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Development Technical
Consultants

LIGHTING



Land East of Warwick Road, Banbury
Lighting Impact Assessment
November 2022

Report Ref: 27617-LIGH-0401

Land East of Warwick Road, Banbury Lighting Impact Assessment November 2022

REPORT REF: 27617-LIGH-0401

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REGISTRATION OF AMENDMENTS

Date	Rev	Comment	Prepared By	Checked By	Approved By
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APPENDICES

- A. PROPOSED SITE LAYOUT
- B. PROPOSED ILLUSTRATIVE LIGHTING DESIGN

1.0 INTRODUCTION

1.1 Mewies Engineering Consultants Ltd (M-EC) has been commissioned by Vistry Homes Ltd to undertake an External Lighting Impact Assessment for a proposed residential development at Land east of Warwick Road, Banbury. A site location plan is provided in Figure 2.1.

1.2 This report assesses, in terms of artificial lighting, the likely effects of the proposed development. The lighting assessment includes information on the baseline lighting conditions within the area, quantitatively assesses the potential effects of the proposed lighting on surrounding sensitive receptors and if required considers possible mitigation measures to reduce potential light spill into neighbouring properties and ecological receptors, upward light (which can create sky glow) and visual source intensity (glare). Indicative illuminance calculations for exterior areas of the proposed development are included in Appendix A.

1.3 M-EC accepts no responsibility or liability for:

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

2.0 SITE DESCRIPTION

Existing Site

2.1 The proposed site is currently comprised of green fields. The site is bound by:

- Green fields and the village of Hanwell to the north, with no major sources of light in the green fields and Hanwell Community Observatory;
- Green fields to the east, with no main sources of light;
- Residential properties to the south, with the main source of light from Street Lighting and;
- Greenfields to the west with no main source of light.

2.2 A site location plan is provided in Figure 2.1 below.

Figure 2.1: Site Location Plan



Proposed Development

2.3 The description of the proposed development proposed is as follows

“Outline application for up to 170 dwellings (Use Class C3) with associated open space and vehicular access off Warwick Road, Banbury. All matters reserved except for access.”

2.4 A proposed site layout plan is contained in Appendix A.

3.0 POLICY AND GUIDANCE

Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

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

National Planning Policy Framework

- 3.2 The National Planning Policy Framework (NPPF), published in July 2021, sets out the governments planning policies for England and how they are expected to be applied and provides a framework for local plans. With regards to lighting, the following is stated;

185 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.

National Planning Practice Guidance November 2019 Lighting

- 3.3 This report also has taken into account the relevant questions the PPG advises on how to consider light within the planning system detailed below;

- What light pollution considerations does planning need to address?
- What factors can be considered when assessing whether a development proposal might have implications for light pollution?
- What factors are relevant when considering where light shines?
- What factors are relevant when considering when light shines?
- What factors are relevant when considering how much the light shines?
- What are relevant when considering possible ecological impacts of lighting?
- What other information is available that could inform approaches to lighting and help reduce light pollution?

Relevant British Standards and Design Mitigation

- 3.4 The most applicable British Standards for lighting that relates to the proposed development are:
- BS EN 12464-2 Lighting of Work Places – Outdoor Work Places, 2014.
 - BS 5489-1:2020 Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas.

3.5 Along with complying with the guidance listed above any potential lighting design will include the following mitigation:

- Lighting solutions will be selected to reduce light pollution. Specifically, designed luminaires will be selected to minimise the upward spread of light. The optics in the lanterns will control the distribution of light to avoid overspill, sky glow and glare.
- Glare will be kept to a minimum by ensuring the main beam angle of all lights directed towards any potential observer is not more than 85°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare.
- Lighting will be restricted to the task area using horizontal cut-off optics and zero tilts.
- A curfew will be operated and the duration of any lighting will be minimized. (switch off or part-night dimming).

Institute of Lighting Professional Documents

3.6 The following Institute of Lighting Professional (ILP) guidance documents have been consulted with regard to lighting from the proposed development;

- PLG 04- Guidance on Undertaking Environmental Lighting Impact Assessments, ILP, 2013;
- Guidance Note 08/18 Bats and artificial lighting in the UK ILP, 2018;
- Guidance Notes for the Reduction of Obtrusive Light, ILP, 2021.

4.0 ASSESSMENT METHODOLOGY

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

4.2 The methodology of this report is as follows:

- Undertake a baseline survey and identify the environmental zone of the site and surrounding sensitive receptors in accordance with ILP GN01/21 and PLG 04;
- Produce a detailed 3D model using industry-standard light modelling software and quantitatively assess the following parameters; light intrusion, source intensity and upward light spill/sky glow; and
- If required, consider possible mitigation measures to reduce potential light intrusion into neighbouring properties and ecological receptors, upward light (which can create sky glow) and visual source intensity (glare).

4.3 In accordance with Guidance Notes for the Reduction of Obtrusive Light, the following definitions are used to describe lighting effects in this assessment:

- Light intrusion – light intrusion into windows (the spilling of light beyond the boundary of a property which may cause a nuisance to others).
- Source intensity – how bright the source appears to an observer (uncomfortable brightness of the light source against a dark background which results in dazzling the observer, which may cause a nuisance to residents and a hazard to road users).
- Skyglow – a combination of direct upward light and indirect upward light, (the upward spill of light into the sky which can cause a glowing effect and is often seen above cities when viewed from a dark area).

4.4 The ILP Guidance Notes for the Reduction of Obtrusive Light: GN01/20 define environmental zones appropriate to the location of the proposed development shown in Table 4.1:

Table 4.1: Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, villages or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small-town centres of suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

4.5 The environmental zone appropriate for the proposed development is considered to be Zone E2. The obtrusive light limits defined in ILP GN01/20 are summarised in Tables 4.2 to 4.5.

Table 4.2: Maximum values of vertical illuminance on properties

Application conditions	Environmental Zone				
	E0	E1	E2	E3	E4
Pre-curfew (07:00-23:00)	n/a	2lx	5lx	10lx	25lx
Post-Curfew (23:00-07:00)	n/a	<0.1 lx*	1lx	2lx	5lx
*Note: If the installation is for public (road) lighting then this may be up to 1 lx.					

4.6 The limits for the luminous intensity of bright luminaires are dependent on the viewing distance d , (between the observer and the bright luminaire(s)) and the projected area A_p , of the bright part of the luminaire in the direction of the observer. Table 4.3 shows the maximum values for the luminous intensity of luminaires in designated directions where views of bright surfaces of luminaires are likely to be a nuisance to occupants of premises or from positions where such views are likely to be maintained, that is, not momentary or short-term.

Table 4.3: Maximum values of vertical illuminance on properties

Application Conditions	Luminaire Group (Projected area A_p in m^2)					
	$0 < A_p \leq 0.002$	$0.002 < A_p \leq 0.01$	$0.01 < A_p \leq 0.03$	$0.03 < A_p \leq 0.13$	$0.13 < A_p \leq 0.50$	$A_p > 0.5$
E0 Pre-Curfew	0	0	0	0	0	0
Post-Curfew	0	0	0	0	0	0
E1 Pre-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500
Post-Curfew	0	0	0	0	0	0
E2 Pre-Curfew	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
Post-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500
E3 Pre-Curfew	0.86 d	1.9 d	3.8 d	7.5 d	15 d	10,000
Post-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	1,000
E4 Pre-Curfew	1.4 d	3.1 d	6.3 d	13 d	26 d	25,000
Post-Curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500
Aid in gauging A_p	2 to 5cm	5 to 10cm	10 to 20cm	20 to 40cm	40 to 80cm	>80cm
Geometric mean of diameter (cm)	3.2	7.1	14.1	26.3	56.6	>80
Corresponding A_p representative area (m^2)	0.0008	0.004	0.016	0.063	0.251	0.5>

Notes:

d is the distance between the observer and the glare source in metres;
 A luminous intensity of 0 cd can only be realised by a luminaire with a complete cutoff in the designated directions;
 Ap is the apparent surface of the light source seen from the observer position
 For further information refer to Annex C of CIE 150
 Upper limits for each zone shall be taken as those with column $Ap > 0.5$

4.7 Skyglow is the brightening of the night sky caused by artificial lighting resulting from the reflection of radiation (visible and non-visible); ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky. UFR (Upward Flux Ratio) is the maximum permitted percentage of luminaire flux that goes into the sky both from direct and reflected upward of the whole installation. The ILP limits for ULR are shown in Table 4.4 below.

Table 4.4: Maximum values of upward light ratio (ULR) of luminaries

Application conditions	Environmental Zone				
	E0	E1	E2	E3	E4
Upward Light ratio (ULR)/%	0	0	2.5	5	15

4.8 The ILP limits for UFR are shown in Table 4.5. This should only be considered where an installation consists of four or more luminaires that form an installation with a defined performance requirement or specialised fauna growth lighting systems (such as those use to promote grass growth in sports stadia) and is in proximity to:

- Optical observatories
- Lies within dark (E1) zones which abuts a protected (E0) dark sky zone

4.9 As the site is within Environmental Zone E2 and within close distance to Hanwell Observatory this assessment has been undertaken.

Table 4.5 Maximum values of upward flux ratio of installation (of four or more luminaires)

Application Conditions	Type of installation	Environmental Zone				
		E0	E1	E2	E3	E4
Upward Flux Ratio (UFR) / %	Road	n/a	2	5	8	12
	Amenity	n/a	n/a	6	12	35
	Sports	n/a	n/a	2	6	15

5.0 BASELINE CONDITION

- 5.1 The site was visited, during night-time conditions on the 20th September 2022, to assess the general ambience of the site itself.
- 5.2 The development site currently comprises arable farmland. There are no existing buildings on site and consequently does not produce any sky glow.
- 5.3 The environment surrounding the proposed site is low district brightness, categorised as an E2 Environmental Zone in accordance with the ILP Guidance Notes (see Table 1).
- 5.4 The night-time survey was carried out to determine lux levels on the surrounding roads adjacent to the site and to establish existing lighting conditions.
- 5.5 The ILP Guidance Note 08/18 specifies that readings should be taken at ground level on the horizontal plane and in at least one direction on the vertical plane at 1.5-2.0m above the ground. The orientation should be perpendicular to the dominant light sources or perpendicular to the surface/edge of the feature. Further measurements at other orientations may prove beneficial in capturing the influence of all luminaires in the proximity of the site.
- 5.6 The weather conditions during the light survey were cloudy with no clear view of the moon. The location of the light monitoring points can be found in Figure 5.1 below with the results found in Table 5.1.

Figure 5.1: Light Monitoring Location



Table 5.1: Survey Results

Location	Location Description and key Source of Light	Measured Illuminance Lux					Skyglow Levels
		Facing Up	Facing North	Facing East	Facing South	Facing West	
1	Western Boundary of the Site, Warwick Road – No main source of light	0.06	0.00	0.03	0.05	0.06	17.93
2	Western Boundary of the Site, Warwick Road – No main source of light	0.05	0.00	0.04	0.07	0.02	17.69
3	Nickling Road – Street Lighting	0.03	0.02	0.08	0.27	0.03	17.24
4	De La Warr Drive – Street Lighting	12.73	1.73	0.35	0.74	15.72	16.26
5	Bismore Road – Street Lighting	13.10	2.10	0.28	0.94	12.30	16.99
6	Bismore Road – Street Lighting	15.22	1.45	0.31	0.68	10.10	17.10
7	Main Street Entrance to Hanwell Village - Street Lighting	0.58	0.52	1.30	0.04	0.05	17.63
8	Corner of Main Street and Guillicott Lane Hanwell – Street Lighting	0.25	0.40	0.52	0.06	0.02	17.67
9	Corner of Church Lane and Main Street Hanwell - Street Lighting	0.48	0.06	0.75	1.16	0.07	17.57
10	Footpath in the middle of the site.	0.04	0.01	0.06	0.08	0.02	17.87

6.0 RECEPTORS

6.1 Following the site visit, a desktop survey of the site and having liaised with the project team the following light-sensitive receptors have been identified;

- Residential
- Ecological

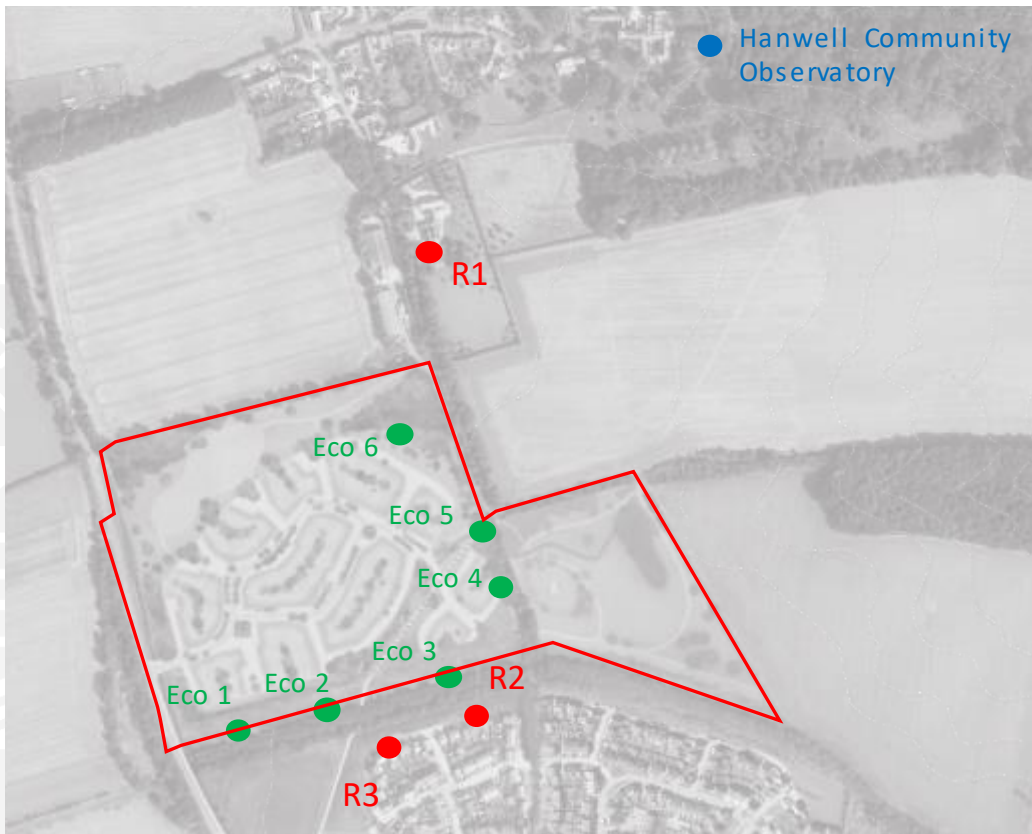
Residential receptors

6.2 The following residential properties surrounding the site have been identified and assessed based on their proximity to the site and the potential impact of the proposed lighting on them. Each receptor has been modelled at 4.0m to represent a first-floor bedroom. The locations of these receptors are visually presented in Figure 6.1 below as well as in Table 6.1.

Table 6.1: Residential Receptor Locations

Receptor	Location Description	Height (m)	Environmental Zone (ILP)
R1	Residential property south of Gullicott Lane	4.0	E2
R2	Residential property on De La Warr Drive	4.0	E2
R3	Residential property on De La Warr Drive	4.0	E2

Figure 6.1: Ecological and Residential Receptor Locations



Ecological receptors

- 6.3 The ILP Guidance Note 08/18 specifies that when a planning application includes additional artificial lighting, developers should ensure that a lighting assessment is done alongside an ecological assessment. Lighting can impact light-sensitive species such as bats by impacting roosting, commuting and foraging behaviour.
- 6.4 Following consultation with project ecologists, there is potential that a number of bat species are anticipated to use the treelines along the boundaries of the site. Therefore, ecology receptors have been located along the woodland at a height of 3m. The locations of these receptors are visually presented in Figure 6.1, as well as in Table 6.2 below.

Table 6.2: Ecological Receptor Locations

Receptor	Location Description	Height (m)
Eco 1	Woodland on the southern boundary of the site	3
Eco 2	Woodland on the southern boundary of the site	3
Eco 3	Woodland on the southern boundary of the site	3
Eco 4	Woodland on the eastern boundary of the site	3
Eco 5	Woodland on the eastern boundary of the site	3
Eco 6	Woodland on the north eastern boundary of the site	3

7.0 LIGHTING ASSESSMENT

- 7.1 A site plan (see Appendix A) was provided by the project architect for this development and the lighting criteria has been discussed with the project team. A 3D model has been produced using a range of industry-standard light modelling software including Lighting Reality and Dialux, the model only considers the effect of solid structures so natural structures such as trees will be assessed qualitatively outside the model calculations.
- 7.2 The assessment currently considers 24 hours operation of the light fittings as a worst-case scenario, however it is Oxfordshire County Council policy to have some part-time dimming of lighting.

Light Intrusion Residential Receptors

- 7.3 Table 7.1 compares the modelled light intrusion at the surrounding residential properties with the relevant ILP environmental zone criteria as specified in Tables 2.1 and 2.1. For this assessment based upon the site location and survey results, this will be Environmental Zone E2 – Rural Area of Low-level brightness with the criteria being 5 lux pre curfew and 1 lux post curfew.

Table 7.1: Residential Receptor Results

Receptor	Predicted model vertical illuminance	ILP Pre-curfew criteria (Lx)	ILP Post Curfew Criteria (Lx)
R1	0.00	5	1
R2	0.00	5	1
R3	0.00	5	1

- 7.4 The results in the table above show that with the proposed development in place, lighting from the site will not exceed the recommended ILP pre- and post-curfew criteria.

Ecology Receptors

- 7.5 The ILP Guidance Note 08/18 specifies that acceptable lux limits should be used to assess the impact of lighting upon ecological species including bats. Therefore, following consultation with project ecologists and the LPA, impacts will be considered significant were predicted vertical illuminance levels exceed 1 lux. The results of this assessment can be found in Table 7.2 below.

Table 7.2: Ecology Receptor Results

Receptor	Predicted model vertical illuminance
Eco 1	0.00
Eco 2	0.00
Eco 3	0.05
Eco 4	0.26

Receptor	Predicted model vertical illuminance
Eco 5	0.05
Eco 6	0.01

7.6 The results show that lux levels along the woodland and tree line surrounding the development will be below 1 lux therefore lighting is not anticipated to have a significant impact on any light-sensitive species using this space.

Source Intensity

7.7 R1 is over 200m away from the site and R2-3 are 70m away and have a substantial boundary of vegetation between them and the nearest proposed luminaire and given the mitigation provided by shielding from the proposed residential properties, it is anticipated that no residential receptors surrounding the site will exceed the luminous intensity criteria.

SkyGlow

7.8 The model has been used to calculate the predicted Upward Lighting Ratio (ULR) of the proposed external lighting scheme. Model outputs predict a sky glow figure (ULR) of 0.0%. As illustrated in Table 4.4, the ILP sky glow limitation for an area classified as Environmental Zone E2 is 2.5% ULR. As such the indicative lighting scheme meets the ILP sky glow limitations and is therefore not considered to result in detrimental impacts on the dark sky landscape.

7.9 The UFR is obtained from the following formula;

$$R_{UF} = \frac{\bar{E}_i}{\bar{E}_m} \left[1 + \frac{R_{ULO,\alpha}}{\rho_1 \cdot u} + \frac{\rho_2}{\rho_1} \left(\frac{R_{DLO,\alpha} - u}{u} \right) \right] \quad \text{and for Roadways} \quad R'_{UF} = \frac{\rho_1 W_c}{\rho_1 W_c + \rho_2 W_a} \cdot R_{UF}$$

7.10 Using the information shown in Table 7.3, the predicted upward flux ratio for the site is 3.5%. As illustrated by Table 4.5 the ILP upward flux ratio (UFR) for this area is 5%. As such the indicative lighting scheme meets the ILP sky glow limitation and is not considered to result in a detrimental impact on the dark sky and the adjacent Hanwell Observatory.

Table 7.3 Upward Flux Ratio Information

Calculation and description	Value
ULOR – proportion of the total lamp luminous flux of the luminaires emitted above the horizontal plane passing through the luminaires in their installed position.	0.03
DLOR – proportion of the total lamp luminous flux of the luminaires emitted under the horizontal plane passing through the luminaires in their installed position.	0.70
u – utilisation factor of the installation related to the surface area intentionally to be lit.	0.25
P1 – the reflectance of the surface intentionally to be lit	0.10

Calculation and description	Value
P2 – the reflectance of the surrounding surfaces	0.07
E_m – The average maintained illuminance required on the area to be lit. -P4	5
E_i – the actual average initial illuminance as a result of the actually designed lighting installation	5.5
W_c – Width of Carriageway	5
W_a – Width of the adjacent area, same on each side of the carriageway	2



8.0 CONCLUSIONS

- 8.1 Mewies Engineering Consultants Ltd (M-EC) has been commissioned by Vistry Homes Ltd to undertake an External Lighting Impact Assessment for a proposed residential development at Land east of Warwick Road, Banbury.
- 8.2 With the proposed development in place, lighting from the site will not exceed the recommended ILP pre- and post-curfew criteria.
- 8.3 Lux levels along the woodland to the south of the development will be below 1 lux therefore lighting is not anticipated to have a significant impact on any light-sensitive species using this space.
- 8.4 The UFR and ULR levels from the site will not exceed the recommended ILP levels therefore it is not anticipated that lighting from the site will impact the quality of dark sky around Hanwell Observatory.
- 8.5 The proposed lighting scheme will comply with all relevant British Standards and the Institution of Lighting Professionals lighting guidelines and will serve to ensure safety and security of all areas of the development can be effectively maintained.



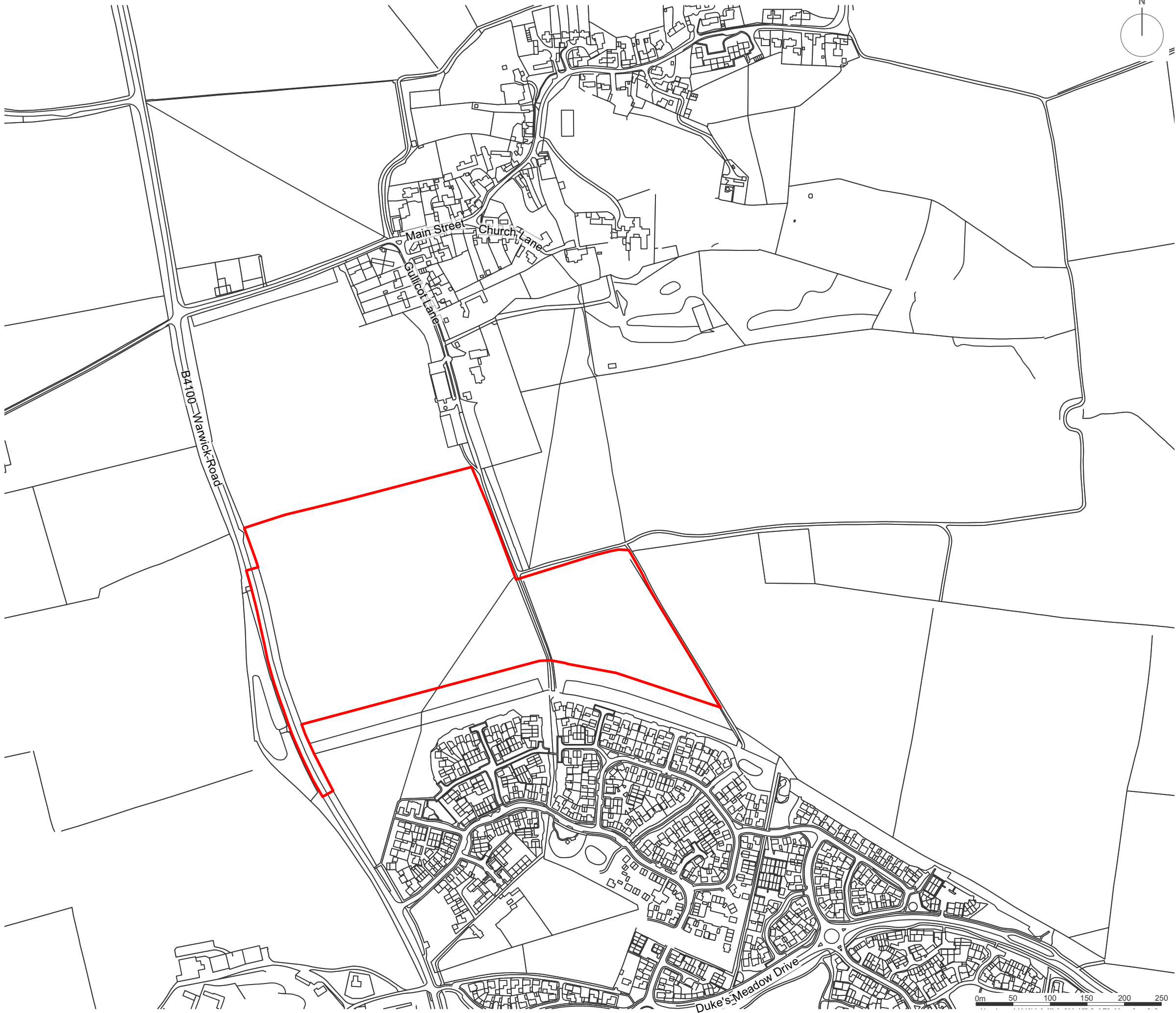
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APPENDICES



APPENDIX A



Site Boundary

12.63ha

client

Vistry Group

project title

Land East of Warwick Road, Banbury

drawing title

Site Location Boundary

date

10 MAY 2022

drawn by **RA**

drawing number

edp3253_d007e

checked **PW**

scale

1:5,000 @ A3

QA



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- Site Boundary (12.63ha)
- 1 Arrival Square
- 2 Attenuation Pond
- 3 Wildflower Meadow and Oak Parkland
- 4 Woodland Planting
- 5 Public Right of Way Integrated within Green Corridor
- 6 Vehicular Access Point
- 7 Main Street With Green Verge, Including Rain Gardens
- 8 Neighbourhood Green with Swale
- 9 Natural Play Space
- 10 Informal Kick-about Space
- 11 Mown Grass Trails

client
Vistry Group

project title
Land to the East of Warwick Road, Banbury

drawing title
Concept Masterplan

date	03 OCTOBER 2022	drawn by	NBo
drawing number	edp3253_d038c	checked	RAI
scale	1:5,000 @ A3	QA	RBa



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APPENDICES



APPENDIX B







STREET LIGHTING SPECIFICATION

1. STREET LIGHTING TO BS 5489-1:2020 & BS EN 13201-2:2015 P4 (EAV 5.00 TO 7.50 LUX, EMIN 1.0) FOR SUBSIDIARY ROADS, ENVIRONMENTAL ZONE E2 AND NORMAL/QUIET TRAFFIC FLOW WITH SPEED LIMITS <30MPH
2. COLUMNS TO BE INSTALLED AT THE REAR OF THE FOOTWAY, WHERE WITHIN VERGES TO BE SET BACK TO A MINIMUM OF 1.0m FROM KERBLINE.
3. COLUMNS 6m TUBULAR STEEL GALVANISED WITH GLASS FLAKE ROOT COLUMN WITH POST TOP MOUNT.
4. LANTERN
DW WINDSOR KIRIUM PRO 16LED A1 300mA 1.99KLM
5. (PROJECT MAINTENANCE FACTOR 1.00).

NOTES:

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH REPORT 27617-04-EUA-01.

STREET LIGHTING KEY

PROPOSED STREET LIGHTING COLUMN	
COLUMN HEIGHT: 6m	
PROJECTION: 0.3m	
LANTERN MANUFACTURER: DW WINDSOR	
QUANTITY	LANTERN NAME: KIRIUM PRO MINI
61	INCLINATION: 0°
	LAMP TYPE: 16LED 3000K
	WATTAGE: 14W
	OPTIC: A1 300mA 1.99KLM
	7.50 LUX ISO CONTOUR
	5.00 LUX ISO CONTOUR
	1.00 LUX ISO CONTOUR
	SITE BOUNDARY

REV	FIRST ISSUE	NA	DMH	AB	01.11.22
AMENDMENTS:	DRN	CHK	APP	DATE:	

PROJECT: LAND EAST OF WARWICK ROAD, BANBURY

DRAWING TITLE: ILLUSTRATIVE LIGHTING LAYOUT

CLIENT: VISTRY GROUP

DRAWING NUMBER: 27617_04_100_01

REVISION: - SHEET SIZE: A1 SCALE: 1:1000

STATUS: FOR INFORMATION / APPROVAL

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