The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 2 Description of the Permanent Development Appendix 2B of the Environmental Statement: Lighting Management Plan - Tracked Changes Version

Revision:	3.0
Applicable Regulation:	Regulation 5(2)(a)
PINS Reference Number:	EN010012

September 2021

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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~~1. Lighting management plan for construction and operational sites~~

1 LIGHTING MANAGEMENT PLAN FOR CONSTRUCTION AND OPERATIONAL SITES

1.1 Introduction

a) Purpose

~~2.1.1~~1.1.1 The purpose of this Lighting Management Plan (LMP) is to

- ~~set~~ Set out the operation and maintenance procedures for the control of artificial light emissions associated with the construction and operation of Sizewell C power station, to enable safe working whilst addressing planning and environmental considerations~~.~~, and

~~2.1.2~~- ~~The purpose of this LMP is to ensure~~ Ensure that the external lighting provided on the construction and operational sites of Sizewell C power station provides safe lighting for the staff on-site and is functional to allow the safe construction and operation, but is also both energy efficient and designed as far as reasonably practicable to minimise its impact on the surrounding environment. It should be noted that internal lighting of buildings does not form part of this document.

~~1.1.1~~1.1.2 ~~This~~ Section 1.3 and Section 1.4 of this Lighting Management Plan ~~is~~ are to be secured in the Sizewell C DCO through Requirements 9 and 15 as explained further below.

b) Scope

~~2.1.3~~1.1.3 The LMP is limited to the area within the main development site boundary and is therefore not applicable to any of the associated developments or existing power station facilities. It has been broken down into three sections in this report.

- **Section 1.2**: Site Context. This section will look at the existing environmental conditions (predominantly landscape, visual and ecological) within and around the Sizewell C development site and provide the baseline lighting conditions. A summary of relevant legislation, standards, good practice guidelines and policies will be discussed.

- **Section 1.3**: Construction Lighting Management Plan. This section identifies the tasks requiring lighting during the construction phase,

appropriate levels of illumination when required and details control and mitigation measures.

- **Section 1.4**: Operational Lighting Management Plan. This section identifies the tasks requiring lighting during the operational phase, appropriate levels of illumination when required and detailscontrol and mitigation measures.

1.1.4 Level 1 control documents will either be certified under the DCO at grant or annexed to the Deed of Obligation (DoO). All are secured and legally enforceable. Some Level 1 documents are compliance documents and must be complied with when certain activities are carried out. Other Level 1 documents are strategies or draft plans which set the boundaries for a subsequent Level 2 document which is required to be approved by a body or governance group. The obligations in the DCO and DoO set out the status of each Level 1 document.

1.1.5 The Construction Lighting Management Plan (Section 1.3) and the Operational Lighting Management Plan (Section 1.4) are Level 1 documents. These documents are secured under the draft DCO (dDCO) by:

~~2.1.4~~• ~~The DCO Requirements provide that during the construction phase,~~ Requirement 9 which provides that external lighting at the main development site must be installed, operated and maintained ~~in general~~ throughout the construction phase of Work No.1 in accordance with the controls and limits set out in Section 1.3 of this ~~document~~plan, save to the extent that alternative details are submitted ~~by the undertaker~~ to and approved by ~~the local planning authority. During the operational period, the same applies to **Section 1.4** of this document.~~East Suffolk Council; and

- Requirement 15 which provides that external lighting at the permanent development site must be installed, operated and maintained throughout the operational life of Work No.1 in accordance with the controls and limits set out in Section 1.4 of this plan, save to the extent that alternative details are submitted to and approved by East Suffolk Council, in consultation with the relevant Statutory Nature Conservation Body.

1.1.6 Where further documents or details require approval, this plan states which body or governance group is responsible for the approval and/or must be consulted. Any approvals by East Suffolk Council, Suffolk County Council or the MMO will be carried out in accordance with the procedure in

Schedule 23 of the dDCO. Any updates to these further documents or details must be approved by the same body or governance group and through the same consultation and procedure as the original document or details.

1.1.7 Where separate Level 1 or Level 2 control documents include measures that are relevant to the measures within this document, those measures have not been duplicated in this document, but cross-references have been included for context. Where separate legislation, consents, permits and licences are described in this document they are set out in the Schedule of Other Consents, Licences and Agreements (Doc Ref. 5.11(B)) [REP3-011].

1.1.8 For the purposes of this document the term 'SZC Co.' refers to NNB Nuclear Generation (SZC) Limited (or any other undertaker as defined by the dDCO), its appointed representatives and the appointed construction contractors.

~~2.1.5~~1.1.9 A description of development at the main development site is set out in **Chapter 2** and **Chapter 3** of **Volume 2** of the **Environmental Statement** [~~REP5-047~~REP-061, ~~REP5-048 and REP5-061~~ REP5-047,and REP7-281].

~~2.2~~1.2 Site context

a) Introduction

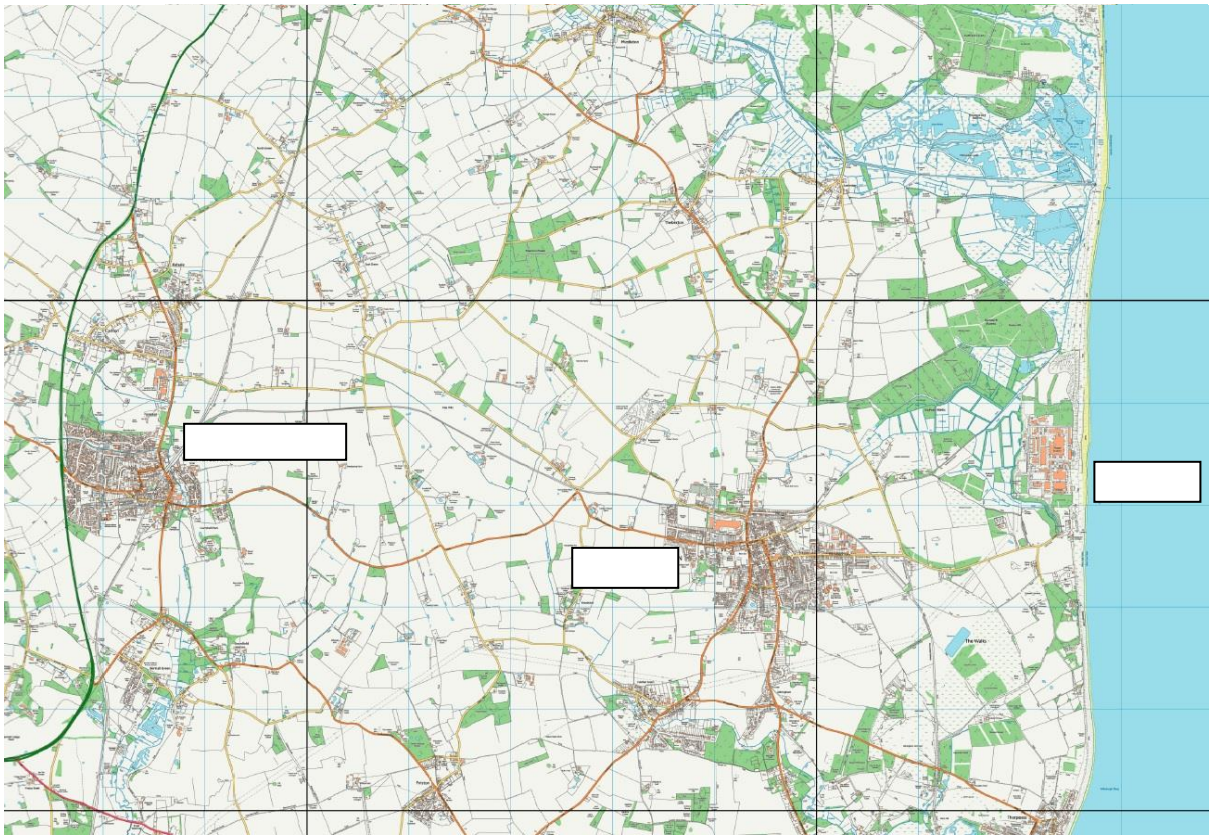
i. Outline

~~2.2.1~~1.2.1 This section describes the existing environmental conditions (predominantly landscape, visual and ecological) within and around the Sizewell C development site and provides details of the baseline lighting conditions. It also provides a summary of relevant legislation, standards, good practice guidelines and policies.

ii. Site location

~~2.2.2~~1.2.2 The site is located to the north of the existing Sizewell B power station, approximately 500 metres (m) north of the hamlet of Sizewell, and 2 kilometres (km) north-east of the town of Leiston, at its closest point. Its location is approximately halfway between the towns of Felixstowe and Lowestoft see **Plate 1.1** and within the civil parish of Leiston, East Suffolk district and the county of Suffolk.

Plate 1.1: Location of Sizewell in East Suffolk



~~2.2.3~~1.2.3 The North Sea is located adjacent to the eastern boundary of the site, with the Sizewell Belts ponds and drainage ditches located adjacent to the west and south of the site. Leiston Beck and Minsmere New Cut are located west of the main development site and Sizewell B. Parts of the main development site lie within Flood Zone 3, although are protected by existing flood defences.

~~2.2.4~~1.2.4 There are a number of statutory environmental designations within the site. The majority of the onshore portion of the site is located within the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB). The main development site is located in the Suffolk Coast and Heaths National Character Area which is a predominantly low-lying landscape characterised by productive agricultural areas.

~~2.2.5~~1.2.5 Approximately two hectares (ha) of habitat of the Sizewell Marshes Site of Scientific Special Interest (SSSI)~~—~~, which lies adjacent to the main development site would be used temporarily during construction and either be protected from damage or restored to SSSI quality following the

construction phase. Approximately 6.5ha of permanent land take would also occur from the SSSI to create the western edge of the platform for the station and the SSSI Crossing. However the great majority of the SSSI would be retained and protected during the construction process. The main development site borders the Minsmere to Walberswick Special Protection Area (SPA) and Ramsar site. The Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC) and SSSI are located to the north-eastern boundary of the site, as shown in **Plate 1.2**.

Plate 1.2: Sites of Special Scientific Interest close to Sizewell [source: http://magic.defra.gov.uk]

~~2.2.6~~1.2.6 The northernmost boundary of the site is to the north of Ash Wood and south of Lower Abbey. At its southernmost extreme the site includes the land to the east of Eastlands Industrial Estate. The site is currently predominantly agricultural and commercial forestry land.

~~2.2.7~~1.2.7 Land to the east of Eastlands Industrial Estate will be required temporarily for construction and for construction workers accommodation purposes. This part of the site comprises three arable fields to the east of Leiston bounded by Valley Road to the north, Lover's Lane to the east and King George's Avenue to the south. The western boundary is defined by a single rail track forming part of the Saxmundham – Leiston branch line, which serves the existing railhead in Leiston (Sizewell Halt).

~~2.2.8~~1.2.8 The coastal strip within the site is characterised by a vegetated engineered embankment, known as Bent Hills and a lower vegetated bund which together form the sea defences to the existing Sizewell power stations. East of the lower bund is a shingle beach which shelves into the offshore portion of the site which includes the Sizewell A intake and outfall headworks structures. The site includes land within and adjacent to the Sizewell B secure perimeter which is characterised by structures associated with the existing operational Sizewell B power station, parking areas, access infrastructure, ancillary structures and overhead power lines and pylons. Buildings are arranged on an axial alignment and the area has a planned and industrial character. The coastal beach vegetation supports nationally scarce plant species such as sea pea and sea-kale and at Sizewell Marshes SSSI, wetland plant communities of national importance, including fen meadow dominated by blunt-flowered Rush, ditches with diverse aquatic plant assemblages and reedbed.

iii. The surrounding area

~~2.2.9~~1.2.9 The area surrounding the site is rural, with agriculture utilising a significant portion of the gently rolling landscape. There are a number of settlements located nearby, including Eastbridge and Theberton approximately 500m and 1.2km, respectively, to the north-west at the closest point. The coastal towns of Thorpeness and Aldeburgh are located 3km and 6km, respectively, further south, with Dunwich and Southwold 4km and 12km, respectively, to the north. Ipswich is some 36km to the south-west.

~~2.2.10~~1.2.10 Arable farmland is the predominant land use in the wider area with relatively large geometric fields defined by hedges and tree belts. Also present are areas of pasture, for example in the vicinity of Upper Abbey Farm; pockets of acid grassland and heathland; wet woodland, freshwater grazing marsh and reedbeds; and areas of conifer plantation, notably at Goose Hill.

~~2.2.11~~1.2.11 Sizewell Belts is partly enveloped by the site to the north, east and west. This landscape is characterised by freshwater grazing marsh and a large part of the area is designated as the Sizewell Marshes SSSI. The Sizewell

Marshes SSSI comprises a large area of lowland, unimproved wet meadows, for which it is designated, located in a low-lying basin of deep fen peat. The Sizewell Marshes SSSI site also contains an extensive network of ditches.

~~2.2.12~~1.2.12 There are seven non-statutory local designated Country Wildlife Sites (CWS) within a 2km radius of the site, including the Sizewell Levels and associated areas CWS, and the Suffolk Shingle Beaches CWS. The main habitats within the site are agricultural farmland with large areas of conifer plantation and smaller areas of deciduous woodland, acid grassland and heathland, with newly created acid grassland and reedbed at Aldhurst Farm.

~~2.2.13~~1.2.13 To the east of the site lies the Suffolk coast. The shoreline in this area is characterised by stretches of shingle ridges, pebble and sand beaches and vegetated dunes.

~~2.2.14~~1.2.14 For a detailed assessment of the landscape character within and around the site, please refer to **Chapter 13** of the **Environmental Statement** [APP-216, amended by AS-181].

b) Legislation, policy and guidance

i. National & local policy

~~2.2.15~~1.2.15 The Overarching National Policy Statement for Energy (NPS EN-1) requires the application of the principles of good design to energy infrastructure. Applying good design should produce sustainable infrastructure which is sensitive to place and it is through good design that many policy objectives in the NPS can be met, including those relating to nature conservation.

ii. The need to light

~~2.2.16~~1.2.16 Light pollution & nuisance – People need light to see and artificial lighting has become an essential requirement for construction and the safe operation of a nuclear power station. It is provided to encourage a safe environment for a range of activities including providing safe outdoor work places, driving, cycling, walking and sporting activities. It is also used to enhance the environment by means of decorative and flood-lighting of areas, features and buildings.

~~2.2.17~~1.2.17 Whilst it is recognised that lighting needs to be provided, the incorrect use of such light can become a problem, causing a nuisance and affecting

the environment by unwanted light intruding into properties, as well as wasting energy and therefore money. It can also have an impact on the wider environment, including on the night sky, visual amenity and influencing wildlife behaviours. Appropriate measures need to be taken where possible to limit these effects.

~~2.2.18~~1.2.18 Those constructing and operating the proposed power station are required to consider the health and safety and security of those who work within the area. Consequently the need for lighting of both the construction site phase and the operational site is justified even within an SSSI and AONB site and an area of dark landscape. In fact, the operators of the proposed power station have a legal duty of care to ensure a safe workplace is provided.

~~2.2.19~~1.2.19 The Workplace (Health, Safety and Welfare) Regulations 1992, as enforceable under the Health and Safety at Work Act 1974, maintain that safe lighting must be provided in all premises, including outdoor places, for all workplace activities, which include those carried out during construction and operation of the power station.

iii. How much light is required?

~~2.2.20~~1.2.20 The level of lighting depends upon the task to be undertaken to ensure that it can be performed safely. In general, national bodies including British Standards, The Institution of Lighting Professionals (ILP) and The Chartered Institution of Building Services Engineers (CIBSE) prescribe required lighting levels.

~~2.2.21~~1.2.21 It is important that any exterior lighting installation does not over-light, controls energy consumption and avoids light pollution or spill wherever practicable.

iv. Light pollution

~~2.2.22~~1.2.22 Light pollution is a term that describes the release of light that serves no useful purpose as it falls outside the required area.

v. Sky glow

~~2.2.23~~1.2.23 The release of light into the night sky, brightening the horizon, creates what is known as sky glow (as can be seen over most towns and cities) and reduces the enjoyment of the night sky by reducing the visibility of stars.

vi. Glare

~~2.2.24~~1.2.24 Another form of pollution is glare, this is where a direct view of the light source presented to the viewer is a visual distraction and may present a hazard depending upon the intensity of the light source and the distance to the viewer.

vii. Legislation controlling light pollution

~~2.2.25~~1.2.25 The Environmental Protection Act 1990 was revised on the 6th April 2006 by a supplementary section of the Clean Neighbourhoods and Environmental Act 2005 (CNEA) adding “artificial light emitted from premises as to be prejudicial to health or a nuisance” to a list of statutory nuisances.

~~2.2.26~~1.2.26 Artificial light emitted from an airport, harbour premises, railway premises, tramway premises, a bus station and any associated facilities, a public vehicle operating centre, a goods vehicle operating centre, a light house or a prison are exempt from these changes. It should be noted that Sizewell C does not fall into any of the exempt premise types.

~~2.2.27~~1.2.27 Other premises would also comply with the legislation where the operator employs “best practicable means” to prevent, or to counteract the effects of any light nuisance in respect to:

- Artificial light emitted from industrial, trade or business premises; or
- The artificial light (not being light to which the above applies) is emitted by lights used for the purpose only of illuminating an outdoor relevant sports facility.

~~2.2.28~~1.2.28 It should be noted that highway lighting installations are not included as part of the CNEA, and therefore cannot be deemed as a statutory nuisance. However, the issues relating to artificial lighting and its potential effects on the environment and health of individuals is a topic of constant discussion within the highway lighting industry and manufacturers and designers alike employ good standard industry practices to reduce or minimise the effects of artificial lighting.

viii. Preventing light nuisance

~~2.2.29~~1.2.29 Through the careful consideration and selection of lighting equipment at the planning and design stage it is possible to ensure that the required lighting levels for the various tasks that will be undertaken in the different

areas of both the construction and operational areas of the site can be achieved whilst controlling light pollution.

c) Lighting baseline condition

i. Existing Sizewell A and B lighting

~~2.2.30~~1.2.30 The Sizewell C development site lies within an area of intrinsically dark skies with the only other source of significant lighting in the immediate vicinity being that of the existing Sizewell A and B power stations.

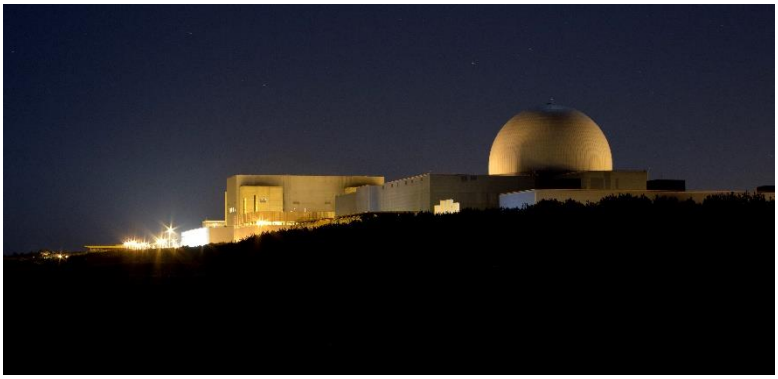
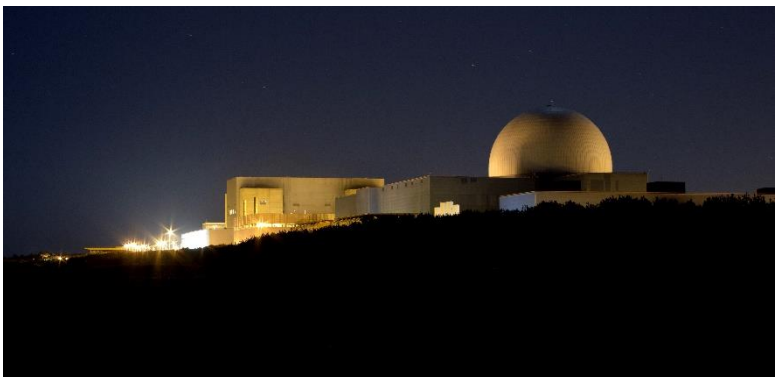


Plate 1.3: Typical view of existing lighting at Sizewell A & B Power stations



~~2.2.31~~1.2.31 The lighting infrastructure on the Sizewell A and B sites, illustrated on **Plate 1.3**, includes:

- Highway lighting, typically lighting columns;
- Security and operations lighting, comprising of columns, mobile flood lighting towers and building mounted luminaires; and
- Lighting emitted from buildings.

~~2.2.32~~1.2.32 Within the existing Sizewell A and B sites there is a mixture of light sources comprising;

- Low Pressure Sodium (SOX) lamps (orange in appearance);
- High Pressure Sodium (SON) lamps (golden in appearance);
- Light Emitting Diodes (LEDs) a white light source; and
- Fluorescent and compact fluorescent lamps a white light source.

~~2.2.33~~1.2.33 For a detailed assessment of the lighting on the existing Sizewell A and B sites refer to **Annex 2B.3** of this document.

ii. Baseline lighting environment

~~2.2.34~~1.2.34 In order to obtain a night time assessment of any lighting on the landscape and visual receptors, the site was visited by members of the design team from LDA Design between 9 February 2016 and 20 March 2019 between the hours of 17:00hrs and 20:45hrs to record views to illustrate the level of existing illumination. Night time viewpoints are summarised in **Table 1.1** and are shown in more detail in **Chapter 13** of this volume [APP-216, amended by AS-181], and are also discussed in **Appendix 13B**: Night time landscape and visual appraisal [APP-218 and APP-219].

iii. Viewpoint locations

Table 1.1: Locations of night time viewpoints

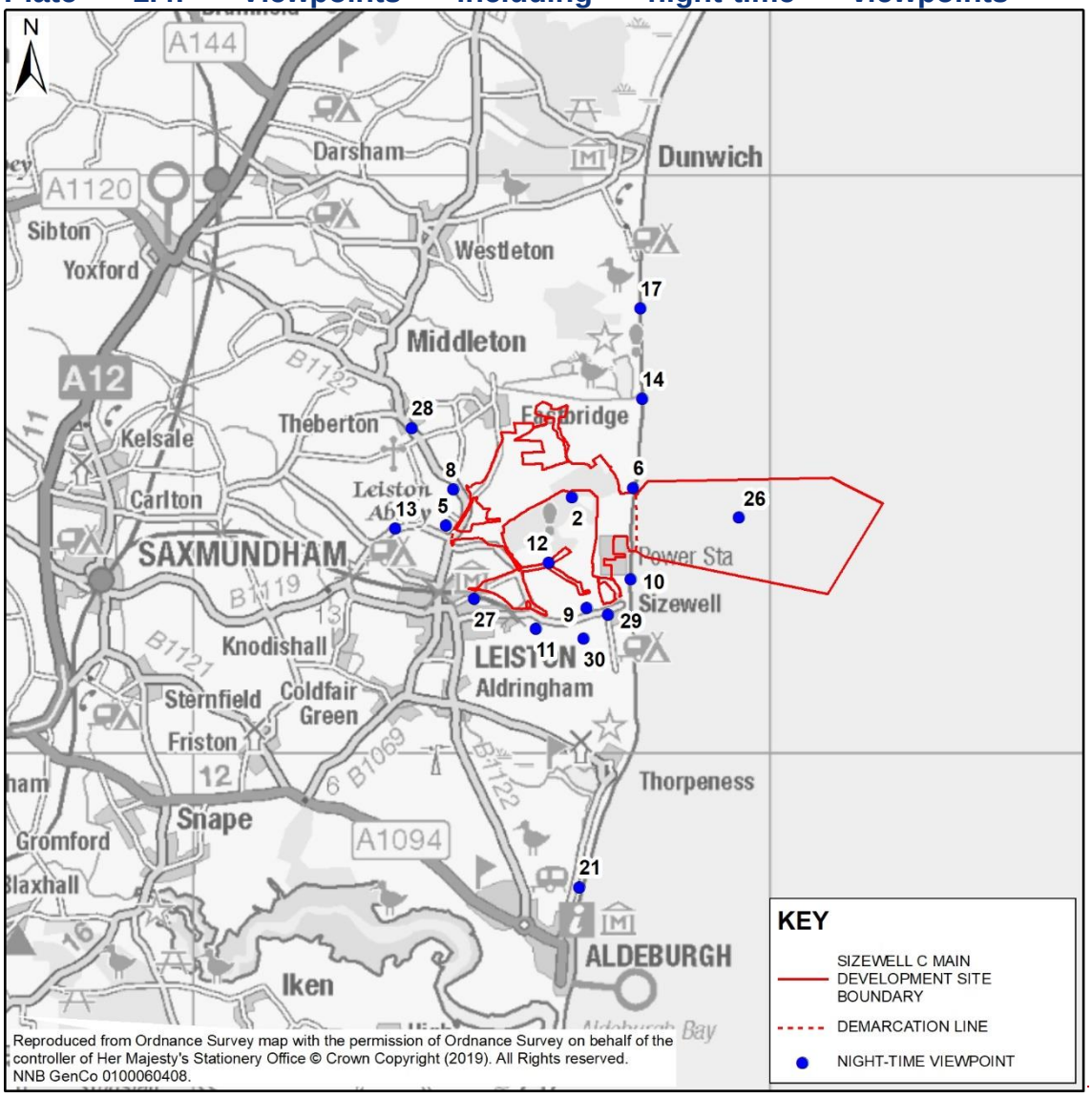
Viewpoint Number (LDA Reference)	Viewpoint Descriptive	Viewpoint OS Co-ordinates	Date Viewpoint Photograph Taken	Time Photograph Taken
Viewpoint 2 (R2)	Permissive path at Kenton Hills.	646563 E 264432 N.	27/02/2019	18:40
Viewpoint 5 (R5)	Footpath south of Leiston Abbey.	644377 E 263946 N.	27/02/2019	20:50
Viewpoint 6 (R6)	Suffolk Coast Path east of Goose Hill.	647623 E 264593 N.	10/02/2016	20:50
Viewpoint 8 (R8)	Footpath north of Leiston Abbey.	644508 E 264568 N.	27/02/2019	20:35

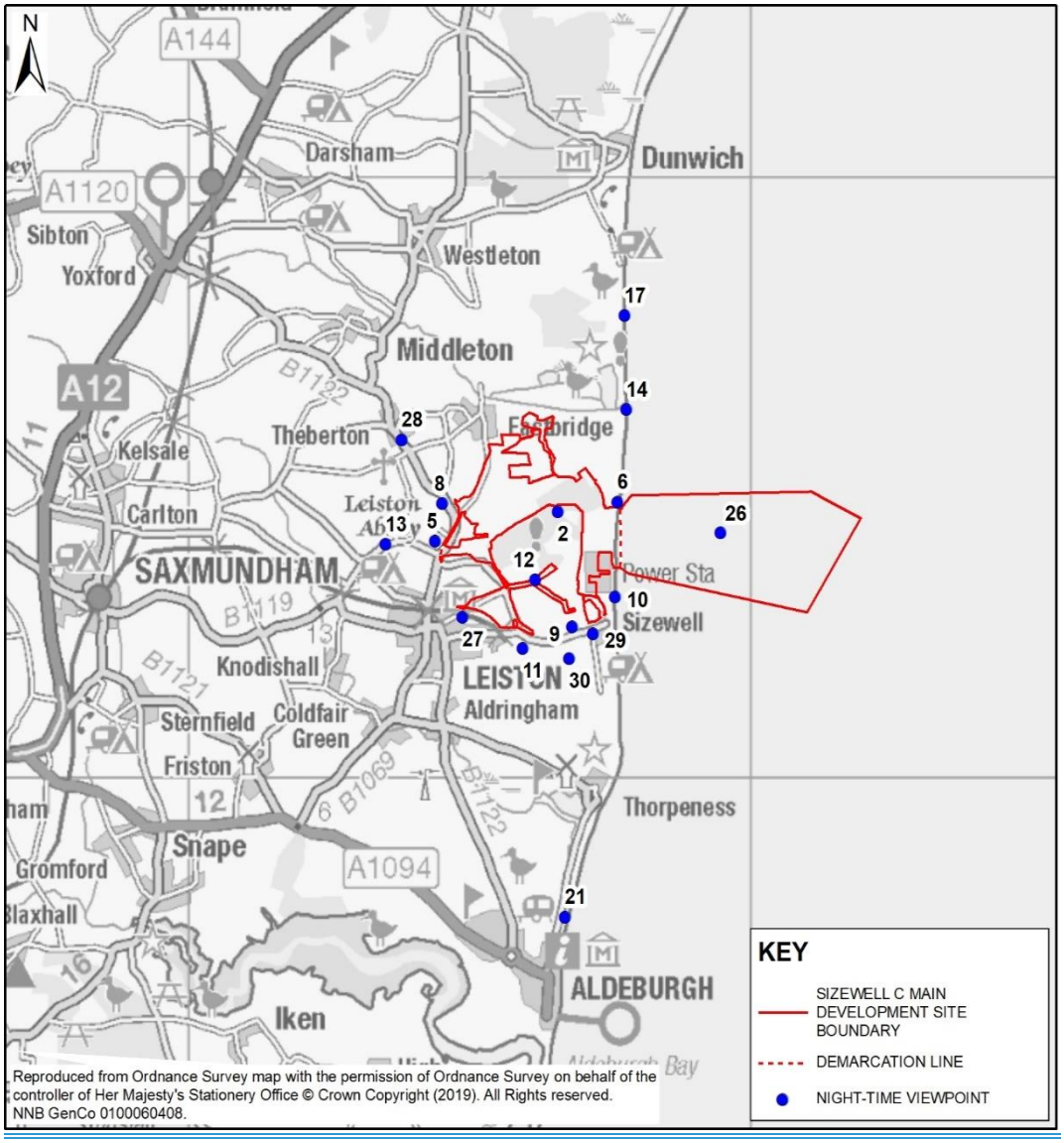
Viewpoint Number (LDA Reference)	Viewpoint Descriptive	Viewpoint OS Co-ordinates	Date Viewpoint Photograph Taken	Time Photograph Taken
Viewpoint 9 (R9)	Sizewell Gap south of Greater Gabbard Sub-Station.	646816 E 262514 N.	27/02/2019	20:00
Viewpoint 10 (R10)	Suffolk Coast Path and Sandlings Walk east of Hill Wood.	647573 E 263015 N.	27/02/2019	19:15
Viewpoint 11 (R11)	Junction of footpaths south west of Halfway Cottages.	645933 E 262157 N.	16/02/2016	18:30
Viewpoint 12 (R12)	Bridleway south east of Reckham Lodge.	646156 E 263298 N.	09/02/2016	18:30
Viewpoint 13 (R13)	Abbey Lane east of Cakes and Ale Caravan Park.	643501 E 263893 N.	16/02/2016	20:45
Viewpoint 14 (R14)	Suffolk Coast Path at Minsmere Sluice.	647781 E 266137 N.	10/02/2016	19:00
Viewpoint 17 (R17)	National Trust Dunwich Coastguard Cottages car park.	647743 E 267703 N.	24/02/2016	19:00
Viewpoint 21 (R21)	Aldeburgh beach car park.	646689 E 257683 N.	15/02/2016	17:00
Viewpoint 26 (R26)	1800m directly east of Sizewell power stations.	649452 E 264084 N.	23/02/2016	18:50
Viewpoint 27 (R27)	Footpath, Valley Road Allotments, Leiston.	644870 E 262678 N.	27/02/2019	20:15
Viewpoint 28 (R28)	Footpath south of Theberton.	643788 E 265632 N.	27/02/2019	20:15
Viewpoint 29 (R29)	Sandlings Walk at Home Farm.	647184 E 262405 N.	20/03/2019	19:25
Viewpoint 30 (R30)	Junction of Footpaths, The Walks.	646762 E 261985 N.	27/02/2019	19:40

~~2.2.35~~1.2.35 The view point locations were selected from the Principal Viewpoints for the Landscape and Visual Assessment, provided in **Chapter 13** of this volume [APP-216, amended by AS-181] and **Appendix 13B** of this volume [APP-218 and APP-219].~~.~~

~~2.2.36~~1.2.36 Night viewpoints are shown in **Plate 1.4** in blue.

Plate 1.4: Viewpoints including night-time viewpoints





iv. Overview of existing lighting conditions

~~2.2.37~~1.2.37 From inspection of the seventeen night-time locations, four locations have been chosen as representative samples of the surrounding site, giving good context and capturing the landscape character and environmental constraints. The selection of these four key locations for lighting receptors has been based on professional lighting judgement. These four key locations are located north, east, south and west of the proposed development site. These locations are Viewpoint 14 (R14) (North), Viewpoint 26 (R26) (east), Viewpoint 30 (R30) (south) and Viewpoint 13 (R13) (west). In addition, viewpoints 2 (R2) and 12 (R12) have been

selected for their views across the Sizewell Marshes / Belts SSSI site. The key lighting receptor locations are discussed below.

Plate 1.5: Viewpoint 14 (R14) Suffolk Coast Path at Minsmere Sluice (North)

~~2.2.38~~1.2.38 Viewpoint 14 is located approximately 1km from the Sizewell C development site boundary. The existing Sizewell A and B power stations to the centre of **Plate 1.5** can clearly be seen along with sky glow from the nearby towns.

Plate 1.6: Viewpoint 26 1800m directly east of Sizewell power stations

(East)

~~2.2.39~~1.2.39 Viewpoint 26 is located approximately 1.8km off shore within the Sizewell C development site boundary. The existing Sizewell A and B power stations can clearly be seen in centre **Plate 1.6**.

Plate 1.7: Viewpoint 30 Junction of Footpaths, The Walks (South)

~~2.2.40~~1.2.40 Viewpoint 30 is located approximately 0.95km from the Sizewell C development site boundary. The existing Sizewell A and B power stations can clearly be seen in centre of **Plate 1.7**.

Plate 1.8: Viewpoint 13 Abbey Lane east of Cakes and Ale Caravan Park (West)

~~2.2.41~~1.2.41 Viewpoint 13 is located approximately 1.0km from the Sizewell C development site boundary. The existing Sizewell A and B power stations can clearly be seen in centre of **Plate 1.8**.

Plate 1.9: Viewpoint 2 Permissive path at Kenton Hills

~~2.2.42~~1.2.42 Viewpoint 2 is located approximately 0.15km from the closest Sizewell C development site boundary and overlooks the Sizewell Marshes / Belts SSSI site. As can be seen on **Plate 1.9,** this is an intrinsically dark view with little or no visible light from the existing site.

Plate 1.10: Viewpoint 12 Bridleway south east of Reckham Lodge

~~2.2.43~~1.2.43 Viewpoint 12 is located on the Sizewell C development site boundary and overlooks the Sizewell Marshes SSSI. The existing Sizewell A and B power stations can be seen to the right of **Plate 1.10**.

~~2.2.44~~1.2.44 As can be seen from the viewpoints above, the existing Sizewell A and B power stations do provide a source light spillage on what is an intrinsically dark landscape. The existing light spillage from Sizewell A & B Power stations is due in part to the age and type of lighting equipment used to illuminate the existing sites. Poor mounting configurations of the luminaires

also add to the light spillage and skyglow. There are several instances where individual or clusters of luminaires are causing direct glare to the observer. Improvements to the lighting on the existing site could be made to reduce light spillage from the existing site but does not form part of this plan.

d) Environmental considerations

i. General

~~2.2.45~~1.2.45 There are various environmental considerations that need to be taken into account when considering the installation of exterior lighting. These are the direct energy usage, the visual impact of the lighting equipment during the day, the effect of light spillage on surrounding areas, the spill of light into the night sky, and the effects on human receptors, animal, plant life and surrounding landscape.

~~2.2.46~~1.2.46 These factors will vary depending on the location of the proposed lighting installation and can also vary within a site.

~~2.2.47~~1.2.47 The Institution of Lighting Professionals (ILP) document "GN01: Guidance notes for the reduction of obtrusive light (2020)" and International Commission on Illumination CIE 150: 2017, establish five Environmental Zones, as provided in **Table 1.2**. Each zone has a different approach to the provision of external lighting. These zones establish 'Obtrusive Lighting Limitations for External Lighting Installations' and include the effects of 'Sky Glow' and maximum values of vertical illuminance on properties. The document also includes 'limits for the luminous intensity of bright luminaires'; the potentially obtrusive direction of light outside the area being lit.

Table 1.2: ILP GN01 Maximum values of vertical illuminance on properties

Light Technical Parameter	Application Conditions	Environmental Zones				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (Ev).	Pre-curfew	n/a	2lx	5lx	10lx	25lx
	Post-curfew	n/a	<0.1lx*	1lx	2lx	5lx

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

~~2.2.48~~1.2.48 The limits published within these documents set upper performance levels above which the lighting would be considered as a nuisance within

each environmental zone. Curfews are sometimes applied after a locally agreed hour when the lighting levels may be reduced or switched off.

~~2.2.49~~1.2.49 In general, the effect of distance from the lighting source / installation has the effect of reducing the lighting levels falling on a surface, but has little effect regarding source intensity which tends to be more affected by the background against which it is viewed. In basic terms, a bright torch shining towards an observer will appear brighter when the background it is viewed against is darker than it would, say, in a town or city centre which is likely to have high background lighting levels.

~~2.2.50~~1.2.50 The five environmental zones are defined as detailed in **Table 1.3**.

Table 1.3: ILP environmental zones classification

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO starlight reserves, IDA dark sky parks.
E1	Natural	Intrinsically dark.	National parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness.	Village or relatively dark outer suburban locations.
E3	Suburban	Medium district brightness.	Small town centres of suburban locations.
E4	Urban	High district brightness.	Town/city centres with high levels of night-time activity.

~~2.2.51~~1.2.51 The environmental zones are normally grouped as E1/E2 and E3/E4 and are considered as rural and urban respectively.

~~2.2.52~~1.2.52 Based upon the lighting baseline condition, the information above and the limits within **Table 1.2**, the area of development is considered to be in an intrinsically dark area and, as such, any lighting installed should be designed to meet the limitations laid out for an E1 Environmental Zone.

~~2.2.53~~1.2.53 **Sections 1.3** and **1.4** of this report set out the lighting strategy during the construction and operational phases of the proposed power station.

ii. Flora and Fauna

~~2.2.54~~1.2.54 From the point of view of the impact of artificial lighting on wildlife, there have been a number of reports published over the years with the main focus being on bats, however a document that looks at the broader wildlife is 'Wildlife and Roads, The Ecological Impact' which incorporates a section regarding 'The ecological effects of road lighting on wildlife' by A. Outen. The work investigates the general impact of artificial lighting on wildlife and found that the colour temperature of the light source used is significant to its impact on wildlife.

~~2.2.55~~1.2.55 Outen's research shows that the use of:

- Low Pressure Sodium (SOX) light sources, an orange monochromatic source, has a negligible affect;
- High Pressure Sodium (SON) lighting, a more golden light source, has minimal effect and attracts insects;
- White Lighting (Metal Halide, CDO, CPO, PLL,) has a significant effect on wildlife, disrupting its 24 hour cycle in part due to the high ultra-violet (UV) content of the light to which insects in particular are very sensitive.

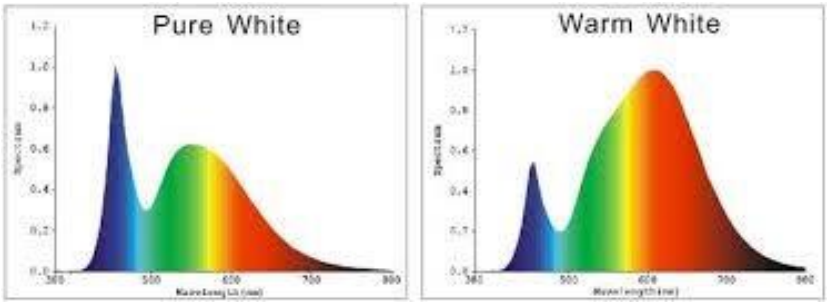
~~2.2.56~~1.2.56 Additional research carried out by many others has shown that the disturbance of insects in relation to the use of artificial lighting has a knock-on effect to the 24 hour patterns of other wildlife such as birds and bats.

~~2.2.57~~1.2.57 The development of LEDs as a viable lighting technology has led to this technology becoming an energy-efficient alternative to the conventional light sources more commonly associated with highway and exterior lighting installations. LED technologies with higher energy efficiencies, long life and colour rendering properties are a viable and cost-effective alternative. However, research into the effects of such light sources on bats is in its infancy and no definitive answers can be formed as to how light produced by an LED light source affects bats. It is known that bats are affected by light sources that have high UV levels, and broad spectrum lights, particularly those with high blue light content, and these should be avoided or their use kept to a minimum where practicable to minimise their effects.

~~2.2.58~~1.2.58 It should be noted that very few light sources utilised in exterior lighting actually emit UV, UVa or UVb, and those emissions are normally filtered out by the lamps' glass envelope or the glazing on the lantern / optics.

Focus is therefore on the blue content within the spectrum of a light source and the effect this may have.

Plate 1.11: Colour spectral charts for cool and warm LEDs (note the difference in blue content)



iii. Bats

~~2.2.59~~1.2.59 The following section provides some general guidance on bats and artificial lighting; more specific site management and mitigation measures are provided in later sections of this report.

~~2.2.60~~1.2.60 The Institution of Lighting Professionals (ILP) in collaboration with the Bat Conservation Trust have recently published GN 08/18 Bats and artificial lighting in the UK, Bats and the built environment series. This document is aimed at lighting professionals / designers, planning officers, developers, bat workers / ecologists and anyone who specifies lighting. It is intended to raise the awareness of the impacts of artificial lighting on bats and suggests mitigation measures for various scenarios, rather than to provide a site-specific ecological and lighting assessment / management plan.

~~2.2.61~~1.2.61 As further research has been carried out, our understanding of how artificial lighting impacts bats is increasing. Some of the key findings are:-

- Artificial lighting is thought to increase the chances of predation and so bats may modify their behaviour.
- Different types of luminaires and light sources emit different spectrums of light. See **Plate 1.11**. This has an impact on the amount of insects that will be drawn to the light source.
- Illumination of a bat roost can cause disturbance and may result in the colony abandoning the roost or even becoming entombed within it.

- Illumination of the entrance to a bat roost may delay bats from emerging and will potentially shorten foraging times.
- Lighting may also impact on flight paths and commuting routes
- Lighting in addition to disturbance at the roost may also affect feeding behaviour. There are two elements to this a) certain light sources attract a range of insects and this may alter foraging habits. b) the presence lit conditions may act as a barrier to movement.
- Illumination of drinking resources such as water ways, ponds and cattle troughs can stop bats from drinking.
- Some impacts on bat migration have also been studied.

~~2.2.62~~1.2.62 In summary, artificial lighting does have an effect on all species of bats to a greater or lesser extent for all their night time activities. Where bats are present or likely to be present, a professional ecologist's advice should be sought and the lighting designed to mitigate any impacts as far as practically possible.

iv. Lighting Design Considerations Where Bats Are Present

~~2.2.63~~1.2.63 The first question that has to be answered is "Do I need to light it?". If so, then the lighting should be designed under the principle of Ultra Efficient Lighting (UEL) which means that the right light will be provided at the right time, in the right place, controlled by the right system. This is effectively broken down as follows:

- Right light – look to the correct application of the lighting standards which define the required lighting levels dependent upon the tasks being undertaken and the level of activity. This also looks to the use of the right light source which should be as energy efficient as possible and will include due consideration of LED lighting whilst also taking due consideration of the mitigation requirements for the impact of the light source on bats, wildlife and the wider environment as previously identified.
- Right time – the standards permit light levels to be changed dependent upon use, i.e. when activity levels fall then the light levels can be redefined. Lighting will need to be in situ for construction workers and plant operatives, and to provide security during the hours of darkness to ensure safe navigation within the site and surrounding compounds both during the construction and operation.

- Right place – ensuring that only the tasks which need to be lit are illuminated, reducing spill and obtrusive light. This is achieved through the careful consideration of luminaires and how they are mounted / installed.

- Right system – the most energy-efficient lighting installation requires a suitable control system that could also permit monitoring and its remote operation (dependent on the operating parameters).

~~2.2.64~~1.2.64 A key element where bats are present is the type of light source employed. Lighting professionals have a palette of sources available to them ranging from the 'old' High Pressure Sodium (golden) lamps through to metal halide and now LEDs, and many more. These sources all have different spectra and thus, from a human perspective, different abilities to render (replicate) colours accurately. This is described as their colour rendering index (CRI), illustrated on **Plate 1.12**; denoted Ra, and measured on a scale of 0 to 100, the CRI indicates how well a source replicates colours based upon day-light conditions: a score of 0 being no colour rendering through to 100 being (equivalent to) daylight.

Plate 1.12: Colour rendering index (CRI)

~~2.2.65~~1.2.65 **Table 1.4** gives indicative colour-rendering recommendations for various areas and tasks.

Table 1.4: Indicative colour rendering index recommendations

Area	Application	Minimum Ra
Roads/footways	Walkways exclusively for pedestrians.	20
Roads/footways	Traffic areas and roads for slow moving vehicles, max 6mph (e.g. trucks & excavators).	20
Roads/footways	Regular vehicular traffic (max 25mph).	20

Area	Application	Minimum Ra
Roads/footways	Pedestrian passages, vehicular turning. Loading and unloading points.	20
Outdoor working & storage areas.	Short-term handling of large units & raw materials, loading & unloading of solid bulk goods.	20
Outdoor working & storage areas.	Continuous handling of large units and raw materials, loading & unloading of freight lifting and descending location for cranes, open loading platforms.	20
Outdoor working & storage areas.	Reading of addresses, covered loading platforms, use of tools, ordinary reinforcement and casting tasks in concrete plants.	20
Outdoor working & storage areas.	Demanding electrical, machine and piping installations, inspection. (use local lighting).	60
Security	vehicle storage areas, industrial yards and storage areas; vehicle storage areas element mould, timber and steel storage, building foundation hole and working areas on sides of the hole at building sites etc.	20
Security	Checkpoints	80
Security	Gatehouses	80

~~2.2.66~~1.2.66 These days, with the wider use of LEDs, the use of white light sources with an Ra>60 is more common.

~~2.2.67~~1.2.67 With the introduction of LED light sources, Colour Temperature is important. This is a measure (in degrees Kelvin) of how 'warm' (2000 to 3000k) or 'cool' (4000 to 6000k) the colours appear, as shown in **Plate 1.13** below. The higher colour temperature sources appear cooler with a higher blue light content.

Plate 1.13: Colour rendering examples; cool white to warm white

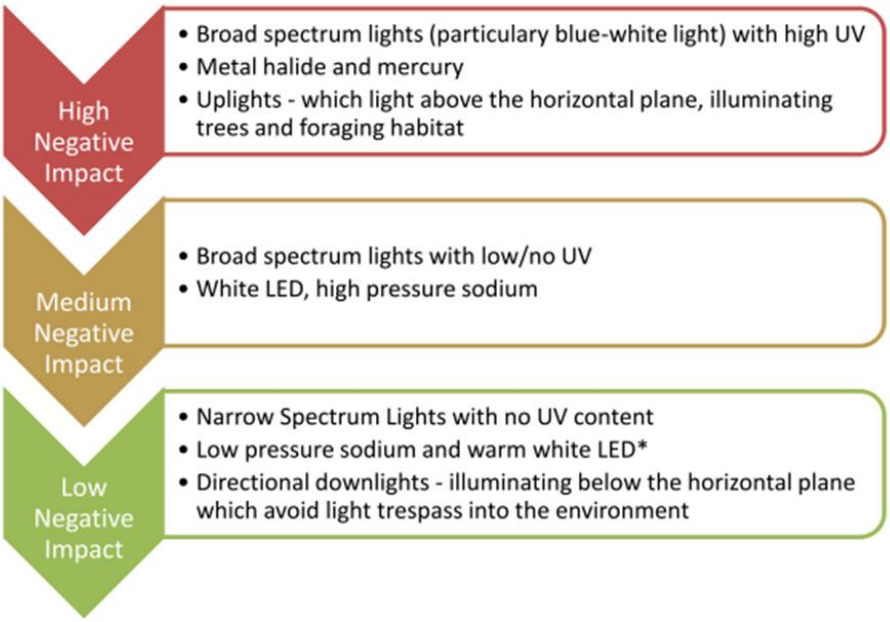
~~2.2.68~~1.2.68 Research across Europe is showing that amber light has a negligible effect on wildlife. Suppliers of LED products now present a more wildlife-friendly product in which the blue wavelength is minimised, and the light has a more golden / amber feel to it, whilst still providing good colour rendering and performance.

v. Summary of impacts of light types on bats

~~2.2.69~~1.2.69 Studies continue to look at the comparative impacts of different light sources on different bat species and behaviours. However, **Table 1.5** extracted from 'Bats and Lighting – Overview of Current Evidence and Mitigation' (2014) provides a good summary of what is known of existing light sources and the likely effects on bats and their behaviours. This table should be used as a guide and general summary only as research is always ongoing.

~~2.2.70~~1.2.70 **Plate 1.14** is an extract from 'Bats and Lighting – Overview of Current Evidence and Mitigation' and provides a good guide for the impacts of light types on bats as identified in **Table 1.5**.

Plate 1.14: Relative impact of types of lights on bats (guidance only)



*Low relative attractiveness for insects compared to white light and therefore minimal impact on bats insect prey (Eisenbeis 2009)

Table 1.5: Extracted from 'Bats and Lighting – Overview of Current Evidence and Mitigation'

Light type	Species	Impact	Evidence
White LED.	Rhinolophus hipposideros and Myotis spp.	Reduced activity and special avoidance of commuting routes.	"Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats" (Ref. 1.1)
Warm white LED.	Unknown at present.	Unknown – though likely to have less impact on light-sensitive species than white light types.	
Low pressure sodium.	Nyctalus noctula.	Increased activity and foraging.	"Bats and streetlamps. The Bats Magazine" (Ref. 1.2)
	Pipistrellus spp.	No significant increase in activity compared to dark areas.	"The Switch from Low-Pressure Sodium to Light Emitting Diodes Does Not Affect Bat Activity at Street Lights" (Ref. 1.3)

Light type	Species	Impact	Evidence
High pressure sodium.	Rhinolophus hipposideros and Myotis spp.	Reduced activity and spatial avoidance of commuting routes; delayed commuting time.	"Street lighting disturbs commuting bats. Current biology" (Ref. 1.4) "Bats and development: with a particular focus on the impacts of artificial lighting" (Ref. 1.5)
	Pipistrellus spp., Nyctalus noctula, Eptesicus serotinus	Increased activity and foraging.	"Bats and streetlamps. The Bats Magazine" (Ref. 1.2)
Compact fluorescent.	Unknown at present.	Unknown – though likely to have a similar impact on light sensitive species as other white light types.	
Mercury vapour lamps.	P. pipistrellus and Pipistrellus spp., Eptesicus spp.	Increased activity ("Seasonal use of illuminated areas by foraging northern bats" (Ref. 1.6)) recorded increased activity of Eptescius nilssoni (a species not present in the UK) at mercury vapor lamps in Sweden in spring.	"Abundance of Pipistrellus pipistrellus and Pipistrellus kuhlii foraging at street-lamps" (Ref. 1.7) "Street lamps and the feeding ecology of insectivorous bats. Symposium of the Zoological Society London" (Ref. 1.8)

~~2.3~~1.3 Construction lighting management plan

~~i.~~a) Lighting Objectives

~~2.3.1~~1.3.1 The primary objective of lighting during the construction phase is to provide illumination for construction activities providing a safe working environment in the absence of natural light, allowing workers and site traffic to safely undertake various construction-related tasks and to provide security lighting.

~~2.3.2~~1.3.2 As discussed earlier, the Sizewell C site sits in a sensitive environment and is considered to be within an E1 Environmental Zone, as defined in **Table 1.3**. The site also supports a valuable assemblage of bats. The required lighting therefore ~~needs to~~ must be designed to minimise impact on the surrounding environment.

~~2.3.3~~1.3.3 The objectives of this section of the LMP are to achieve the following:

- provide a safe working environment, meeting statutory requirements and standards;
- allow 24hr working (when required);
- provide site security lighting; and
- mitigate the impact of artificial lighting on the surrounding environment as far as reasonably practicable.

~~ii.~~a) Required Lighting Levels

~~1.1.2~~1.3.4 Due to the dynamic nature of a construction site, there will be the need for different levels of illumination needed for certain tasks or stages in the construction process in order to provide a safe working environment. Some areas will require suitable task lighting while other areas will require a level of ambient lighting.

~~1.1.3~~1.3.5 Task lighting – Task lighting will typically be provided for construction activities and the required levels will vary depending upon the type of activity being undertaken. For example, clearance, excavation and loading typically requires an average of 20 lux, whereas undertaking fine work such as framework element mounting, light reinforcement work, wooden mould and, electric piping and cabling typically require an average of 100 lux or more. There are various standards with various lighting levels which set out the required lighting levels for the various tasks that will need to be undertaken and these can be found in **Annex 2B.1** of this document. The most appropriate standard ~~shall~~ must be used. Task lighting ~~will~~ shall also be required at security check points to allow the inspection of vehicles entering and exiting the site. It shall be the responsibility of ~~the appropriate Contractor~~ SZC Co. to undertake the design of any required task lighting making sure it meets with the required standards and the recommendations/restrictions set out within this LMP ~~and is submitted to SZC Co. for approval prior to installation~~.

~~1.1.4~~1.3.6 Ambient lighting – Ambient lighting will be constant and typically be provided to aid the safe navigation for areas such as access roads, footpaths, car parks contractors' compounds and accommodation areas. Typical levels will be an average of 5 to 30 lux, depending on the area to be lit. There are various standards which set out the required lighting levels for the various tasks that will need to be undertaken and these can be found in **Annex 2B.1** of this document. The most appropriate standard ~~shall~~ must

be used. Where ambient lighting is identified as 'required', it ~~will~~ must be implemented whenever natural light levels are insufficient.

~~ii.~~a) Areas to be lit and Associated Activities

~~2.3.4~~1.3.7 For the construction phase, the zones detailed in **Table 1.6** have been identified, along with the associated activity or task being undertaken that requires lighting. For details of the zones, please refer to **Figure 2B.1**.

Table 1.6: Construction zones and activity/tasks being undertaken

Zone	Description	Activity / Task	Comments
Zone A	Main construction area.	Construction of the permanent operational site.	Task and ambient lighting will be required in this area.
Zone B	Temporary construction area – common user facilities, contractor compounds and other yards.	Temporary construction and fabrication areas for various elements of the power station construction. This area also includes roads and car parks.	Task and ambient lighting to specific lighting levels within the temporary construction area will be required at various periods during the construction programme. Ambient lighting will mainly be limited to the roads and car parks but may also include areas of contractor's compounds.
Zone C	Temporary construction area – borrow pit and stockpiles.	Temporary excavation and bulk storage areas to facilitate the power station construction.	Task lighting will be required exceptionally when there is a requirement to carry out material movements or essential maintenance in hours of darkness. There will typically be no ambient lighting in these areas, as they are expected to be used infrequently during hours of darkness. Any fixed lighting in these areas will only operate when there is a requirement to access the area.
Zone D	Temporary construction area – accommodation campus.	Temporary accommodation for workers during power station construction, including roads, footpaths and car parks.	Ambient lighting will be required.
Zone E	Temporary construction area – site entrance hub.	Parking facilities, temporary buildings, security facilities and freight management.	Task and ambient lighting will be required in this area. Task lighting should be localised to the task being undertaken. Ambient lighting will mainly

Zone	Description	Activity / Task	Comments
			be limited to the roads and car parks.
Zone F	Roundabout, junctions and level crossing.	New permanent interfaces with the public highway and level crossing of the railway line.	The lighting in these areas ~~will~~ must be based on highway and network rail design standards.
Zone G	No fixed lighting.	These areas typically provide ecological buffers between construction activity and retained habitats.	If any lighting is required in these areas it ~~should~~ must be short duration ~~(if unavoidable)~~ and be pre-agreed with ~~the on-site ecology team, and be comprising of~~ theEcological Clerk of Works (ECoW), and comprise temporary equipment of an agreed type(s)~~.~~ with SZC Co
Zone H	Railway infrastructure.	New rail spur to the construction site.	Task lighting ~~will~~ must be localised to the task being undertaken.
Zone I	Rail inspection area.	Security and access control area on the railway track.	Task and ambient lighting will be required in this area. Task lighting ~~should~~ must be localised to the task being undertaken. Ambient lighting will mainly be limited to a security level.
Zone J	Sizewell B Relocated Facilities.	Relocation of certain facilities associated with Sizewel B	~~Task~~ In the event that notice is served pursuant to Article 5 of the dDCO, task lighting ~~will~~ must be localised to the task being undertaken.
Zone K	National Grid land	Substation and pylon works	Task lighting ~~will~~ must be localised to the task being undertaken.

~~b)~~a) Mitigation Measures

i. General Construction Phase Mitigation Measures

~~2.3.5~~1.3.8 A range of mitigation ~~measure~~ measures are available to address the potential impact from the construction phase lighting. These range from equipment choice, use of site topography and competent design and site management.

~~2.3.6~~1.3.9 The following mitigation measures ~~shall~~ must be adopted for both fixed and temporary lighting:

- adopt the lowest safe lighting levels possible for task being undertaken;
- limit the hours of lighting ~~where practicable~~;
- use a luminaire with good optical control;
- use the lowest possible mounting for the luminaire based on the required level of illumination needed for the task being undertaken;
- direct luminaires into the area to be lit (light from the boundary inwards);
- ensure the luminaire is mounted at zero degrees to the horizontal and avoid any tilt;
- if required, make use of manufacturers' supplied custom louvres; and
- provide local control for the lighting so it may be switched off or dimmed when not required.

~~2.3.7 In addition to the physical equipment, lighting should be placed such that it makes use of the existing and proposed topography.~~

- Keep mounting heights lower than fences and bunding, where practicable.
- Position equipment so it is not visible to sensitive receptors by using natural screening.

~~2.3.8~~1.3.10 All lighting installations ~~would~~ must be designed by a competent lighting professional that ~~ideally~~ meets the ILP competency requirements, and who is at least a member of the ILP and is accredited to the Engineering Council as I.Eng or greater.

~~2.3.9~~1.3.11 Prior to first use of any lighting on-site during the construction phase, the lighting ~~shall~~ must be inspected and verified by SZC Co. to ensure it has been installed as per the design and the specified equipment and optics are installed.

~~2.3.10~~1.3.12 The lighting installation ~~shall~~ must be periodically inspected during the site operations to ensure the correct aiming directions are maintained

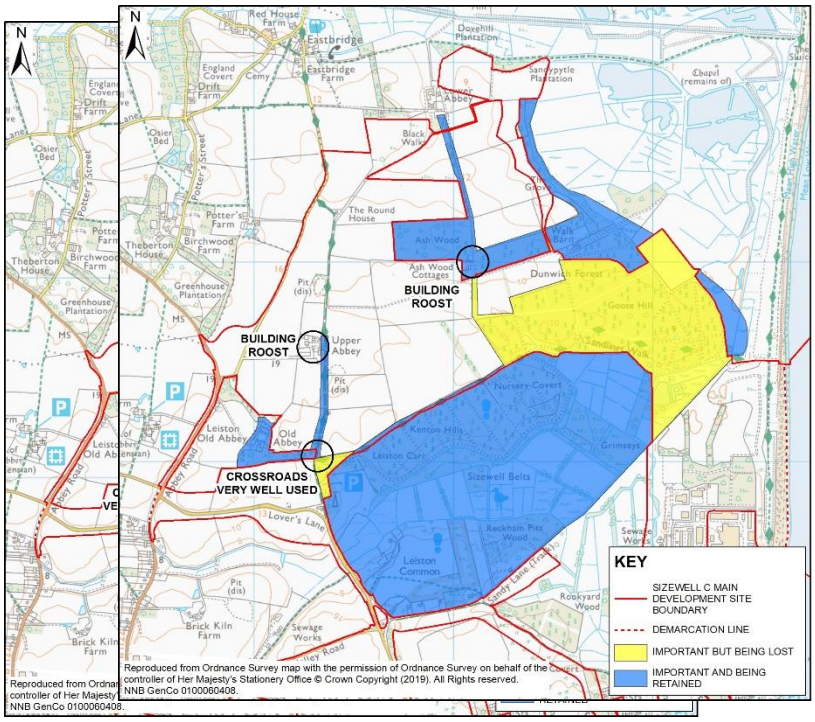
throughout the life of the installation. If any equipment is found to be incorrectly aligned, modifications ~~shall~~ must be made to ensure it is restored to 'as designed' and, if required, re-inspected. This monitoring procedure ~~shall~~ must ensure that, during the time the site is occupied, the levels of lighting are maintained in accordance with current best practice and standards whilst ensuring the potential impact associated with the introduction of temporary lighting on identified receptors is controlled and minimised ~~as far as practicably possible~~.

~~c)~~e) Sensitive Areas

i. Bat sensitive areas

~~2.3.11~~1.3.13 As previously mentioned in this document, there are several areas within and adjacent to the main development site that are particularly important for bat roosting and foraging and ~~these~~ are shown in **Plate 1.15**.

Plate 1.15: Areas important for bats



~~2.3.12~~1.3.14 There are a large number of trees that provide conditions suitable for roosting bats, which together comprise the 'roost resource'. This includes trees that are confirmed to have been used as roosts, notably within Ash Wood, Kenton Hills, The Grove, Leiston Abbey. Buildings at Upper Abbey Farm and Ash Wood Cottages also support roosts. There are also several

commuting routes / flight paths along bridleway E-363/019/0, north from Ash Wood (Black Walks) and the Grove, and east-west along the northern edge of Kenton Hills. The junction (Known as The Crossroads) of the Upper Abbey Bridleway and Leiston Old Abbey, adjacent to Fiscal Policy is also well used. Areas of greatest value to foraging bats varies between seasons and years, but include Ash Wood and areas to the north, part of the Upper Abbey bridleway, Leiston Old Abbey, Kenton Hills/Nursery Covert, rides within Goose Hill, and Sizewell Marshes SSSI.

~~2.3.13~~1.3.15 Parts of Goose Hill and a limited part of the Sizewell Marshes SSSI will be within the construction footprint, ~~and~~ however all retained areas adjacent to the site boundary ~~shall~~ must be kept as dark as reasonably practicable and in accordance with the dark corridors and low light areas plan attached as **Figure 2B.3** (see also below)..

~~2.3.14~~1.3.16 Where foraging routes and flight paths interconnect over the temporary construction area these connecting areas must be left dark where reasonably practicable ~~these connecting areas shall be left dark~~and in accordance with the dark corridors and low light areas plan attached as **Figure 2B.3** (also see below). Where lighting ~~in~~ adjacent to these areas has been deemed necessary the lighting ~~shall~~ must be switched off when not required. This is further addressed, by defining dark corridors and low light areas in the section below.

ii. Lighting mitigation measures to be adopted in proximity to bat roosts & commuting routes / flightpaths

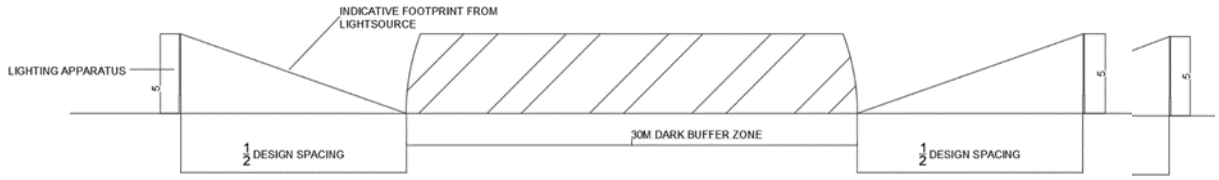
~~2.3.15~~1.3.17 Where lighting in proximity to a bat roost or commuting route/flightpath is unavoidable then, in addition to the points made in the Mitigation Measures section above, the following additional mitigation measures ~~shall~~ must be adopted for both fixed and temporary lighting:

- use a light source that has a narrow spectrum with no UV content;
- use a warm colour temperature (2700K and below); and
- use a tuneable LED luminaire.

~~2.3.16~~1.3.18 Where the ~~interconnected~~ dark corridor network crosses ~~a~~ an otherwise lit area these areas ~~shall~~ must be kept dark by introducing a gap in the lighting design where ~~safe to do so~~reasonably practicable. For example, if they are dissected by a road, a gap of approximately 30m ~~will~~ must be left beyond the design spacing of any lighting. Where lighting is proposed

parallel to commuting routes / flightpath a 10m buffer zone ~~will~~ must be left. **Plate 1.16** shows the 30m dark buffer zones.

Plate 1.16: Creation of 30m buffer zones



iii. Indicative lighting levels for bat sensitive areas during construction phase

~~2.3.17~~1.3.19 A plan showing dark corridors and low light areas is attached as **Figure 2B.3**. This plan has been informed by modelling submitted to the examination at Deadline 3 [REP3-057]. This plan shows how with good lighting design, use of appropriate mitigation measures and the introduction of buffer zones~~.~~, dark corridors ~~can~~ and low light areas will be created and maintained across the proposed construction site. The plan shows four colour codes as follows:

- Retained dark corridors to be maintained at 0.1 lux or lower;
- Low light areas which are to be maintained at levels of lower than 1 lux,with no permanent lighting to be included in these areas;
- Lighting levels assumed to be as the existing baseline (lighting modelling to date predicts that the existing levels can be maintained at the site margins);
- White or grey scale areas within the order limits are operational areas and no lighting level targets have been set for these areas.

~~2.3.18~~1.3.20 Three areas where bat activity is known to occur have been selected and indicative lighting models have been produced to illustrate what level of lighting is likely to occur on these areas if the mitigation measures are followed. At this time generic luminaires have been used and are modelled for the worst case scenario. This is assessed at the first day of operation, when there has been no loss of light due to lumen depreciation or dirt build up on the luminaire and with no mitigation measures in place, such as shields and baffles.

~~2.3.19~~1.3.21 The three areas are listed below and shown on **Plate 1.17**:

- Area 1 – Bridleway 19 adjacent to the proposed campus.
- Area 2 – Southern edge of temporary construction area, Kenton Hills.
- Area 3 – SSSI crossing.

Plate 1.17: Location of indicative areas of lighting for areas of bat activity

~~2.3.20~~1.3.22 Area 1 the Bridleway 19 is situated to the north west of the construction site area with the proposed campus to the west and stockpile areas to the east. The bridleway ~~will~~ must remain as a green corridor ~~and~~ with no fixed lighting ~~is planned for it~~unless it is required for safety purposes. It has been

identified that bats use the bridleway as an important commuting and foraging route.

~~2.3.21~~1.3.23 An indicative lighting model has been prepared for a section of the bridleway to show the lighting levels that may occur on the bridleway.

~~2.3.22~~1.3.24 The lighting levels have been calculated on the following planes:

- Calculation 1 – Horizontal illuminance at ground level on carriageway within the Campus.
- Calculation 2 – Horizontal illuminance at ground level on the bridleway.
- Calculation 3 – Vertical illuminance on the hedgerow east side of the bridleway from ground level to 20m above ground level directed towards the campus.

~~2.3.23~~1.3.25 The calculated values are summarised in **Table 1.7** below.

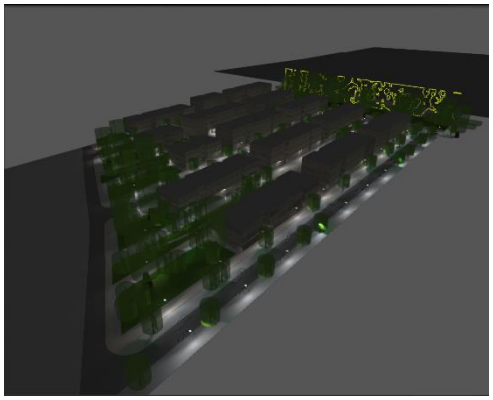
Table 1.7: Area 1 – Bridleway 19 – indicative lighting levels

Grid Location	Average Illuminance (lux)	Minimum Illuminance (lux)	Maximum illuminance (lux)	Comments
Calculation 1	6.76 lux	0.008 lux	110 lux	No masking of areas.
Calculation 2	0.003 lux	0.001 lux	0.005lux	--
Calculation 3	0.096 lux	0.001 lux	0.18 lux	--

NOTE: At the time of preparing this Lighting Management Plan no detailed designs for the campus area have been undertaken so the proposed lighting is for indicative purposes only and will be subject to a detailed design

~~2.3.24~~1.3.26 **Plate 1.18** and **Table 1.7** show how the bridleway can be maintained as a dark buffer zone whilst still providing the required lighting levels for the accommodation campus.

Plate 1.18: Indicative lighting model for accommodation campus with the Bridleway maintained as a dark route



~~2.3.25~~1.3.27 Area 2, the southern edge of temporary construction area, Kenton Hills is situated to the east of the rail terminal and north of Sizewell Levels and it is proposed the areas will be used as contractor compounds. The existing hedge line that runs from east to west and forms the boundary to Kenton Hills has been identified as an important bat foraging route.

~~2.3.26~~1.3.28 An indicative lighting model has been prepared for a section of the proposed contractors compounds and rail terminal area.

~~2.3.27~~1.3.29 The lighting levels have been calculated on the following planes:-

- Calculation 1 – Horizontal illuminance Platform / terminal area 1.
- Calculation 2 – Horizontal illuminance Platform / terminal area 2.
- Calculation 3 – Horizontal illuminance sample area of contractors compound 1.
- Calculation 4 – Horizontal illuminance sample area of contractors compound 2.
- Calculation 5 – Horizontal illuminance Kenton Hills south of proposed 5m bund.
- Calculation 6 – Vertical illuminance on the hedgerow on east side of compound 1 from ground level to 20m above ground level directed towards the compound.

- Calculation 7 – Vertical illuminance on the hedgerow on west side of compound 2 from ground level to 20m above ground level directed towards the compound.
- Calculation 8 – Vertical illuminance on north side of 5m bund.

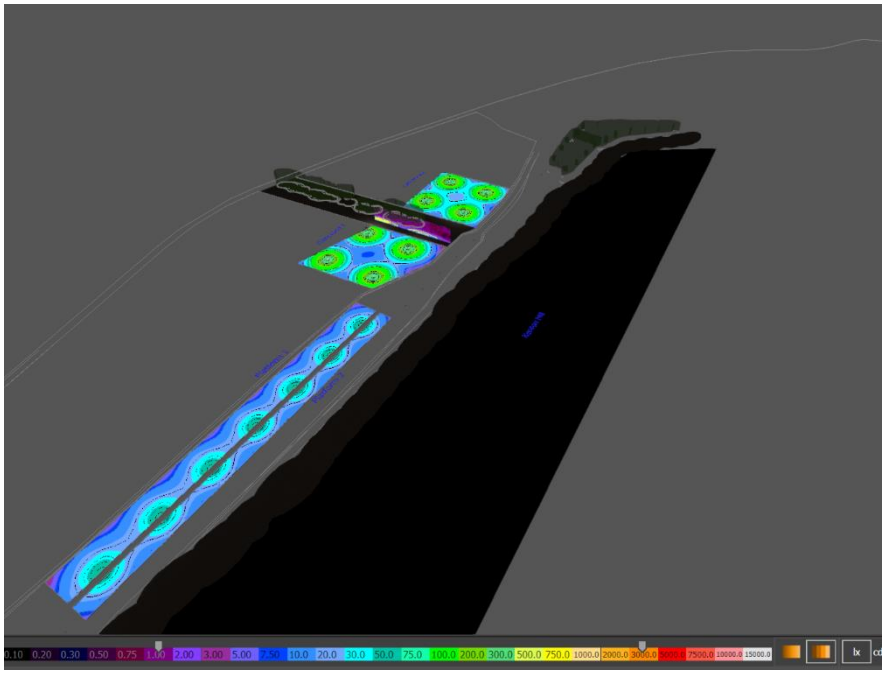
~~2.3.28~~1.3.30 The calculated values are summarised in **Table 1.8**.

Table 1.8: Area 2 – Southern edge of temporary construction area, Kenton Hills – indicative lighting levels

Grid Location	Average Illuminance (lux)	Minimum Illuminance (lux)	Maximum illuminance (lux)	Comments
Calculation 1	25.5 lux	3.38 lux	66.6 lux	
Calculation 2	25.9 lux	5.66 lux	66.0lux	
Calculation 3	107.0 lux	0.38 lux	486.0 lux	Working level of light from temporary light towers.
Calculation 4	115.0 lux	0.53 lux	475.0 lux	Working level of light from temporary light towers.
Calculation 5	0.00 lux	0.00 lux	0.003 lux	
Calculation 6	3.68 lux	0.047 lux	42.7 lux	The maximum figure is at a height of no greater than 5m ABGL.
Calculation 7	2.80 lux	0.00 lux	23.3 lux	The maximum figure is at a height of no greater than 5m ABGL.
Calculation 8	0.92 lux	0.00 lux	13.5 lux	This grid is from behind platforms to compound 2.

~~2.3.29~~1.3.31 **Plate 1.19** and **Table 1.8** show how the southern edge of temporary construction area, Kenton Hills, can be maintained as an intrinsically dark area whilst still providing the required lighting levels for the contractor's compounds.

Plate 1.19: Indicative lighting model for southern edge of temporary construction area, Kenton Hills



~~2.3.30~~1.3.32 Area 3 the SSSI crossing is situated to the north of the proposed main construction site and is bounded on the east by the North Sea / Beach and to the west Sizewell Marshes SSSI. The marshes have been identified as an important bat foraging area with a culvert for bat movements being designed into the SSSI crossing.

~~2.3.31~~1.3.33 An indicative lighting model has been prepared for a section of the proposed SSSI crossing.

~~2.3.32~~1.3.34 The lighting levels have been calculated on the following planes:

- Calculation 1 – Horizontal illuminance on SSSI crossing roads.
- Calculation 2 – Horizontal illuminance on SSSI marshes.

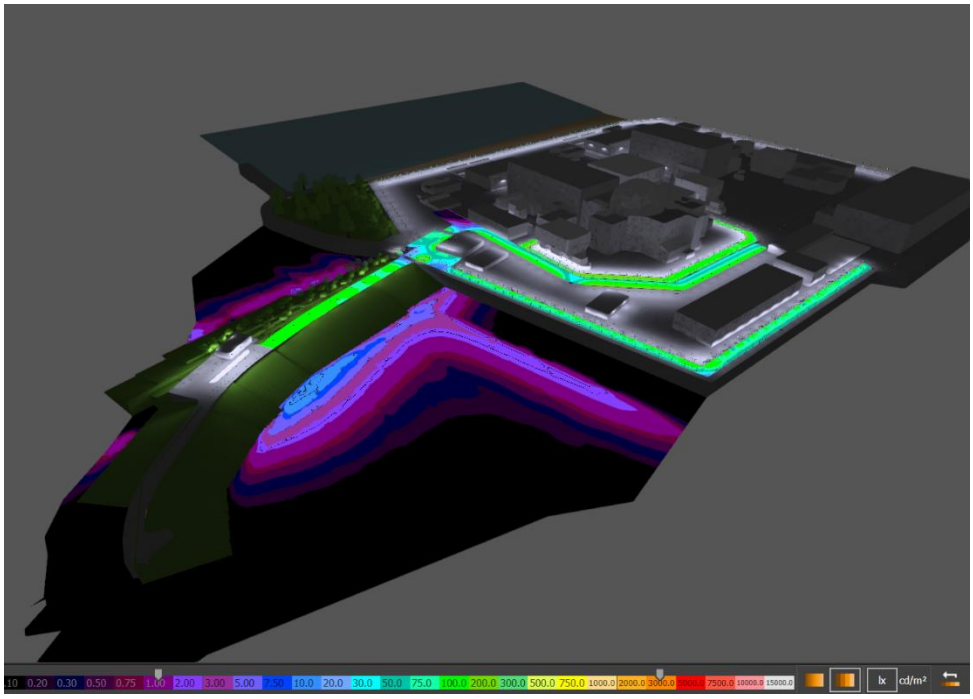
~~2.3.33~~1.3.35 The calculated values are summarised in **Table 1.9**.

Table 1.9: Area 3 – SSSI crossing – indicative lighting levels

Grid Location	Average Illuminance (lux)	Minimum Illuminance (lux)	Maximum illuminance (lux)
Calculation 1	121.0 lux	0.074 lux	198.0 lux
Calculation 2	0.68 lux	0.00 lux	18.4 lux

~~2.3.34~~1.3.36 **Plate 1.20** and **Table 1.9** show how the SSSI marshes area can be maintained as an intrinsically dark area whilst still providing the required lighting levels for the construction site entrance and crossing point.

Plate 1.20: Indicative lighting model for SSSI crossing



~~2.3.35~~1.3.37 ~~The~~ SZC Co must ensure that the Lighting designer ~~shall have~~ has regular dialogue with the ecologist at all points of the design process for all areas that have been identified as areas of significant wildlife activity.

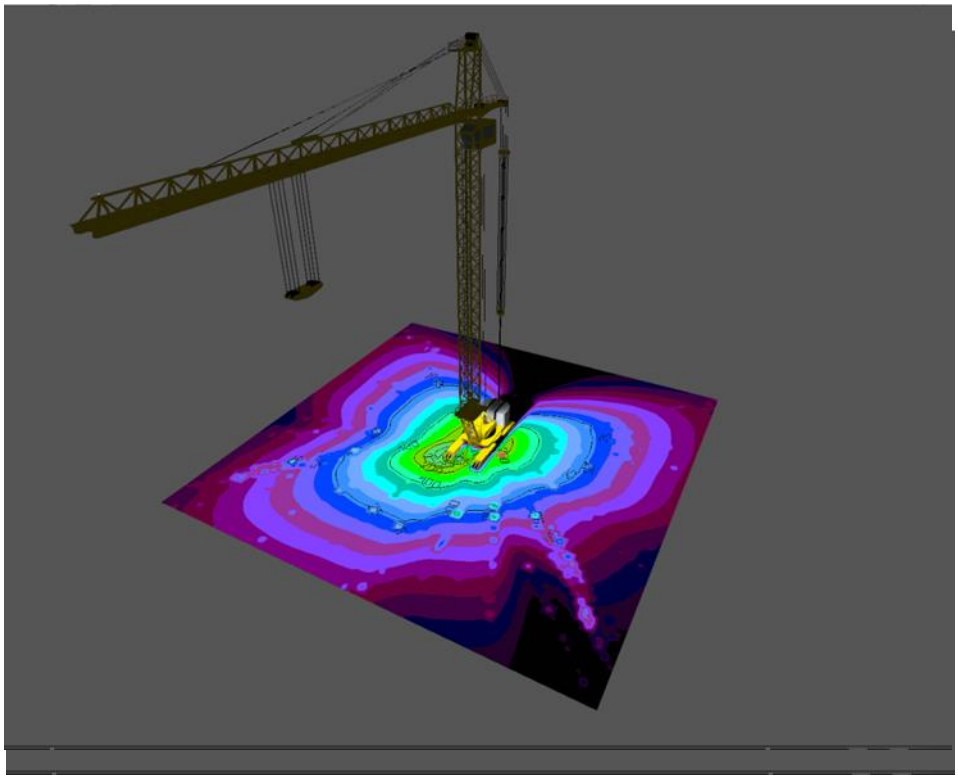
iv. Tower Cranes, Batching Plants & Site Buildings

~~2.3.36~~1.3.38 The construction phase will require the use of tower cranes, batching plants and other temporary site buildings. To mitigate the impact that these may have on the night sky, the following measures ~~should~~ must be put in place~~.~~:

- Tower cranes ~~– No illumination to~~ –illumination must be mounted ~~above 12m ideally kept~~ as low as ~~possible~~practicable and not above 12m, other than that required for safe operation and obstacle avoidance.
- Tower cranes – No illuminated operator boards to be fixed to the structure.
- Tower cranes – Any illumination that is required for the crane during operational times for safety to be switched off when crane is not in use with the exception of obstacle-avoidance lighting.
- ~~Tower cranes – Light-coloured paint finishes to be avoided to reduce reflectivity; matt paint to be used, a dark blue matt finish would have a minimal impact.~~Tower cranes –Paint finishes must be in accordance with best practice safety standards minimising visual impact where practicable. Batching plants – No illumination to be mounted above 8m, other than that required for the safe operation of the plant.
- Batching plants – No illuminated operator boards to be fixed to the structure.
- Batching plants – Any illumination that is not in constant use during operational times and is not needed for safety to be switched off.
- Batching plants – Light-coloured paint finishes to be avoided to reduce reflectivity; matt paint to be used.
- Site buildings – Any lighting attached to site buildings should be full cut-off and fitted with shield / louvres if required.
- Site buildings – Light coloured paint finishes to be avoided to reduce reflectivity; matt paint to be used.

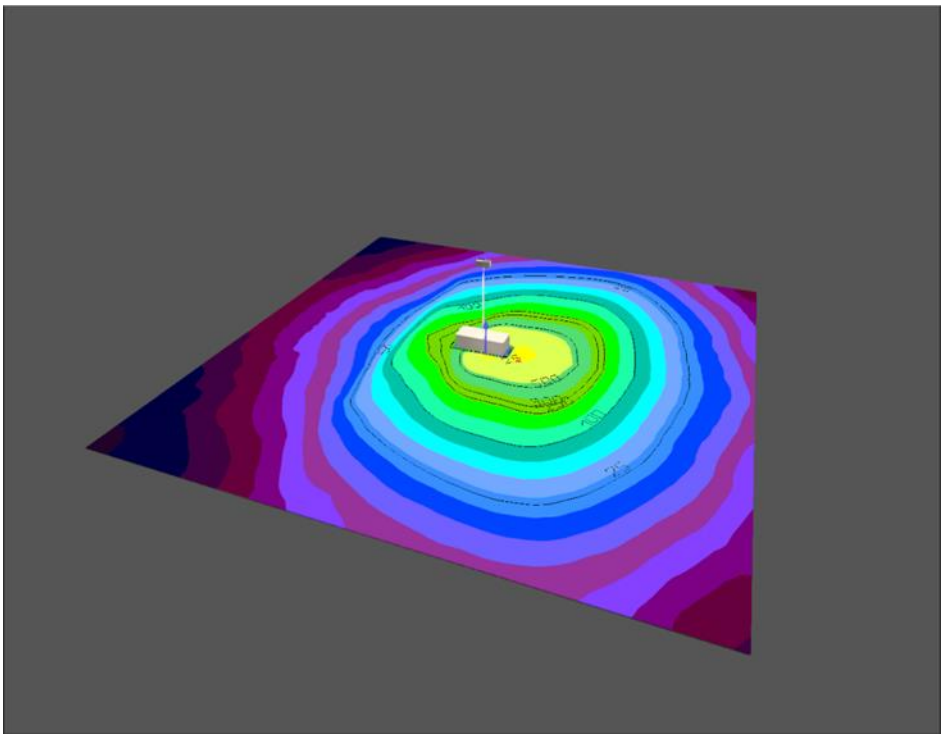
~~2.3.37~~1.3.39 **Plate 1.21** shows an example of a typical tower crane with six luminaires mounted at approximately 12m and the lighting levels achieved.

Plate 1.21: Indicative lighting model for typical tower crane lighting.



~~2.3.38~~1.3.40 **Plate 1.22** below shows an example of a typical mobile lighting tower rig with four luminaires mounted at approximately 9m and the lighting levels achieved.

Plate 1.22: Indicative lighting model for typical mobile lighting tower rig



~~d)~~f) Lighting Equipment & Controls

i. Luminaires

~~2.3.39~~1.3.41 When required, the chosen lighting equipment ~~shall~~ must meet the requirements set out in ~~3.5.3 1.4.7of~~ 1.3.8 to 1.3.12 of this document. **Table 1.10** gives examples of acceptable products and installations that can be used, and examples of equipment and installations that are not acceptable and ~~will~~ must not be used.

Table 1.10: Examples of acceptable and unacceptable lighting equipment

Acceptable Products / Installations		Unacceptable Products / Installations	
	Example of a good LED flat glass full cut-off luminaire with good optical control. For column mounting.		Example of old Lamp technology with poor optical control and luminaire tilted.
	Example of a good LED flat glass full cut-off luminaire with good optical control and custom shield. For column mounting.		Example of a poorly shielded luminaire that will still produce upward light. Replacement is a better option.
	Example of a good LED flat glass full cut-off area luminaire. For column or building / surface mounting.		Example of poorly installed and aimed area luminaires.
	Example of a good LED flat glass full cut-off area luminaire with hood. For column or building / surface mounting.		Example of extreme source intensity glare from poorly installed area luminaires.
	Example of a good LED flat glass full cut-off luminaire with good optical control. For building / surface mounting.		Example of bad building / surface mounting luminaire with no optical control.

Acceptable Products / Installations		Unacceptable Products / Installations	
	Example of a good cut-off LED bollard lighting.		Example of bollard lighting with poor optical control .
	Example of portable site lighting unit with well positioned luminaires.		Example of bad portable balloon-type lighting with no control of upward light.

~~ii.~~g) Control

~~2.3.40~~1.3.42 All lighting installed ~~shall~~ must have some form of control to suit the tasks being undertaken and ensure energy is not wasted with lights being in operation 24hrs a day.

~~2.3.41~~1.3.43 Task lighting – In general task lighting ~~will~~ must only be used during specific times at specific locations and will typically be provided by portable units which will have manual switching. If the units are to be in place for a prolonged period it would be beneficial for the unit to have a photo electric control cell which will automatically turn the lighting on at dusk and off again at dawn when natural lighting levels have increased or reached pre-determined levels. Where task lighting is used in close proximity to dark corridors, low light areas or site boundaries, the approval of the EcOW will be sought, in accordance with the procedure outlined in the CoCP.

~~2.3.42~~1.3.44 Ambient lighting – Ambient lighting will be more permanent and will be required to operate dusk to dawn, so the most suitable method of control will be via a photo electric control cell possibly with pre-programmed dimming or via a central management system (CMS).

~~2.3.43~~1.3.45 Access control points – At access control points there will be the need to boost the ambient lighting when there is the need to undertake an inspection etc. This would best be controlled via a local switch either at the

check point or in a control centre. It is important to consider the light source when instant boost lighting is required as most light sources other than LED will need some form of run up time to reach full output.

~~2.4~~1.4 Operational Phase Lighting Management Plan

~~i.~~a) Lighting Objectives

~~2.4.1~~1.4.1 The primary objective of lighting during the operational phase is to provide illumination for the safe operation of the power station facility and provide a safe working environment in the absence of natural light allowing workers and site traffic to safely navigate the site and to provide security lighting.

~~2.4.2~~1.4.2 As discussed earlier, the Sizewell C site sits in a sensitive environment and has been assessed as being with in an E1 Environmental Zone. The site also supports a valuable assemblage of bats. The required lighting therefore ~~needs to~~ must be designed to have minimal impact on the surrounding environment.

~~2.4.3~~1.4.3 Post-construction, parts of the site will be restored, providing valuable habitat to a range of species, including bats. Therefore, any lighting for the operational phase ~~needs to~~ must be designed to have minimal impact on the surrounding environment and receptors.

~~2.4.4~~1.4.4 The objectives of this section of the LMP ~~shall be~~ are to achieve the following:

- Provide a safe working environment, meeting statutory requirements and standards.
- Allow 24hr working (when required).
- Provide site security lighting.
- Mitigate the impact of artificial lighting on the surrounding environment.

~~ii.~~b) Areas to be lit and Associated Activities

~~2.4.5~~1.4.5 For the operational phase, the zones detailed in **Table 1.11** have been identified along with the associated activity or task being undertaken as requiring lighting. For details of the zones please refer to **Figure 2B.2**.

Table 1.11: Operational zones and activity/tasks being undertaken

Zone	Description	Activity / Task	Comments
Zone A	Fences	Illumination of permanent security fences, allowing detection of perimeter activity.	Permanent ambient lighting will be required in these areas to specific security levels with a high uniformity.
Zone B	Vehicle search areas.	Illumination of security check points with additional task lighting to carry out security searches of vehicles entering or leaving the site.	Permanent ambient lighting will be required in these areas to specific security levels. There will be additional task lighting to allow vehicle inspections.
Zone C	Internal roads and hard standings.	Lighting to all such areas inside the security fence, as necessary to operate the power station.	Permanent ambient lighting will be required in these areas. It should be noted that hard standings are likely to be used as laydown areas during power station maintenance outages. Although infrequent (typically 12-18 month intervals), additional temporary lighting may be provided during these times to increase illumination above the usual ambient levels.
Zone D	Car park.	Permanent car park to the north of the power station.	Permanent ambient lighting will be required in this area.
Zone E	BLF access road.	The access road to the BLF will not normally be illuminated. On the occasions when the BLF is in use, lighting necessary for the safe movement of people and vehicles will be provided on both the BLF access road and the BLF itself.	Task lighting will be provided when required and will be locally controlled.
Zone F	Roundabout	New permanent interface with the public highway.	The lighting in this area ~~will~~ must be based on highway design standards.
Zone G	Access road.	The access road to the power station.	No Illumination.
Zone H	External roads.	Private external roads outside the security fence where illumination is required for safety and security reasons.	The lighting in these areas will be based on highway design standards.

Zone	Description	Activity / Task	Comments
Zone J	Sizewell B Relocated Facilities	General lighting related to the operation of the permanent facilities.	~~Any~~ In the event that notice has been served under Article 5 of the dCO, any lighting in this area ~~will~~ must be in accordance with the SZB RF Volume II Technical Appendices 3.1 Lighting Strategy, provided in **Annex 2B.3** of this document.
Zone K	National Grid land	General security and task related flood lighting.	General lighting around the perimeter fence and within the National Grid substation for the purposes of security and to provide adequate lighting levels for access and inspection of equipment; and Task related flood lighting within the National Grid substation which may be necessary from time to time during repair/maintenance activities.

~~iii.~~c) Required Lighting Levels

~~2.4.6~~1.4.6 The lighting design criteria for each of the zones discussed above ~~shall~~ must be as scheduled below.

~~2.4.7~~ Zone A fences –

1.4.7 Security fence lighting levels ~~will need to~~ must comply with those set out by the (NNB) Operational Security Team and as summarised in **Table 1.12**.

Table 1.12: (NNB) Operational Security Team fence lighting levels

Location	Minimum Average Lux Level Normal Operation	Lighting Uniformity Normal Operation	Minimum Point Lux Level Emergency Operation	Lighting Uniformity Emergency Operation
Perimeter fence – Sterile zone between fences	5	0.33	N/A	N/A

Location	Minimum Average Lux Level Normal Operation	Lighting Uniformity Normal Operation	Minimum Point Lux Level Emergency Operation	Lighting Uniformity Emergency Operation
HSA fence – Clear zone either side of fence	5	0.33	N/A	N/A
Interim fence – as required	5	0.33	N/A	N/A

~~2.4.8~~1.4.8 Zone B Vehicle Search Areas – The requirements for good security lighting is set out in the CIBSE Lighting Guide 1: The Industrial Environment. Section 4.5 is summarised in **Table 1.13**.

Table 1.13: Checkpoint & gatehouse lighting levels summary

Area, Task or Activity	Minimum Average Lux Level	Lighting Uniformity	Glare Rating GRL	Colour Rendering Index Ra
Checkpoint	150	0.40	45	20
Gatehouses	200 (dimmable).	0.40	16	20

~~2.4.9~~1.4.9 For zones listed in **Table 1.11**, with the exception of zones A, B, F and G, the required lighting levels for these areas are set out in BS EN 12464-2:2014 Lighting of Workplaces Part 2 Outdoor Work Places. Reference should be made to the specific tables listed within that document, but **Table 1.14** provides a summary of the relevant levels required.

Table 1.14: BS EN 12464-2:2014 Lighting of Workplaces, Summary of Lighting Levels

Area, Task or Activity	Minimum Average Lux Level	Lighting Uniformity	Glare Rating GRL	Colour Rendering Index Ra
Walking exclusively for pedestrians.	5	0.25	50	20
Pedestrian movements within electrically safe areas.	5	0.25	50	20
Internal Roads – Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators.	10	0.40	50	20
Medium traffic parking areas.	10	0.25	50	20
Inspection areas.	50	0.40	50	20

Area, Task or Activity	Minimum Average Lux Level	Lighting Uniformity	Glare Rating GRL	Colour Rendering Index Ra
Servicing areas.	100	0.40	45	40

~~b)~~d) Mitigation Measures

i. Operational Phase Mitigation Measures

~~2.4.10~~1.4.10 A range of mitigation ~~measure~~ measures are available to address the potential impact from the construction phase lighting. These range from equipment choice, use of site topography and competent design and site management.

~~2.4.11~~1.4.11 The following mitigation measures ~~shall~~ must be adopted for both fixed and temporary lighting~~.~~:

- Adopt the lowest safe lighting levels possible for task being undertaken.
- Limit the hours of lighting where practicable.
- Use a high quality luminaire with good optical control.
- Use the lowest possible mounting for the luminaire based on the required level of illumination needed for the task being undertaken.
- Direct luminaires into the area to be lit (light from the boundary inwards).
- Ensure the luminaire is mounted at zero degrees to the horizontal and avoid any tilt.
- If required make use of manufacture supplied custom shields.
- Provide local control for the lighting so it may be switched off when not required.

~~2.4.12~~1.4.12 In addition to the physical equipment, lighting ~~should~~ must be placed such that it makes use of the existing and proposed topography:

- Keep mounting heights lower than fences and bunding, where possible.

- Position equipment so it is not visible to sensitive receptors by using natural screening.

~~2.4.13~~1.4.13 All lighting installations ~~should~~ must be designed by a competent lighting professional that ~~ideally~~ meets the ILP competency requirements, and who is at least a member of the ILP and is accredited to the Engineering Council as I.Eng or greater.

~~2.4.14~~1.4.14 Prior to the use of any lighting on-site during the operational phase the lighting ~~shall~~ must be inspected and ~~signed off by the designers~~ verified by SZC Co. to ensure it has been installed as per the design and the specified equipment and optics are installed.

~~2.4.15~~1.4.15 During routine lighting maintenance activities the lighting installation ~~shall~~ must be inspected to ensure the correct tilt angles and aiming directions are maintained throughout the life of the installation. If any equipment is found to be incorrectly aligned modifications ~~will~~ must be made to ensure it is restored to as designed and if required re-inspected. This monitoring procedure ~~will~~ must ensure that during the time the site is occupied the levels of lighting in the required areas on-site are maintained in accordance with current best practice and standards whilst ensuring the potential impact associated with the introduction of lighting on identified receptors is controlled and minimised as far as ~~practicably possible~~practicable..

~~c)~~e) Sensitive Areas

i. Bat sensitive areas

~~2.4.16~~1.4.16 All habitats adjacent to the operational site, notably but not limited to Sizewell Marshes SSSI should be kept as dark as reasonably practicable.

ii. Lighting mitigation measures to be adopted in proximity to bat commuting routes / flightpaths

~~2.4.17~~1.4.17 The best mitigation when considering lighting in the proximity of a bat roost or commuting routes / flightpath ~~is avoidance~~ by avoiding the use of lighting where reasonably practicable

~~2.4.18~~1.4.18 Where lighting is unavoidable then, in addition to the points made in the Mitigation Measures section above, the following additional mitigation measures where reasonably practicable ~~shall~~ must be adopted for both fixed and temporary lighting:

- Use a light source that has a narrow spectrum with no UV content.
- Use a warm colour temperature.
- Use a tuneable LED luminaire.

~~iii.~~f) Operational site buildings

~~2.4.19~~1.4.19 The operational site will have a mixture of buildings of varying heights and materials. To help mitigate the impact that these may have on the night sky the following measures ~~should~~ must be put in place.

- Site buildings – Any lighting attached to site buildings ~~should~~ must be fully cut off (emitting no light above the horizontal).
- Site buildings – Where reasonably practicable avoid light coloured paint finish to reduce reflectivity.

~~d)~~g) Lighting Equipment & Controls

i. Luminaires

~~2.4.20~~1.4.20 The lighting design for the operational site will use a mixture of high-quality highway luminaires and area projector luminaires. All luminaires used ~~will~~ must be capable of having manufacturer shields or louvers fitted if required.

ii. Control

~~2.4.21~~1.4.21 All lighting installed ~~shall~~ must have some form of control to suit the tasks being undertaken and ensure energy is not wasted (lights ~~should~~ must not be left on continuously).

~~2.4.22~~1.4.22 Task lighting ~~– In general, task~~ –Task lighting ~~will~~ must only be used during specific times at specific locations and will have manual switching.

~~2.4.23~~1.4.23 Ambient lighting – Ambient lighting will be permanent and will be required to operate dusk to dawn, so the most suitable method of control will be via a photo electric control cell which will automatically turn the lighting on at dusk and off again at dawn, when natural lighting levels have fallen or reached pre-determined levels.

~~2.4.24~~1.4.24 Access control points – At access control points, there will be the need to increase the ambient lighting when there is the need to undertake an inspection etc. This would best be controlled via a local switch, either at

the check point or in a control centre. It is important to consider the light source when an increase in the lighting level is required, as most light sources other than LED will need some form of run-up time to reach full output.

~~2.4.25 A Lighting Strategy was prepared and submitted as part of the SZB RF Town and Country Planning Act application and is still valid, with the exception of the footbath between the outage car park at Pillbox Field and the Coronation Wood development area. This footpath was proposed to be lit to ensure pedestrians had a safe and secure access route to and from the car park in hours of darkness. However, this footpath is no longer proposed. The Lighting Strategy is attached as **Annex 2B.3** of this document and the Relocated Facilities from part of this application for development consent.~~

~~References~~

1.4.25 A Relocated Facilities Lighting Strategy (Annex 2B.3) must be complied with in the operation of the SZB relocated facilities pursuant to the Relocated Facilitites Planning Permissions (DC/20/4646/FUL and DC/19/1637/FUL). In the event that notice is served pursuant to Article 5 of the dDCO the Relocated Facilities Lighting Strategy (**Annex 2B.3** of this document) must be complied with in relation to the Relocated Facilities works. .

REFERENCES

~~1.1~~1. Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats. Global Change Biology - Stone, E.L., Jones, G. & Harris, S. (2012)

~~1.2~~2. Bats and streetlamps. The Bats Magazine - Rydell, J. & Baagoe, H.J. (1996)

~~1.3~~3. The Switch from Low-Pressure Sodium to Light Emitting Diodes Does Not Affect Bat Activity at Street Lights - Baker 1994

~~1.4~~4. Street lighting disturbs commuting bats. Current Biology - Stone, E.L., Jones, G. & Harris, S. (2009)

~~1.5~~5. Bats and development: with a particular focus on the impacts of artificial lighting. PhD, PhD Thesis, School of Biological Sciences, University of Bristol - Stone, E.L. (2011)

~~1.6~~6. Seasonal use of illuminated areas by foraging northern bats Eptesicus - Rydell, J. (1991)

~~1.7~~7. Abundance of Pipistrellus pipistrellus and Pipistrellus kuhlii foraging at street-lamps. Myotis - Haffner, M. & Stutz, H.P. (1985/86)

~~1.8~~8. Street lamps and the feeding ecology of insectivorous bats. Symposium of the Zoological Society London - Rydell, J. & Racey, P.A. (1995)

Annex 2B.1 Legislation and Guidance Documents

1.1 Legislation

a) Health and Safety at Work Act 1974

1.1.1 The Workplace (Health, Safety and Welfare) Regulations 1992, as enforceable under the Health and Safety at Work etc. Act 1974, maintain that safe lighting must be provided in all premises, including outdoor places, for all workplace activities, which include those carried out during construction and operation of the power station.

1.1.2 The primary aim of the lighting strategy is to ensure a safe working environment is maintained in the absence of adequate natural light.

b) Environmental Protection Act 1990

1.1.3 The Environmental Protection Act 1990 was amended by a supplementary section to the Clean Neighbourhoods and Environment Act 2005, adding "artificial light emitted from premises so as to be prejudicial to health or a nuisance" to the list of statutory nuisances. This change does not apply to artificial light from lighthouses, prisons, airports, harbours and railway or tramway premises, nor to street lighting for public service or goods vehicles, however it will be applicable to the external lighting from the development site.

1.1.4 The lighting strategy will comply with relevant British Standards and best practice guidelines prepared by the Chartered Institution of Building Services Engineers, the Institution of Lighting Professionals, and the International Dark-Sky Association to minimise obtrusive light and ensure compliance with the Environmental Protection Act.

c) Wildlife and Countryside Act 1981 and Conservation of Habitats and Species Regulations 2017

1.1.5 All species of bat are protected by the Wildlife & Countryside Act 1981 (as amended) and by the Conservation of Habitats and Species Regulations (2017).

1.1.6 Of relevance in relation to lighting, in both it is unlawful to disturb bats, thus lighting in the vicinity of roosts, flight lines and foraging areas within and adjacent to the development needs to be carefully designed.

1.2 British Standards

1.2.1 The design criteria for the lighting strategy must use the following British Standards as demonstration of best practice.

a) BS EN 12464-2:2014 Light and lighting – Lighting of workplaces Part 2: Outdoor Work Places

1.2.2 To enable people to perform outdoor visual tasks efficiently and accurately, especially during the night, adequate and appropriate lighting has to be provided. The degree of visibility and comfort required in a wide range of outdoor work places is governed by the type and duration of activity.

1.2.3 This standard specifies requirements for lighting tasks in most outdoor work places and their associated areas in terms of quantity and quality of illumination.

1.2.4 Tables scheduling areas, tasks and activities relevant to this development are as follows:

- Table 5.1 – General requirements for areas.
- Table 5.3 – Building sites.
- Table 5.7 – Industrial sites and storage areas.
- Table 5.9 – Parking areas.
- Table 5.11 – Power, electricity, gas and heat plants.
- Table 5.12 – Railways and tramways.

b) BS 5489-1:2013 Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas

1.2.5 This standard gives recommendations on the general principles of road lighting, gives recommendations on aesthetic and technical aspects, and advises on statutory provisions, operations and maintenance.

1.2.6 It gives recommendations for the design of lighting for all types of highways and public thoroughfares, including those specifically for pedestrians and cyclists, and for pedestrian subways and bridges.

1.2.7 The standard will be used to ensure that statutory design criteria are met where the primary roads in the development site interface with the surrounding public road network.

1.2.8 c) CEN/TR 13201-1 Road lighting - Part 1: Selection of lighting classes

This document specifies the lighting classes set out in EN 13201-2 and gives guidelines on the application of these classes. To do this, it includes a system to define an outdoor public traffic area in terms of parameters relevant to lighting. To assist in the application of classes, it suggests a

practical relationship between the various series of lighting classes, in terms of comparable or alternative classes.

1.2.9 It also gives guidelines on the selection of the relevant area to which the lighting classes from EN 13201-2 and the calculation grids and procedure from EN 13201-3 should be applied.

1.3 Guidance

a) Lighting in the Countryside: Towards Good Practice, 1997

1.3.1 Lighting in the Countryside: Towards Good Practice was issued by the then Department of the Environment in 1997. The purpose of the Good Practice guide is to provide practical advice on the prevention and control of lighting impacts and it identifies a number of objectives that should be considered when developing the lighting strategy.

b) The Society of Light and Lighting (SLL) Lighting Handbook, 2009

1.3.2 The SLL Lighting Handbook provides further guidance behind the specific requirements of the British Standards and also identifies other sources of technical information.

c) Institution of Lighting Professionals (ILP) GN01: Guidance notes for the reduction of obtrusive light, 2011

1.3.3 The ILP guide specifically identifies the sources of obtrusive lighting and provides further explanation of the British Standard requirements, it is referenced in many planning requirements.

d) Institution of Lighting Professionals (ILP) Guidance Note 8 Bats and Artificial Lighting

1.3.4 This guidance note supersedes the previous 2009 guidance and goes into depth about lighting levels and colour temperature impacts on different bat species. It is intended to raise awareness of the impacts of artificial lighting on bats but also the potential solutions to avoid and reduce this harm.

1.3.5 e) Bats and Lighting: Overview of current evidence and mitigation, 2013

The Bats and Lighting Research Project raises awareness of the impact of lighting on bats and suggests mitigation measures for various scenarios.

1.3.6 f) Safety in docks Approved Code of Practice and guidance, 2014

The Docks Regulations 1988 were revoked in April 2014 because the duties had been replaced by equivalent requirements in more modern legislation. This publication contains guidance on duties under the Health and Safety

at Work etc. Act 1974 and its relevant statutory provisions that are specific to the docks industry. The guidance on lighting will be of relevance to the Beach Landing Facility (BLF) at the Sizewell C site.

g) International Dark-Sky Association (IDA)

1.3.7 Dark Sky policy refers to the aims of the International Dark-Sky Association with regards to the avoidance of light pollution. The IDA's goals are to be effective in stopping the adverse environmental impact on dark skies by building awareness of the problem of light pollution and of the solutions.

1.3.8 IDA describes light pollution as any adverse effect of artificial light including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste. The IDA has a number of policy initiatives and collates technical information identifying best practice for avoiding light pollution.

Annex 2B.2 Glossary of terms & Abbreviations

1.1 Terms

Term	Definition
Colour rendering.	Colour rendering (as per BS EN 12665:2002) Effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant.
Glare	Glare is a visual sensation caused by excessive and uncontrolled brightness. It can be disabling or simply uncomfortable.
Illuminance	Quotient of the luminous flux (dϕ) incident on an element of the surface containing the point, by the area (dA) of that element. Equivalent definition: Integral, taken over the hemisphere visible from the given point, of the expression Unit: L x cos ϴ x dΩ. Where L is the luminance at the given point in the various directions of the incident elementary beams of solid angle dΩ; and ϴ is the angle between any of these beams and the normal to the surface at the given point. Unit Lx (lux) or lumens per metre2 (lm/m2).
Illuminance uniformity.	Ratio of minimum illuminance to average illuminance on a surface. Note: Use is also made of the ratio of minimum illuminance to maximum illuminance, in which case, this should be specified explicitly.
Lamp	Light source made in order to produce optical radiation, usually visible. Note: This term is also sometimes incorrectly used for certain types of luminaires.
LED	A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.
Light pollution.	The spillage of light into areas where it is not desired.
Luminaire	Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply. Note: The term 'light fitting' is deprecated.
Maintained illuminance (Em or Eav).	Value below which the average illuminance on the specified area should not fall. It is the average illuminance at the time during which maintenance should be carried out. Unit: Lx (Lux) or lm/m2.
Minimum illuminance.	Lowest illuminance at any relevant point on the specified surface. Unit: Lx or lm/m2 Note: The relevant points at which the illuminances are determined shall be specified in the appropriate application standard.

Term	Definition
Obtrusive / Nuisance light.	Light, outside the area to be lit, which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information, e.g. at signal lights.

1.2 Abbreviations

Abbreviation	Definition
AONB	Area of Outstanding Natural Beauty.
CRI	Colour Rendering Index.
IDA	International Dark-Sky Association.
ILP	Institution of Lighting Professionals.
LMP	Lighting Management Plan.
SLL	Society of Light and Lighting.
SSSI	Site of Special Scientific Interest.