

Cambridge Waste Water Treatment Plant Relocation Project
Anglian Water Services Limited

Environmental Statement

Appendix 2.5: Lighting Design Strategy

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Summary

Light pollution refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users.

This Lighting Design Strategy (herein ‘the Strategy’) has been prepared to inform an assessment of the potential effects from artificial lighting associated with the Proposed Development. Therefore, the Applicant has provided this Strategy to outline the design objectives and principles related to the use of artificial lighting during the construction, operation, and maintenance of the Proposed Development. The decommissioning works are on the existing WWTP so would be undertaken in accordance with the restrictions applied to the existing operational and task lighting.

The lighting design will be determined by construction and operational requirements on site for both day-time and night-time lighting of buildings.

The installation shall be designed to avoid light pollution beyond the site boundary and upwards into the surrounding atmosphere, particularly in rural areas. An assessment of light pollution by the Proposed Development is presented in the Lighting Assessment Report (Appendix 15.3, Application Document Reference 5.4.15.3).

Though only the Waterbeach Pipeline would be in a rural area of low district brightness, the proposed WWTP would be within a Green Belt landscape and located on the edge or within the panoramic vista of a dark sky area. Therefore, the lighting design strategy has sought to minimise any impact on the rural area north of the A14.

The effects of the Proposed Development’s construction and operational lighting on sensitive receptors and the surrounding environment are considered in Environmental Statement Chapter 15 Landscape and Visual Amenity (App Doc Ref 5.2.15) and the Lighting Assessment Report (Appendix 15.3, App Doc Ref 5.4.15.3).

[This will include the guidance given in the Bat Conservation Trust Guidance Note 08/23.](#)

1 Introduction

1.1 Anglian Water Services Limited

- 1.1.1 Anglian Water Services Limited (the 'Applicant') is the largest regulated water and water recycling company in England and Wales by geographic area, supplying water and water recycling services to almost seven million people in the East of England and Hartlepool.
- 1.1.2 The Applicant is committed to bringing environmental and social prosperity to the region they serve, through their commitment to Love Every Drop. As a purpose-led business, The Applicant seeks to contribute to the environmental and social wellbeing of the communities within which they operate. As one of the largest energy users in the East of England, they are also committed to reaching net zero carbon emissions by 2030.

1.2 Background

- 1.2.1 The Applicant is proposing to build a modern, low carbon waste water treatment for Greater Cambridge on a new site area north of the A14 between Fen Ditton and Horningsea within the Cambridge drainage catchment area, to replace the plant on Cowley Road, hereafter referred to as the existing Cambridge Waste Water Treatment Plant (WWTP).
- 1.2.2 The relocation will enable South Cambridgeshire District Council and Cambridge City Council's long held ambition to develop a new low-carbon city district on Cambridge's last major brownfield site, known as North East Cambridge. The site is an important component of the First Proposals (preferred options) for the new Greater Cambridge Local Plan that were subject to public consultation late last year. The North East Cambridge Area Action Plan has also recently been agreed by the Councils in its Proposed Submission form and will be subject to public consultation prior to submission, once the Development Consent Order is determined. The relocation of the existing waste water treatment facility will enable this new district to come forward and deliver 8,350 homes, 15,000 new jobs and a wide range of community, cultural and open space facilities in North East Cambridge. Further details on this can be found in our Statement of Requirement (App Doc Ref 7.2) which was published in September 2019.
- 1.2.3 The relocation of the waste water treatment plant will also allow The Applicant to continue providing vital waste water services to customers across Cambridge and Greater Cambridge. The new plant will continue storing and treating storm flows and treating sludge to produce renewable energy. It will be designed to deal with a growing population. It offers the opportunity for a joined-up solution for treating waste water from Cambridge and Greater Cambridge, including Waterbeach. The proposal is for both waste water from the existing Waterbeach Waste Water Treatment Plant and future flows from Waterbeach New Town to be treated at the proposed Cambridge Waste Water Treatment Plant.

- 1.2.4 The Proposed Development will be the first waste water project to seek a Development Consent Order that is not specifically named in the National Policy Statement (NPS). ‘The Applicant’ sought and obtained a direction from the Secretary of State under section 35 of the Planning Act 2008 (“the 2008 Act”), which confirms that the project will be treated as a Nationally Significant Infrastructure Project (“NSIP”) when the application is submitted.

1.3 The Proposed Development

- 1.3.1 This section provides a high-level summary of the Proposed Development. The term Proposed Development refers to the Cambridge Waste Water Treatment Plant (WWTP) Relocation project in its entirety and all works associated with the development.
- 1.3.2 A detailed description of the Proposed Development can be found in Chapter 2: Project Description of the Environmental Statement (Application Document Reference 5.2.2).
- 1.3.3 The purpose of the proposed WWTP will be to treat all waste water and wet sludge from the Cambridge catchment just as the existing Cambridge WWTP currently does, plus that from the growth indicated and being planned within the catchment in the Local Plan to 2041, with ability to expand beyond to deal with further growth.
- 1.3.4 As part of its statutory function, the Applicant operates the existing Cambridge WWTP. The existing Cambridge WWTP receives waste water from the Cambridge catchment either directly from the connected sewerage network or tankered to the plant from homes and businesses that are not connected. This waste water is then treated and the treated effluent discharged through an outfall to the nearby River Cam. The existing Cambridge WWTP is an integrated WWTP, as would be the Proposed Development. Integrated WWTP incorporate a sludge treatment function, in the form of a Sludge Treatment Centre (STC), which treats the sludge derived from the waste water from the catchment, and the “wet sludge” produced by other satellite plants which do not have integrated STC.
- 1.3.5 The Waterbeach New Town development lies to the north of Cambridge. When built out Waterbeach New Town will comprise some 11,000 new homes along with associated business, retail, community and leisure uses. Waste water from Waterbeach will ultimately be treated by the proposed Cambridge WWTP once operational. However, the rate of development at Waterbeach New Town may require a new pipeline (rising main) to be built from Waterbeach to the existing Cambridge WWTP to allow treatment of waste water in advance of the proposed WWTP becoming operational. In that case, either a later connection would be made to the proposed WWTP from a point on the pipeline route, or flows diverted from the existing Cambridge WWTP via the transfer tunnel.
- 1.3.6 In summary the Proposed Development will comprise of:
- an integrated waste water and sludge treatment plant.

- a shaft to intercept waste water at the existing Cambridge WWTP on Cowley Road and a tunnel/ pipeline to transfer it to the proposed WWTP and terminal pumping station. Temporary intermediate shafts to launch and recover the micro-tunnel boring machine.
- a gravity pipeline transferring treated waste water from the proposed WWTP to a discharge point on the River Cam and a pipeline for storm water overflows.
- a twin pipeline transferring waste water from Waterbeach to the existing Cambridge WWTP, with the option of a connection direct in to the proposed WWTP when the existing works is decommissioned.
- ancillary on-site buildings, including a Gateway Building with incorporated Discovery Centre, substation building, workshop, vehicle parking including electrical vehicle charging points, fencing and lighting.
- environmental mitigation and enhancements including substantial biodiversity net gain, improved habitats for wildlife, extensive landscaping, a landscaped earth bank enclosing the proposed WWTP, climate resilient drainage system and improved recreational access and connectivity.
- renewable energy generation via anaerobic digestion which is part of the sludge treatment process that produces biogas designed to be able to feed directly into the local gas network to heat homes, or as an alternative potential future option burnt in combined heat and power engines.
- renewable energy generation via solar photovoltaic and associated battery energy storage system.
- other ancillary development such as internal site access, utilities, including gas, electricity and communications and connection to the site drainage system.
- a new vehicle access from Horningsea Road including for Heavy Goods Vehicles (HGV's) bringing sludge onto the site for treatment and other site traffic.

1.4 Purpose of this report

- 1.4.1 Light pollution (also called 'obtrusive pollution') refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users.
- 1.4.2 This Lighting Design Strategy (herein 'the Strategy') has been prepared to inform an assessment of the potential effects from artificial lighting associated with the Proposed Development. Therefore, the Applicant has provided this Strategy to outline the design objectives and principles related to the use of artificial lighting during the construction and operation of the Proposed Development. The decommissioning works on the existing WWTP would be undertaken in accordance with the restrictions applied to the existing operational and task lighting.

- 1.4.3 The effects of the Proposed Development's construction, operation and maintenance of lighting on sensitive receptors and the surrounding environment are considered in Environmental Statement Chapter 15 Landscape and Visual Amenity (App Doc Ref 5.2.15) and the Lighting Assessment Report (Appendix 15.3, App Doc Ref 5.4.15.3).

2 Legislation, Planning Policy, Guidance and Standards

2.1 Introduction

- 2.1.1 This section presents a summary of the legislation, planning policy, standards and guidance that the lighting design must adhere to or are relevant to identifying measures to minimise the potential for light from the Proposed Development being prejudicial to the health or create a nuisance to its users or sensitive receptors in the surrounding landscape.
- 2.1.2 A detailed review of planning policy and guidance is contained within the Planning Statement (App Doc Ref 7.5).

2.2 National Legislation and Planning Policy

Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act (2005)

- 2.2.1 Section 102 ‘Statutory nuisance: lighting’ of The Clean Neighbourhoods and Environment Act (2005) amended Section 79 of the Environmental Protection Act 1990 by extending the statutory nuisance regime to include light nuisance, by stating the following:

“S102 Statutory nuisance: lighting

(1) Section 79 of the Environmental Protection Act 1990 (c. 43) is amended as follows.

(2) In subsection (1) (matters constituting statutory nuisances) after paragraph (fa) (as inserted by section 101 (2)) insert—

“(fb)artificial light emitted from premises so as to be prejudicial to health or a nuisance;”.”

National Policy Statement for Waste Water, March 2012

- 2.2.2 Paragraph 4.7.4 requires the assessment supporting the DCO application to:
“...include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include any light pollution effects including on local amenity and nature conservation.”
- 2.2.3 Paragraph 4.12 acknowledges that *“During the construction, operation and decommissioning of waste water infrastructure there is potential for the release of a range of emissions such as dust, steam, smoke, artificial light and for infestation of insects. All have the potential to have a detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990.”*

- 2.2.4 Paragraph 4.12.4 requires the Applicant to: “...*assess the potential for insect infestation and emissions of dust, steam, smoke and artificial light to have a detrimental impact on amenity, as part of the Environmental Statement.*”
- 2.2.5 Paragraph 4.12.7 advises that: “*The decision maker should satisfy itself that all reasonable steps have been taken, and will be taken, to minimise any detrimental impact on amenity from insect infestation and emissions of dust, steam, smoke, and artificial light.*”

National Planning Policy Framework 2021

- 2.2.6 At the national level, the need to consider the potential effects of artificial lighting is embodied in the wording of the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2021) and should be considered during the application process to reduce the potential for unnecessary delays owing to unacceptable (unknown) potential effects on local amenity and nature conservation.
- 2.2.7 The NPPF sets out the government’s planning policies for England and how they are expected to be applied and provides a framework for local plans. With regard to light pollution, paragraph 185 states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”

National Planning Practice Guidance

- 2.2.8 The UK Government’s National Planning Practice Guidance (NPPG) for England presents specific guidance on light pollution that advises on how to consider light within the planning system (MHCLG, 2019). Table 2-1 below sets out how these paragraphs are relevant to the Facility and how each has been considered.
- 2.2.9 Paragraph 002 of the guidance outlines what factors can be considered when assessing whether a development proposal might have implications for light pollution:
- 2.2.10 “The following questions indicate matters that may need to be considered in relation to managing the effects of light pollution:
- *“Does an existing lighting installation make the proposed location for a development unsuitable, or suitable only with appropriate mitigation? For example, this might be because:*
 - *the artificial light has a significant effect on the locality; and/or*
 - *users of the proposed development (e.g. a hospital) may be particularly sensitive to light intrusion from the existing light source.*

- *Where necessary, development proposed in the vicinity of existing activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme, reflecting the agent of change principle. Additional guidance on applying this principle is set out in the planning practice guidance on noise.*
- *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', local planning authorities and applicants should think about:

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

2.3 Local Planning Policy - South Cambridgeshire Local Plan 2018

2.3.1 The following policies in the adopted South Cambridgeshire Local Plan 2018 are relevant to the Proposed Development:

“SC/9 Permits development which includes new external lighting only where it can be demonstrated that lighting and levels are the minimum required for reasons of public safety and security, and there is no unacceptable adverse impact on the local amenity of nearby properties, or on the surrounding countryside.”

2.4 Guidance

HSE Guidance

2.4.1 The design, construction and operation of the Proposed Development need to comply with the Workplace (Health, Safety and Welfare) Regulations 1992 and thereby meet the expectations of the Health and Safety Executive (HSE) guidance note HSG38 ‘Lighting at Work’. The design and installation of outdoor lighting installations shall comply with the following publications:

- BS EN 12464-2 - Lighting of work places. Outdoor work places;
- SLL (Society of Light and Lighting) Code for Lighting (2012); and
- SLL Lighting Guide 6: The Outdoor Environment (1992).

Design Guidance

2.4.2 As a water industry facility, the minimum light design provision required to operate and maintain the Proposed Development are defined by the Water Industry Mechanical and Electrical Specifications (WIMES) 3.02(E), which is a recognised industry standard. Table 2-1 and 2-2 outline the lighting requirements specific in WIMES.

Table 2-1: Lighting requirements for external areas, tasks and activities

Type of Task / Location	E_m (Lx)	U_o	GR_L	CRI (R_a)
Major road and car parks	20	0.25	50	20
Minor roads and pedestrian walkways between plant areas	10	0.25	50	20
Plant areas - general	20	0.25	50	20
Plant areas – task lighting, working areas	100	0.4	45	40
Areas surrounding outdoor switchgear and transformers	30	0.4	45	20
Walkways, platforms, gantries and stairways (associated with plant areas)	50	0.4	45	20

Source: WIMES 3.02 Low Voltage Electrical Installations, April 2013

Table 2-2: Lighting requirements for internal areas, tasks and activities

Type of Location	E_m (Lx)	U_o	GR_L	CRI (R_a)
Offices ¹	300	0.4	19	80

Type of Location	E_m (Lx)	U_o	GR_L	CRI (R_a)
Mess-rooms	200	0.4	22	80
Lobbies	200	0.4	22	80
Passageways	100	0.4	25	80
Indoor substations and switch-rooms	200	0.4	25	60
Plant-rooms ² and diesel generator rooms	150	0.4	25	60
Loading bays	150	0.4	25	40
Store rooms and boiler houses	100	0.4	25	60
Control rooms (inc vertical panels/desks)	500	0.7	16	80

Source: WIMES 3.02 Low Voltage Electrical Installations, April 2013

Notes:

1 – The lighting requirements will vary according to the task/activity being performed in the office.

2 – The definition a ‘plant room’ is any location containing plant or machinery that will require operator attendance for operation and/or inspection/maintenance.

Key

E_m - maintained illuminance. This is the value below which the average illuminance on the specified surface is not allowed to fall.

U_o - illuminance uniformity. This is the ratio of minimum illuminance (luminance) to average illuminance (luminance) on (of) a surface.

GR_L - Glare rating limit. This is the upper limit of glare as determined by the CIE Glare Rating system (external locations)

UGR_L - Unified glare rating limit. This is the upper limit of glare as determined by the CIE Glare Rating system (internal locations)

CRI (R_a) – Colour rendering index.

2.4.3 The main regulations on the lighting requirements, specifically the Workplace (Health, Safety and Welfare) Regulations 1992, reference a series of Chartered Institution of Building Services Engineers (CIBSE) guides which are also referenced through WIMES. This shows a logical path back to the Regulations and best practice, such as the below CIBSE and Society of Light and Lighting (SLL) guidance:

- Code for Lighting;
- Lighting Guide 1 – The Industrial Environment Section 4.4; and
- Lighting Guide 6: The Exterior Environment.

2.4.4 The Electricity At Work Regulations 1989 also state:

“Working space, access and lighting

15. For the purposes of enabling injury to be prevented, adequate working space, adequate means of access, and adequate lighting shall be provided at all electrical equipment on which or near which work is being done in circumstances which may give rise to danger.

Guidance Notes for the Reduction of Obtrusive Light (ILP, 2021)

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

2.4.6 With regards obtrusive light, consideration is given to light intrusion, direct upward light (sky glow) and glare within the context of varying environmental zones. Light intrusion or obtrusive light occurs when the light ‘spills’ beyond the boundary of the area being lit. For example, light spill can result in safety impacts related to the impairment or distraction of people (e.g. when driving vehicles), health impacts arising from impaired sleep, cause annoyance to people, compromise an existing

dark landscape and/or adversely affect natural systems (e.g. plants, animals, insects, aquatic life).

2.4.7 Sky glow refers to the brightening of the sky above towns caused by direct or reflected upward light. Glare refers to the uncomfortable brightness of a light source when viewed against a dark background.

2.4.8 These adverse effects can usually be avoided with careful lamp and luminaire selection and positioning:

- Lighting near or above the horizontal is usually to be avoided to reduce glare and sky glow (the brightening of the night sky).
- Good design, correct installation and ongoing maintenance are essential to the optical effectiveness of lighting schemes such as fixed and/or regularly operated functional and decorative lighting elements.
- In combination with optical good practice aimed at limiting light pollution, efficient lamp and luminaire selection are important considerations to minimise energy use and associated carbon emissions

2.4.9 This guidance provides the basis for defining whether an installation will cause light pollution that would be obtrusive to the environment and neighbouring properties. It advises how to quantify and define acceptable maximum limitations for light intrusion, sky glow and glare from exterior lighting installations.

Guidance Note ~~08/1808/23~~ Bats and Artificial Lighting in the UK, Bats and the UK (ILP and Bat Conservation Trust, ~~2018~~2023)

2.4.10 This document provides guidance for artificial exterior lighting in close proximity to light sensitive ecology. The following is stated within the document:

“Bats in the UK are nocturnal mammals with highly sophisticated echolocation systems that allow them to avoid obstacles, socialise and catch insect prey in complete darkness. When flying, bats produce a stream of high-pitched calls (above the range of human hearing) and listen to the echoes, to produce an acoustic picture of their surroundings, commonly called “echolocation”. Echolocation has allowed bats to avoid competition from daytime insectivorous birds such as house martins, swifts and swallows. Fossil records have shown bats evolved echolocation over 50 million years ago ii so have adapted to a world without light since that time

For bats, artificial lighting is thought to increase the chances of predation by avian predators, such as owls and hawks; in lit areas bats modify their behaviour, potentially in response to this threat. vii Many avian predators will hunt bats, which may be one reason why bats avoid flying in the day; viii species such as peregrine falcons have been recorded hunting bats in lit environments.”

Lighting in the vicinity of a bat roost causing disturbance and potential abandonment of the roost could constitute an offence both to a population and to individuals (Garland and Markham, 2007). It is therefore important that the use of

an area by bats is thoroughly assessed before artificial lighting is changed or added in the vicinity of a roost or where bats may commute or forage.”

“It is acknowledged that, especially for vertical calculation planes, very low levels of light (<0.5 lux) may occur even at considerable distances from the source if there is little intervening attenuation. It is therefore very difficult to demonstrate ‘complete darkness’ or a ‘complete absence of illumination’ on vertical planes where some form of lighting is proposed on site despite efforts to reduce them as far as possible and where horizontal plane illuminance levels are zero. Consequently, where ‘complete darkness’ on a feature or buffer is required, it may be appropriate to consider this to be where illuminance is below 0.2 lux on the horizontal plane and below 0.4 lux on the vertical plane. These figures are still lower than what may be expected on a moonlit night and are in line with research findings for the illuminance found at hedgerows used by lesser horseshoe bats, a species well known for its light averse behaviour (Stone, 2012).”

British Standards

2.4.11 The most applicable British Standards for lighting that relate to the Proposed Development are:

- BS EN 12464-2:2014 Lighting of workplaces – Part 2 (9): Outdoor workplaces. This document provides guidance for a variety of outdoor workplaces and the anticipated lighting requirements, in the form of illuminance levels and uniformities that are used as part of standard practice.
- Road lighting design shall comply with BS EN 5489-1:2020 .
- Code of Practice for the Design of Road Lighting – Part 1 – Lighting of Roads and Public Amenity Areas: defines lighting classes for road lighting aimed at the visual needs of road lighting aimed at the visual needs of road users and it considers environmental aspects of road lighting. Also applicable to the selection of lighting classes for the pedestrian foot / cycle paths and steps.
- BS EN 13201-2:2015 Road lighting – Performance requirements: defines road lighting performance requirements, detailed as lighting classes and considers the environmental aspect of road lighting. Also applicable to the selection of lighting classes for the pedestrian foot / cycle paths.
- Illuminated road signs and internally illuminated traffic bollards shall comply with BS EN 12899-1 and BS EN 12899-2 respectively.
- Lighting columns shall comply with BS 5649-5 and BS EN 40 (all relevant parts).

3 Lighting Design Context

3.1 Introduction

3.1.1 This section establishes the context for why lighting is needed and the existing ambient lighting conditions in the surrounding area that will guide the lighting design strategy.

3.2 Proposed Development lighting needs

3.2.1 Certain activities during the construction and operation of the Proposed Development would operate 24 hours a day, so lighting would be required during the hours of darkness to fulfil health and safety requirements.

3.2.2 During construction of the Proposed Development there will be temporary lighting required to facilitate construction including:

- Lighting of temporary compounds
- Lighting on plant and equipment i.e. cranes
- Vehicle lighting
- Lighting within buildings remaining under construction
- Temporary lighting structures to illuminate working areas

3.2.3 The most likely sources of lighting during the operation of the Proposed Development are:

- Additional road lighting along Horningsea Road
- Lighting within the proposed WWTP
- Lighting of the gateway building and the car park external to the proposed WWTP earth bank

3.3 Local environment

3.3.1 Table 3.1 presents the ILP's guidance on categorising environmental zones for exterior lighting based on the existing external ambient lighting levels in the area.

3.3.2 An objective appraisal has been carried out to classify the Proposed Development in terms of its 'environmental zone', which equates to the district brightness of the surroundings. The appraisal of the environmental zones is based on the nature of the area in general and not the presence of various types and levels of lighting within it. In this case two different environmental zones, E2 and E3, have been identified. The E2 zone location is in the vicinity of Cambridge City and Milton Village. All other locations have been deemed to be an E3 environmental zone.

3.3.3 A more detailed assessment of the ambient lighting and associated effects on the Proposed Development’s construction and operational lighting is presented in the Lighting Assessment Report (Appendix 15.3, App Doc Ref 5.4.15.3).

Table 3-1: Environmental Zone Classification (ILP, 2021).

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (Sky Quality Measurements (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 or suburban locations
E4	Urban	High district brightness	Town/City centres with high levels of night-time activity

Source: reproduced from Guidance Notes for the Reduction of Obtrusive Light GN01:2021, ILP

NOTE: SQM measures the brightness of the night sky in magnitudes per square arcsecond.

4 Lighting Design Principles

4.1 Introduction

- 4.1.1 The lighting design will be determined by construction, operational and maintenance requirements on site for both day-time and night-time lighting of buildings. The installation shall be designed to avoid light pollution beyond the site boundary and upwards into the surrounding atmosphere, particularly in rural areas. An assessment of light pollution by the Proposed Development assessment is presented in the Lighting Assessment Report (Appendix 15.3, App Doc Ref 5.4.15.3).
- 4.1.2 Though Section 3.3 above indicates that only the Waterbeach Pipeline would be in a rural area of low district brightness, the proposed WWTP would be within a Green Belt landscape and located on the edge or within the panoramic vista of a rural area of low district brightness. Therefore, the lighting design strategy has sought to minimise any impact on the existing rural area north of the A14.
- 4.1.3 Section 4.2 presents the lighting design objectives that guided the development of the project specific lighting design principles outlined in Section 4.3. Discussions on the Scheme design and lighting assessment with the local planning authority has also influenced the development of the lighting strategy principles.

4.2 Lighting design objectives

Lighting design objective 1 – maintain safety

- 4.2.1 The lighting design would provide adequate lighting levels to enable the safe operation of all plant and buildings within the proposed WWTP, use of public highways (Horningsea Road) and use of supporting vehicular, pedestrian and cyclist facilities internal and external to the proposed WWTP.

Lighting design objective 2 – maximise low level lighting

- 4.2.2 The proposed WWTP would avoid unnecessary use of lighting and, where possible, keep required lighting hidden / screened behind the proposed WWTP's earth bank. Traditionally such a waste water treatment plant would be very well lit with CCTV cameras everywhere to detect / monitor any intrusions and make it unattractive to thieves. In comparison though the proposed WWTP is a large industrial facility, it would be very dim compared to petro-chemical facilities or power stations with significant levels of lighting for both security and for personnel safety.

Lighting design objective 3 – minimise light spread

- 4.2.3 All lighting should point downwards or shaped to light the required areas only so the sky around the proposed WWTP would be affected only by reflection from the surface rather than light being directed upwards and, where external to the proposed WWTP earth bank, directed away from the nearest sensitive receptors.
- 4.2.4 Figure 4.1 below shows an example of downward pointing lighting units angled to avoid upward light emissions.



Figure 4.1: Example lighting in an industrial area

4.2.5 This approach is standard practice on modern street lights where poor low/high pressure sodium lights (with no control) have been replaced by light emitting diode (LED) lights; in some cases the light beams can be modified to only illuminate certain areas. Wherever possible, lighting installation components (lamps, control gear, luminaires, control systems etc.) shall satisfy the criteria detailed within the Energy Technology Criteria List set by the Carbon Trust in the Energy Technology Criteria List, Revision 1 (June 2021) published by the Department for Business, Energy & Industrial Strategy.

4.2.6 With regards LED lighting units, Section 8.2.3.4 of the Carbon Trust guidance requires:

- LED lighting unit components shall comply with the standards in Table 4.1 below, as appropriate.
- To maximise their performance and lifetime, LED lighting units shall comply with the following requirements, as a minimum:
 - a) LED drivers and luminaires shall be specifically selected to match the requirements of their associated LED chips;
 - b) LED lighting units shall incorporate features / facilities to limit the maximum operating temperature of the LED chip (e.g. a heat sink)
 - ~~b)c)~~ LED units shall be specified as warm white (2700Kelvin or lower) to reduce the blue light component to reduce the effect on bats.
- With respect to item (b), LED lighting unit lifetime vs ambient temperature data shall be provided to verify the design.

Table 4.1: LED Lighting Units Requirements

Component	Safety Standard	Performance Standard
LED drivers	IEC 61347-1 and IEC 61347-2-13 (2006)	BS EN 62384 (2006) + A1:2009
LED connectors	BS EN 60838-2-2 (2006)	
LED lamps, self-ballasted	IEC 62560 (2010)	IEC/PAS 62612 (2009)
LED lamps, non self-ballasted	IEC 62663-1	IEC 62663-2
LED modules	BS EN 62031 (2008)	IEC/PAS 62717 (2011)
LED luminaires	BS EN 60598 (2008)	IEC/PAS 62717 (2011)

Source: WIMES 3.02 Low Voltage Electrical Installations, April 2013

Lighting design objective 4 – avoid or minimise night working

- 4.2.7 Task lighting would only be provided for those working areas where overnight reactive maintenance (not routine maintenance) or emergency repairs are required. These areas would be those where failure could result in a pollution incident in the River Cam at the outfall or in Cambridge itself due to an inability to pump / process the raw effluent. Other areas would be left unlit and maintenance undertaken during the next working day.
- 4.2.8 Any area that requires lighting would be minimised by keeping the illuminated area being relatively close to the point of work. Reducing the light spread (i.e. total area that is illuminated) the available Lumens available for reflection would be reduced.
- 4.2.9 Pathway lighting within the proposed WWTP will only be provided to get employees from the roadside (their car, van or truck) to the relevant building or task / general inspection area. Other areas will be unlit, such as the access road to the proposed WWTP.
- 4.2.10 Pathway lighting would be controlled by PIR sensors, where possible.
- 4.2.11 Areas on top of tanks / structures (top of digesters) where lighting is critical for safety would be manually controlled only to ensure that a PIR sensor doesn't time-out and switch-off whilst the employee is still on the tank.
- 4.2.12 During construction of the Proposed Development, in line with the Community Liaison Plan (App Doc Ref 7.8) the Construction team would work with those affected by any temporary adverse lighting effects to remove or reduce this impact where practicable.

Lighting design objective 5 – minimise number of lighting assets

- 4.2.13 The lighting design will be as low as the legislation and guidelines in Section 2 allow.
- 4.2.14 Minimum light levels for the proposed WWTP are defined by WIMES as the recognised Industry Standard written by the Water Industry. The main regulations on lighting provision, specifically the Workplace (Health, Safety and Welfare) Regulations 1992, reference a series of CIBSE guides that are also referenced in WIMES; for example, HSE Guidance 38 'Lighting at Work'. It is worth noting that CIBSE Guide 1 uses higher Lux levels than WIMES, justifying use of WIMES and not seeking to reduce lighting levels further.

- 4.2.15 The Lux level is the light intensity at the point of work or on a path. The Lux levels for paths and points of work within the proposed WWTP would be a consequence of the lumens of the lamp and the surface area that it is spread across. Using less powerful lighting reduces the Lumens from the lamp, meaning it can't illuminate as wide an area so additional lights need to be installed to keep the required Lux level across the same area (i.e. either install 1 off 100 Lumen lamp or 2 off 50 Lumen lamps to get the required Lux level on a fixed area).
- 4.2.16 Reducing the Lux level would lead to maintenance staff not being able to see what they are doing or people not seeing where they are walking. The Lux level at the reflection surface would still need to be achieved even if using more lighting units at a lower Lux level (1 large or many smaller lamps still need to give 100Lux at the point of work). Therefore, the design would seek to achieve a balance between achieving the required lux level between a balance of low Lux level lighting units versus minimising the number of lighting units.
- 4.2.17 Lighting units shall be selected to be aesthetically appropriate and to limit light pollution, improve energy efficiency and increase equipment longevity. The design of the locations of the lighting will be sympathetic to needing to avoid/minimise adverse effects by considering the direction of light relative to potential receptors. Wherever possible, lighting installation components (lamps, control gear, luminaires, control systems etc.) shall satisfy the criteria detailed within the Energy Technology Criteria List' set by the Carbon Trust and shall therefore qualify for enhanced capital allowances (ECAs) (refer to www.eca.gov.uk).

Lighting design objective 6 – minimise impacts on ecological receptors

4.2.18 In addition to the benefits from the objectives, further reduce impacts on sensitive ecological receptors throughout the year, or at particular times (e.g. during bird migrations), by the design of the lighting or by turning it off or down at sensitive times.

4.2.19 LED Light units shall be specified as warm white (2700Kelvin or lower) to reduce the blue light component to minimise the effect on bats.

4.2.184.2.20 Lighting design must maintain the dark corridor along the county wildlife site adjacent to the disused railway line.

4.3 Lighting design principles

- 4.3.1 The following outlines the key lighting design principles to be applied during the development of the detailed design for the Proposed Development:
- the lighting installation shall be designed on the basis of lowest life cycle costs, considering the following factors, as a minimum:
 - a) power consumption/energy efficiency of lamps and control gear;
 - b) minimum rated service lives and replacement costs of components (lamps, control gear and luminaires etc.);

- c) lighting installation control philosophy; and
- d) lighting installation maintenance requirements.

- all lighting should point downwards and if possible shaped to light the required areas only so the sky will largely be affected by reflection from the surface rather than light being directed upwards;
- a designer risk assessment will be used to remove permanent operational lighting from the Proposed WWTP's internal roads where possible, on the basis that the Applicant's operations staff can safely travel around most of the site after dark guided by their vehicles headlights;
- task lighting will only be provided for those working areas where overnight reactive maintenance (not routine maintenance) or emergency repairs are required, and where possible will be restricted in height to avoid visibility from outside the earth bank (although lighting on taller structures where access may be required will be visible if activated);
- all lighting of ground level walkways and internal accesses will be below 5m in height and below the height of the earth bank);
- pathway lighting will be provided to get employees from the roadside (their van/truck) to the relevant task area/general inspection area. This will be controlled by passive infrared (PIR) sensors where possible;
- areas on top of tanks/structures (top of digesters) where lighting is critical for safety will be manually controlled only to ensure that a PIR sensor doesn't time-out and switch-off whilst the employee is still on the tank;
- where lights are manual On/Off there will be an automatic reset from a daylight sensor each morning so such lights would only be on for one night in the worst case;
- lighting sources shall be selected to be aesthetically appropriate and to limit light pollution, improve energy efficiency and increase equipment longevity;
- all luminaires should lack UV elements. Metal halide, fluorescent sources should not be used;
- LED luminaires will be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability;
- a warm white spectrum (ideally <2700 Kelvin) should be adopted to reduce blue light component to minimise the effect on bats;
- luminaires should feature peak wavelengths higher than 550 nanometers to avoid the component of light most disturbing to bats;
- internal luminaires can be recessed where installed in proximity to windows to reduce glare and light spill;

- use of specialist bollard or low-level downward directional luminaires to retain darkness above can be considered. As these may cause glare, poor illumination efficiency, a high upward light component and poor facial recognition, their use should only be as directed by the lighting professional;
- column heights will be set to minimise light spill;
- only luminaires with an upward light ratio of 0% and with good optical control should be used – following ILP Guidance for the Reduction of Obtrusive Light;
- luminaires should always be mounted on the horizontal, i.e. no upward tilt;
- external security lighting should use both motion sensors and infra-red lighting with 30 minute timers;
- as a last resort, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct light only to where it is needed;
- final design of street lighting required on a public highway, such as Horningsea Road, would be discussed and agreed with Cambridgeshire County Council as the Local Highway Authority with the aim to keep to a minimum and only placed for safety reasons;
- wherever possible, lighting installation components (lamps, control gear, luminaires, control systems etc.) shall satisfy the criteria detailed within the Energy Technology Criteria List' set by the Carbon Trust and shall therefore qualify for enhanced capital allowances (ECAs) (refer to www.eca.gov.uk) The Purchaser shall be notified of all items that qualify for ECAs; and
- All lighting levels cited in this lighting strategy are Em (maintained illuminance) levels, which are the values below which the average illuminance (in lux) on the specified surface is not allowed to fall. A maintenance factor, comprising a luminaire and lamp specific de-rating factor, is applied to lighting calculations to allow for lumen depreciation of a light source over time and a predicted amount of dirt build up on the glazing of the lantern given its height and the pollution category of the area. Applying the maintenance factor within the design calculations ensures an installation will have compliant lighting levels at the end of the maintenance cycle when the light source has depreciated the most and the glazing of the lantern is the dirtiest. The maintenance factor for the Proposed Development's lighting will be designed in line with the recommended guidance BS5489-1 2020

5 Lighting Design Strategy During Operation and Maintenance

5.1 Introduction

- 5.1.1 This section outlines how the principles of the lighting design would be applied across the Proposed Development.
- 5.1.2 Environmental Statement Chapter 2 Project Description (App Doc Ref 5.2.2) also provides details of the worst case lighting requirements for individual plant areas.

5.2 Highways - Horningsea Road improvements and proposed WWTP access

- 5.2.1 It is anticipated that lighting would be required around the new proposed WWTP access junction with Horningsea Road and the new pedestrian crossing point on Horningsea Road. The Horningsea Road lighting strategy would comprise:
- At present street lighting is confined to the area in the immediate vicinity of the two existing signalised junctions of Horningsea Road with the A14 off and on slip roads, north and south of the A14 overbridge respectively.
 - The proposed highway works on Horningsea Road to facilitate the new site access to the proposed WWTP would require changes to the existing street lighting infrastructure on the public highway.
 - The length of Horningsea Road from its junction with Low Fen Drove Way to approximately 100m south of the southern signalised junction with the A14 Westbound On-slip Road would need to be lit. A short extent (approximately 10m) of adopted carriageway on the proposed WWTP access arm of the new 4 arm signalised junction would also need to be lit.
 - The final extent and design of the street lighting required on the public highway would be discussed and agreed with Cambridgeshire County Council as the Local Highway Authority. Following discussions with the Local Highway Authority the proposed extent of street lighting may be reduced.
 - The street lighting design must conform to the latest specification as found in the Council's Highways policies and based on their 'Street Lighting Development Specification' lighting columns would be 10m high.
 - Post-completion lighting surveys shall be completed to confirm that the proposed lighting levels are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.
 - During ongoing maintenance of the works the operation of the lighting system shall be routinely checked to ensure that the lights are still operating as intended.

5.3 Gateway building visitor car park

5.3.1 The lighting strategy for the car park outside the proposed WWTP earth bank would comprise:

- 5m high lighting columns with 5 to 20 Lux at ground level.
- Each lighting column can reach 17.5m either side of the column using a typical light emitting diode (LED) lighting unit.
- Passive infrared sensor (PIR) would ensure lights only come on when motions is detected, but a manual override option would be available from the gateway building. If provided, safe access lighting shall be automatically controlled by PIR sensors, incorporating an adjustable 'on-time' control of up to two hours. Discharge lighting shall not be controlled by PIR sensors.
- The lighting around the visitor car park, which is located outside the proposed WWTP earth bank, will be on during office hours which will be between 08:00 and 18:00 Monday to Friday. The lighting will then operate in the evening on PIR control as and when required.
- Post-completion lighting surveys shall be completed to confirm that the proposed lighting levels are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.
- During ongoing maintenance of the works the operation of the lighting system shall be routinely checked to ensure that the lights are still operating as intended.

5.3.2 Bollard lighting for the car park outside the proposed WWTP earth bank could be considered during detailed design to reduce view of lights from a distance. However, this approach would need significantly more bollards than lighting columns to meet the required light intensity (uniform 20 lux at ground level) since each light won't illuminate as large an area and wouldn't give the same level of security for people walking in the car park and is not recommended in the Bat Conservation Trust Guidance Note 08/23. Using bollards reduces the level of security people would feel (i.e. how comfortable they feel walking through the car park). With the bollards being positioned very localised to the ground it means a person's eye line is less illuminated so they won't see past cars and around the car park as much as with lighting columns; they will just see the walkways in the car park. Walking across a dimly lit car park at night could be scary to many employees, and was a concern raised by female colleagues during the development of the proposed WWTP design. Reasonable light levels go a long way to relieving such concerns and supporting the long-term mental health and well-being of Operational staff.

5.4 Gateway building

5.4.1 The following design considerations would apply to developing the detailed lighting design within the Gateway Building, plus the outside facades:

- Lighting design to follow CIBSE lighting guides and BS 8300-2:2018 *Design of an accessible and inclusive built environment. Buildings - code of practice*. The Gateway Building will not be lit as a night time feature.
- In the office areas the surface maximum illuminance would be up to 500 Lux.
- The proposed WWTP main entrance gates would have 5m high lighting at 20 Lux lights which are PIR controlled. Could operate at any time of night as people enter / exit site.
- There would also be PIR controlled downward pointing 20 lux lights at building entry points and the cycle shelter lighting the local pathway. These would be mounted on the building at 5m above ground level.
- Task lighting for Distribution Network Operator (UK Power Networks) area, mounted off structures at 5m above ground level providing 200 lux.
- Post-completion lighting surveys shall be completed to confirm that the proposed lighting levels are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.
- During ongoing maintenance of the works the operation of the lighting system shall be routinely checked to ensure that the lights are still operating as intended.
- The mitigation of night-time light pollution, if required, could be achieved in a number of ways:
 - Through the specification of glass with a low visible light transmission factor; though this would reduce the amount of natural light entering the building, which is an important design consideration for the health and well-being of those using the building.
 - Limiting the amount of glass.
 - Providing automated shutters and/or blinds (the preferred option) that would be activated when the lights are switched on.
- The DCO application design assumes:
 - the first floor would be about 50% glazed with vertical louvres to reduce solar gain and the ground floor is about 25% glazed; and
 - the west, south and north façades facing the landscape would need mitigation, whereas the façade facing the plant would not.

5.5 Working Shop Building

5.5.1 The following design considerations would apply to developing the detailed lighting design within the Workshop Building, plus the outside facades:

- Lighting design to follow CIBSE lighting guides and BS 8300-2:2018 *Design of an accessible and inclusive built environment. Buildings - code of practice*. The Workshop Building will not be lit as a night time feature.
- In the laboratory area of this building (no external windows) the surface maximum illuminance would be up to 500 Lux. Other staff areas of the building would be up to 200 lux including the kitchenette (the only windowed area of the building).
- In the workshop area of the building (no external windows) the general surface maximum illuminance would be up to 150 Lux with any specialised lighting being by local mounted task lighting (lathes, benches etc).
- There would be PIR controlled downward pointing 20 lux lights at the pedestrian building entry point to the staff areas of the building. This would be mounted above the entry door on the building at 3m above ground level. This could operate at any time of night as people enter / exit the building although this is expected to be for emergency works only.
- There would be PIR controlled downward pointing 20 lux lights at the 5m high roller shutter doors to the Workshop areas and the Innovation Space. These would be mounted on the building at 5.5m above ground level. These could operate at any time of night as people enter / exit the maintenance building although this is expected to be for emergency works only.
- Post-completion lighting surveys shall be completed to confirm that the proposed lighting levels are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.
- During ongoing maintenance of the works the operation of the lighting system shall be routinely checked to ensure that the lights are still operating as intended.
- The mitigation of night-time light pollution, if required, could be achieved in a number of ways:
 - Through the specification of glass with a low visible light transmission factor; though this would reduce the amount of natural light entering the building, which is an important design consideration for the health and well-being of those using the building.
 - Limiting the amount of glass to sections of the North and West elevations at ground floor for the kitchenette only.
 - Providing automated shutters and/or blinds (the preferred option) for these windows that would be activated when the lights are switched on.

- The 5m high roller shutter doors for plant and machinery on the Workshop areas and the Innovation Space would be fitted with electric access shutters which would be closed after entry / exit to minimise the time these doors are open.
- The DCO application design assumes:
 - The only glazed area of this building would be half of the West facade (8m long) and a short (5m long) section of the North facade at ground level only specifically for the kitchenette.

5.6 Proposed WWTP

- 5.6.1 A small amount of low level path lighting would be provided around the proposed WWTP to enable Operational staff to travel safely from vehicle to process area. Unless otherwise specific in Appendix A, the maximum height of lighting units will be 5m above ground level to ensure these are below the height of the earth bank. The lighting units along walkways would provide a localised 10 lux light and would be fitted with downward pointing LED units to minimise light pollution. Where relevant lighting units on columns would be replaced with equivalent wall mounted fixtures.
- 5.6.2 This street lighting at the proposed WWTP would provide 10 lux lighting levels and be located close to the offices and car park areas only and would be on movement sensors (with 30 minutes timers) at building and car park entries. Lighting of the proposed WWTP road network will only be applied around the roads beside the Gateway Building, HGV parking area and staff car park as illustrated by the blue dashed line around Areas 1 and 2 on the plan in Appendix A. Operations staff would travel around the site after dark guided by their vehicle headlights.
- 5.6.3 There would also be downward pointing 20 lux lights at building entry points lighting the local pathway.
- 5.6.4 There would be some 100 lux task lighting located on the main process structures; 50 lux lighting on the walkways and stairways around the structures would provide safe access to the task lighting areas. This lighting would be activated if an operator is required to inspect / maintain the plant during night time hours, but the structures would not be permanently lit. Where possible this task lighting would be located below the top of the earth bank and downward pointing.
- 5.6.5 Appendix A illustrates how the above principles would apply to separate parts of the proposed WWTP, plus how lighting will be controlled by sensors and operational timings to minimise the duration of the lights being switched on after dark.
- 5.6.6 Post-completion lighting surveys shall be completed to confirm that the proposed lighting levels are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.
- 5.6.5.6.7 During ongoing maintenance of the works the operation of the lighting system shall be routinely checked to ensure that the lights are still operating as intended.

6 Lighting Design Strategy During Construction

6.1 Construction work areas

6.1.1 Temporary lighting will be provided during the construction phase in construction laydown areas, parking facilities and offices to ensure construction work can continue safely and effectively during periods of the working day when there is insufficient natural daylight. Floodlights will not be used, with the need for extended night-time working avoided except in exceptional circumstances (for accidents and emergencies, or critical tasks such as continuous concrete pours and at drive shaft sites).

6.1.2 Additional points with regards the construction lighting strategy are:

- The lux levels under task lighting, of 50-100 lux, would apply during construction.
- During the occasional night time lift or concrete pour the lux level may increase to a maximum of 300 lux.
- Lighting would be provided by fixing LED floodlights to office and welfare units, and these floodlights would be cowled and downward pointing.
- Temporary lighting will be no higher than 8 metres high and mounted on columns/ structures.
- Along access roads and site working areas tripods, mobile tower lights solar and festoon lighting along walkways will be provided where required.
- Where possible lighting will be solar powered.

6.1.3 The above construction lighting will only apply within the 'Working Hours' defined in Section 5 of the Code of Construction Practice Part A (Appendix 2.1, App Doc Ref 5.4.2.1).

6.1.4 Construction lighting will be designed and positioned to ensure that any artificial light emitted from the working areas: minimises glare; does not prejudice health including for residents, walkers or passing drivers/trains; does not create a nuisance under the Environmental Protection Act 1990; and avoids or reduces potential impacts upon the natural and historic environment.

6.2 Lighting sources

6.2.1 The Proposed Development will comprise a number of different working areas within which a range of construction activities will be carried out including the construction of a new WWTP, shaft and tunnel construction and pipe laying along with a new outfall to the River Cam.

6.2.2 During construction the following temporary lighting would be required to facilitate construction:

- lighting of temporary compounds;
 - lighting on plant and equipment (i.e. cranes);
 - vehicle lighting;
 - lighting of construction parking facilities and associated security entrance lighting;
 - lighting within buildings remaining under construction; and
 - temporary lighting structures to illuminate working areas.
- 6.2.3 Lighting details (locations, duration of use, lighting types) will be agreed between the Applicant and their Principal Contractor during the detailed design stage. Where details are not currently fixed reasonable worst-case assumptions have been developed for the environmental lighting impact assessment as outlined in Table 6-1 below.

6.3 Lighting Design Compliance verification

6.3.1 Post-completion lighting surveys shall be completed to confirm that the proposed lighting levels are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.

6.3.2 During ongoing maintenance of the works the operation of the lighting system shall be routinely checked to ensure that the lights are still operating as intended.

Table 6-1: Construction lighting assumptions for the environmental lighting impact assessment

Basis of assessment Construction and compound area/s	Details / tasks info	Duration of use / activity ¹	Lighting types	Maintained Illuminance (Em)	Maximum height
Waterbeach compound	100 x 100m	12 months	LED Tower Lights & PIR security lights	200	8m
Railway – north crossing Horizontal Directional Drilling (HDD) launch / recovery sites	25m x 25m footprint of works area in use for 4 weeks with the drill shot activities occurring over 14 days. Works to be completed in day and night (24/7). HDD pits would be secured when not in use and lit with PIR security lights.	2 weeks in total	LED Tower Lights & PIR security lights	200	8m
Burgess Drove laydown area	Secured and lit. Some task lighting for activities in darker winter months.	6 months	LED Tower Lights & PIR security lights	200	8m
Typical open trench section	Assume a section of up to 250m. Some task lighting for activities in darker winter months.	2 weeks	LED Tower Lights & PIR security lights	200	8m
A14 Crossing	25m x 25m footprint of works area in use for 4 weeks with the drill shot activities occurring over 14 days. Works to be completed during the day Lighting for safety in darker winter months would be needed and as a standby for 24 hour working.	2 weeks	LED Tower Lights & PIR security lights	200	8m
Main compound – land for proposed WWTP	Maximum of a 300 x 300m compound, construction parking facilities and security entrance all secured with lighting	42 months	LED flood lights, that will be a mix of installation off the top of the first floor office, installed off storage containers and LED tower lights where required.	50	8m
Construction of the proposed WWTP	Approx. 300 tonne crawler cranes at peak	During the occasional night	LED tower lights	Guidance would say 200 but, due to the level of detail	15m <u>NOTE – This is an</u>

¹ Construction lighting will only apply within the ‘Working Hours’ defined in Section 5 of the Code of Construction Practice Part A (Appendix 2.1, App Doc Ref 5.4.2.1).

Basis of assessment Construction and compound area/s	Details / tasks info	Duration of use / activity ¹	Lighting types	Maintained Illuminance (Em)	Maximum height
		time lift or concrete pour		required this will go to 300	<u>exceptional need during critical activities, very special circumstances and winter working. Where possible this will be limited to 8m.</u>
Horningsea Road crossing – treated effluent pipeline	Crossing works Temporary lighting – highways requirements, including night lighting	4 months	LED Tower Lights	200	8m
River /outfall compound	40 x 25m	4 months	LED Tower Lights	200	8m
Shaft 4	64m x 60m compound with solid hoarding Day works only, so would only be morning & evening lighting for start and finish during winter	3 months, then intermittent 4x equipment recover events over 5 days Reinstatement over 6 weeks	LED Tower Lights	50 for welfare access and egress during winter and 200 for shaft where required	8m
Shaft 5	64m x 60m compound with solid hoarding	3 month set up Use for 24 months, including 24/7 De-mobilisation and site reinstatement over 6weeks	LED Tower Lights	As above	8m
River Cam crossing south	25m x 25m footprint of works area in use for 4 weeks with the drill shot activities occurring over 14 days. Works to be completed in day.	2 weeks	LED Tower Lights & PIR security lights	200	8m

Basis of assessment

Construction and compound area/s	Details / tasks info	Duration of use / activity ¹	Lighting types	Maintained Illuminance (Em)	Maximum height
	Lighting for safety in darker winter months would be needed.				
Shaft 3 within existing WWTP	64m x 60m compound	104 weeks	LED Tower Lights	50 for welfare access and egress during winter and 200 for shaft where required	8m
Shafts 1 and 2 within existing WWTP	60 x 130	32 weeks	LED Tower Lights	50 for welfare access and egress during winter and 200 for shaft where required	8m

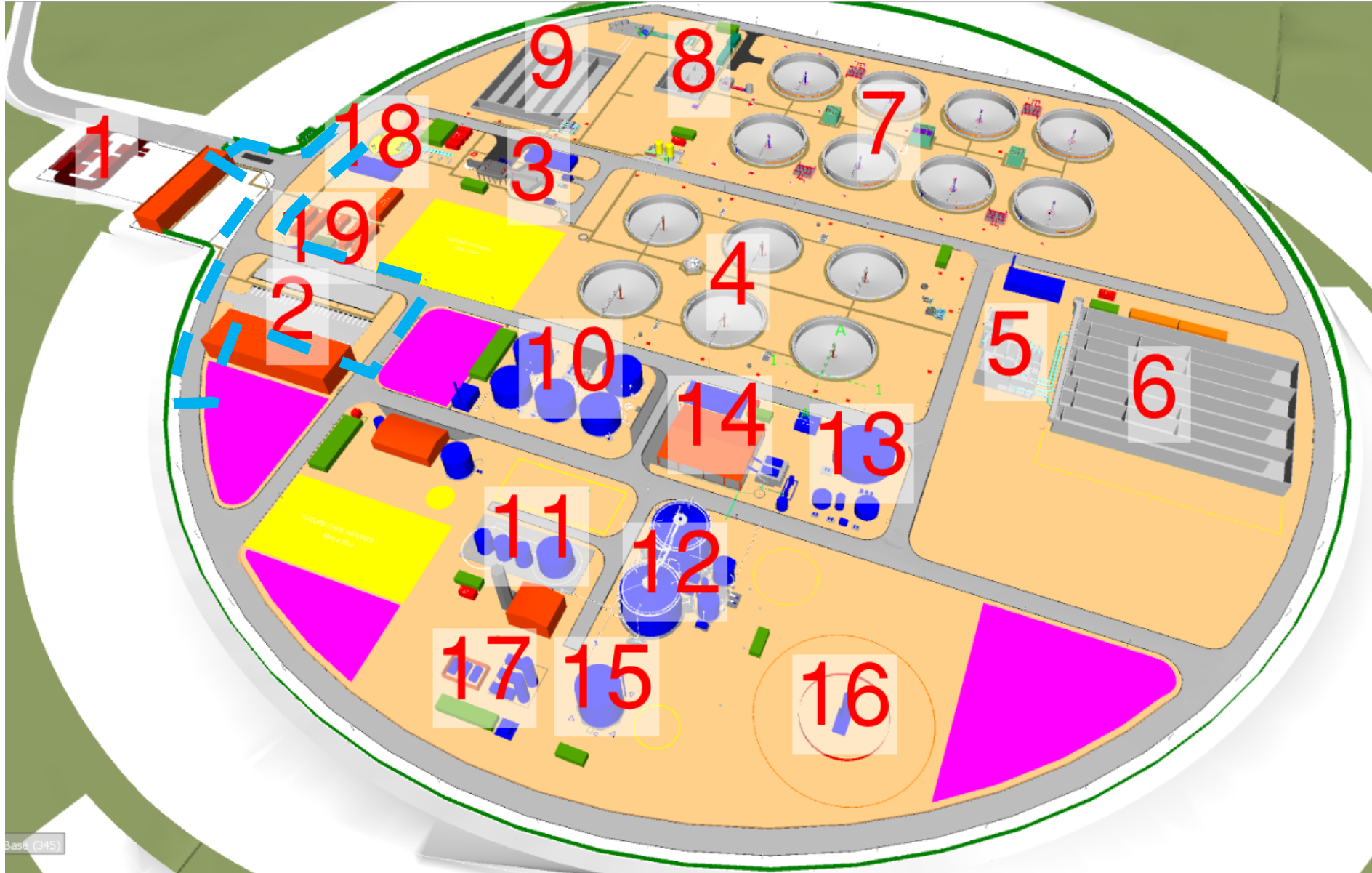
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Appendix A – Application of lighting strategy across proposed Cambridge WWTP

Figure A.1: Lighting areas within proposed WWTP



Basin (245)

AREA 1 – VISITOR CAR PARK / SITE ENTRANCE

- External to the 5m high earth bank.
- Car park lights would be on 5m high lighting columns or mounted on the gateway building as necessary with downward pointing LED lights using warm white LEDs.
- Car Park lighting will be on at 5 to 20 Lux during office hours between 08:00 and 18:00 Monday to Friday, then operate via PIR sensors and short 30 minute timers with manual override out of office hours.
- No requirement to light the car-park overnight.
- The proposed WWTP main entrance gates would have 5m high lighting at 20 Lux lights which are PIR controlled. Could operate at any time of night as people enter / exit site.

AREA 2 – WORKS CAR PARK

- Internal to the 5m high earth bank.
- Lights would be 5m high lighting columns or mounted on the building at 5m above ground level as necessary with downward pointing LED lights using warm white LEDs.
- Lighting to be 5 - 20 Lux and on during office hours, which is between 08:00 and 18:00 Monday to Friday.
- Potential for overnight reactive maintenance staff to attend site.
- Outside office hours operation via PIR sensors with short 30 minute timer and manual override, to ensure lights are not on through night.

AREA 3 – INLET WORKS

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m above ground level (agl).
- High level 100 Lux task lighting required (maximum height 8m agl) which would be above the 5m high earth bank. Would be via manual on/off switch ~~and~~ with auto reset every morning so worst case this would be on for 1 night only.
- 50 Lux lighting on access platforms/stairs (maximum height 8m agl) - visible over the earth bank). Would be via manual on/off switch at stairway entrances ~~and~~ with auto reset every morning so worst case this will be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 4 – PRIMARY SETTLEMENT TANKS

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.

- 20 to 50 Lux lighting on rotating bridges required (maximum height 6m agl). Would be via manual on/off switch at stairway entrances ~~and with~~ auto reset every morning so worst case this will be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 5 – INTERMEDIATE PUMP STATION

- 100 Lux task lighting required at pump sump (maximum height 4m agl) which is below the 5m high earth bank. Would be controlled via local manual on/off switch and have auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 6 – AERATION LANES (MABR)

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 50 Lux on access platforms/stairs (maximum height 8m agl). Would be via manual on/off switch at stairway entrances with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight

AREA 7 – FINAL SETTLEMENT TANKS

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 20 to 50 Lux lighting on rotating bridges (maximum height 9m agl) required and 100 Lux at ground level on the pumps at four locations (maximum height 5m agl). Would be via manual on/off switch at stairway entrances with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 8 – TERTIARY TREATMENT / WORKS OUTFALL

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 50 Lux on access platforms/stairs (maximum height 10m agl). Would be via manual on/off switch at stairway entrances with ~~and~~ auto reset every morning so worst case this would be on for 1 night
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 9 – STORM TANKS

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 50 Lux lighting on access platforms/stairs (maximum height 5m agl). Would be via manual on/off switch at stairway entrances with ~~and~~ auto reset every morning so worst case this will be on for 1 night only.
- 100 Lux task lighting for screens (maximum height 5m agl), controlled by manual on/off switch.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 10 – SLUDGE STORAGE / SLUDGE IMPORTS

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 50 Lux on access platforms/stairs/roof space (maximum height 10m agl - visible over the earth bank).
- 100 Lux task lighting required on working platform (maximum height 10m agl) and at 5m ground level, mounted off the structure by the pumps.
- No task lighting to top of sludge tanks.
- Building with sludge thickening would need no external lighting, but there would be a 20 Lux light at the entry point, mounted at 5m above ground level.
- Access to this area at night will would be limited to emergency maintenance activities only. No routine maintenance required overnight.
- No task lighting at high level, but 100 Lux task lighting required to Odour Control base. Lighting would be mounted at 5m above ground level and would be controlled via manual on/off switch at work locations with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.

AREA 11 – HEATING PASTEURISATION HYDROLYSIS / BOILER HOUSE / BOILER HOUSE STACK

- The boiler exhaust stack would be a tall stack (maximum height 24m agl) so would need four automatic navigation lights on the top.
- Boiler house itself would need no external task lighting, but there would be a 20 Lux light at the entry point mounted above entrance door or on building at 5m above ground level
- Heating pasteurisation hydrolysis area would have: 20 to 50 Lux light on access platforms and stairways; 50 Lux high level lighting (maximum height 15m agl) visible over the proposed WWTP earth bank; and 100 Lux task lighting at ground level, mounted on structure at height

of 5m above ground level. Control would be via manual on/off switch at stairway entrances and have auto reset every morning so worst case this would be on for 1 night only.

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 12 – DIGESTERS / POST DIGESTION

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 50 Lux on access platforms/stairs/roof space (maximum height 20m agl - visible over the earth bank).
- No task lighting at high level, but potentially some 100 Lux task lighting at ground level at the recirculation pumps. Mounted off structure at 5m above ground level.
- Would be via manual on/off switch at stairway entrances with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- It is anticipated that there will be the need for four medium intensity steady red lights on the digesters (maximum height 20m agl).

AREA 13 – LIQUOR TREATMENT

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 100 Lux task lighting required to low level plant, mounted off structure at 5m above ground level. Control would be via manual on/off switch at work locations with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.
- No task lighting to top of tank.
- No task lighting at high level, but 100 Lux Task Lighting required to Odour Control base. Mounted off structure at 5m above ground level and control would be via manual on/off switch at work locations with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 14 – DEWATERING

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 50 Lux on access platforms/stairs (maximum height 8m agl - visible over the earth bank).

- 100 Lux task lighting required on working platform (maximum height 8m agl) and at ground level by the pumps (maximum height 5m agl).
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.
- Lighting required within Dewatered Cake Storage Barn area. 100 Lux lights would be under roof and pointing downwards. Would be via manual on/off switch at work locations with ~~and~~ auto reset every morning so worst case this 100 Lux be on for 1 night only

AREA 15 – GAS BAG

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 100 Lux task lighting at ground level required to Gas Bag blowers, mounted off structure at 5m above ground level. Control would be via manual on/off switch at work locations with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- It is anticipated that there will be the need for four medium intensity steady red lights on the lightning protection installation above the gas bag (maximum height 20m agl).
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 16 – FLARE STACK

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 100 Lux task lighting required to Flare Stack base mounted off structure at 5m above ground level. Control would be via manual on/off switch at work locations with ~~and~~ auto reset every morning so worst case this would be on for 1 night only.
- It is assumed that flare stack does not require high level lighting.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.
- The flare will be enclosed and not be visible unless directly from above.

AREA 17 – GAS TO GRID

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- 100 Lux task lighting required to Gas to Grid at ground level, mounted off structure at 5m above ground level. Control would be via manual on/off switch at work locations ~~and~~ with auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 18 – TERMINAL PUMP STATION (TPS)

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- No external task lighting provided in this area for TPS.
- No task lighting at high level, but 100 Lux Task Lighting required at ground level mounted off structure at 5m above ground level. Control would be via manual on/off switch at work locations ~~and~~ with auto reset every morning so worst case this would be on for 1 night only.
- Access to this area at night would be limited to emergency maintenance activities only. No routine maintenance required overnight.

AREA 19 – EMERGENCY GENERATORS

- Walkways to be lit by 10 Lux lighting with PIR control and at heights no greater than 5m agl.
- No external task lighting provided in this area for Emergency Generators.

GENERAL – ROADS / OPEN SPACES

- The roads in general would not be lit. Lighting will only be installed along roads beside the Gateway Building, HGV parking area and staff car park as illustrated by the blue dashed line around Areas 1 and 2 on the plan above.
- As minor roads, the proposed WWTP road lighting would have 10 Lux level.
- Operations staff would travel around site by Electric Vehicle (EV) or internal combustion engine (ICE) vehicles and thereby guide by headlights.

GENERAL – OTHERS AREAS

Motor Control Centre (MCC) Buildings would have a 20 Lux external light (maximum height 5m agl), with PIR control, above the entrance door which is lit at night.

Access limited to emergency maintenance activities only Walkways to be lit by 10 Lux lighting level with PIR control and at heights no greater than 5m agl.

Generator Area Buildings would have 20 lux external lighting (maximum height 5m agl), with PIR control, above the entrance doors which is lit at night.

Access limited to emergency maintenance activities only Walkways to be lit by 10 Lux lighting level with PIR control and at heights no greater than 5m agl.

LV & HV Area - Buildings would have 20 lux external lighting (maximum height 5m agl), with PIR control, above the entrance doors which is lit at night.

Access limited to emergency maintenance activities only Walkways to be lit by 10 Lux lighting level with PIR control and at heights no greater than 5m agl.

Get in touch

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Emailing at info@cwwtpr.com



Calling our Freephone information line on **0808 196 1661**



Writing to us at **Freepost: CWWTPR**

You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

<https://infrastructure.planninginspectorate.gov.uk/projects/eastern/cambridge-waste-water-treatment-plant-relocation/>