

The Sizewell C Project

9.38 Technical Note on Indicative Lighting Modelling

Revision: 1.0

Applicable Regulation: Regulation 5(2)(q)

PINS Reference Number: EN010012

June 2021

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





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1 PURPOSE

- 1.1.1 The purpose of this technical note is to illustrate the artificial light levels associated with the construction sites of Sizewell C (SZC) power station. These levels indicate what could be achieved to enable safe working whilst minimising off-site spillage of light protecting both internal site corridors for bats and indicate the levels on the Permanent Beach Landing Facility (BLF) and Temporary Beach Landing Facility (BLF) with regard to its location within an AONB and being a dark coastal location. This technical note should be read in conjunction with the Sizewell C Project Lighting Management Plan for Construction and Operational Sites (LMP).
- 1.1.2 This note provides commentary on photometric modelling undertaken to produce the indicative isolux contour levels that would be experienced across the SZC construction site, and the beach landing facilities, albeit subject to further detailed design.2

2 CONSTRUCTION SITE MODELLING AND DESIGN CONSIDERATIONS

2.1 Construction Site

2.1.1 For the purpose of this exercise the construction site is taken as detailed in section 1.2 of the LMP.

2.2 Photometric Model

- 2.2.1 A photometric model and isolux contours plot have been produced using Lighting Reality which is industry recognised software for carrying out lighting calculations in external settings.
- 2.2.2 To produce the model the proposed site layout has been imported into the Lighting Reality software. Lighting calculation grids are then applied to the individual areas to be lit as well as an overall grid for the entire site. Columns and luminaire at the appropriate mounting heights have then been added to the various areas requiring illumination. Luminaires can be chosen from a wide range of manufactures, for this model a luminaire that provides good photometric performance for the area to be lit and with the benefits of good mitigation measures such as manufacture supplied shields and louvers available have been used.
- 2.2.3 Once the model has been calculated it produces calculated lighting levels and isolux contour plots across the selected areas of the site.
- 2.2.4 The Lighting units selected for use in the model are from reputable manufacturers with a proven track record for quality products and photometric data. The units are



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however indicative only and demonstrate what can be achieved when the appropriate apparatus has been selected and the design carried out by a competent lighting professional.

- 2.2.5 Due to the complexity and size of the area being modelled it has been necessary to break the construction site up into seven calculation areas with overlaps and then the isolux contour lines have been combined into a confederated single isolux contour plot.
- At this stage, the site has been treated as level site devoid of topographical features such trees or buildings, thus representing worst case for the spread of light. In addition, no maintenance factor has been applied to the lighting calculations and so the model outputs represent the worst case i.e. the day of switch on, when the luminaires are at their brightest with their greatest lumen output. As such the plans presented provide indicative lighting levels that are unmitigated.
- 2.2.7 To assist in understanding how the lighting changes as you get further above ground level the isolux contour plots have been prepared at 0m above ground level (AGL), 5m AGL and 10m AGL.
- 2.2.8 The calculated isolux contour plots are presented on the following drawings contained in Appendix C
 - SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000041 Main Development Site Temporary Construction Area Lighting Management Plan GA @ 0m
 - SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000054 Main Development Site Temporary Construction Area Lighting Management Plan GA @+5m
 - SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000054 Main Development Site Temporary Construction Area Lighting Management Plan GA @+10m

2.3 Lighting Levels

2.3.1 The lighting for each of the areas are detailed in the main LMP (ref 1). A summary of the levels designed to in the model and how this lighting is assumed to be provided is listed in table 1 below and shown on the figure in appendix A.



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Table 1: Summary of lighting design levels

Area (Letter indicates location on plan)	Lighting provision	Standard to which lighting is designed to.	Average illuminance (lux)	Target uniformity (Uo)	Comments
Campus carpark (A)	Fixed columns	BS EN 12464-2, Table 5.9, section 5.9.1	5 lux	0.25	
Campus (B)	Fixed columns	BS5489, Table A5, E1 to E2,<30mph mixed use P5	3 lux (0.6 lux min)	-	
Bus interchange (C)	Fixed columns	BS EN 12464-2, Table 5.1, section 5.1.3	50 lux	0.40	
Main carpark (D)	Fixed columns	BS EN 12464-2, Table 5.9, section 5.9.2	10 lux	0.25	
Vehicle entry inspection area (E)	Fixed columns	BS EN 12464-2, Table 5.1, section 5.1.3 & 4	50 lux	0.40	
Lorry park (F)	Fixed columns	BS EN 12464-2, Table 5.9, section 5.9.2	10 lux	0.25	
Rail inspection facility (G)	Fixed columns and overhead gantry	BS EN 12464-2, Table 5.12 section 5.12.13	30 lux	0.40	Local switching to turn off when not in use



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Area (Letter indicates location on plan)	Lighting provision	Standard to which lighting is designed to.	Average illuminance (lux)	Target uniformity (Uo)	Comments
General use Contractors compounds (H)	Portable lighting towers	BS EN 12464-2, Table 5.3 section 5.3.1	20 lux	0.25	Additional enhanced localised lighting may be needed
Fabrication compounds (I)	Portable lighting towers	BS EN 12464-2, Table 5.7 section 5.7.1	20 lux	0.25	Additional enhanced localised lighting may be needed
Heavy lift compound (J)	Portable lighting towers	BS EN 12464-2, Table 5.7 section 5.7.2	50 lux	0.40	Additional enhanced localised lighting may be needed
Roundabout (K)	Fixed columns	BS5489	15 lux (C3)	0.40	Design by others
Rail sidings	Fixed columns	BS EN 12464-2, Table 5.12 section 5.12.	10 lux	0.40	
Site Roads (Purple Lines)	Fixed columns	BS EN 12464-2, Table 5.1, section 5.1.2	10 lux	0.40	
Main construction pad (MCP)	Fixed lighting on cranes & portable lighting towers	BS EN 12464-2, Table 5.3 all sections dependant on task	20 – 200 lux	0.25 to 0.40	Additional enhanced localised lighting may be needed.

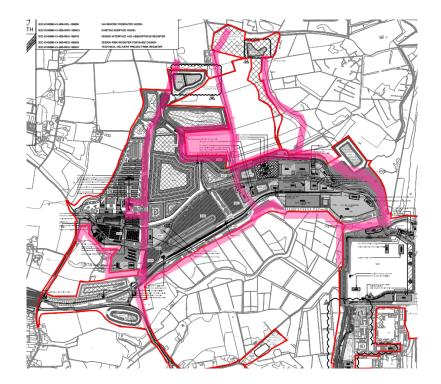


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2.4 Maintaining Dark Boundaries and Dark Corridors for Bats

2.4.1 Those areas which have been identified as important foraging, commuting and roosting areas for bats are hi-lighted pink on **Plate 1** below. Where practicably possible these areas are to be kept as dark as possible, whilst considering the health and safety of those on site.

Plate 1: Extract of Development Site showing bat activity



- 2.4.2 In these areas, the modelled lighting levels have been kept to a minimum primarily though lighting location.
- 2.4.3 Aside from the site boundaries, many of which are important to bats, key corridors within the sites which are identified of importance to bats are:
 - Bridleway 19, including where it crosses internal site roads and rail line
 - A new bat corridor linking Kenton Hills with Ash Cottages / Ash Wood, associated with two proposed WMZs and new tree planting
 - The Leiston Beck, in the vicinity of the proposed SSSI crossing.



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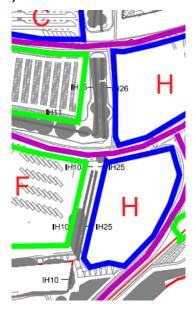
2.5 Bridleway 19 and Ash Cottages / Ash Wood WMZ 3 & 4 Areas

2.5.1 In order to ensure the key corridors for bats are kept as dark as practically possible, this section describes mitigation measures which are embedded in the model.

Bridleway 19

2.5.2 As general contractors' compounds and lorry park are in close proximity to Bridleway 19, as shown in **Plate 2** below, the model includes no lighting within 10m of the centreline of the Bridleway.

Plate 2: Section of Bridleway 19 in close proximity to Compounds Shown to East of BR19 (areas H)



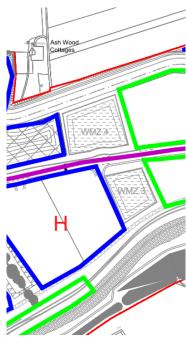
Ash Cottages / Ash Wood WMZ 3 & 4 Areas

2.5.3 Similar to that for Bridleway 19 the close proximity of general contractors' compounds and fabrication compounds as shown in **Plate 3** below, the model assumes no lighting would be positioned within 10m of the edges of the WMZ.



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- 2.5.4 Any lighting that is placed in these areas would be directed into the compounds and would have rear shields and would be inspected before initial switch on and would only be operational when the lighting is required.
- 2.5.5 A visualisation of the impact of the lighting and a snapshot of the contours for each of the three on bridleway 19 along with the SSSI crossing have been shown in Appendix B to this note.

2.6 Managing the Lighting

2.6.1 The photometric model and isolux contours plot (see Appendix C Drawing SZC-EW0220-ATK-XX-000-XXXXXX-DRW-CIV-000041) clearly indicates that relatively high levels of lighting can be achieved in the required areas whilst maintaining low levels of spill lighting at the site boundary and within the three bat corridors within the main development site.

2.7 Model Limitations

2.7.1 The model is provided as a proof of concept and does not constitute a detailed design. Each area of the site will still need a detailed design once the layouts are fixed.



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- 2.7.2 A visualisation of the impact of the lighting and a snapshot of the contours for each of the three on bridleway 19 locations along with the SSSI crossing have been shown in Appendix B to this note, they provide lighting levels without any mitigation measures in place. If it is identified that the area would benefit from additional physical mitigation measures these could be further modelled.
- 2.7.3 It is important that when mitigation measures are considered that may impact on operational lighting levels they are fully risk assessed so that they do not present a health and safety risk to the staff on site undertaking the tasks.
- 3 PERMANENT & TEMPORARY BLF MODELLING & DESIGN CONSIDERATIONS
- 3.1 Permanent Beach Landing Facility (BLF) and Temporary Beach Landing Facility (TBLF)
- 3.1.1 To achieve the ambition of reducing HGV journeys to the Sizewell main development site, a temporary beach landing facility (TBLF) has been proposed for the import of bulk materials to the site. This is in addition to the Beach Landing Facility (BLF) to the north which is to continue to be used for the import of Abnormal Indivisible Loads (AIL).
- 3.1.2 The proposed BLF does not have any artificial lighting proposed on it as it use is limited to daylight hours only.
- 3.1.3 The proposed TBLF is required to function for a limited period during the construction phase of the project.
- 3.1.4 The TBLF will be removed following the completion of the SZC Construction Works under Requirement 16. However, the operational requirements placed on the facility are such that lighting will be required on the facility to ensure the health and safety of the operative working there.
- 3.2 Photometric Model
- 3.2.1 The photometric model, isolux contours plot and renderings (visualisations produced from the model) have been produced using Dialux Evo which is industry recognised software for carrying out lighting calculations in external settings.
- 3.2.2 Lighting units used in the calculation are from reputable manufacturers with a proven track record for quality products and photometric data. The photometric model demonstrates the performance which would be achievable from an indicative solution when carried out by a competent lighting professional and using currently



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available products. Detailed design may offer subsequent improvements over the currently modelled performance and may allow benefits from future developments in technology and product ranges, and selection of specific product combinations. Detailed design would not be permitted to introduce retrograde performance levels compared to the indicative solution.

3.2.3 When considering the impact of lighting on the surrounding environment it is important that the realistic worst-case scenario is modelled. With this in mind, no maintenance factor has been applied to the lighting calculations i.e. the day of switch on where the luminaires will have their greatest lumen output and are clean.

3.3 Lighting Levels

- 3.3.1 The Area Lighting proposals in Table 1 represent the lighting required for normal operations such as bulk material discharge. Any specific task lighting for maintenance activities would be portable and short-term. Maintenance lighting for the conveyor would be housed within the conveyor enclosure, limiting the potential for unwanted light spill during its operation.
- The lighting levels for the two areas of the temporary BLF have been selected from the British Standard BS EN 12464-2:2014, Light and lighting Lighting of workplaces, Part 2: Outdoor workplaces. Both areas have been selected from BS EN 12464-2:2014 Part 2 section 5.3 schedule of areas, tasks and activities and for this application table 5.4 Canals, locks and harbours. A summary of the levels is detailed below.

Table 2: Lighting levels summary

Area	Lighting provision	Standard to which lighting is designed to.	Average illuminance (lux)	Target uniformity (Uo)	Comments
Main jetty walkway	Fixed luminaires on railing at apx 0.7m	BS EN 12464- 2, Table 5.4, section 5.4.2	10 lux	0.25min ideal 0.4	Reference has also been made back to table 1 section 2.3
Main working area	Luminaires on fixed columns of 8m	BS EN 12464-2, Table 5.4, section 5.4.4	30 lux	0.25	



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3.4 Lighting Equipment

The following images are indicative of the luminaires used in the photometric model.

Main jetty walkway



Main jetty walkway - A low level mounted unit designed to provide illumination across the jetty without the need for tall columns minimising upward light.

Main working area



Main working area - A full cut off lighting unit with good optical control to ensure the light is directed to the required working surfaces

3.5 Managing the Lighting

- 3.5.1 Photometric modelling has been undertaken adopting the principles of the LMP. This modelling indicates that the required levels of lighting required for safe operation of the facility can be achieved and maintained whilst minimising artificial lighting and light spill in the surrounding coastal environment within the AONB and Heritage Coast.
- 3.5.2 The calculated isolux contour plot is presented on the following drawing contained in Appendix C:
 - SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000049 Main Development Site Temporary BLF Lighting Isolux Contours

3.6 Model Limitations

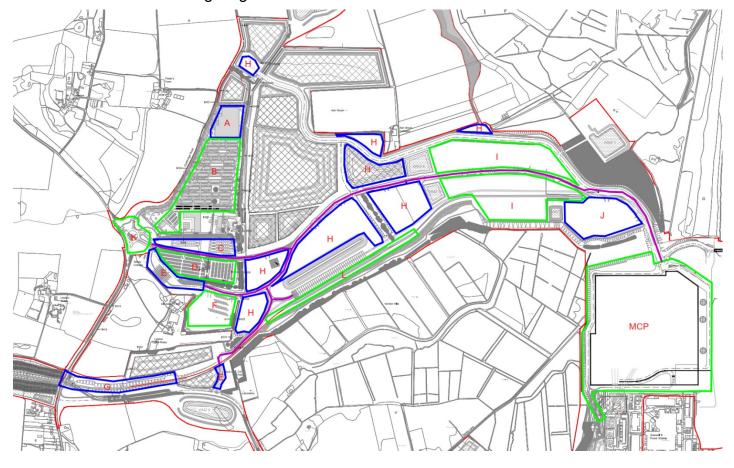
3.6.1 The model is provided as a proof of concept and does not constitute a detailed design. Each area of the temporary BLF will still need a detailed design once the layouts and equipment locations have been specified.



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APPENDIX A: AREAS OF LIGHTING

A.1.1. Letters refer to lighting levels shown above.





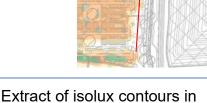
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APPENDIX B: EXTRACTS FROM LIGHTING MODEL

B.1.1. The following images are extracts from the lighting model and Isolux contour plots at ground level (0m) in proximity to the bat corridors listed in section 2.3 of the Technical Note. Red arrows indicate direction of view.

Bridleway 19 looking north with campus to the west.



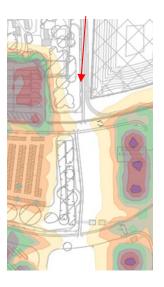


corresponding area

Visulised view north with Campus to left and stockpile to east

Bridleway 19 looking south towards main car park and lorry park to the west





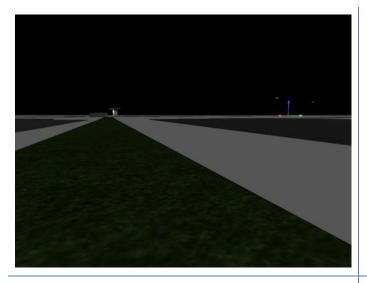


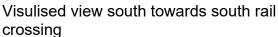
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Visualised view south with main car and lorry parks to the west across main site raods

Extract of isolux contours in corresponding area

Bridleway 19 looking south towards rail crossing







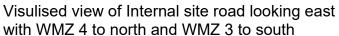
Extract of isolux contours in corresponding area

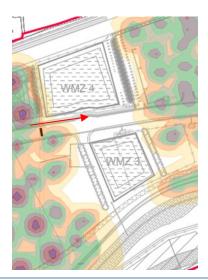


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Internal site road looking east with WMZ 4 to north and WMZ 3 to south







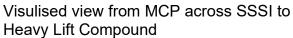
Extract of isolux contours in corresponding area

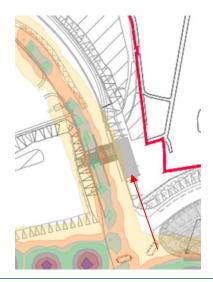


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View from MCP across SSSI to Heavy Lift Compound







Extract of isolux contours in corresponding area



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APPENDIX C: LIGHTING MODELLING PLOTS

- C.1. Construction Site Isolux Plots
- C.1.1. SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000041 Main Development Site Temporary Construction Area Lighting Management Plan GA @ 0m
- C.1.2. SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000054 Main Development Site Temporary Construction Area Lighting Management Plan GA @+5m
- C.1.3. SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000062 Main Development Site Temporary Construction Area Lighting Management Plan GA @+10m
- C.2. Temporary BLF Isolux Plot
- C.2.1. SZC-EW0220-ATK-XX-000-XXXXXXX-DRW-CIV-000049 Main Development Site Temporary BLF Lighting Isolux Contours



