

Imperial Wharf, Gravesend, DA11 0DY



Lighting Assessment

784-B071233
14th February 2025

PRESENTED TO

FM Conway Ltd

PRESENTED BY

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EXECUTIVE SUMMARY

Tetra Tech were commissioned by FM Conway Limited to prepare a lighting assessment to part discharge a planning condition for the installation of lighting in respect of a planning consent for the installation of two additional bitumen tanks, load out gantry, the installation of a bitumen emulsion plant and alternative car parking. The lighting assessment relates only to the lighting proposed to be installed in the new alternative car park.

Lighting plans have been designed by Designs for Lighting Ltd and used to produce a model of the proposed development within DIALux software in accordance with the appropriate criteria.

The assessment has concluded that the risk of the proposed scheme resulting in exceedances of either the ILP pre-curfew or post-curfew obtrusive light limitations at local residential receptors will be low.

Following the installation of an appropriate lighting scheme as detailed in this report, the risk of the proposed development resulting in exceedances of 1 lux along potential bat foraging/commuting routes and dark corridors is low at all ecological receptor locations. As such, there is a low risk of adverse impacts on local sensitive ecological receptors.

The assessment demonstrates that the proposed development does not conflict with any national or local planning policies.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
CIBSE	Chartered Institute of Building Services Engineers
CIE	Commission on Illumination
ILP	Institution of Lighting Professionals
LDF	Local Development Framework
LP	Local Plan
CS	Core Strategy
DPD	Adopted Development Plan Documents
SPD	Adopted Supplementary Planning Documents
SG	Endorsed Supplementary Guidance Documents
NGR	National Grid Reference
PPS	Planning Policy Statement
NPPF	National Planning Policy Framework
Lx	Lux
ULR	Upward Light Ratio

1.0 INTRODUCTION

Tetra Tech were commissioned by FM Conway to prepare a lighting assessment for a proposed car park on site at Imperial Wharf, Gravesend. FM Conway were granted planning permission for the installation of two additional bitumen tanks, load out gantry and the installation of a bitumen emulsion plant and alternative car parking was granted by Gravesham Borough Council in September 2023 in accordance with planning permission reference 20220733.

Condition 12 attached to the consent requires that:

“Prior to the completion of the development hereby approved, an ecologically sensitive lighting plan shall be submitted to and approved in writing by the local planning authority.”

The plan shall:

a) Identify any areas / features on or off site that are particularly sensitive to light disturbance for ecological features; and

b) Show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not have any significant effect upon biodiversity features.

All lighting shall be installed in accordance with the specifications and locations set out in the plan, and these shall be maintained thereafter in accordance with the plan. Under no circumstances should any other lighting be installed without prior to consent from the Local Planning Authority.”

This lighting assessment aims to satisfy the requirements of Condition 12 in relation to the proposed alternative car parking only.

1.1 SITE LOCATION AND CONTEXT

The site is located at Clifton Marine Parade in Gravesend and is centred at Ordnance Survey National Grid Reference (OSNGR) 563888, 174416.

The site is currently comprised of a storage area surrounded by fencing.

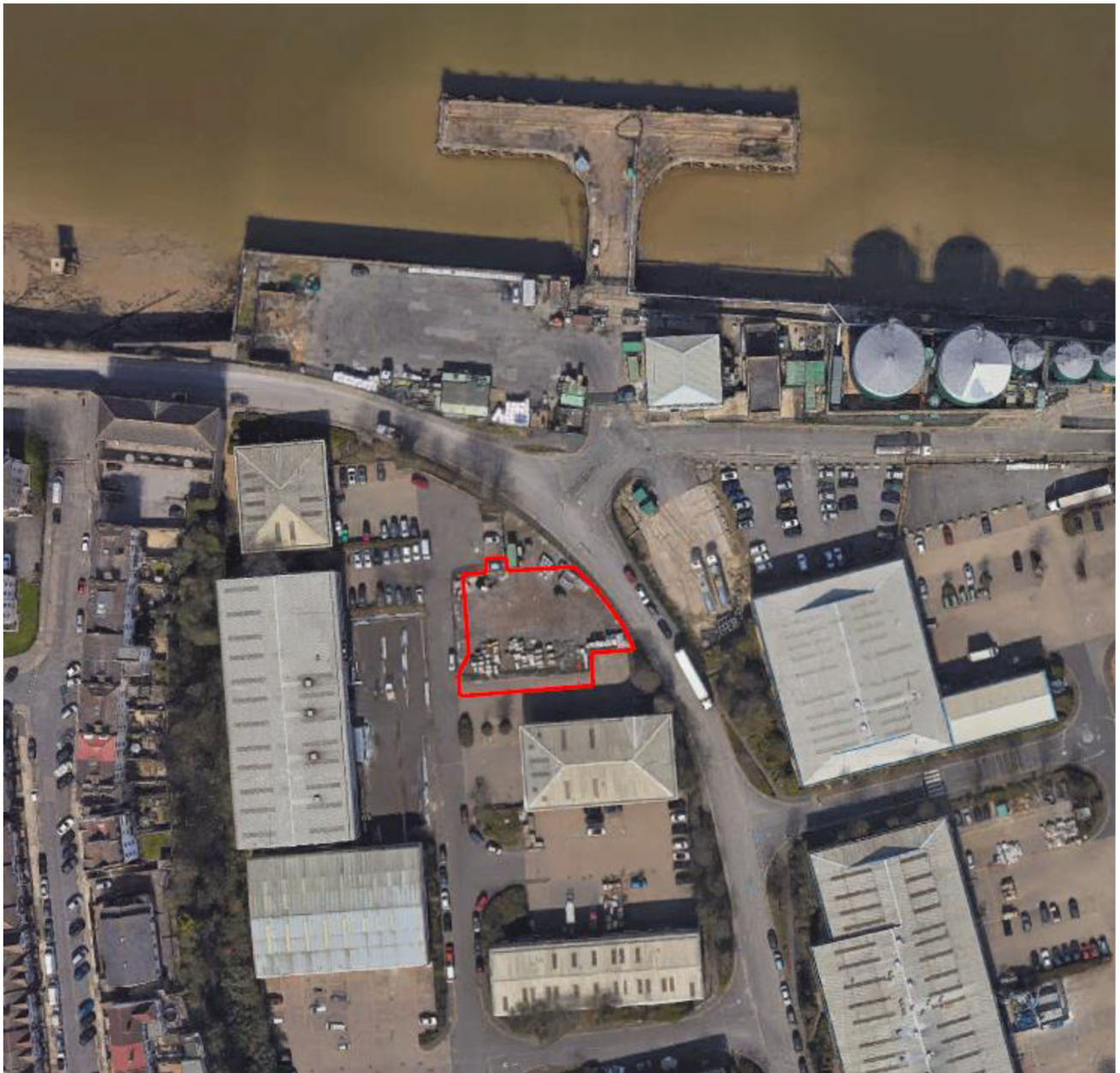
The site is bounded on all sides by industrial buildings and associated access and parking. The Shore/Clifton Marine Parade runs adjacent to the north and east boundaries of the site. The Thames River lies approximately 65 metres north of the site.

Reference should be made to **Figure 1-1** for a visual representation of the application site and surrounding area.

1.2 LIGHTING DESIGN AND ASSESSMENT - OVERVIEW

The proposed development will require the installation of luminaires that have the potential to increase existing light levels at sensitive locations within the vicinity of the site. The following stages have therefore been undertaken in order to produce a suitable lighting layout and assess potential impacts:

- Baseline survey;
- Quantitative assessment of potential lighting impacts at existing light sensitive receptors bordering the proposed development site, based on the proposed external lighting design;
- Formulation of appropriate mitigation measures, where necessary, in order to minimise the potentially detrimental impacts of the proposed lighting scheme.

Figure 1-1 – Site (Car Park) Location and Surrounding Area

2.0 POLICY, LEGISLATION AND RELEVANT AGENCIES

2.1 DOCUMENTS CONSULTED

The following documents were consulted during the undertaking of this assessment:

- Guidance Notes for the Reduction of Obtrusive Light, The Institution of Lighting Professionals, 2021;
- National Planning Policy Framework Ministry of Housing, Communities & Local Government, December 2024;
- Planning Practice Guidance on Light Pollution, Ministry of Housing, Communities & Local Government, 1st November 2019;
- The Conservation of Habitats and Species Regulations, as amended, 2017;
- Environmental Protection Act, 1990;
- Statutory Nuisance from Insects and Artificial Light, Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005, DEFRA 2006;
- Artificial Lighting and Wildlife Interim Guidance: Recommendations to Help Minimise the Impact of Artificial Lighting, Bat Conservation Trust, 2014;
- BS EN 12464-2: Lighting of Work Places - Outdoor Work Places, British Standards Institute, 2007;
- BS EN 13201-4: Road Lighting – Methods of Measuring Lighting Performance, 2003;
- BS 5489-1: Code of Practice for the Design of Outdoor Lighting - Lighting of Roads and Public Amenity Areas, British Standards Institute, 2013;
- PLG 04- Guidance on Undertaking Environmental Lighting Impact Assessments, ILP, 2013;
- Bats and artificial lighting in the UK, Institution of lighting professionals, Bat Conservation Trust, 2018;
- Gravesham Local Plan Core Strategy, 2014, and;
- Kent County Council Minerals and Waste Local Plan 2013-20, 2020.

2.2 LEGISLATIVE FRAMEWORK

Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of statutory nuisance under the Environmental Protection Act (1990), which was amended to include the following definition:

"[...] (fb) artificial light emitted from premises so as to be prejudicial to health or nuisance [...]"

Although light was described as a statutory nuisance, no prescriptive limits or rules have been set for assessment. Guidance within the National Planning Policy Guidance with regards to Light pollution has been referred to while producing this assessment as well as documents produced by the International Commission on Illumination (CIE), Institution of Lighting Professionals (ILP) and the Chartered Institute of Building Services Engineers (CIBSE).

2.3 DESIGN STANDARDS

2.3.1 National Standards

The appropriate lighting design criteria for the scheme are contained within:

- BS 5489-1: Code of Practice for the Design of Outdoor Lighting - Lighting of Roads and Public Amenity Areas, 2020; and
- BS EN 13201-2: Road Lighting - Performance Requirements, 2020.

2.4 PLANNING POLICY AND GUIDANCE

2.4.1 National Policy

The National Planning Policy Framework (NPPF), December 2024 principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Practice Guidance (PPG) which previously guided planning policymaking. The NPPF broadly retains the principles of PPS 23: Planning and Pollution Control and with regard to light pollution, paragraph 198 states that:

“198 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.”

The National Planning Practice Guidance web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6 March 2014 and updated for lighting on 1st November 2019 to support the National Planning Policy Framework and make it more accessible. It states that “for maximum benefit, the best use of artificial light is about getting the right light, in the right place and providing light at the right time”. In light of this guidance, the assessment has considered the following implications of the proposed lighting design:

“Does an existing lighting installation make the proposed location for a development unsuitable? For example, this might be because:

- *the artificial light has a significant effect on the locality;*
- *users of the proposed development (e.g. a hospital) may be particularly sensitive to light intrusion from the existing light source.*
- *Will a new development, or a proposed change to an existing site, be likely to materially alter light levels in the environment around the site and/or have the potential to adversely affect the use or enjoyment of nearby buildings or open spaces?*
- *Will the impact of new lighting conflict with the needs of specialist facilities requiring low levels of surrounding light (such as observatories, airports and general aviation facilities)? Impacts on other*

activities that rely on low levels of light such as astronomy may also be a consideration but will need to be considered in terms of both their severity and alongside the wider benefits of the development.

- *Is the development in or near a protected area of dark sky or an intrinsically dark landscape where new lighting would be conspicuously out of keeping with local nocturnal light levels, making it desirable to minimise or avoid new lighting?*
- *Would new lighting have any safety impacts, for example in creating a hazard for road users?*
- *Is a proposal likely to have a significant impact on a protected site or species? This could be a particular concern where forms of artificial light with a potentially high impact on wildlife and ecosystems (e.g. white or ultraviolet light) are being proposed close to protected sites, sensitive wildlife receptors or areas, including where the light is likely to shine on water where bats feed.*
- *Does the proposed development include smooth, reflective building materials, including large horizontal expanses of glass, particularly near water bodies? (As it may change natural light, creating polarised light pollution that can affect wildlife behaviour.)*

If the answer to any of the above questions is 'yes', consideration should be made for:

- *where the light shines;*
- *when the light shines;*
- *how much light shines; and*
- *possible ecological impact."*

2.4.2 Local Policy

Following a review of the Gravesham Local Plan (Core Strategy) (Adopted September 2014), the following policies were identified as being relevant to potential light impacts associated with the proposed scheme:

"Policy CS19: Development and Design Principles

New development will be visually attractive, fit for purpose and locally distinctive. It will conserve and enhance the character of the local built, historic and natural environment, integrate well with the surrounding local area and meet anti-crime standards. The design and construction of new development will incorporate sustainable construction standards and techniques, be adaptable to reflect changing lifestyles, and be resilient to the effects of climate change. This will be achieved through the criteria set out below:...

"New development will be located, designed and constructed to:

- *Safeguard the amenity, including privacy, daylight and sunlight, of its occupant and those of neighbouring properties and land;*
- *Avoid adverse environmental impacts from pollution, including noise, air, odour, and light pollution, and land contamination; and*

Not pose an unacceptable risk or harm to the water environment, including the quality and/or quantity of ground waters, surface waters, wetlands and coastal water systems.”

3.0 METHODOLOGY

The Lighting Assessment includes the establishment of baseline ambient light conditions and an evaluation of impacts associated with the lighting design. This includes an assessment of change in light obtrusion at existing receptor locations.

Light modelling was undertaken using DIALux software, an independent lighting model which is capable of calculating daylight and artificial lighting scenes in interior and exterior scenarios. The model incorporates ILP, CIE 112 and BS EN 12464-2 calculation methodologies and is commonly used for lighting impact assessments.

3.1 LIGHTING DESIGN

The lighting scheme for the development has been designed by Designs for Lighting Ltd. The design of the lighting has been undertaken in a manner such as to address two potentially conflicting needs; namely, on the one hand, to provide a safe environment for the movement of users within the car park when the natural lighting levels fall and, on the other hand, to meet the light obtrusion criteria stated within the relevant standards and guidance in order to avoid any detriment to local amenity and wildlife.

Modelling for the assessment includes luminaires considered appropriate for the proposed car parking, as shown below. The luminaires are attached to a column at a height of 10m.

- CU Phosco P863 128 F7 740 WS 350 46W

3.2 QUANTITATIVE LIGHTING ASSESSMENT

3.2.1 Obtrusive Light

The ILP has developed an Environmental Zone classification system for the categorisation of sensitive receptor locations based on typical levels of baseline obtrusive light. This is summarised in **Table 3-1**, below.

Table 3-1 - 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 t 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

For each Environmental Zone, recommended obtrusive light limits for exterior lighting installations have also been determined. These are summarised in **Table 3-2** to **Table 3-4**.

Table 3-2 shows the maximum allowable illuminance in the vertical plane for each Environmental Zone for Pre-curfew scenarios (after 07:00 hours) and post-curfew scenarios (after 23:00).

Table 3-3 shows the maximum allowable luminous intensity emitted by the luminaires relative to the position of each luminous intensity receptor location depending on what the Environmental Zone is.

Table 3-4 shows the maximum allowable Upward Light Ratio (ULR) for each environmental zone. If the modelled maximum values of vertical illuminance, the modelled maximum luminous intensity and the ULR are below the criteria in the tables below, they pass the assessment.

Table 3-2 - Maximum Values of Vertical Illuminance on Properties

Light technical parameter	Application conditions	Environmental Zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (Ev)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

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

Table 3-3 - Limits for the Luminous Intensity of Bright Luminaires

Light technical parameter	Application conditions		Luminaire group (projected area A_p in m²)					
			$0 < A_p \leq 0.002$	$0.002 < A_p \leq 0.01$	$0.01 < A_p \leq 0.03$	$0.03 < A_p \leq 0.13$	$0.13 < A_p \leq 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd)	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 to 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 AP representative area (m2)			0.0008	0.004	0.016	0.063	0.251	>0.5

NOTE:

1. D is the distance between the observer and the glare source in meters;
2. A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut off in the designated directions;
3. A_p is the apparent surface of the light source seen from the observer position;
4. For further information refer to Annex C of CIE 150
5. Upper limits for each zone shall be taken as those with column $A_p > 0.5$

Table 3-4 - Maximum Values of Upward Light Ratio (ULR) of Luminaires

Light technical parameter	Environmental Zone				
	E0	E1	E2	E3	E4
Upward light ratio (ULR)/%	0	0	2.5	5	15

The assessment determined the lighting levels and Environmental Zone classification in the vicinity of the proposed development through the baseline survey. Modelling of the lighting scheme was undertaken and predicted obtrusive light values compared with the relevant guidelines, as detailed within **Table 3-2** to **Table 3-4**. The potential environmental effects of the proposed development are identified, as far as current knowledge of the site and development allows. The significance of potential environmental effects is assessed according

to their scale (magnitude) and the sensitivity of the receptors.

For the purposes of this assessment, the effects of the development are considered to be 'significant' if:

- The development is predicted to exceed the maximum sky glow ULR at any surrounding receptor; or,
- The development is predicted to cause either an exceedance of the ILP obtrusive light trespass limitation at a receptor or if the development is predicted to cause an increase of more than 10% at an existing receptor where the ILP obtrusive light trespass limitation is already being exceeded.

4.0 BASELINE

This section provides a review of the existing lighting levels at the site in order to provide a benchmark against which to assess potential impacts associated with the development.

4.1 BASELINE SURVEY

4.1.1 Survey Conditions

A baseline lighting survey was undertaken on 3rd February 2025. The survey was undertaken an hour after sunset at 18:00 to establish conditions that are representative of the existing post curfew lighting conditions.

4.1.2 Existing Light Sources

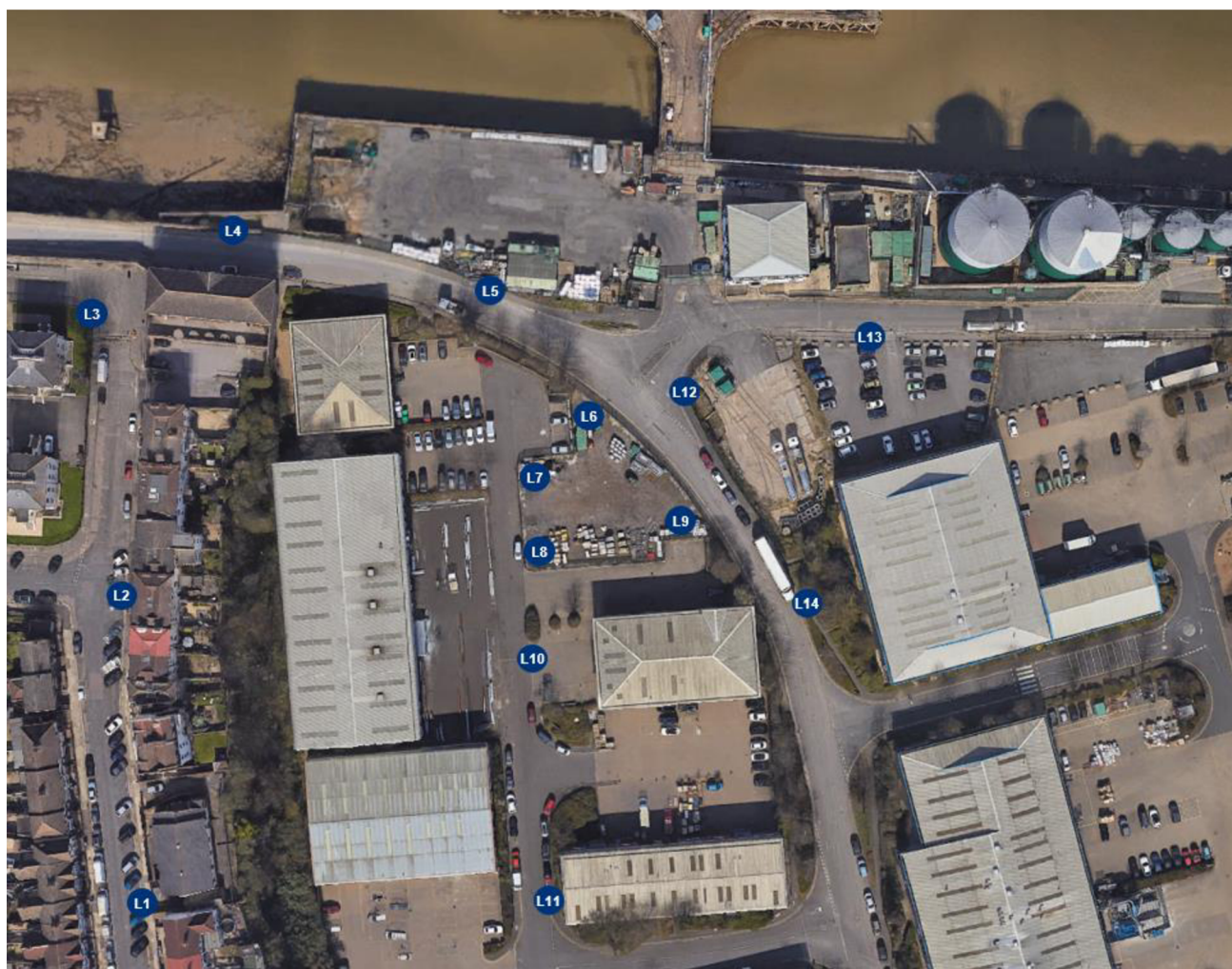
Existing light sources include street lighting from the surrounding roads and lights from surrounding buildings.

4.1.3 Survey Locations

Light monitoring was undertaken at a number of survey locations to determine variations in baseline light levels within the vicinity of the site. Where possible, monitoring at the boundary of the receptor locations was undertaken to provide the best possible representation of existing light obtrusion. Where this was not possible, monitoring was undertaken at the most appropriate representative location. Reference should be made to **Figure 4-1** for an illustrative site map of the monitoring locations.

The purpose of the survey is fourfold:

- The survey enables quantified light levels at (or as near as possible to) local sensitive receptor locations to be measured;
- The site survey also provides an understanding of any significant landforms and vegetation that can potentially provide a pathway screen between light sources and receptors;
- The survey enables the ILP environmental zone to be determined as outlined in Section 3.2.1, based on sound, quantified evidence; and
- The survey enables existing significant sources of artificial light and natural screens to be accounted for outside of the quantified model predictions.

Figure 4-1 - Light Monitoring Locations

The survey provides a robust understanding of the current artificial lighting illuminance levels currently experienced around the development site. The light monitoring locations are summarised in **Table 4-1**, below, and the results from the survey are shown in **Table 4-2**.

A series of measurements were taken at key points; a horizontal ground level measurement and four vertical measurements at 1.5m facing north, east, south and west in general accordance with the recommended monitoring method in the statutory guidance issued by the ILP. Illuminance levels can vary quite significantly over relatively small distances and even with slight changes in the plane of the lens. Therefore, the range of measurements taken over a monitoring length was recorded, to determine the minimum and maximum illuminance at receptor façades.

Table 4-1 - Base Light Monitoring Locations

Reference	Monitoring Location	Key Local Sources of Light
L1	Pier Road	Lights from residential buildings
L2	Pier Road	Lights from residential buildings
L3	Pier Road	Lights from residential buildings
L4	The Shore – north of site	Street lights and lights from industrial buildings
L5	The Shore – north of site	Street lights and lights from industrial buildings
L6	Within proposed site	Street lights and lights from industrial buildings
L7	Within proposed site	Street lights and lights from industrial buildings
L8	Within proposed site	Street lights and lights from industrial buildings
L9	Within proposed site	Street lights and lights from industrial buildings
L10	West Mill – southwest of site	Street lights and lights from industrial buildings
L11	West Mill – southwest of site	Street lights and lights from industrial buildings
L12	Clifton Marine Parade – northeast of site	Street lights and lights from industrial buildings
L13	Clifton Marine Parade – northeast of site	Street lights and lights from industrial buildings
L14	Clifton Marine Parade – northeast of site	Street lights and lights from industrial buildings

4.1.4 Survey Results

The results of the monitoring are displayed in **Table 4-2**.

Table 4-2 - Survey Results

Reference	Recorded Illuminance (Lux)					Sky Quality (visual magnitudes per square arcsecond)
	Facing Up	Facing North	Facing East	Facing South	Facing West	
L1	0.34	0.54	0.07	0.48	0.51	16.45
L2	0.77	0.27	0.33	1.41	0.53	16.76
L3	0.62	0.88	1.16	1.25	1.19	16.49
L4	3.18	0.71	5.03	3.56	1.42	15.95
L5	1.20	0.22	0.83	0.85	2.83	14.33
L6	2.46	2.32	2.71	3.15	0.62	13.80
L7	1.07	0.42	2.79	4.33	1.69	17.24
L8	2.82	0.78	4.96	4.40	3.66	16.23
L9	1.35	1.40	1.20	8.82	4.28	16.99
L10	4.05	0.67	1.26	5.83	4.55	14.90
L11	1.84	0.22	0.26	2.36	3.04	15.82
L12	0.76	3.70	1.08	2.14	3.04	16.07
L13	33.71	66.2	5.31	0.78	6.02	13.20
L14	5.05	0.80	1.25	0.71	5.98	12.08

Following the environmental lighting survey, it was concluded that the proposed development site and the surrounding area should be classified as 'Environmental Zone E3 – Medium District Brightness', in accordance with the ILP guidance limits for Sky Quality outlined within **Table 3-1**.

This represents a worst case scenario for the purposes of assessing impacts at sensitive receptors. E3 is considered representative of well inhabited rural and urban settlements, small town centres of suburban

locations. Therefore, the permitted light trespass limit at an offsite receptor in the pre-curfew period (typically considered to be 07:00-23:00) is 10 lux and in the post curfew period (typically considered to be 23:00-07:00) is 2 lux.

4.2 RECEPTORS

The term 'receptors' includes any persons, locations or systems that may be susceptible to changes in environmental factors as a consequence of the development.

4.2.1 Residential Receptors

Key residential properties were identified which have the potential to be affected by obtrusive light from the proposed development, as shown in **Table 4-3**. Reference should be made to **Figure 4-1** for an illustration of the residential receptors used for the purposes of this assessment. All the identified residential receptors are considered to be within ILP Environmental Zone E3. Each receptor was input into the model at a height of 4.0m (bungalows and single-storey building at height of 1.5m) at a distance of 10 cm from the building façade to represent illuminance at first-floor window level, representing a typical bedroom, which is deemed to be the most sensitive receptor room type.

Table 4-3 - Residential Receptors

ID	Description	ILP Environmental Zone
R1	35 Pier Road, DA11 9NB	E3
R2	40 Pier Road, DA11 9NB	E3
R3	44 Pier Road, DA11 9NB	E3
R4	49 Pier Road, DA11 9NB	E3
R5	52 Pier Road, DA11 9NB	E3

4.2.2 Ecological Receptors

Lighting associated with the operational phase of the proposed development has the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The Conservation of Habitats and Species Regulations (2017) and subsequent amendments require competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Areas of Conservation).

For the purposes of the assessment, ecological receptor locations have been included at 14 points along the riverbank, vegetation in gardens along Pier Road, and within the vegetation along Clifton Marine Parade, at heights of 2m. **Table 4-4** below provides a reference for these locations whilst a full spatial illustration of modelled ecological receptors is included in **Figure 4-2**.

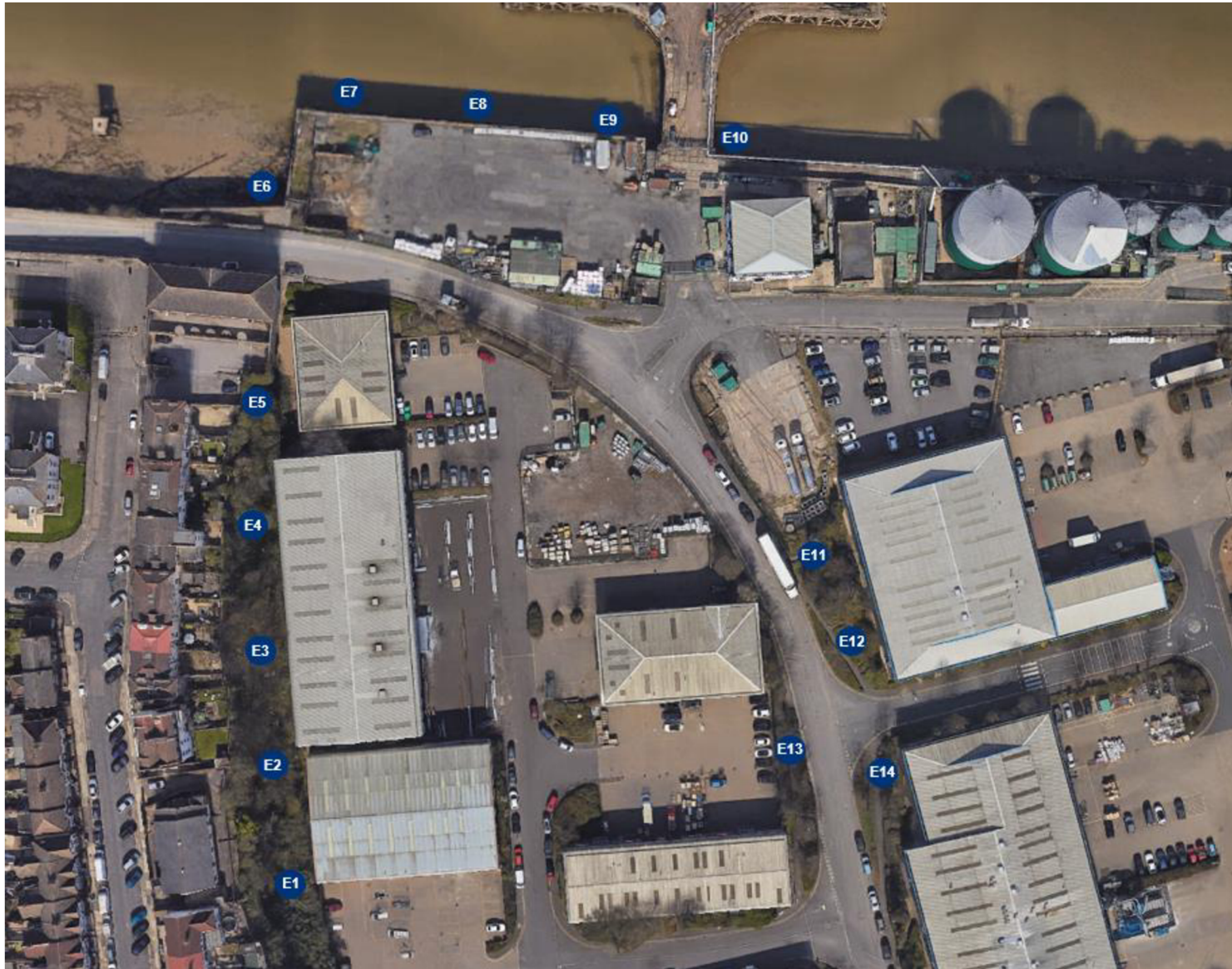
Table 4-4 - Ecological Receptors

ID	Description
E1-E5	Vegetation in back gardens along Pier Road
E6-E10	Thames River
E11-E14	Trees bordering pavement on Clifton Marine Parade

Figure 4-2 - Modelled Residential Receptors



Figure 4-3 - Modelled Ecological Receptors



5.0 LIGHTING ASSESSMENT

Potential impacts associated with the proposed lighting design at locations in the vicinity of the site were assessed as described in the following sections.

5.1 OBTRUSIVE LIGHT MODELLING

The lighting design is displayed in **Figure 5-1** and **Figure 5-2**. A lighting plan has been designed by Designs for Lighting Ltd and included within a DIALux model of the proposed development in accordance with appropriate criteria. Reference should be made to **Figure 5-3** and **Figure 5-4** for a 3D representation of the proposed model. Buildings surrounding the development site were also included in the model at heights of 8m (2-storey building) and 4m (1-storey building).

Modelling for the assessment includes luminaires considered appropriate for the proposed car parking, as shown below. The luminaires are attached to a column at a height of 10m.

- CU Phosco P863 128 F7 740 WS 350 46W

The assessment considers the effect of the proposed development in the pre-curfew and post-curfew periods. The assessment consists of a comparison between baseline illuminance levels at each of the receptor locations against the predicted light obstruction from the proposed development determined in lighting model. The baseline illuminance levels are ILP Environmental Zone E3.

Figure 5-1 - External Lighting Layout

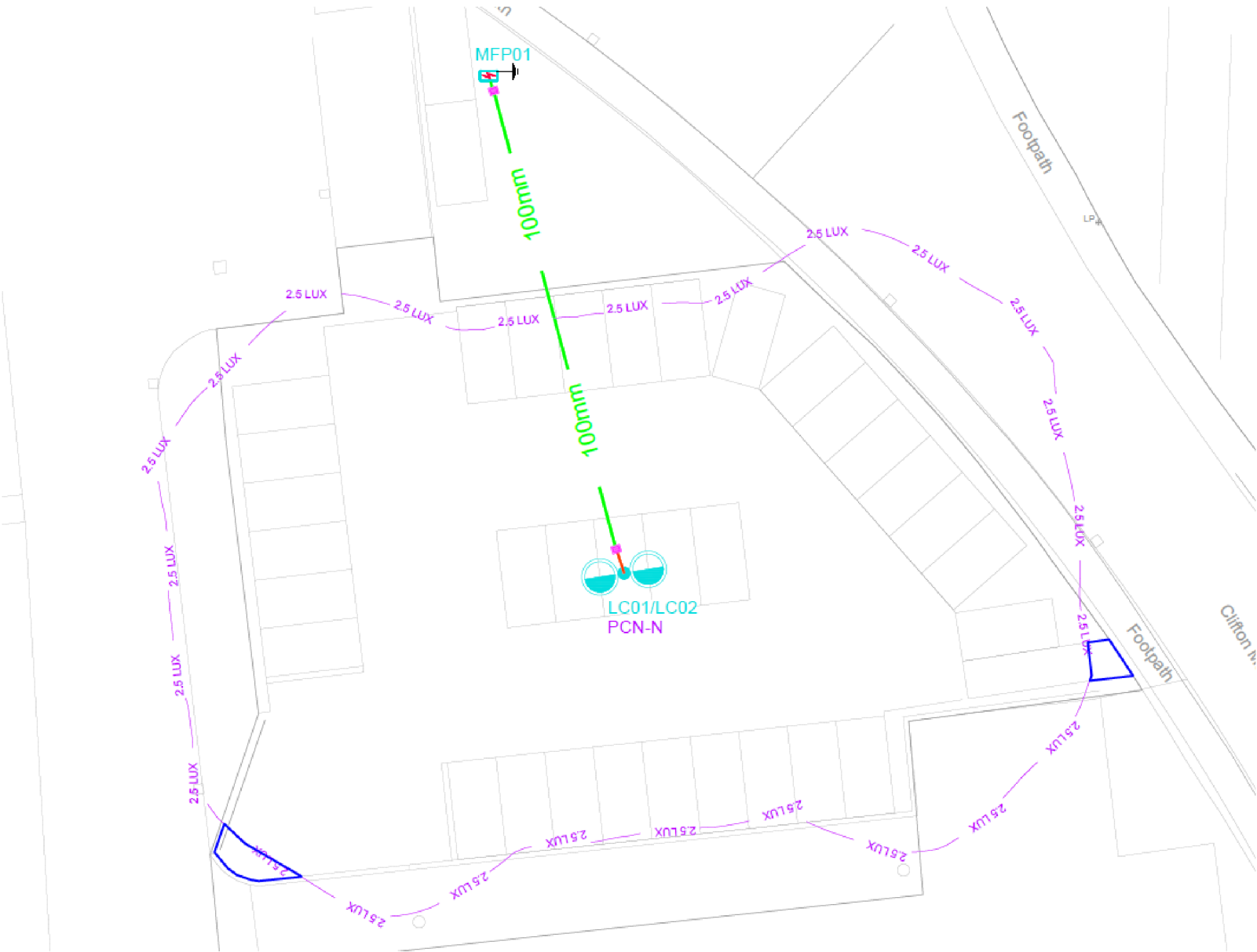


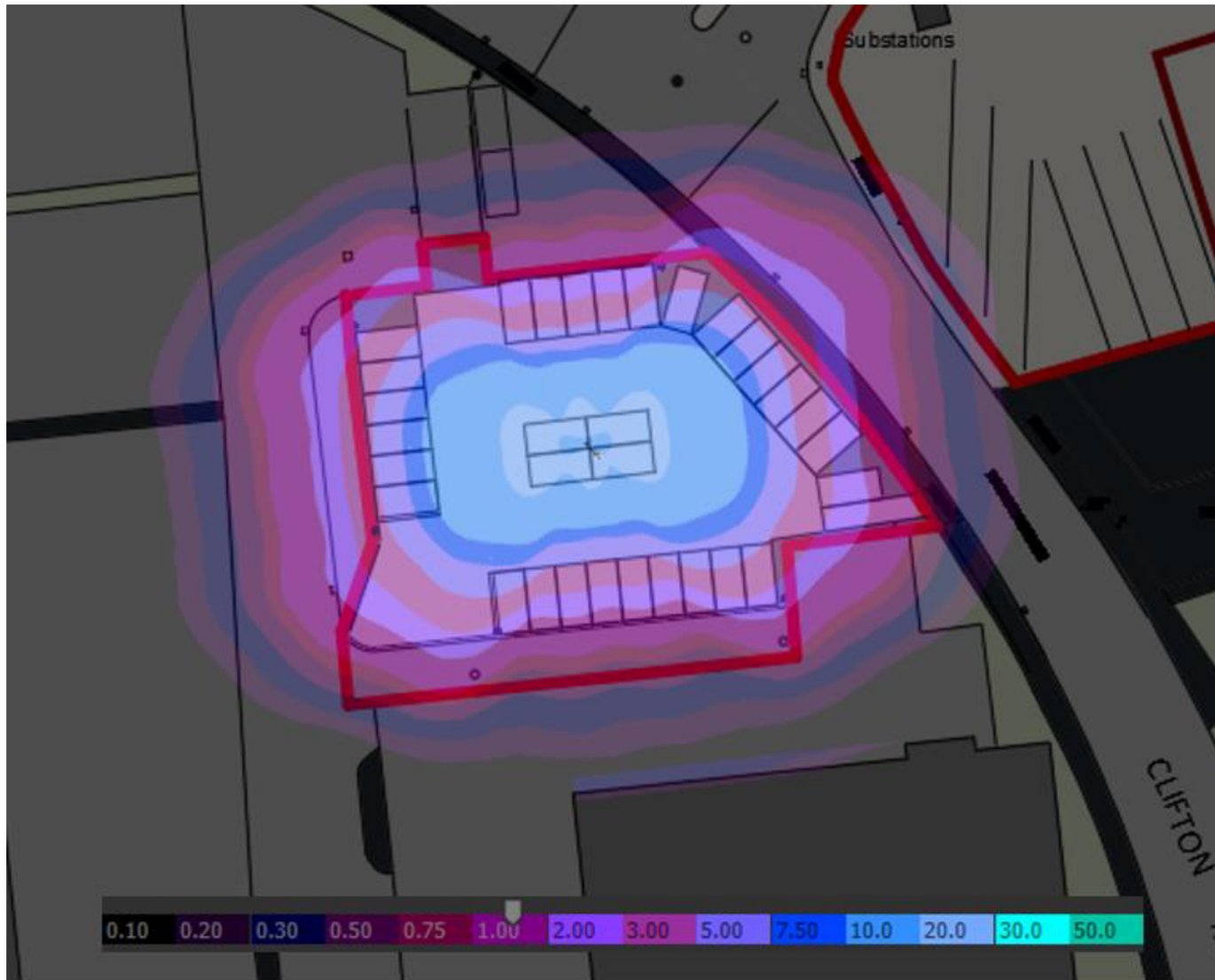
Figure 5-2 – External Lighting Layout Key

KEY PROPOSED		
QTY.	SYMBOL	DESCRIPTION
1		COLUMN REF: PROPOSED 10m GALVANISED STEEL ROAD LIGHTING COLUMN. BRACKET REF: TWIN ARM 0.5m STUB BRACKET LANTERN REFERENCE: 2 NO. CU PHOSCO P863 LIGHT SOURCE REF: 128 NUETRAL WHITE LED [4000K] FLUX: 7.09 klm LANTERN MOUNTING: SIDE ENTRY LANTERN INCLINATION: 0 LANTERN OPTIC REF: F7 LANTERN WATTAGE: 46W LANTERN PROTECTOR: FLAT GLASS CONTROL GEAR REF: ELECTRONIC AND FULLY DIMMABLE. DRIVE CURRENT: 350mA LANTERN COLOUR: TBC CONTROL: PRE-PROGRAMMED STEP DIMMING TBC. LUMINAIRES TO BE SWITCHED VIA ASTRO TIMECLOCK HOUSED IN FEEDER PILLAR.
	LC0#	PROPOSED INDICATIVE COLUMN ID NUMBERS.
	PCN-N	NEW PRIVATE SUPPLY

Figure 5-3 - Visual Representation of Proposed External Lighting Model



Figure 5-4 – Visual Representation of Lux Contours



5.1.1 Model Results

5.1.1.1 Residential Receptors

Table 5-1 compares the results for the modelled lighting arrangements with the ILP pre-curfew and post-curfew criteria limits for ILP Environmental Zone E4, in accordance with the classifications detailed in **Table 3-2** to **Table 3-4**.

Table 5-1 - Residential Receptor Assessment Results

ID	ILP Post-curfew Criteria (Lx)	Predicted Model Illuminance (lx)
R1	5.00	<0.01
R2	5.00	<0.01
R3	5.00	<0.01
R4	5.00	<0.01
R5	5.00	<0.01

The assessment shows that pre-curfew lighting levels for ILP pre-curfew Environmental Zone E3 criteria will not be exceeded at any of the 5 residential receptor locations as a result of lighting from the proposed development. With a maximum predicted model illuminance of <0.01lux. Therefore, the proposed development is not predicted to result in significant adverse impacts with respect to local sensitive residential receptors.

5.1.1.2 Ecological Receptors

It is believed that most bat emergence requires light levels below 1 lux for late emerging species, up to 14 lux for those that emerge earlier (Noctule and Pipistrelle). These lighting levels of 1 lux are required to ensure that bat commuting, and foraging routes are not impacted and that dark corridors beyond the limits of the site are retained. While some bat species, such as Pipistrelle are more tolerant with light levels above this criterion, it reflects worst-case assumptions concerning the sensitivity of those species present to background illuminance levels. As such, the assessment criteria represent a worst-case scenario in terms of impacts on emergence, commuting and foraging. (Bat Conservation Trust, 2018).

Table 5-2 presents the results for modelled lighting arrangements for the ecological receptors surrounding the site vicinity and within the site.

Table 5-2 - Ecological Receptor Assessment Results

ID	Predicted Model Illuminance (lx)
E1	<0.01
E2	<0.01
E3	<0.01
E4	<0.01
E5	<0.01
E6	<0.01
E7	<0.01
E8	<0.01
E9	<0.01
E10	0.01
E11	0.10
E12	0.03
E13	<0.01
E14	<0.01

As shown in **Table 5-2**, light trespass associated with the proposed site does not exceed 1 lux at any of the 14 modelled ecological receptor locations assessed. As such, lighting from the proposed development is not predicted to result in any significant adverse impacts with respect to local sensitive ecological receptors.

5.1.1.3 Upward Light Ratio

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 3-2** to **Table 3-4** the ILP sky glow limitation for an area classified as Environmental Zone E3 is 5% ULR. As such the indicative lighting scheme meets the ILP sky glow limitations and will result in no impacts on the dark sky landscape.

6.0 CONCLUSIONS

Tetra Tech were commissioned by FM Conway Limited to prepare a lighting assessment to part discharge a planning condition for the installation of lighting in respect of a planning consent for the installation of two additional bitumen tanks, load out gantry, the installation of a bitumen emulsion plant and alternative car parking. The lighting assessment relates only to the lighting proposed to be installed in the new alternative car park.

Lighting plans have been designed by Designs for Lighting Ltd and used to produce a model of the proposed development within DIALux software in accordance with the appropriate criteria.

The assessment has concluded that the risk of the proposed scheme resulting in exceedances of either the ILP pre-curfew or post-curfew obtrusive light limitations at local residential receptors will be low.

Following the installation of an appropriate lighting scheme as detailed in this report, the risk of the proposed development resulting in exceedances of 1 lux along potential bat foraging/commuting routes and dark corridors is low at all ecological receptor locations. As such, there is a low risk of adverse impacts on local sensitive ecological receptors.

The assessment demonstrates that the proposed development does not conflict with any national or local planning policies.

APPENDIX A – REPORT CONDITIONS

This Report has been prepared using reasonable skill and care for the sole benefit of FM Conway Limited (“the Client”) for the proposed uses stated in the report by Tetra Tech Limited (“Tetra Tech”). Tetra Tech exclude all liability for any other uses and to any other party. The report must not be relied on or reproduced in whole or in part by any other party without the copyright holder’s permission.

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The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

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