

Lighting Assessment for Planning Application
26/00942/STPLF

Land South Of Raich Carter Way, Dunswell,
HU6 7YJ

Prepared by Strenger

May 2025

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Dunswell Park & Ride
[Lighting Assessment](#)

[Prepared for:](#) Ashcourt Group
[Date:](#) May 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 Ashcourt Group to undertake a lighting assessment for an exterior lighting installation associated with a proposed park & ride at land off Raich Carter Way, Dunswell, Hull (hereon in, the 'Proposed Development'). The assessment is required in order to quantify the impact of artificial lighting associated with the Proposed Development on its surroundings.

Emergency lighting and CCTV lighting are 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 lighting 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 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, it is ensured that the impact of light pollution on local amenity is suitably limited, consistent with the requirements of the NPPF. 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 0.29d to 500 cd (I - source intensity)
- 'Sky-glow' limit of 2.5 %

Best practice measures as set out in ILP Guidance Note 08/23: Bats and artificial lighting at night have been adopted for the Proposed Development lighting, all as set out in the mitigation measures below. It has been demonstrated that with the adoption of suitable mitigation measures, it would be possible to reduce potential harm associated with light spill on species using adjacent habitat to an acceptable level. The proposals ensure that the impact of light pollution on nature conservation is suitably limited, consistent with the requirements of the NPPF.

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 minimal to zero direct contribution to upward light;
- the use of zero degree 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 via factory preset and variable control;
- optimisation of mounting heights;
- minimising the task illuminance level;
- the use of lighting bollards; *
- the use of 'warm-white' 2700K light source correlated colour temperatures generally; *
- the use of LED light sources with minimal UV and blue light spectral content; *
- the use of light spill shields to luminaires; * and
- the use of zoned switching / presence detection controls. *

Although all above mitigation measures would potentially contribute to reducing adverse effects associated with artificial lighting on ecological receptors, those mitigation measures marked with an asterisk (*) demonstrate specific consideration of ILP Guidance Note 08/23: Bats and artificial lighting at night.

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

National Planning Policy Framework, 2024

- 1.4 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans can provide for housing and other development in a sustainable manner. The NPPF states that the purpose of the planning system is to contribute to the achievement of sustainable development, including the provision of homes, commercial development and supporting infrastructure in a sustainable manner. With regard to artificial lighting, the NPPF states the following:

'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.'

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

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

- 1.7 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

- 1.8 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

- 1.9 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

- 1.10 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

- 1.11 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

Residential

- 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)					
	$0 < A_p \leq 0.002$	$0.002 < A_p \leq 0.01$	$0.01 < A_p \leq 0.03$	$0.03 < A_p \leq 0.13$	$0.13 < A_p \leq 0.50$	$A_p > 0.50$
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 on the outskirts of Hull, to the south of Dunswell. The existing residential receptors with a view of the Proposed Development site all have a rural outlook. Therefore, it is considered that the most appropriate classification for the purposes of this obtrusive light assessment is ILP Environmental Zone E2.
- 2.5 Such classifications will ensure that the Proposed Development is in fitting with the surroundings, that the nightscape within the immediate and wider study area is suitably protected and that residential amenity is suitably safeguarded.

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 0.57d to 7,500 cd (I - source intensity)
 - Post-curfew 'glare' limit of 0.29d 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 0.29d 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 with the potential to be affected by light spill associated with the Proposed Development. It is understood that the southern boundary of the Proposed Development site is light-sensitive; measures have therefore been implemented to limit the levels of light spill to this area.
- 3.5 The levels of light spill to ecological receptors are set out in Strenger drawing ref: SK-03 Light Spill.

4. EXTERIOR LIGHTING

Overview

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

Assessed Scheme of Lighting

- 4.2 A scheme of lighting (Assessed Scheme of Lighting) has been produced for the Proposed Development.
- 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	49	BELL	Skyline Virtus	2700K 50-100W LED	Asy' + 360° Shield
LUM-A2	4	BELL	Skyline Virtus	2700K 50-100W LED	Sym'
LUM-A3	24	BELL	Skyline Virtus	2700K 100-200W LED	Asy' + 360° Shield
LUM-A4	3	BELL	Skyline Virtus	2700K 100-200W LED	Asy'
LUM-B1	16	DW Windsor	Kirium Flood 2	2700K 24 LED (1,050mA)	A1
LUM-B2	3	DW Windsor	Kirium Flood 2	2700K 24 LED (500mA)	C2
LUM-C1	12	DW Windsor	Pro Mini	2700K 16 LED (500mA)	A2 + RS
LUM-C2	9	DW Windsor	Pro Mini	2700K 16 LED (550mA)	B2
LUM-C3	11	DW Windsor	Pro Mini	2700K 16 LED (1,050mA)	C2
LUM-C4	19	DW Windsor	Pro Mini	2700K 16 LED (500mA)	C2
LUM-C5	9	DW Windsor	Pro Mini	2700K 8 LED (500mA)	C2 + RS
LUM-D1	39	DW Windsor	Kirium Pro 2	2700K 64 LED (400mA)	A2
LUM-E1	22	DW Windsor	Pharola Max (1m)	2700K 9 LED	Sym'
LUM-F1	11	Luceco	Semita Arc	2700K 15W LED	Street
LUM-G1	16	Thorlux	PSL 65 Recessed	46W LED	Broad
LUM-G2	5	Thorlux	PSL 65 Surface	60W LED	Asy'



Figure 4.1: BELL Lighting Skyline Virtus (LUM-A)

N.B. Shown with uplift above - assessed luminaires have 0° uplift angle



Figure 4.2: DW Windsor Kirium Flood 2 (LUM-B)

N.B. Shown with uplift above - assessed luminaires have 0° uplift angle



Figure 4.3: DW Windsor Kirium Pro Mini (LUM-C)



Figure 4.4: DW Windsor Kirium Pro 2 (LUM-D)



Figure 4.5: DW Windsor Pharola Max (LUM-E)



Figure 4.6: Luceco Semita Arc (LUM-F)



Figure 4.7: Thorlux PSL 65 Recessed (LUM-G1)



Figure 4.8: Thorlux PSL 65 Surface (LUM-G2)

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 throughout Europe and beyond. 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 lighting model only.

6. MITIGATION

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

- the use of luminaires with minimal to zero direct contribution to upward light;
- the use of zero degree 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 via factory preset and variable control;
- optimisation of mounting heights;
- minimising the task illuminance level;
- the use of lighting bollards; *
- the use of 'warm-white' 2700K light source correlated colour temperatures generally; *
- the use of LED light sources with minimal UV and blue light spectral content; *
- the use of light spill shields to luminaires; * and
- the use of zoned switching / presence detection controls. *

6.2 Although all above mitigation measures would potentially contribute to reducing adverse effects associated with artificial lighting on ecological receptors, those mitigation measures marked with an asterisk (*) demonstrate specific consideration of ILP Guidance Note 08/23: Bats and artificial lighting at night.

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	0.01	PASS
RES-02	1	0.01	PASS
RES-03	1	0.08	PASS
RES-04	1	0.07	PASS
RES-05	1	0.06	PASS
RES-06	1	0.06	PASS
RES-07	1	0.05	PASS
RES-08	1	0.06	PASS
RES-09	1	0.01	PASS
RES-10	1	0.02	PASS
RES-11	1	0.02	PASS
RES-12	1	0.08	PASS
RES-13	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 0.29d 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	500	28	PASS
RES-02	500	28	PASS
RES-03	240	56	PASS
RES-04	220	86	PASS
RES-05	255	182	PASS
RES-06	290	79	PASS
RES-07	300	68	PASS
RES-08	225	75	PASS
RES-09	230	41	PASS
RES-10	263	128	PASS
RES-11	330	140	PASS
RES-12	256	132	PASS
RES-13	388	143	PASS

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 0.29d 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

Residential

- 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, it is ensured that the impact of light pollution on local amenity is suitably limited, consistent with the requirements of the NPPF. 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 0.29d to 500 cd (I - source intensity)
- 'Sky-glow' limit of 2.5 %

Ecological

- 8.2 Best practice measures as set out in ILP Guidance Note 08/23: Bats and artificial lighting at night have been adopted for the Proposed Development lighting, all as set out in the mitigation measures below. It has been demonstrated that with the adoption of suitable mitigation measures, it would be possible to reduce potential harm associated with light spill on species using adjacent habitat to an acceptable level. The proposals ensure that the impact of light pollution on nature conservation is suitably limited, consistent with the requirements of the NPPF.

Mitigation

- 8.3 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 minimal to zero direct contribution to upward light;
 - the use of zero degree 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 via factory preset and variable control;
 - optimisation of mounting heights;
 - minimising the task illuminance level;
 - the use of lighting bollards; *
 - the use of 'warm-white' 2700K light source correlated colour temperatures generally; *
 - the use of LED light sources with minimal UV and blue light spectral content; *
 - the use of light spill shields to luminaires; * and
 - the use of zoned switching / presence detection controls. *
- 8.4 Although all above mitigation measures would potentially contribute to reducing adverse effects associated with artificial lighting on ecological receptors, those mitigation measures marked with an asterisk (*) demonstrate specific consideration of ILP Guidance Note 08/23: Bats and artificial lighting at night.

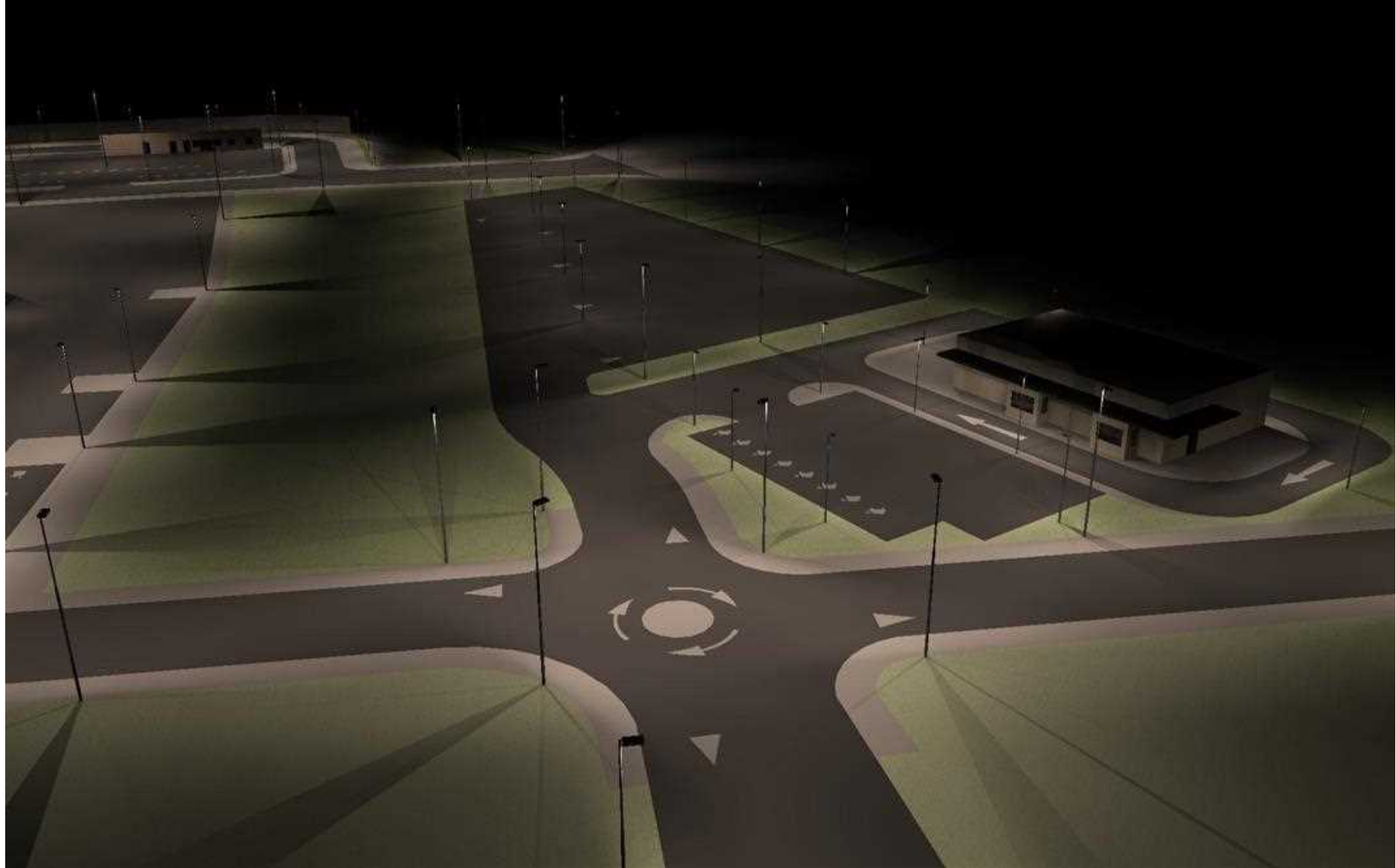
Appendix A - Lighting Model Ray-traced Imagery

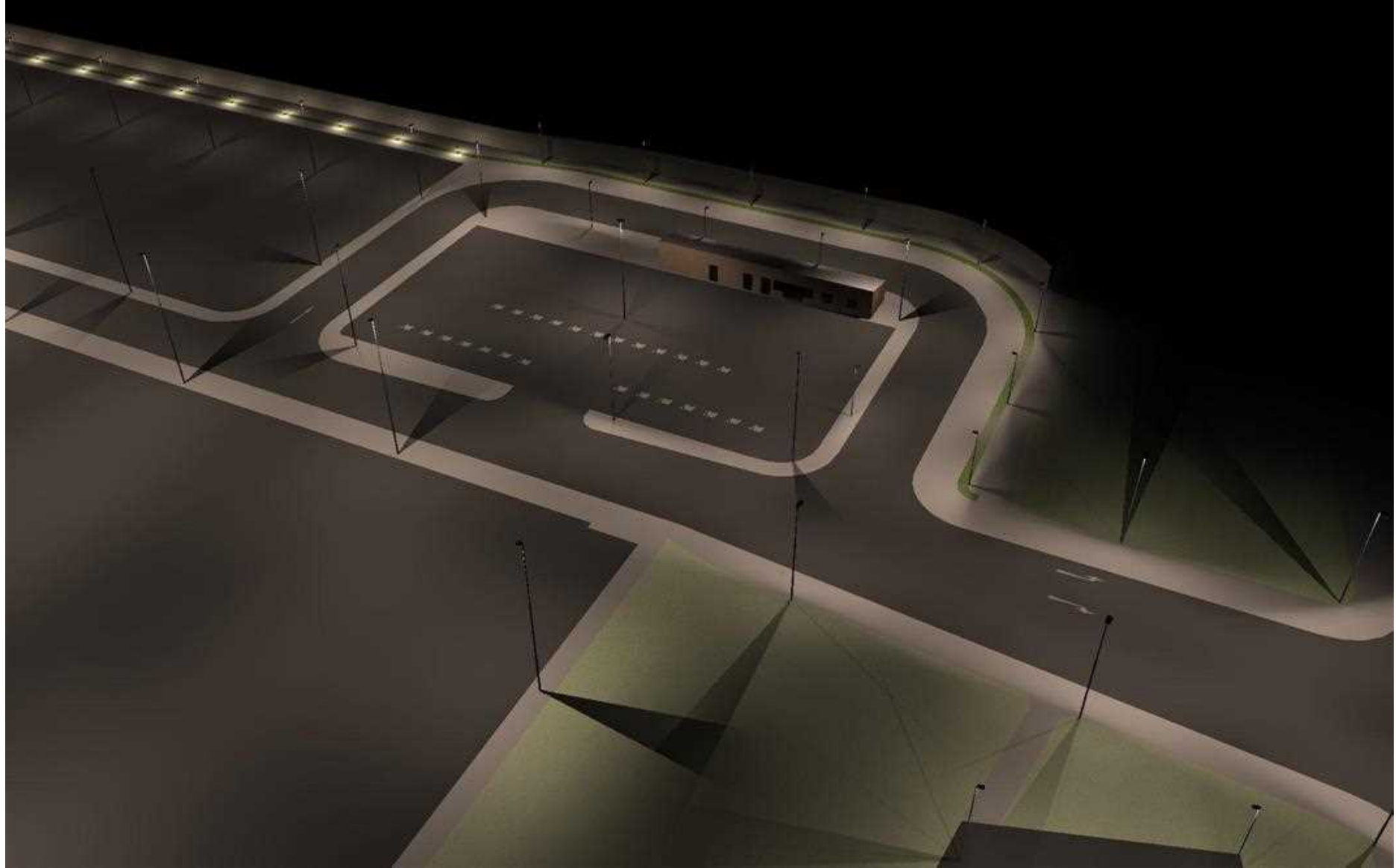




















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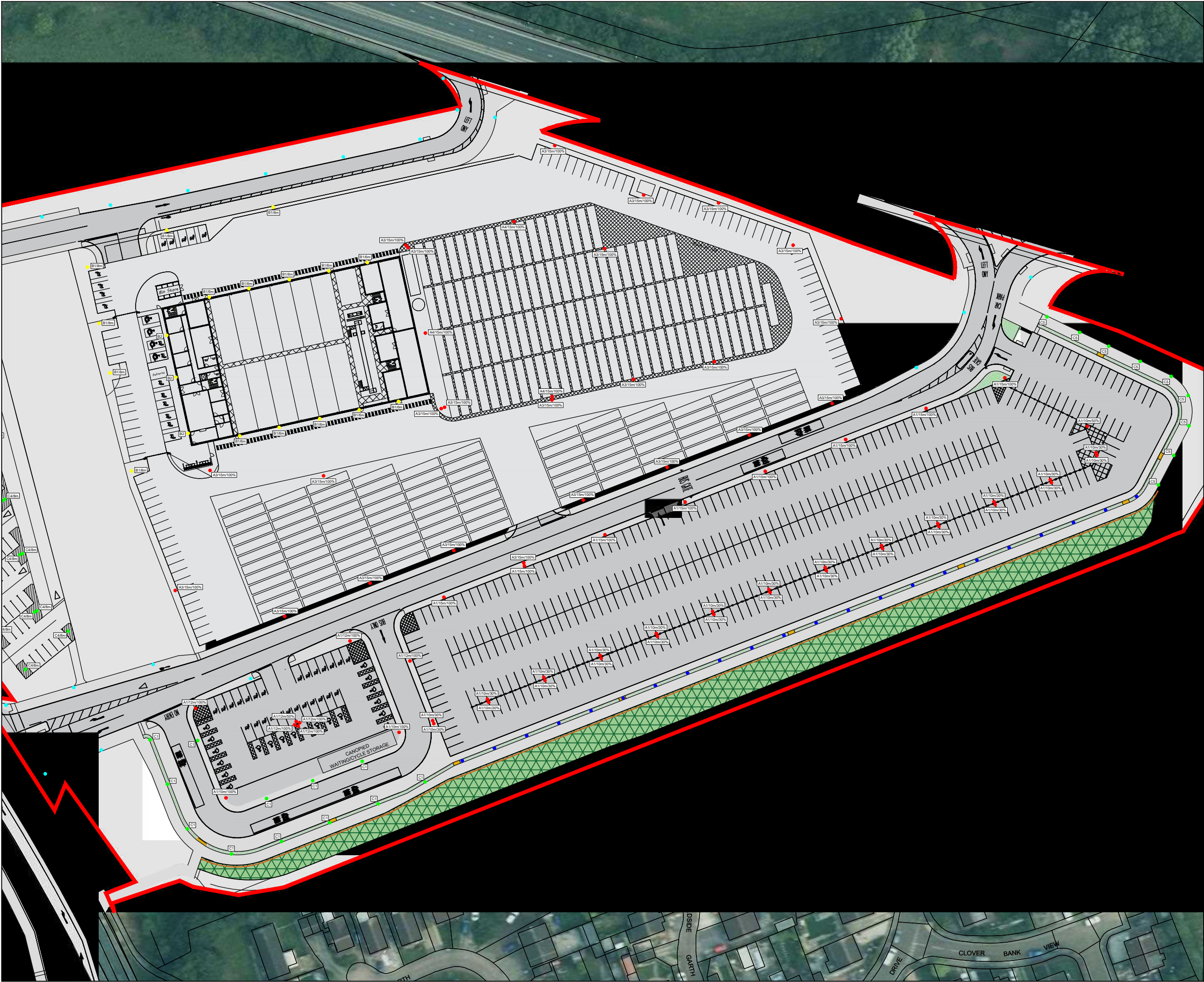
Rev	Date	Details	Drawn

Project	Dunswell Park & Ride
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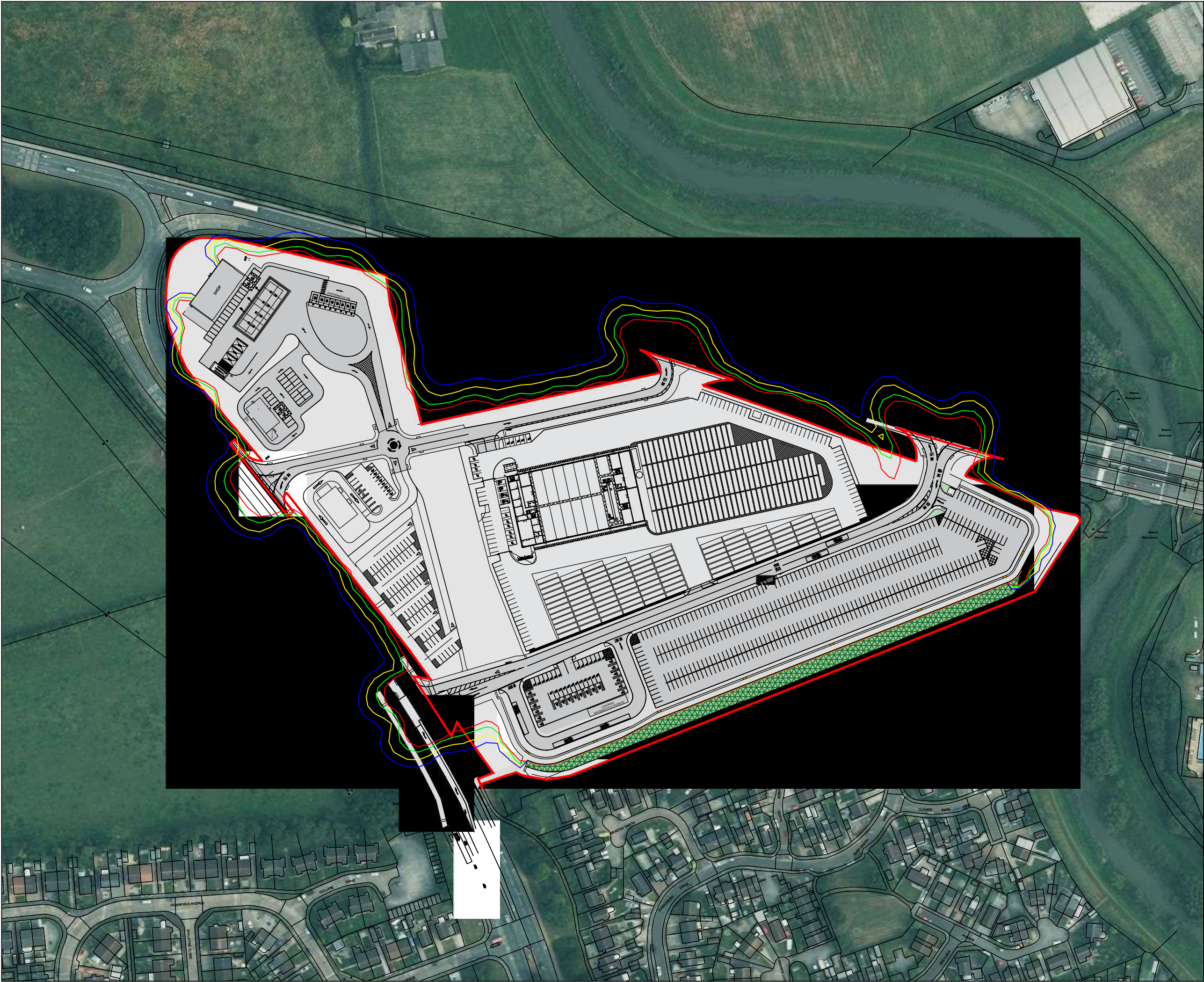
Residential Receptor
Location Plan

Strenger Ltd

Date	Scale	Drawn
MAY 26	NTS	DC
Drawing No. SK-01		
Status	FOR ENV' PLANNING	
Checked	DC	Print A3



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LUMINAIRE SCHEDULE			
● A1 BELL Skyline Virtus 50W-100W 2700K Asy + 360° Shield			
● A2 BELL Skyline Virtus 50W-100W 2700K Sym' @4m			
● A3 BELL Skyline Virtus 100W-200W 2700K Asy + 360° Shield			
● A4 BELL Skyline Virtus 100W-200W 2700K Asy			
● B1 DW Windsor Kirium Flood 2 24 LED 2.7K A1 1050mA			
● B2 DW Windsor Kirium Flood 2 24 LED 2.7K C2 500mA @6m			
● C1 DW Windsor Kirium Pro Mini 16 LED 2.7K A2 + RS 500mA @6m			
● C2 DW Windsor Kirium Pro Mini 16 LED 2.7K B2 550mA @6m			
● C3 DW Windsor Kirium Pro Mini 16 LED 2.7K C2 1050mA			
● C4 DW Windsor Kirium Pro Mini 16 LED 2.7K C2 500mA			
● C5 DW Windsor Kirium Pro Mini 8 LED 2.7K C2 + RS 500mA @5m			
● D1 DW Windsor Kirium Pro 2 64 LED 2.7K A2 400mA @10m			
● E1 DW Windsor Pharola Max (1m) 2.7K 9 LED Sym'			
● F1 Luceco Semita Arc 2700K 15W LED Street @4m			
● G1 Thorlux PSL 65 Recessed 46W LED Broad @canopy soffit			
● G2 Thorlux PSL 65 Surface 60W LED Asy' @canopy soffit			



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Isolines			
0.5 lx			
1.0 lx			
2.0 lx			
3.0 lx			