STRENGER

Proposed IVC Facility, Fenn's Bank, Whitchurch

Lighting Assessment

Prepared for: Axis

Date: September 2025

TECHNICAL CONCEPTS

ILP Environmental Zone

ILP Guidance Note 01/21: The Reduction of Obtrusive Light sets out a series of environmental zones for classifying lighting assessment study areas based on their surroundings type e.g. rural, suburban etc., and the lighting environment e.g. low district brightness, medium district brightness etc. Based on the surroundings type and lighting environment, an environmental zone can be selected, from Zone E0 to Zone E4. The obtrusive light limits associated with the relevant environmental zone(s) are then adopted for assessment purposes.

Lighting curfew

A lighting curfew is an agreed time, beyond which, a lighting installation is subject to more stringent environmental control, generally as agreed with the local planning authority (LPA). Such controls may take the form of switching the lighting installation off in its entirety, switching the lighting installation off in part, dimming the lighting installation, or the implementation of smart lighting controls. Irrespective of the adopted control measures, suitable control of obtrusive light for the pre-curfew scenario and the post-curfew scenario can generally be demonstrated by adhering to ILP Guidance Note 01/21: The Reduction of Obtrusive Light. This national guidance document defines obtrusive light level limits separately for the pre-curfew scenario and the post-curfew scenario. Lighting curfews are generally best suited to facilities where a specific activity requiring artificial lighting ceases at a specific time e.g. a floodlit sports pitch, or a supermarket. However, in many cases, particularly 24-hour operations there is no clear change in activities requiring artificial lighting. In such cases, LPAs seldom impose a lighting curfew per se. However, for the sake of robustness in assessing obtrusive light, it is usual to adopt the ILP post-curfew obtrusive light criteria beyond a certain time. Where this time is not imposed by the LPA, 23:00 hours is generally adopted.

Light Spill

Light spill defines the amount of light spilling beyond an intentionally lit area. It is assessed in terms of the amount of light falling on a surface i.e. illuminance (E) and is measured in lux. Generally, light spill is measured in the horizontal plane to give the horizontal illuminance.

'Light intrusion'

This occurs as a result of light spill falling on to a receptor, generally onto a residential property window (hence the term 'light intrusion') but equally could be any light-sensitive human receptor. It is assessed in terms of the amount of light falling on a surface i.e. illuminance (E) and is measured in lux. Where the receptor is a residential window, the level of perpendicular illuminance on the window is used to give the vertical illuminance (E – lux).

'Glare' (residential context)

This is the degree of discomfort, adaptation or disability associated with a light source when viewed against a darker background. In the context of residential / landscape & visual lighting assessment, the luminance of the background against which the intensity will be assessed is defined by means of the relevant ILP Environmental Zone. It is assessed in terms of the intensity of the light i.e. viewed light source intensity (I) and is measured in candelas (cd).

'Sky-glow'

This is the diffuse luminance of the night sky. Although there is a naturally occurring glow to the night sky, artificial lighting can potentially dominate the level of 'sky-glow'. This occurs due to direct upward lighting and reflected lighting off ground surfaces, buildings etc. reflecting off gaseous molecules in the atmosphere resulting in luminosity of the night sky. The level of 'sky-glow' will vary depending on prevailing atmospheric conditions, particularly metrological conditions i.e. cloud cover and precipitation. There are various potential means of quantifying 'sky-glow'; however, in the case of new exterior lighting installations, 'sky-glow' is addressed by means of limiting the upward light ratio (ULR) of the installation i.e. the ratio between useful light downwards and wasted light upwards towards the sky.

EXECUTIVE SUMMARY

Outline Scope

Strenger Ltd was appointed by Axis to undertake a lighting assessment for an exterior lighting installation associated with a proposed in-vessel composting (IVC) facility at the former Befesa salt slags site, Fenn's Bank, Whitchurch, Flintshire SY13 3PA (hereon in, the 'Proposed Development'). The assessment is required in order to quantify the impact of artificial light associated with the Proposed Development on its surroundings. Emergency and CCTV lighting is beyond the scope of this assessment. This report shall be read in conjunction with the following accompanying drawings produced by Strenger:

- SK-01 Residential Receptor Location Plan
- SK-02 Assessed Scheme of Lighting
- SK-03 Light Spill

Assessment

In order to assess the potential light impacts associated with the Proposed Development, the following has been undertaken:

- review of pertinent legislation, policy and guidance;
- review of the site and surrounding area using aerial photography and OS mapping;
- production of a scheme of lighting (Assessed Scheme of Lighting) suitable for environmental assessment;
- detailed 3D computational modelling of the Assessed Scheme of Lighting;
- specification of high-level mitigation measures;
- calculation of 'light intrusion' (vertical illuminance) at residential receptors;
- calculation of 'glare' (viewed source intensity) at residential receptors;
- calculation of 'sky-glow' (upward light ratio);
- comparison of the obtrusive light levels with national guideline limits;
- production of isolux contours of light spill;
- production of ray-traced rendered light model imagery; and
- production of CAD drawings.

Conclusions

Based on the Assessed Scheme of Lighting, it has been demonstrated that the Proposed Development will be compliant with the residential receptor criteria as set out in ILP GN 01/21: The Reduction of Obtrusive Light. By demonstrating compliance with the ILP national guidelines, the proposals ensure that the impact of light pollution on local amenity is suitably limited, consistent with the requirements of the PPW. Specifically, the Assessed Scheme of Lighting associated with the Proposed Development is compliant with the ILP post-curfew obtrusive light criteria for ILP Environmental Zone E2. The adopted criteria are as follows:

- 'Light intrusion' limit of 1 lux (E - vertical illuminance)
- 'Glare' limit of 1.3d to 500 cd (I - source intensity)
- 'Sky-glow' limit of 2.5 % (upward light ratio)

Compliance has been achieved with the adoption of an environmentally sympathetic scheme of lighting having the following integral mitigation measures:

- the use of luminaires with zero direct contribution to upward light;
- minimising luminaire uplift angles;
- careful aiming and positioning of luminaires;
- the adoption of the lowest intensity LED modules practicable;
- the use of optimal light distributions for their specific location and orientation;
- the use of dimming (generally by means of factory preset);
- optimisation of mounting heights;
- minimising the task illuminance level;
- the use of 'warm-white' (2700K generally & 3000K to specific removed areas) light source correlated colour temperatures;
- the use of LED light sources with minimal UV and blue light spectral content; and
- where possible, the use of zoned switching / presence detection controls.

1. LEGISLATION, POLICY & GUIDANCE

Legislation

Clean Neighbourhoods and Environment Act (CNEA), 2005

1.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act 2005 *('CNEA* 2005') as a form of statutory nuisance under the Environmental Protection Act 1990 (the 'EPA 1990') which was amended in 2006 to include the following nuisance definition:

> *"(fb) artificial light emitted from premises so as to be prejudicial to health or a nuisance;"*

1.2 Although light was described as having the potential to cause statutory nuisance in the CNEA 2005, no prescriptive limits or rules were set for impact assessment purposes. The Guidance Notes for the Reduction of Obtrusive Light produced by the ILP has, therefore, been referred to for the purposes of this assessment.

1.3 Guidance produced by DEFRA, Statutory Nuisance from Insects & Artificial Light (2006) on s101 to s103 of the CNEA has also been referred to which places a duty on local authorities to ensure that their areas are checked periodically for existing and potential sources of statutory nuisances - including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with s80(2) of the EPA 1990), requiring that the nuisance cease or be abated within a set timescale.

National Planning Policy

Planning Policy Wales, Edition 12, 2024

1.4 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales. PPW recognises the need to balance the need for lighting with protecting the natural & historic environment, protecting dark skies and controlling obtrusive light for the sake of amenity.

International Guidance

Commission Internationale De L'Eclairage 150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations, 2017 (CIE-150)

1.5 The purpose of CIE-150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations, 2017 is to help formulate guidelines for assessing the environmental impacts of outdoor lighting and to give recommended limits for relevant lighting parameters to contain the obtrusive effects of outdoor lighting within tolerable levels. As the obtrusive effects of outdoor lighting are best controlled initially by appropriate design, the guidance given is primarily applicable to new installations; however, some advice is also provided on remedial measures which may be taken for existing installations. This Guide refers to the potentially adverse effects of outdoor lighting on both natural and man-made environments for people in most aspects of daily life, from residents, sightseers, transport users to environmentalists and astronomers.

Commission Internationale De L'Eclairage 126: Guidelines for Minimising Sky Glow, 1997 (CIE-126)

1.6 CIE-126: Guidelines for Minimising Sky Glow, 1997 gives general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for exterior lighting installations. These values are regarded as limiting values. Lighting designers should strive to meet the lowest criteria for the design. Practical implementation of the general guidance is left to national regulations.

National Guidance

Welsh Government Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales

1.7 The purpose of this guidance is to increase understanding of how to conserve and enhance dark skies in Wales through planning and design to make a tangible difference. The guidance does not mean no lights, but only where light is needed. Good lighting practice should be followed using the right light in the right place, at the right time. This Welsh Government guidance supports national and local planning policies on dark skies and light pollution. It provides an opportunity to promote a national approach and should be followed by all those involved in the planning, design and determination of planning applications or lighting schemes. The recommendations, lighting design principles and advice set out in this guidance are applicable to the whole of Wales and will lead to more sensitively designed and appropriate lighting schemes that will deliver improved outcomes for the night sky and ecosystems.

Institution of Lighting Professionals (ILP) Guidance Note 01/21: The Reduction of Obtrusive Light, 2021

1.8 The ILP has proposed obtrusive lighting guidance and criteria for local authorities with a recommendation that these are incorporated at the local plan level. ILP Guidance Note 01/21 defines various forms of light pollution and describes a series of environmental zones. ILP Guidance Note 01/21 provides suitable criteria against which the effects of artificial lighting can be assessed.

Institution of Lighting Professionals (ILP) Professional Lighting Guide 04 - Guidance on Undertaking Environmental Lighting Impact Assessments, 2013

1.9 The aim of the Guidance on Undertaking Environmental Lighting Impact Assessments (ILP PLG04:2013) is to outline good practice in lighting design and provide practical guidance on production and assessment of lighting impacts within new developments. The document was produced following the publication of the NPPF in April 2012 and the importance of lighting design being part of a planning application, this document aims to:

- provide an explanation of, and guidance on, the process for producing a lighting assessment;
- prompt the lighting designer on important aspects of specific projects which should be used to remove or minimise potential environmental problems; and
- look at the overall processes and evaluation procedures regarding lighting which are considered to be relevant.

Buglife - The Invertebrate Conservation Trust - A review of the Impact of Artificial Light on Invertebrates, 2011

1.10 A review of the Impact of Artificial Light on Invertebrates is a published literature review on how humans are changing the light environment and the impact that this has on insects and other invertebrates. It makes various recommendations and identifies several further research areas.

Institution of Lighting Professionals (ILP) Guidance Note 08/23: Bats and artificial lighting at night, 2023

1.11 This working document produced by the ILP in conjunction with the Bat Conservation Trust (BCT), is aimed at lighting professionals, lighting designers, planning officers, developers, bat workers/ecologists and anyone specifying lighting. It is intended to raise awareness of the impacts of artificial lighting on bats but also the potential solutions to avoid and reduce this harm. However, it is not meant to replace site-specific ecological and lighting assessments. The document also incorporates a number of useful case studies; the ecological lighting design and assessment for Case Study 2: Dark Corridors at Foxlydiate was undertaken by Strenger.

The Royal Commission on Environmental Pollution (RCEP) – Artificial Light in the Environment, 2009

1.12 This RCEP document discusses the social benefits and drawbacks of outdoor lighting, the impacts of light pollution on organisms and ecosystems, discusses road lighting technology, and makes various concluding recommendations.

2. CRITERIA

Exterior Lighting

2.1 In the absence of statutory guidance, ILP Guidance Note 01/21: The Reduction of Obtrusive Light has been used as criteria against which to assess the effects of artificial lighting associated with the Proposed Development on residential, receptors; this is considered best practice.

ILP Environmental Zone Classification

2.2 The ILP has developed an Environmental Zone classification system for the categorisation of areas with regard to suitable obtrusive lighting limits. The Environmental Zone classifications are reproduced in Table 2.1.

Table 2.1: ILP Environmental Zone Classification

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, village 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

ILP Environmental Zone Criteria

2.3 For each Environmental Zone, obtrusive light limits for exterior lighting installations have been determined. These are summarised in Table. 2.2 to Table 2.4 below and are intended to support decision makers in establishing whether artificial lighting is detrimental to local amenity or a potential statutory nuisance.

Table 2.2: ILP 'Light Intrusion' (vertical illuminance) Limits E - lux

Application Conditions	Environmental Zone				
	E0	E1	E2	E3	E4
Pre-curfew	n/a	2	5	10	25
Post-curfew	n/a	< 0.1 *	1	2	5

* If the installation is for public (road) lighting then this may be up to 1 lux.

Table 2.3: ILP 'Glare' (source intensity) Limits I - cd						
Application Conditions	**Luminaire group (projected area A_p in m^2)**					
	0 < Ap ≤ 0.002	**0.002 < Ap ≤ 0.01**	**0.01 < Ap ≤ 0.03**	**0.03 < Ap ≤ 0.13**	**0.13 < Ap ≤ 0.50**	**Ap > 0.50**
E0 Pre-curfew E0 Post-curfew	0 0	0 0	0 0	0 0	0 0	0 0
E1 Pre-curfew E1 Post-curfew	0.29 d 0	0.63 d 0	1.3 d 0	2.5 d 0	5.1 d 0	2,500 0
E2 Pre-curfew E2 Post-curfew	0.57 d 0.29 d	1.3 d 0.63 d	2.5 d 1.3 d	5.0 d 2.5 d	10 d 5.1 d	7,500 500
E3 Pre-curfew E3 Post-curfew	0.86 d 0.29 d	1.9 d 0.63 d	3.8 d 1.3 d	7.5 d 2.5 d	15 d 5.1 d	10,000 1,000
E4 Pre-curfew E4 Post-curfew	1.4 d 0.29 d	3.1 d 0.63 d	6.3 d 1.3 d	13 d 2.5 d	26 d 5.1 d	25,000 2,500

1) d is the distance between the observer and the 'glare' source in metres

2) Upper limits for each zone shall be taken as those with column $A_p > 0.5$

Table 2.4: ILP 'Sky-glow' (upward light ratio) Limits ULR - %				
Environmental Zone				
E0	**E1**	**E2**	**E3**	**E4**
0	0	2.5	5	15

Determination of ILP Environmental Zone

2.4 The Proposed Development site lies within rural surroundings in a low district brightness. Based on the Proposed Development site surroundings it is considered that the most appropriate classification for the purposes of this obtrusive light assessment is ILP Environmental Zone E2.

2.5 Such a classification will ensure that the nightscape within the immediate and wider study area is suitably protected.

ILP Environmental Zone Criteria

2.6 Based on ILP Environmental Zone E2, the obtrusive light limits for the Proposed Development affecting residential receptors are as follows:

- Pre-curfew 'light intrusion' limit of 5 lux (E - vertical illuminance)
- Post-curfew 'light intrusion' limit of 1 lux (E - vertical illuminance)
- Pre-curfew 'glare' limit of 2.5d to 7,500 cd (I - source intensity)
- Post-curfew 'glare' limit of 1.3d to 500 cd (I - source intensity)
- 'Sky-glow' limit of 2.5 % (upward light ratio)

Adopted ILP Environmental Zone Criteria

2.7 Such as to demonstrate that it would be possible to operate lighting during any hours of darkness, only the post-curfew ILP criteria have been adopted for the purposes of this assessment. As such, the adopted criteria are as follows:

- 'Light intrusion' limit of 1 lux (E - vertical illuminance)
- 'Glare' limit of 1.3d to 500 cd (I - source intensity)
- 'Sky-glow' limit of 2.5 % (upward light ratio)

3. RECEPTORS

Residential

3.1 Within the context of this assessment, residential receptors are taken as those with the potential to be affected by obtrusive light associated with the Proposed Development. Key existing residential receptors which have the potential to be impacted by obtrusive light from the Proposed Development have been identified and adopted as receptor locations within this assessment.

3.2 Residential receptors are positioned at local ground level +2.0 m (i.e. ground floor level window height). At a height of 2.0m, the angle subtended with the light sources will be less than that if assessed at first floor level windows. The assessed receptor height therefore represents a reasonable worst-case scenario, as the level of 'glare' (viewed source intensity) will be at its maximum.

3.3 The assessed residential receptors are set out in Strenger drawing ref: SK-01 Residential Receptor Location Plan.

Ecological

3.4 Within the context of this assessment, ecological receptors are taken as those which have been identified as being light sensitive and having the potential to be affected by light spill associated with the Proposed Development. It is understood that areas beyond the Proposed Development site boundary are potentially light sensitive. Accordingly, measures have been adopted to limit the levels of light spill beyond the Proposed Development site boundary.

4. EXTERIOR LIGHTING

Overview

4.1 Artificial lighting will be required for safe working, security (personal & property) and health & safety requirements during periods of darkness. The associated potential obtrusive light effects towards surrounding light-sensitive receptors would be minimised through the controlled application of lighting in accordance with current best practice.

Assessed Scheme of Lighting

4.2 An indicative scheme of lighting (Assessed Scheme of Lighting) has been produced for the Proposed Development. The final selection of luminaires and their positioning shall be determined by the Responsible Lighting Engineer in order to meet the site final risk assessed lighting requirements; but bearing in mind any obtrusive lighting impact that the selection may have. The final lighting design shall cover matters such as DSEAR requirements, CCTV lighting, emergency lighting, passive protection / electrical isolation, column protection, ingress protection, impact protection, maintenance / installation & decommissioning, underground / overhead services, building / plant mounting methods etc.

4.3 The details of the luminaires used in the Assessed Scheme of Lighting are set out in Table 4.1 below. The Assessed Scheme of Lighting is set out in Strenger drawing ref: SK-02 Assessed Scheme of Lighting. The drawing details the position, height and type of all assessed lighting. The associated levels of light spill are set out in Strenger drawing ref: SK-03 Light Spill.

Table 4.1: Assessed Scheme of Lighting Details

Reference	No. of	Manufacturer	Luminaire	Light Source	Distribution
LUM-A1	16	Designplan	Tuscan Wall	WW 14.9W LED	-
LUM-B1	6	DW Windsor	Sabre	2700K 24 LED (1000mA)	A1
LUM-B2	19	DW Windsor	Sabre	2700K 32 LED (1000mA)	A1
LUM-B3	4	DW Windsor	Sabre	2700K 32 LED (350mA)	A1
LUM-B4	3	DW Windsor	Sabre	2700K 32 LED (1000mA)	C2
LUM-B5	1	DW Windsor	Sabre	2700K 32 LED (500mA)	C2
LUM-B6	4	DW Windsor	Sabre	2700K 64 LED (1000mA)	A1
LUM-B7	11	DW Windsor	Sabre	2700K 64 LED (750mA)	C2
LUM-C1	5	Luceco	Semita Arc	2700K 7.5W LED	Path
LUM-C2	6	Luceco	Semita Arc	2700K 7.5W LED	Street



Figure 4.1: Designplan Tuscan Wall (LUM-A)



Figure 4.2: DW Windsor Sabre (LUM-B)



Figure 4.3: Luceco Semita Arc (LUM-C)

5. MODELLING

5.1 Light modelling was undertaken using industry-standard software capable of calculating artificial lighting scenes in exterior scenarios. The software incorporates recognised calculation methodologies and is commonly used for lighting assessment worldwide. An indicative scheme of lighting for the Proposed Development has been produced for the purposes of this assessment and has been inputted into the lighting model.

5.2 In order to represent a reasonable worst-case scenario for environmental assessment, the maintenance factor within the lighting model was set to 1.0, such that the scheme was assessed based on the full design lumen output, rather than the maintained minimum design lumen output.

5.3 Such as to provide an illustrative overview of the lighting model, ray-traced imagery of the rendered lighting model is appended to this report in Appendix A. The imagery is representative of the light model only and the Project Architect drawings / visualisations should be referred to for accurate depiction.

6. MITIGATION

6.1 The following mitigation measures are integral to good lighting design, and have therefore been included in the Assessed Scheme of Lighting as a matter of course:

- the use of luminaires with zero direct contribution to upward light;
- minimising luminaire uplift angles;
- careful aiming and positioning of luminaires;
- the adoption of the lowest intensity LED modules practicable;
- the use of optimal light distributions for their specific location and orientation;
- the use of dimming (generally by means of factory preset);
- optimisation of mounting heights; and
- minimising the task illuminance level.

6.2 The following mitigation measures, specific to the control of light spill affecting light sensitive ecological receptors have been included in the Assessed Scheme of Lighting:

- the use of 'warm-white' (2700K generally & 3000K to specific removed areas) light source correlated colour temperatures;
- the use of LED light sources with minimal UV and blue light spectral content; and
- where possible, the use of zoned switching / presence detection controls.

7. ASSESSMENT

Residential

'Light Intrusion' (vertical illuminance)

7.1 The levels of 'light intrusion' from the Assessed Scheme of Lighting associated with the Proposed Development have been predicted at residential receptors. The resultant levels of 'light intrusion' are set out in Table 7.1 against the ILP post-curfew 'light intrusion' criterion of 1 lux for Environmental Zone E2. Each receptor has been assigned a PASS / FAIL outcome accordingly.

Table 7.1: 'Light Intrusion' Assessment

Receptor	'Light Intrusion' Criterion - E (lux)	Predicted 'Light Intrusion' - E (lux)	Outcome
RES-01	1	0.02	**PASS**
RES-02	1	0.01	**PASS**
RES-03	1	0.01	**PASS**
RES-04	1	0.02	**PASS**
RES-05	1	0.00	**PASS**
RES-06	1	0.01	**PASS**
RES-07	1	0.00	**PASS**
RES-08	1	0.00	**PASS**
RES-09	1	0.01	**PASS**

7.2 As can be seen from Table 7.1 above, the predicted levels of 'light intrusion' at residential receptors from the Assessed Scheme of Lighting associated with the Proposed Development are compliant with the ILP post-curfew 'light intrusion' criterion of 1 lux for Environmental Zone E2.

'Glare' (viewed source intensity)

7.3 The maximum levels of 'glare' from the Assessed Scheme of Lighting associated with the Proposed Development have been predicted at residential receptors. The resultant maximum levels of 'glare' are set out in Table 7.2 against the adopted ILP post-curfew 'glare' criterion of 1.3d to 500 cd for Environmental Zone E2. Each receptor has been assigned a PASS / FAIL outcome accordingly.

Table 7.2: 'Glare' Assessment

Receptor	Adopted 'Glare' Criteria - I (cd)	Predicted Maximum 'Glare' - I (cd)	Outcome
RES-01	385	10	**PASS**
RES-02	342	18	**PASS**
RES-03	325	12	**PASS**
RES-04	367	10	**PASS**
RES-05	-	0	**PASS**
RES-06	500	7	**PASS**
RES-07	-	0	**PASS**
RES-08	-	0	**PASS**
RES-09	500	6	**PASS**

N.B. Where a predicted 'glare' level is zero then the 'Glare' criterion is non-calculable due to there being no 'offending' light sources

7.4 As can be seen from Table 7.2 above, the predicted maximum levels of 'glare' at residential receptors from the Assessed Scheme of Lighting associated with the Proposed Development are compliant with the ILP post-curfew adopted 'glare' criterion of 1.3d to 500 cd for Environmental Zone E2.

'Sky-glow' (upward light ratio)

7.5 The level of 'sky-glow' from the Assessed Scheme of Lighting associated with the Proposed Development has been predicted. The resultant level of 'sky-glow' is set out in Table 7.3 against the ILP 'sky-glow' criterion of 2.5 % for Environmental Zone E2. Each receptor has been assigned a PASS / FAIL outcome accordingly.

Table 7.3: 'Sky-glow' Assessment

Receptor	'Sky-glow' Criterion - ULR (%)	Predicted 'Sky-glow' - ULR (%)	Outcome
Residential	2.5	0.0	**PASS**

7.6 As can be seen from Table 7.3 above, the predicted level of 'sky-glow' from the Assessed Scheme of Lighting associated with the Proposed Development is compliant with the ILP 'sky-glow' criterion of 2.5 % for Environmental Zone E2.

8. CONCLUSIONS

8.1 Based on the Assessed Scheme of Lighting, it has been demonstrated that the Proposed Development will be compliant with the residential receptor criteria as set out in ILP GN 01/21: The Reduction of Obtrusive Light. By demonstrating compliance with the ILP national guidelines, the proposals ensure that the impact of light pollution on local amenity is suitably limited, consistent with the requirements of the PPW. Specifically, the Assessed Scheme of Lighting associated with the Proposed Development is compliant with the ILP post-curfew obtrusive light criteria for ILP Environmental Zone E2. The adopted criteria are as follows:

- 'Light intrusion' limit of 1 lux (E - vertical illuminance)
- 'Glare' limit of 1.3d to 500 cd (I - source intensity)
- 'Sky-glow' limit of 2.5 % (upward light ratio)

8.2 Compliance has been achieved with the adoption of an environmentally sympathetic scheme of lighting having the following integral mitigation measures:

- the use of luminaires with zero direct contribution to upward light;
- minimising luminaire uplift angles;
- careful aiming and positioning of luminaires;
- the adoption of the lowest intensity LED modules practicable;
- the use of optimal light distributions for their specific location and orientation;
- the use of dimming (generally by means of factory preset);
- optimisation of mounting heights;
- minimising the task illuminance level;
- the use of 'warm-white' (2700K generally & 3000K to specific removed areas) light source correlated colour temperatures;
- the use of LED light sources with minimal UV and blue light spectral content; and
- where possible, the use of zoned switching / presence detection controls.

Appendix A - Lighting Model Ray-traced Imagery

















