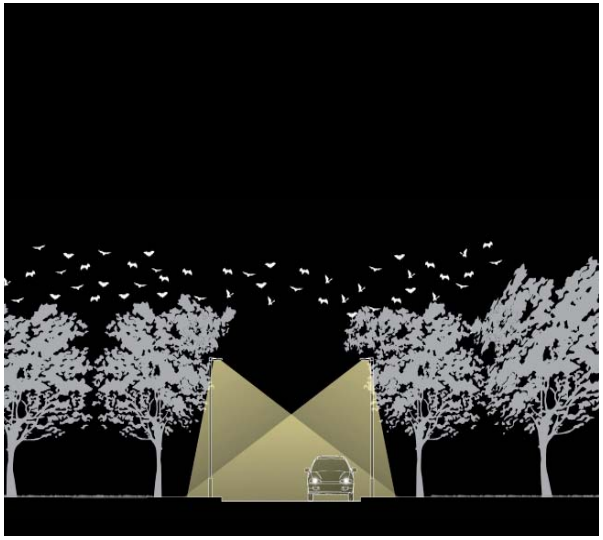


Illustration showing vertical calculation surface inserted into DIALUX computer model.
(Note: False colour rendering shows acceptable levels of illuminance above 4.5 metres)

Sketch cross section showing proposed hedgerow
which creates a dark commuting route for bats



Sketch cross section of "primary road" at bat corridor

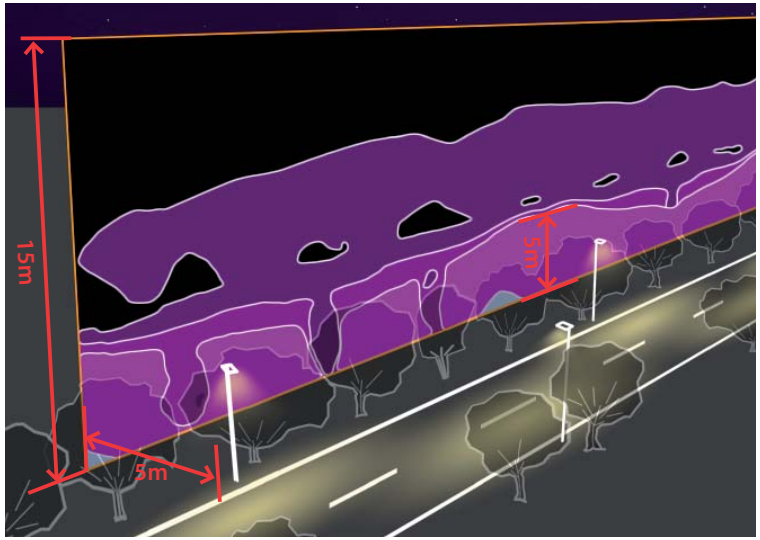


Illustration showing vertical calculation surface inserted into DIALUX computer model.
(Note: False colour rendering shows acceptable levels of illuminance above 5 metres)

7. SITE ANALYSIS: USES

The different uses of the development were identified at the outset.

Roads are classified as either "primary", "secondary" or "tertiary" and different illuminance levels and lighting strategies proposed for each. Generic luminaire types are proposed and sample calculations included in the masterplan.

A hierarchy of "brightnesses" is proposed according to the uses of each space and it is proposed that significant parts of the site should be left unlit.

The local context and the potential impact on neighbouring properties have been considered in developing the lighting strategy for Woodstock East.

Map Legend:

- Roundabout
- Primary Routes
- Secondary Routes
- Tertiary Routes
- Commercial: 'Link & Ride'
- Sports Ground
- Scheduled Monument
- Care Village
- Local Centre
- Primary School
- Site Boundary

Lighting Masterplan: Identified Typologies on the site

8. MASTERPLAN: LIGHTING HIERARCHY

A hierarchy of brightnesses is proposed for Woodstock East, with the more active areas of the site which have greater traffic flow and pedestrian use illuminated to relatively higher levels than areas which are quieter, such as the residential streets.

The primary route leading from the roundabout on the Upper Campsfield Road (A4095) to Shipton Road should be illuminated to a higher level of illuminance relative to the other streets on the site. The roundabout itself should be lit to similarly high levels.

The secondary routes leading from the central spine to the residential streets should be illuminated to a lower level. It is suggested that the residential streets identified as tertiary routes should be lit to the lowest levels of illuminance in the street lighting hierarchy.

The commercial area with "link and ride" and the retail hub are active areas of the site which should be lit to higher levels of illuminance compared to the residential streets.

The sports ground necessarily needs to be illuminated to relatively high levels. 180 Lux is required for matches and 120 Lux for training sessions. However, care must be taken to avoid light spill beyond the pitch into surrounding areas of the site.

Care must be taken to avoid potential hazard to pilots taking off and landing at the adjacent London Oxford Airport. No lighting should be specified that could be confused with airport signal lights, for example, blue taxiway lights. Lighting columns should not be arrayed in such a way that they might be confused with runway approach lighting i.e. columns should not be set out opposite each other, but in a staggered array. The use of high structures should also be avoided on the site.

The use of lighting that could be confused with airport runway lighting must be avoided on the site at all times.

Map Legend:

01. Primary Road
02. Secondary Routes
03. Tertiary Routes
04. Roundabout
05. Commercial: 'Link & Ride'
06. Sports Ground
07. Retail Hub

Lighting Masterplan: Hierarchy of Brightness

9. MASTERPLAN: ZONES OF DARKNESS

It is proposed that significant areas of Woodstock East should remain unlit.

Areas of darkness have been considered alongside the hierarchy of "brightnesses" proposed for the lit areas of the development.

The existing trees and hedgerows at the perimeter of the development already create a dark boundary. The landscape design for the development is adding more trees and planting elements which will further enhance this feature of the site.

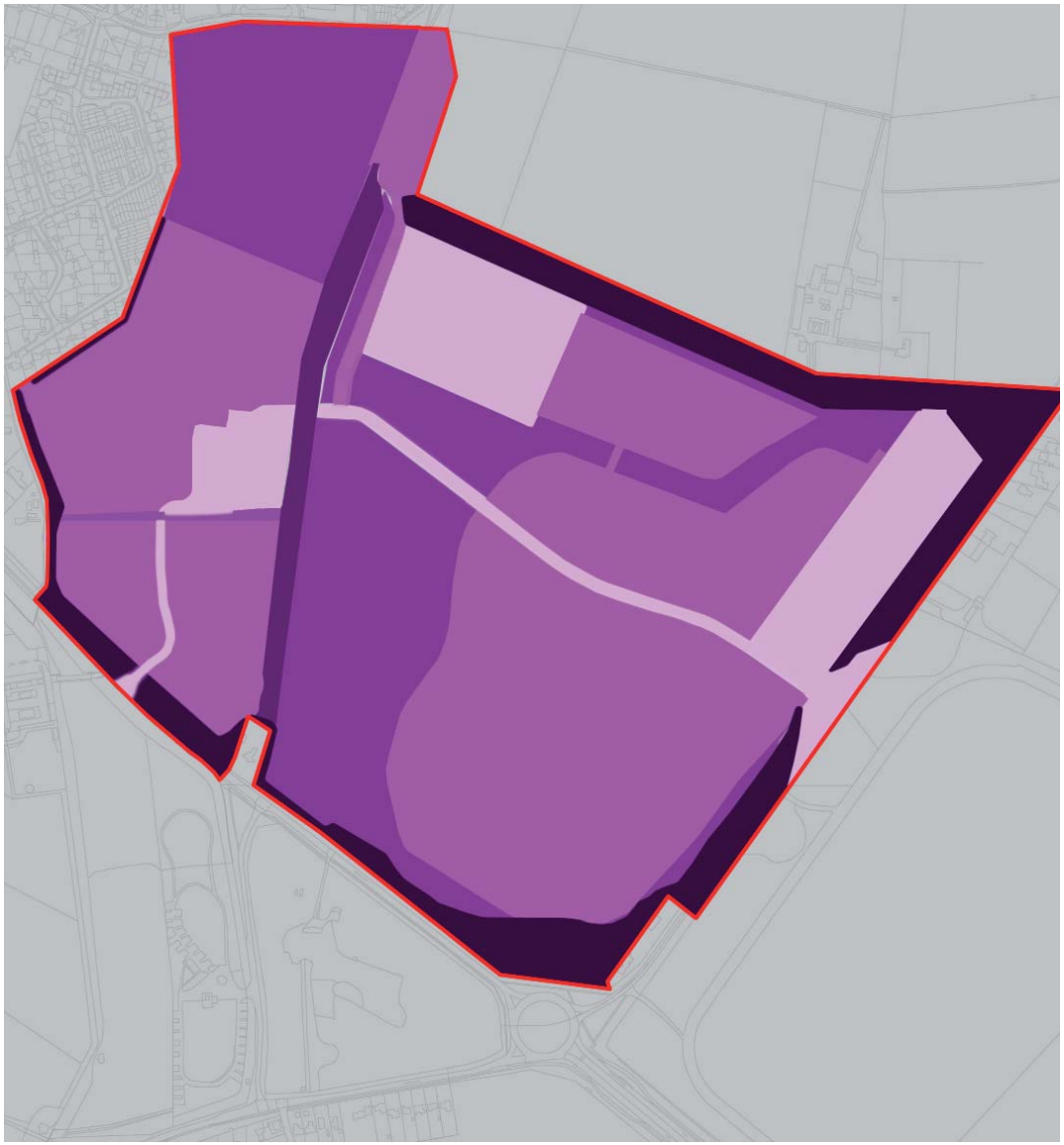
Identified bat commuting routes will be left dark. The central section of the site containing the scheduled monument will also be dark.

Residential gardens which comprise a large area of the site will also be dark at night.

The diagram opposite identifies the unlit areas of the development.

Map Legend:

- Dark boundary
- Bat corridor
- Secondary bat corridor
- Unlit zone
- Low level lighting zone
- High level lighting zone
- Site Boundary



Lighting Masterplan: Dark Zones

10. ROUTE LIGHTING: PRIMARY ROADS

The primary route should be lit with good colour rendering LED street lights mounted onto 6 metre tall columns.

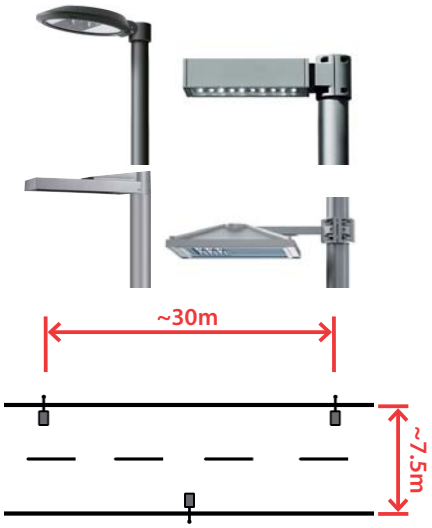
Possible luminaire types are shown opposite. The luminaires specified should have optically efficient street lighting optics with no light spill above the horizontal plane.

A staggered arrangement of columns is proposed as illustrated on the adjacent plan.

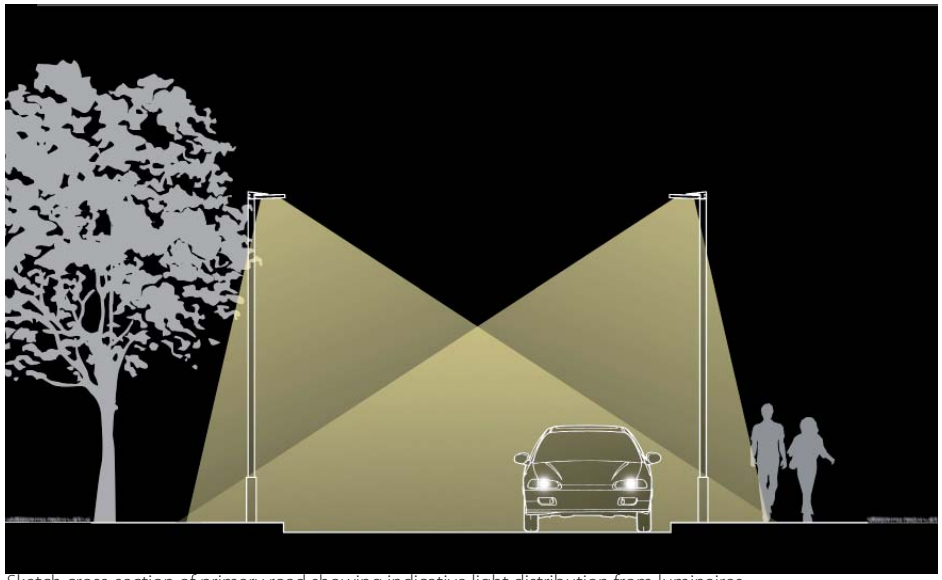
The use of an intelligent lighting control system is proposed as described in Section 19.

The colour finish of the lighting columns will have a significant impact on the daytime appearance of the scheme. If the installation is to be generally seen against the sky, then lighter colours such as Silver RAL9006 should be specified. Darker colours should be specified when the luminaires and lighting columns will be viewed against vegetation such as trees and hedgerows.

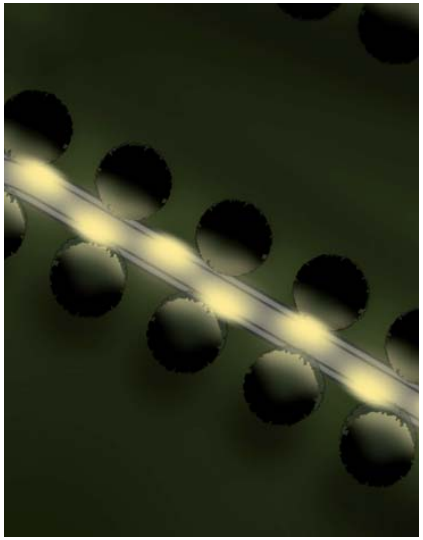
Sample illuminance calculations are included in Section 13.



Suitable luminaire types and recommended mounting arrangement.



Sketch cross-section of primary road showing indicative light distribution from luminaires.



Sketch plan showing lighting arrangement

Column positions coordinated with tree locations

Road surface illuminated with minimal light spill into surrounding areas.

11. ROUTE LIGHTING: SECONDARY ROADS

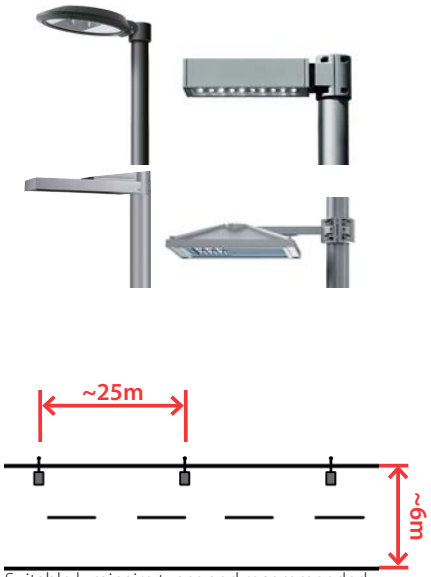
The secondary routes should be lit with good colour rendering LED street lights mounted onto 5 metre tall columns, as proposed for the primary road.

Possible luminaire types are shown opposite. The luminaires specified should have optically efficient street lighting optics with no light spill above the horizontal plane.

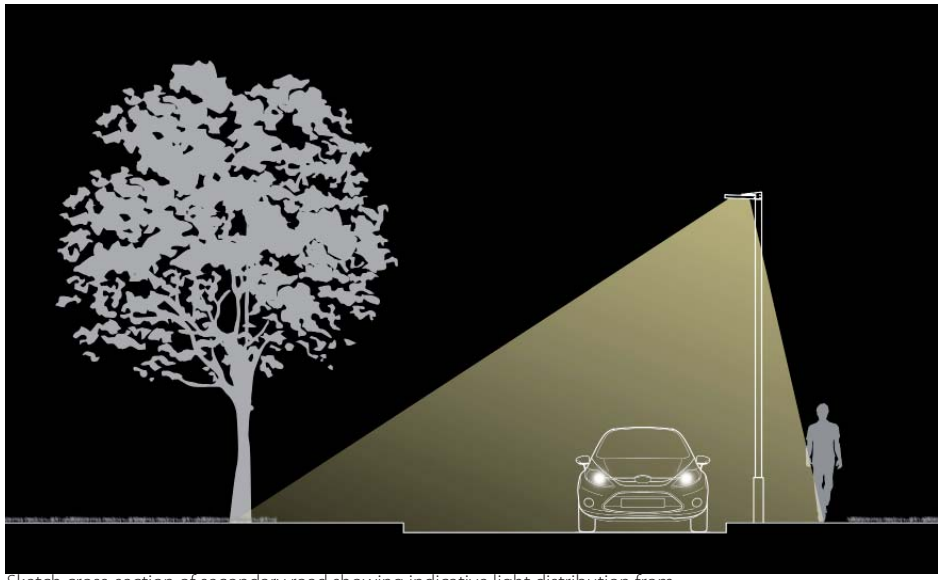
A single row of columns is proposed for the secondary roads in contrast to the staggered arrangement adopted for the primary route through the site.

The use of an intelligent lighting control system is proposed as described in Section 19.

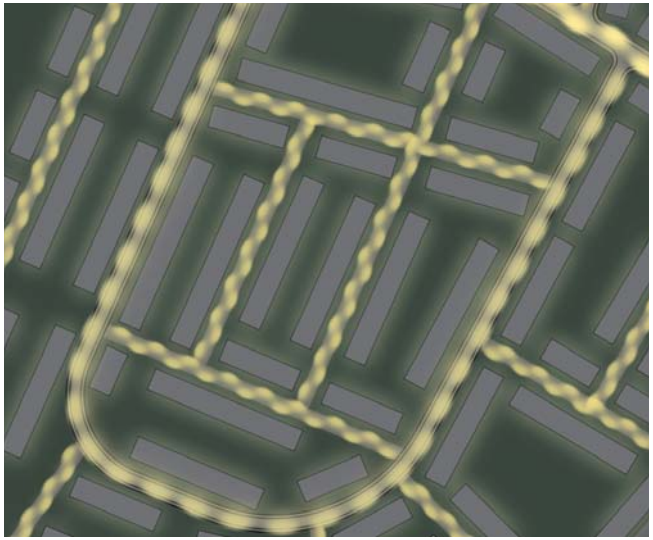
Sample illuminance calculations for the secondary routes are included in Section 13.



Suitable luminaire types and recommended mounting arrangement.



Sketch cross-section of secondary road showing indicative light distribution from luminaires.



Sketch plan showing lighting arrangement for secondary and tertiary roads

Lighting columns installed on one side of the secondary routes.

12. ROUTE LIGHTING: TERTIARY ROADS

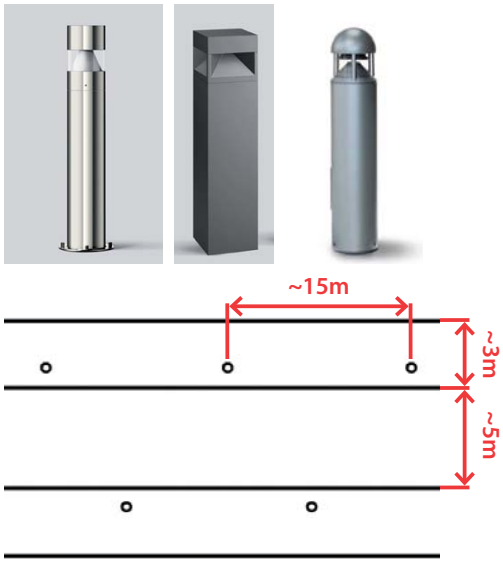
The residential streets of Woodstock East will have much less traffic during the hours of darkness than the primary and secondary routes on the site.

It is therefore proposed that lighting bollards with an optically efficient downward light distribution are used in these tertiary areas.

Possible luminaire types are shown opposite. Luminaire locations should be coordinated with planting elements and the landscape design of each street.

The use of an intelligent lighting control system is proposed as described in Section 19.

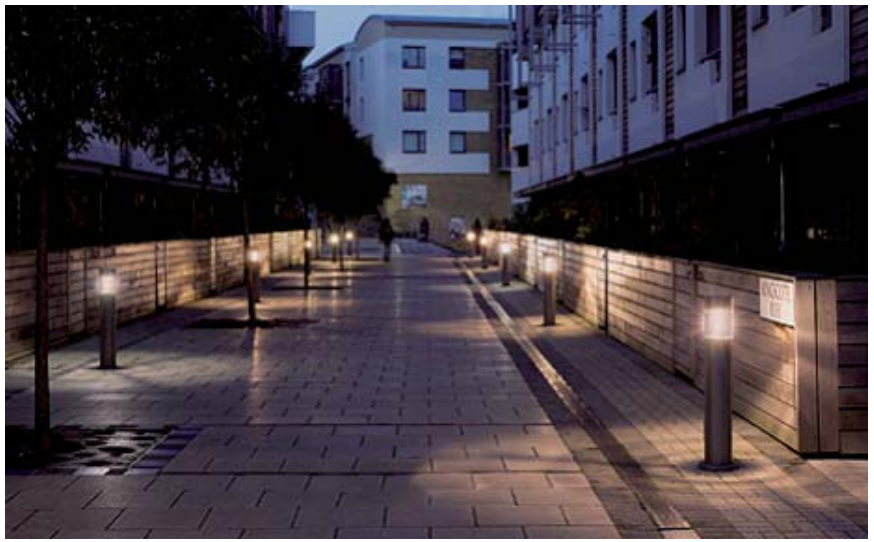
Sample illuminance calculations for the tertiary roads are included in Section 13.



Suitable luminaire types and recommended mounting arrangement.

Sketch cross-section of tertiary road showing indicative light distribution from luminaires.

Sketch plan showing lighting arrangement for secondary and tertiary roads



Precedent project utilising lighting bollards in residential area.

13. ROUTE LIGHTING: SAMPLE CALCULATIONS

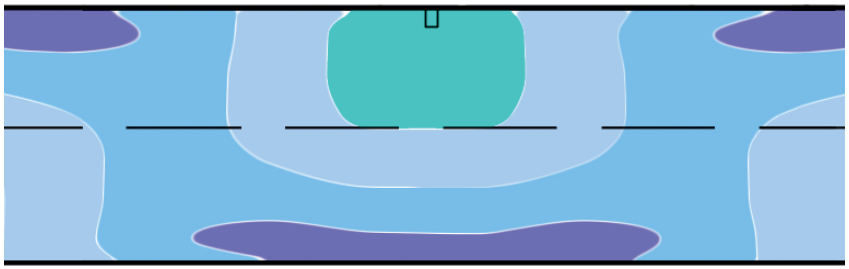
Sample illuminance calculations have been undertaken for sections of the primary, secondary and tertiary routes.

The design illuminances used have were determined by using the methodology published in BS 5489-1:2013 "Code of practice for the design of road lighting. Lighting of roads and public amenity areas".

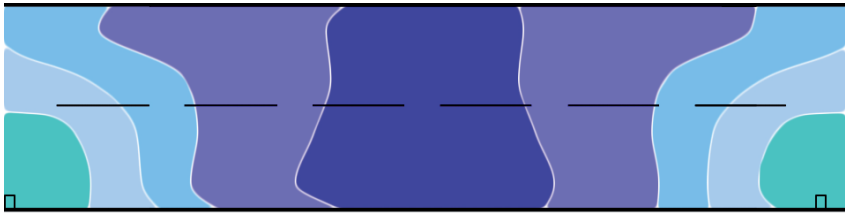
The target illuminance and uniformity values are summarised in the table below, alongside the actual calculation results.

Illuminance levels (Lux)

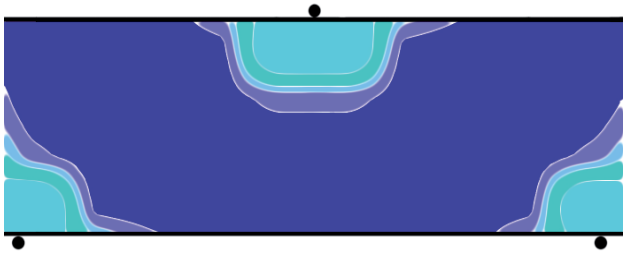
- 50.00lx
- + 30.00lx
- + 20.00lx
- + 15.00lx
- + 10.00lx
- 5.00lx



Road Surface Illuminance: Primary Route

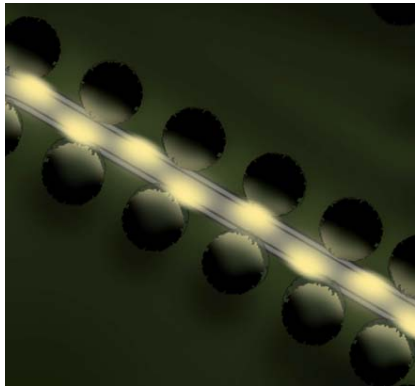


Road Surface Illuminance: Secondary Route

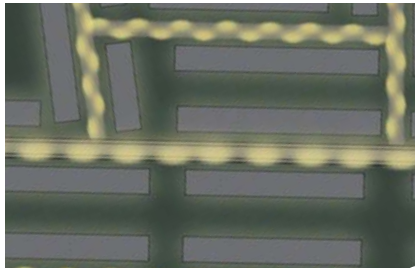


Road Surface Illuminance: Tertiary Route

British Standards Streetlighting		
	Ave. Illuminance	Disability Glare
Primary Road	15	15
Results	**20**	**8**
Secondary Road	10	15
Results	**14**	**7**
Tertiary Road	7.5	15
Results	**11**	**12**



Primary Route Plan



Secondary Route Plan

Tertiary Route Plan

14. ROUTE LIGHTING: NEW ROUNDABOUT

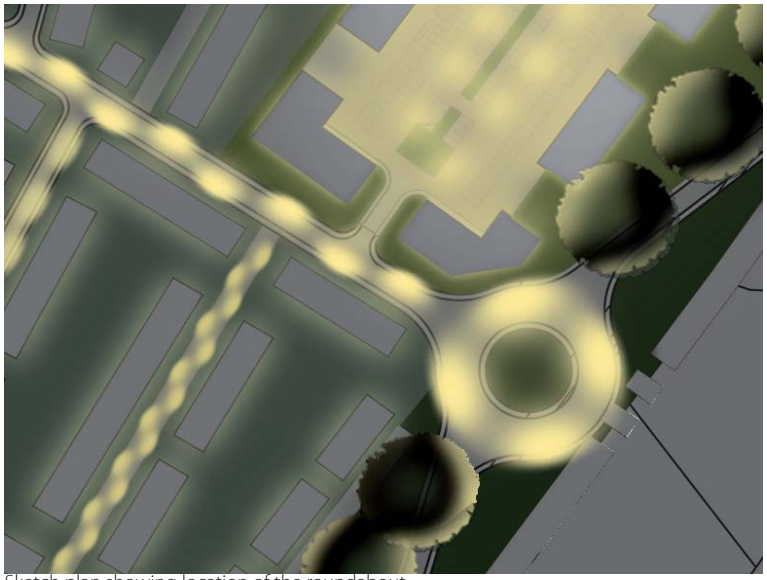
It is proposed to illuminate the new roundabout at the junction of Upper Campsfield Road using 4 no. 5 metre tall columns with high effeciency LED street lanterns. Illuminance levels of 15-20 Lux on the carriageway should be acheived.

It is currently proposed to leave the remainder of Upper Campsfield Road unlit as per the current baseline condition.

Consideration should be given to planting trees around the perimeter of the roundabout to partially conceal views of the lighting columns during the daytime.

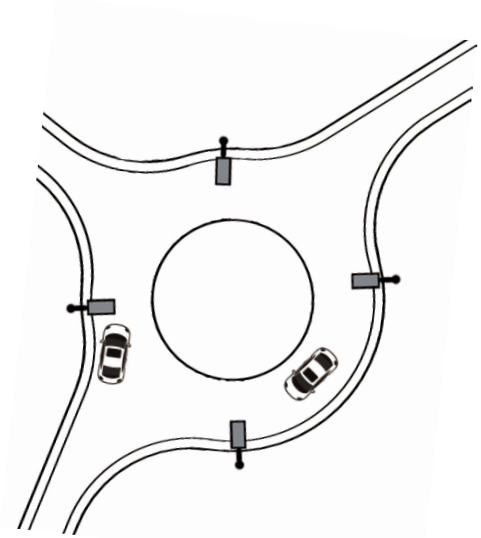
Extending the new lighting installation south to include Bladon roundabout at the junction of the A44 could also be considered as part of the future development of the site. This would create a unified appearance to the street lighting at the southern end of Upper Campsfield Road.

Proposed LED street lighting types



Sketch plan showing location of the roundabout

Roundabout lighting (precedent project)



Sketch plan showing location of proposed street lighting columns

15. COMMERCIAL AREA & "LINK & RIDE"

The proposed commercial area is located on the eastern boundary of the site adjacent to Upper Campsfield Road.

The area comprises a central car park and "link and ride" facility which is surrounded on four sides by small business, general industrial, storage and distribution units (B1, B2, B8). This effectively creates an enclosed courtyard for the commercial activity on the site.

It is proposed to illuminate the central area of the courtyard using twin headed LED street lights mounted onto 5 metre high lighting columns located on the central kerb zone.

The perimeter of the space is illuminated by wall mounted LED street lights with an asymmetric forward throw.

It is proposed to control the lighting of this area using an intelligent web-based lighting control system with absence detection that would monitor activity within the commercial area and dim the lighting to a dormant state when the space is not occupied and after an agreed curfew (See section 19).

Proposed LED street lighting types

Commercial courtyard brightly lit when occupied

Commercial courtyard dimmed "post curfew"

Precedent project

Commercial courtyard brightly lit when occupied

Commercial courtyard dimmed "post curfew"

15. COMMERCIAL AREA - "LINK & RIDE"

It is proposed to illuminate the commercial courtyard to an average illuminance level of 10 Lux.

A sample illuminance calculation using the proposed LED street lighting types is included on this page.

The levels of illuminance and the lighting uniformity acheived comply with BS 5489-1:2013 "Code of practice for the design of road lighting. Lighting of roads and public amenity areas".

British Standards		
Car Park with medium traffic		
	Ave. Illuminance	Uniformity
Car Park	10	0.25

Commercial courtyard illuminance calculation
(False colour rendering showing illuminance values)

16. SPORTS GROUND - FOOTBALL PITCH

Old Woodstock Town Football Club is being relocated to a new sports ground proposed for the northern side of the site adjacent to Shipton Road.

The playing fields will be illuminated to the standards required by the Football Association for "Step 5" football league teams (See summary table below).

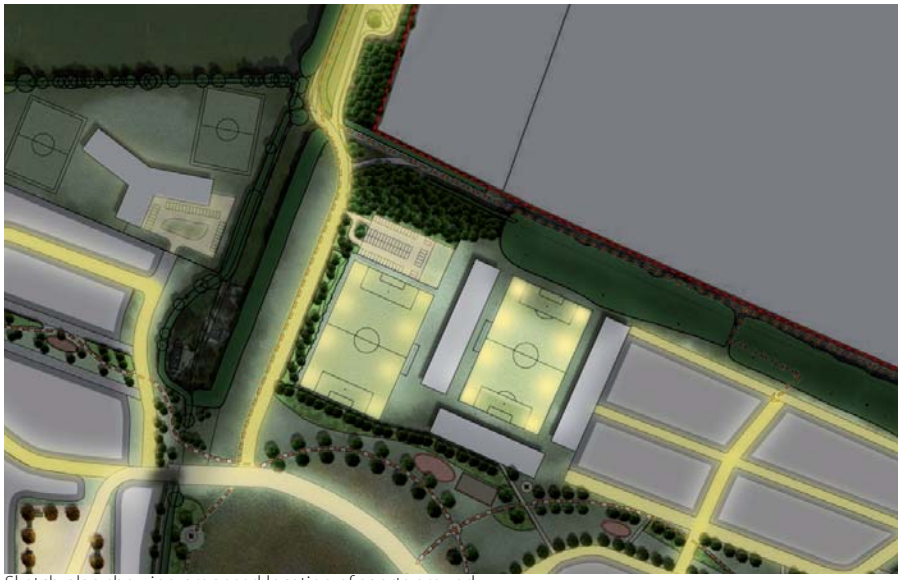
Detailed illuminance and light spill calculations have been carried out to ascertain firstly illumination levels on the pitch and determine potential light spill into the surrounding area. The calculations have assumed that Old Woodstock Town's existing floodlighting system will be reinstalled on the new site.

The pitch lighting uses 6 no. 15 metre tall lighting columns, each with 3 no. asymmetric 2,000W metal halide projectors.

The required levels of illuminace on the pitch are achieved and the calculations show that when barrier planting (a row of trees) is placed around the perimeter of the sports ground, there is no significant light spill beyond the boundary.

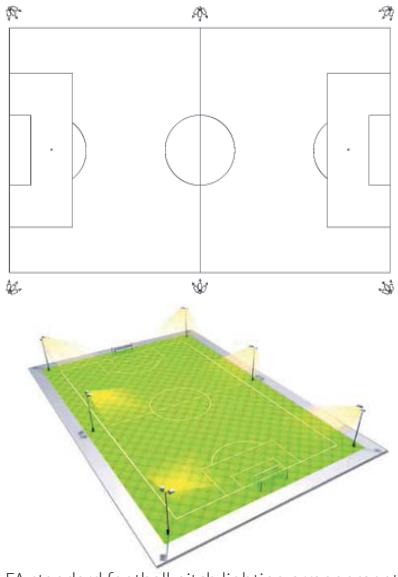
See detailed calculations on the following page.

The FA Guide to floodlighting			
Step 5 Football			
	Ave. Illuminance	Uniformity	Requires Testing
Match	180 lux	0.25	Every two years
Training	120 lux	0.25	Every two years



Sketch plan showing proposed location of sports ground.

Football pitch floodlight (precedent project)



FA standard football pitch lighting arrangement.

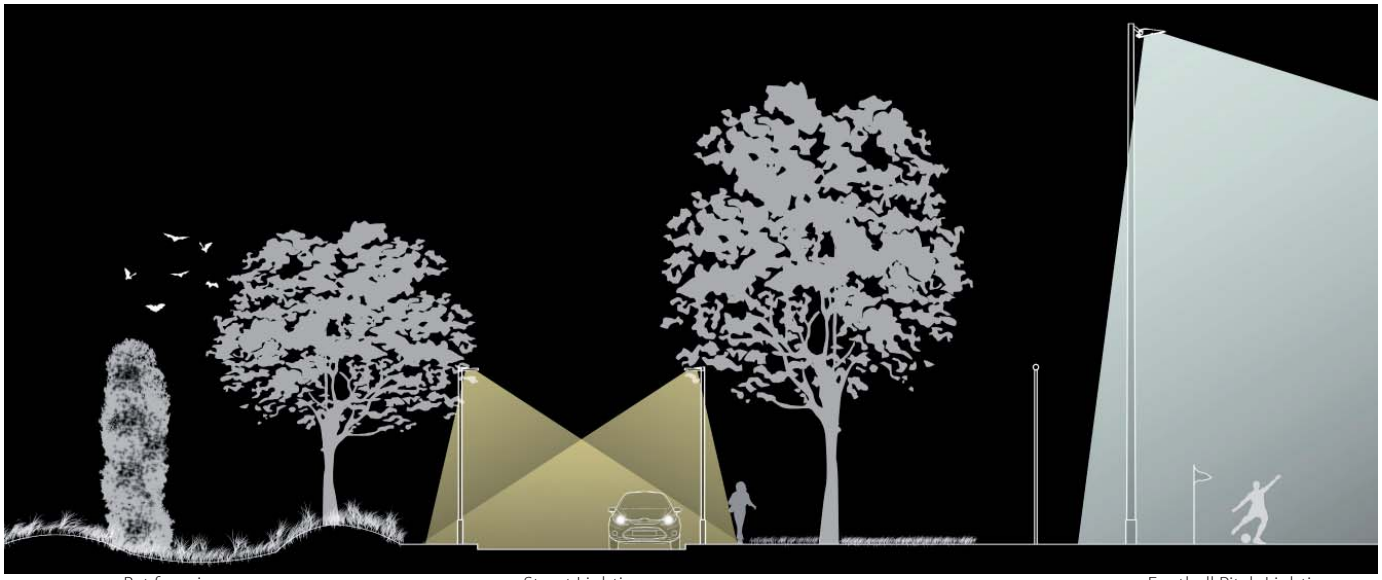
Typical floodlight types
Metal halide (top) and LED (below).

17. SPORTS GROUND - CALCULATIONS

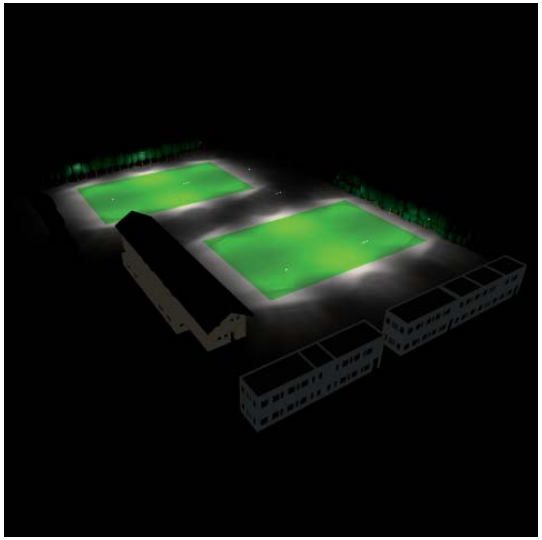
Detailed illuminance calculations for the sports pitches are shown on this page.

A computer model was constructed which included both of the sports pitches, trees at the boundary and dwellings and sports club buildings at the locations that they are indicated on the architectural masterplan.

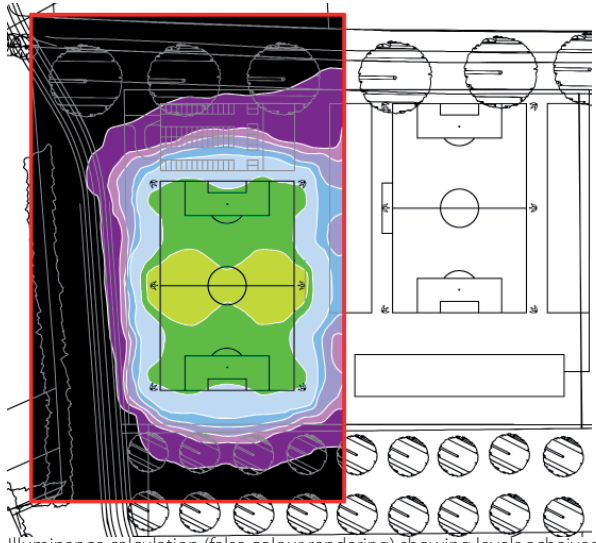
It can be seen from the calculation result that there is no significant light spill beyond the boundary of the sports club assuming that floodlights with an appropriate light distribution are installed at the correct mounting heights and aiming angles.



Bat foraging zone Street Lighting Football Pitch Lighting



Greyscale rendering showing football pitch lighting in context.



Illuminance calculation (false colour rendering) showing levels acheived

18. LOCAL CENTRE

Up to 930 sqm of retail space is proposed for Woodstock East.

The mounting height and spacing of the street lighting should be coordinated with the architectural design of the retail units. The use of wall mounted luminaires will reduce the amount of street furniture and reduce clutter in this zone. This is a strategy currently adopted in parts of Woodstock town.

Car parking areas should be illuminated according to the principles adopted for the commercial area on the eastern side of the site.

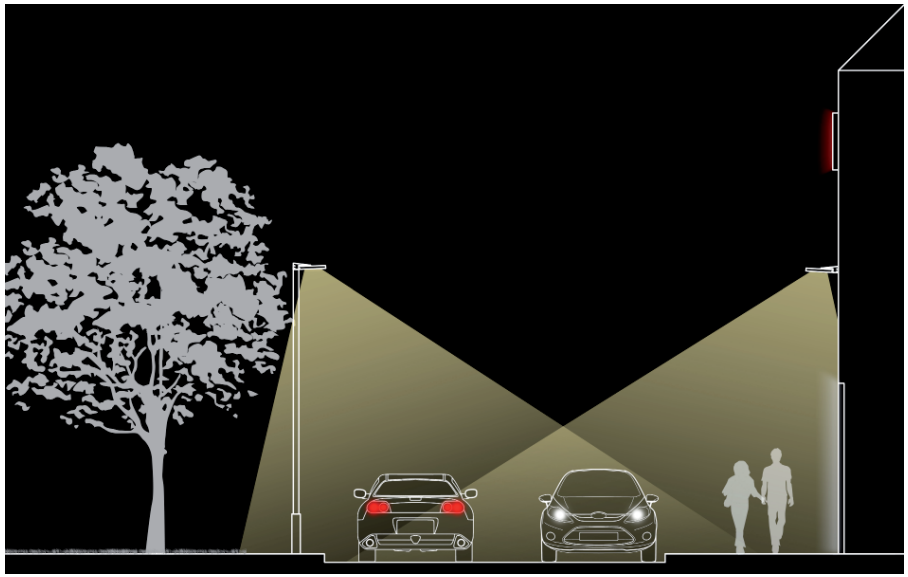
Illuminated shop signs should be located in positions not visible from open countryside i.e. concentrate signage at public entrance to commercial units and ensure they do not face outwards towards the site boundary.

External lighting elements should have solar time clock controllers or PIR sensors to ensure that luminaires and signage remain off during daylight hours and are switched off or dimmed after normal working hours. See Section 19 overleaf.

Lighting provision for parking areas should utilise high efficacy pole top luminaires with a shielded downward light distribution as suggested for other areas of the site.

It is important to retain a dark zone as far as possible for the existing bat commuting route immediately to the north of the care village. Dense landscaping will be required in this area and care should be taken to avoid light spill from the street lighting into this ecologically sensitive area at night.

Proposed LED street light types



Sketch section showing wall mounted luminaires on retail units in combination with column mounted units

Illuminated shop signage

Wall mounted lighting for retail units
(precedent project)

Wall mounted lighting for retail units
(precedent project)

19. INTELLIGENT LIGHTING CONTROLS

The use of LED light sources in exterior lighting systems is already widespread in the UK. This use of electronics provides significant new opportunities for innovative lighting controls and real-time monitoring of external lighting systems.

As an exemplar development of it's type, it is proposed that Woodstock East should adopt this new technology.

Internet based street lighting management systems can adapt lighting levels to traffic patterns and the time of day. The lighting control system can also provide automatic notifications of faults and luminaire failures.

In areas such as the commercial courtyard, the use of absence/ presence detection can also be considered.

The use of high efficiency LED luminaires in combination with intelligent lighting controls will substantially reduce energy use overall, ensuring that Woodstock East is a sustainable development.

Site Plan: Exterior Lighting in "active" mode

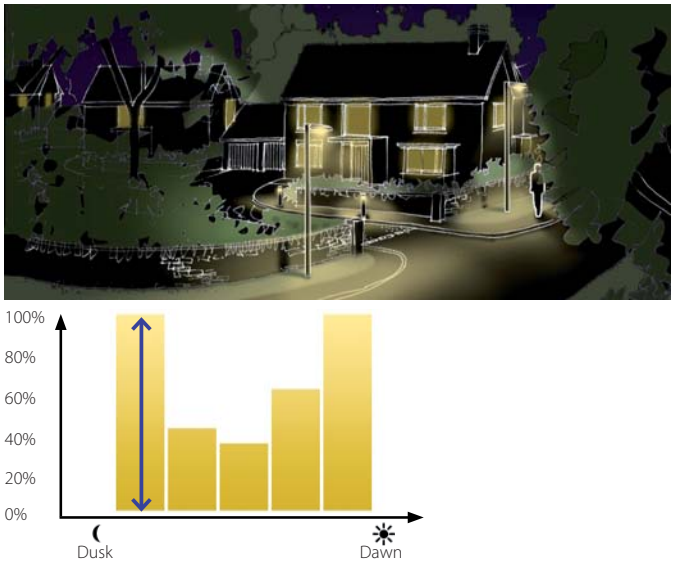


Diagram: Exterior Lighting in "active" mode

Site Plan: Exterior Lighting in "dormant" mode

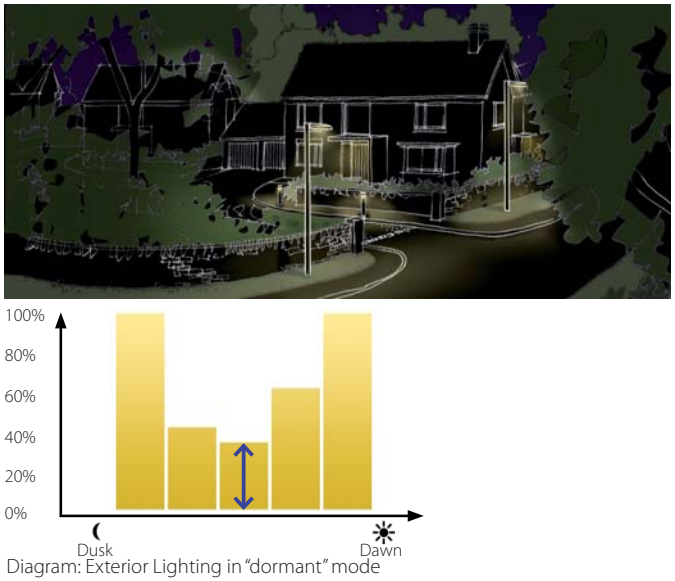


Diagram: Exterior Lighting in "dormant" mode

20. CONCLUSION

The exterior lighting for Woodstock East has been conceived as a series of "layers" which work together to create a harmonious nocturnal environment for residents.

Areas of the site which should remain dark have been identified and a clear hierarchy of lighting typologies applied throughout the proposed development.

The scheme has been considered in relation to existing street lighting in and around Woodstock town. Ecological constraints have also been addressed and embodied in the lighting masterplan.

Energy efficient LED lighting with efficient optics are proposed together with intelligent lighting management sytems that will minimise energy use across the site.

The lighting masterplan will be further refined during the detailed design stages of the project and fully integrated with the architectural and landscape design elements.

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Verification By:	Alkestie Skarlatou
Project Coordinator:	Johannes Stahl