Land at Maxcroft Farm, Hilperton, Trowbridge

Preliminary Lighting Strategy

Developer: Barratt Homes

LIGHTING

DPL

PROJECT	Land at Maxcroft Farm Hilperton, Trowbridge
PROJECT NO	P23685-Rep-02
CLIENT	Barratt Homes

Maxcroft Farm,
Hilperton, Trowbridge

Preliminary Lighting Strategy

Prepared by:

David Long

BS (Hons), CEng, MILP, MIMechE

Revision	Description	Author	Checked	Date
2.1	Updated to final planning layout	DPL	SDL	24.11.23
1.3	0.5 lux contour added to isolux plan	DPL	SDL	15.8.23
1.2	Minor correction	DPL	SDL	22.6.23
1.1	Original for discussion	DPL	SDL	14.6.23

Contents

1.0	Introduction	page	4
2.0	Legislation and standards		6
3.0	Ecological constraints		8
4.0	Lighting Strategy		9

Appendices

A	Baseline lighting survey	13
B	Exterior lighting at Site boundaries Drawing P23685-PL-01 (p01) Drawing P23685-PL-02 (p01)	19

Developer
Barratt Homes Ltd
Barratt House
710 Waterside Drive
Bristol
BS32 4UD

Author
David Long CEng, MILP, MIMechE, BSc

Issued
August 2023

1.0 Introduction

A new housing development is proposed by Barratt Homes on land at Maxcroft Farm, Hilperton, Trowbridge for up to 180 homes. The site is currently agricultural and at the time of survey (March 2023) was being used for grazing ponies.

The land is to the northeast of the B3105 and Marsh Road roundabout and is bounded by the Kennet and Avon canal at the north and Hilperton Marsh Farm to the east with a dense hedgerow at this side.



Fig. 1 – Land Use Plan (Taken from Place By Design drawing 2024_500F)

This report looks at the exterior lighting proposed for the site and discusses mitigation measures to be applied to meet the ecological constaints of the site.

As part of our works on this site, a baseline study of existing lighting was undertaken. The results of this are shown in Appendix A, but in summary, the results show the site to be intrinsically dark with the only light intrusion recorded being at the Marsh Road end.



Fig. 2 The site seen from the gate looking north. Maxcroft Lane is to the left, just out of shot.



Fig. 3 The site seen from the northeast corner looking south.

2.0 Legislation & Standards

There are numerous standards affecting road lighting in England. The most relevant of these to this site are as follows.

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

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

2.2 The National Planning Policy Framework (NPPF), 2023

This sets out the governments planning policies for England and how they are expected to be applied and provides a framework for local plans. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.

- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

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

2.3 British Standards

The relevant British Standards covering street lighting and other exterior lighting are:

- **BS5489-1:2020** - Design of road lighting.
  Lighting of roads and public amenity areas -.Code of practice

- **BS EN 13201 2015** – Road Lighting.
  Part 2 Performance requirements

- **BS 12464-2:2014** – Light and Lighting.
  Lighting of work places.

Part 2 Outdoor work places

- **BS EN 1838:2013** – Emergency Lighting.
  Lighting applications – Emergency lighting.

  BS 5266-1:2016 – Emergency Lighting
  Part 1: Code of practice for emergency lighting of premises

2.4 Local Authority Street Lighting Specifications

These documents detail the lighting standards and equipment specification, to be used for lighting of roads and footpaths to be adopted by Wiltshire Council.

Residential Lighting Specification (LED and CMS) Generic - Revision R – Wiltshire Council / Atkins

Non-Residential Lighting Specification (LED and CMS) Generic - Revision I – Wiltshire Council / Atkins

2.5 Institution of Lighting Professionals / Bat Conservation Trust Lighting Bats and artificial lighting in the UK Guidance Note 08/18

This document discusses appropriate lighting levels, types of lamp, colour temperatures etc. which are suitable for lighting areas near bat roosts and foraging areas.

2.6 Institution of Lighting Professionals The reduction of obtrusive light Guidance Note 01/21

This document proposes good practise to avoid intrusive lights or light nuisance and recommends limits for light intensity towards affected receptors.

2.7 Trowbridge Bat Mitigation Strategy SPD (February 2020)

This document sets out specific requirements for dark corridors including dimensions of buffer zones and allowable maximum illuminance values within the dark zone.

3.0 Ecological Constraints



Fig. 4 – Green and Blue Infrastructure Parameter Plan, showing the 30m ecological buffer at the northern and eastern boundaries of thes site. (Taken from Place By Design drawing 2024_502F)

Surveys undertaken by the developer's ecologist, Ethos Envoronmental Planning, have identified protected species on site, including bats. A 30m wide buffer zone at the northern and eastern boundaries of the site is therefore proposed, see fig 4 above. No lighting is to be insatlled in this area, and the maximum allowable point illuminance value here is 0.5 lux, to be calculated with no maintenace factor applied. Lighting of the developable land immediately adjoining these buffers, will need to account for this and appropriate mitigation measures applied to ensure compliance.

4.0 Lighting Strategy

A lighting strategy to maintain the dark corridors at the site boundaries is proposed. This considers all types of exterior, artificial lighting associated with the development and includes adoptable street lighting both at the site entrance and for the on-site roads, street lighting for the private roads and parking courts, as well as the contribution from domestic lighting at the front entrance porch and in the rear gardens.

An outline design for the lighting associated with the housing near the site boundaries is included to demonstate how adequate lighting can be provided in these areas, whilst maintaining the dark zones. See drawings P23685-PL-01-P01 which shows calculated horizontal illuminance at ground level and vertical illuminance at the site boundary, and edge of the dark zone, & P23685-PL-02-P01, which shows vertical illuminance at 2m AGL and 4m AGL. All these calculations are with no maintenance factor applied, so represent lighting at it brightest, and include contribution from all lighting including adoptable, private communal area and exterior domestic, operated at full output. The design uses the principles set out in the following sections 4.1 to 4.5.

4.1 Offsite adoptable lighting.

The site entrance will be formed off of the existing roundabout at the junction of the B3105 and Marsh Road, shown shaded yellow in fig. 1 above. The existing lighting at this roundabout and the approaches to it will be reviewed, to accommodate the new junction. Currently lighting is by means of LED luminaires mounted on 8m columns, most of which are Urbis Schreder Axia 3.2s and to the current Wiltshire specification. These luminaire use “warm white“ LEDs with a Correlated Colour Temperature (CCT) of 3000K. These luminaires when installed at 0° uplift, e.g. with the exit plane or glass protector, parallel with the ground, will emit no direct light above the horizontal. All luminaires have a controlled light distribution to direct most of the light onto the target area and meet the requirements of a Glare Intensity class of G3 (see table A1 in BS EN 12301-2:2015), so can be considered as low glare luminaires.

Existing equipment will be retained where feasible.

All luminaires will be dimmed in line with Wiltshire Council’s standard non-residential dimming policy:

Dusk to 8:00pm	luminaires at 100% output
8:00pm to 11:00pm	luminaires at 75% output
11:00pm to 6:00am	luminaires at 50 output
6:00am to Dawn	luminaires at 100% output

All adoptable luminaires will be controlled using Wiltshire Council’s Central management (CMS) system, which would allow dimming levels and times to be adjusted, should this be necessary.

4.2 On site adoptable lighting.

New LED street lighting using luminaires to the current Wiltshire residential Street Lighting Specification will be provided. This will generally be as follows:

For the main spine road off the roundabout into the site, lighting will be by means of 6m height columns, fitted with Urbis Schreder Axia 3.1 LED luminaires, using 3000K warm white

LEDs. A lighting class of P4 (BS5489-1:2020) will be applied requiring an average illuminance of 5 lux with a minimum of 1 lux.

For the minor subsidiary roads a lower lighting class of BS5489-1:2020 class P5, requiring an average illuminance of 3 lux with a minimum of 0.6 lux will be applied. A lower column height of 5m will be used here.

Luminaires in locations which do not affect the ecologically sensitive areas, will use LEDs with a warm white light source with a colour temperature of 3000K. For roads close to the "dark corridor" or "buffer zone", a warmer white LED light source, with a CCT of 2700K will be used, as these have a lower blue light component in the emitted spectrum. Both LED types emit no UV radiation. Blue light is considered more disturbing to nocturnal species than longer wavelengths of light at the red end of the visible spectrum.

Note: Luminaires using LEDs with a CCT of 2700K are not generally employed through the scheme, as their efficacy tends to be lower, requiring more energy to achieve the same lighting level.

All lanterns will be installed at 0 degrees uplift, that is to say with the LED panel parallel to the ground such that no direct upwards light is emitted.

All luminaires will be dimmed in line with Wiltshire Council's standard residential dimming policy:

Dusk to 8:00pm	luminaires at 100% output
8:00pm to 11:00pm	luminaires at 75% output
11:00pm to 6:00am	luminaires at 50 output
6:00am to Dawn	luminaires at 100% output

Light shields, fitted to the rear, or sides of the luminaire, may be used as necessary to control the light distribution.

All adoptable luminaires will be controlled using Wiltshire Council's Central management (CMS) system, which would allow dimming levels and times to be adjusted, should this be necessary.

4.3 Lighting for private roads, parking courts and shared driveways.

Lighting for private roads and driveways will only be provided when deemed necessary and will normally only be provided when requested by a Housing Association. Where required, lighting will be by 5m columns carrying an LED luminaire with warm white LED light source, with a CCT of 2700K. A different luminaire type to that used on the adoptable roads will be used to help identify the units for maintenance purposes. This luminaire must have a flat glass optic and emit no direct upwards light. The lighting class used should be to a similar level of P5 (requiring an average illuminance of 3 lux with a minimum of 0.6 lux) and it is recommend that this is programmed to dim to the same levels as the adoptable roads. Luminaires in privately managed areas will be switched by a photocell mounted on the lantern canopy.

Low level, bollard type illumination will not be used as this emits high levels of upwards light, gives poor uniformity and is accessible to tampering/vandalism.

4.4 Domestic security lighting - Front entrances.

Lighting is proposed at the front entrance porch to each property for basic security. The luminaire selected for this will need to provide sufficient vertical illuminance to allow facial recognition, of visitors by the resident, but will need to be low wattage, using a warm white LED light source with a CCT of 2700K.
The fitting used should be switched by photocell and PIR sensor to ensure that the light is only on when actually required. The timer on the PIR should be set to switch the light off within 2 minutes if there being no further movement detected.
Generally, front entrances to houses will face away from the dark corridors and as these are low powered luminaires, they should not have a significant contribution to spill light to sensitive areas. Where properties do face the dark corridors.

4.5 Domestic security lighting – Rear gardens.

Some rear gardens may face the ecologically sensitive areas and domestic security type lighting installed for security lighting can be particularly polluting. Luminaires for this purpose are often cheap, small floodlights with poor optical control, be overly bright and use a cool white led light source containing a high proportion of the shorter, blue wavelengths. To discourage residents from installing their own lighting it is suggested that each house has an LED Wall Pack type luminaire fitted to the rear wall, near the doorway.
The light fitting should have a well controlled distribution which produces downwards light only, i.e. have an Upwards Light Ratio(ULR) of 0. The light source should use a warm colour temperature of 2700K and should provide adequate light for navigation and security without being over powering.
An example of an acceptable luminaire would be a wall pack type bulkhead fitting as shown below, which would be mounted at approximately 2.5m height on the rear of a house. The fitting will be fitted with 2700K LEDs (warm white with very low blue light content) and have an asymmetrical optic to project light away from the house. To ensure light is only produced when it is actually required, the fitting should be switched by both a passive infrared motion sensor (PIR) and a photocell.



Fig. 5 An acceptable style of rear garden luminaire – The fitting has an asymmetric distribution and emits no direct upwards light

As these fittings are mounted at a low height of c. 2.5m, boundary fences, walls and hedges will screen much of the light from the sensitive areas.

4.6 Summary

The calculated illuminance values summarised on the drawings in this report are based on achieving a maintained P5 lighting class for the adoptable roads, close to the site boundary and additionally include porch lighting and rear garden lighting, where it faces the boundaries.

The results summarised in the drawings are for the absolute worst case for spill light, with street lighting lanterns operated at its full output and all domestic lighting switched on. In practise, street lighting will be dimmed after 8:00pm in line with Wiltshire County Council's Residential Street Lighting policy, and exterior domestic lighting will be switched by PIR sensor, so in actuality all luminaires are highly unlikely to be switched on at the same time. Also, the calculation program used does not account for screening from walls, fences, trees etc which will further reduce levels realised at the site boundary.

The levels calculated and shown in the drawings are lower than 0.5 lux in both horizontal and vertical planes within the 15m wide dark zone and no lighting is installed within the 15m wide buffer zone.

Should this application be approved, a further detailed lighting design would be required at the Reserved Matters stage, and following confirmation of the detailed site layout, to fully ensure compliance with the ecological constraints.

Appendix A - Baseline Lighting Survey

A1.0 Method

Measurements were taken on the evening of 28th March 2023 between 8:15pm and 10:30 pm. Details were:

Lightmeter – Minolta T10 (Serial Number S/N 20015895 (Calibration date 30/6/2022)
Weather – Cloudy, dry but there had recently been light rain, 6°C, No moonlight, visibility was good

Illumination measurements were taken at various locations around the site with a concentration around the areas which were lit to some degree and at the areas identified as ecologically sensitive.
The site is a field left to pasture and grazed by ponies. Conditions under foot are therefore rough, and accurate measurement of location was not feasible. Note Fastfield software with GPS positioning, was used to determine positions and this has a tolerance of ±5m in open country.

At each location the following illuminance measurements were recorded :

- Horizontal illuminance at ground level, E_h
- Vertical illuminance at 1.5m AGL with meter facing north (directly away from Marsh Road), E_{v1}
- Vertical illuminance at 1.5m AGL with meter facing east (towards hedge line), E_{v2}
- Vertical illuminance at 1.5m AGL with meter facing south (directly towards Marsh Road), E_{v3}
- Vertical illuminance at 1.5m AGL with meter facing west (towards Maxcroft Lane), E_{v4}

Accuracy of measurements

Several factors affect the accuracy of illuminance measurements taken on site. These include:

- Accuracy of illuminance meter quoted by manufacturer as ± 2% or ± last digit of display
- Location of measurement points, ±5m
- Orientation of light meter ±5°
- Illuminance values recorded therefore should only be considered accurate ± 0.1 lux at best and readings recorded below 0.1 lux are considered to be 0 lux.

A2.0 Results



Fig. 4 - Survey Measurement Locations

Site:	**Maxcroft Farm, Hilperton, Trowbridge**
Date:	28/03/2023
Time:	8:15pm to 10:20pm
Conditions:	Overcast, ground damp but not raining, 6°C
Note:	Where Illuminance values of less than 0.10 lux were measured these are recorded as 0 lux as this accuracy exceeds the measuring tolerance of the lightmeter.

Location	Eh	Ev1	Ev2	Ev3	Ev4	Notes
A	0	0	0	0.12	0.10	
B	0.12	0	0.10	1.20	0.45	Spot light on house wall
C	0.15	0	0.12	2.60	0.37	Spot light on house wall
D	0.10	0	0.15	0.20	0.15	Spot light shielded by tree
E	0.10	0	0.10	0.15	0.22	
F	3.10	0.12	0.28	2.14	1.10	Light from nearby street light (col 9)
F1	6.35	0	0.32	11.2	1.3	
G	1.60	0	1.20	2.20	1.02	Road lighting
H	1.20	0	0.35	1.86	1.50	Road lighting
I	0.10	0	0	0.15	0.15	
J	0.12	0	0.11	1.40	0.12	
K	0.10	0	0.20	1.30	0.10	
L	0	0	0	0	0	
M	0	0	0	0	0	
N	0.15	0	0.15	0.60	0.20	20m from gate
O	0.13	0	0.13	0.44	0.15	20m from hedge at boundary
P	0.15	0	0.15	0.32	0.10	20m from hedge at boundary
Q	0	0	0.10	0.12	0	
R	0	0	0	0.86	0	
S	0	0	0	0.63	0	
T	0	0	0	0.16	0	
U	0	0	0	0	0	
V	0	0	0	0.10	0	
W	0	0	0	0.13	0	
X	0	0	0	0.11	0	
Y	0	0	0	0.25	0	Spot light on house wall
Z	0	0	0	0.32	0	Spot light on house wall
a	0	0	0	0	0	
b	0	0	0	0	0	
c	0	0	0	0	0	
d	0	0	0	0	0	

Fig. 3 - Measurement results (illuminance values in lux)

A3.0 Survey Commentary

Measurable illuminance values were only seen at the south end of the field closest to Marsh Road, and at the rear of the properties along Marsh Road.

The relatively high lighting levels recorded in the south east corner of the site are due entirely to a poorly aimed, and overly powerful spot light fixed to the rear of one of the private houses on Marsh Road. A maximum vertical illuminance towards the building of 2.6 lux was recorded at the fence, with this still at 0.86 lux 50m from the fence and c. 0.3 lux at 100m distance. Other spill light from house windows and fairy lights fitted to the rear fence at one point, have virtually no contribution to this area.



Fig. 5 Spot light on rear of house in Marsh Road

The area around the gate and to the southwest corner of the site has significant light spill close to the fence. This is due to overspill from the existing street lighting installation at the roundabout, and the brightly lit petrol station forecourt.

Light levels as high as 6.3 lux were recorded at the gate, with higher values immediately behind the column.
Measurement of horizontal illuminance at a distance of 20m from the site boundary showed illuminance values of below 0.2 lux at all locations. However, a vertical illuminance value of 0.65 lux was recorded 20m behind one of the street lighting luminaires.



Fig 6. Marsh Road. Light sources are at the petrol station and street lighting at the roundabout

Survey results at the point further north into the field all yielded results of less than 0.1 lux. This included points close to the site boundary with the houses on Maxcroft Lane, where light from windows can be seen but, at the time of survey, measured illuminance values were very low.



Fig. 7 The site looking north. The house lights visible are from a building on Maxcroft lane

A4.0 Conclusions

With the exception of the 20 – 30m of land closest to Marsh Lane, the site is dark and receives no artificial light.
The only other area affected by artificial light is the southeast corner where a poorly aligned floodlight mounted on the rear of a private house spills a lot of light into the field. This floodlight could be a nuisance to future residents of the new development.

Appendix B Spill Light Estimation at Site Boundary

Drawing P23685-PL-01(p01) – Horizontal illuminance at ground level and vertical illuminance

Drawing P23685-PL-02(p01) - Horizontal illuminance at 2m above ground level