

## VPI Immingham OCGT Project

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### The Immingham Open Cycle Gas Turbine Order

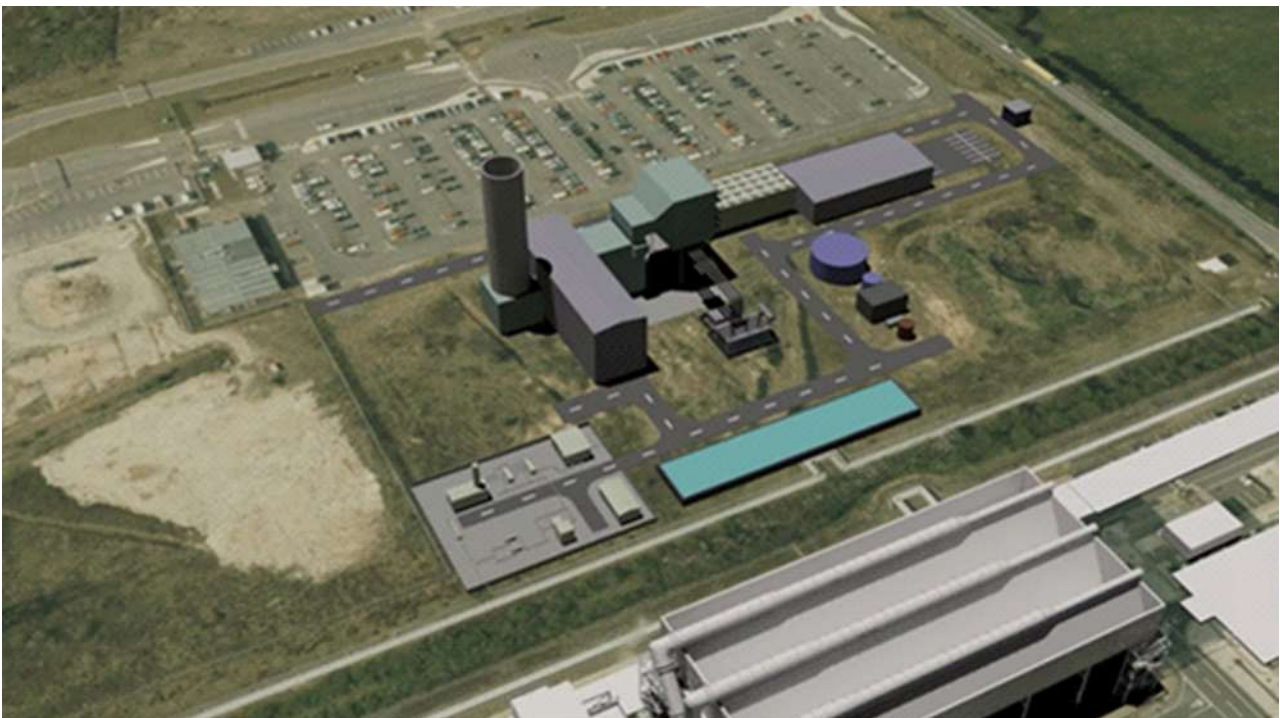
Land to the north of and in the vicinity of the VPI Immingham Power Station, Rosper Road, South Killingholme, Lincolnshire, DN40 3DZ

## Indicative Lighting Strategy

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(q)

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Applicant: VPI Immingham B Ltd

Date: April 2019

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## DOCUMENT HISTORY

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## GLOSSARY

<b>Abbreviation</b>	<b>Description</b>
Abbreviation	Description
AGI	Above Ground Installation
ANO	Air Navigation Order
BS	British Standard
CAA	Civil Aviation Authority
CCGT	Combined Cycle Gas Turbine.
CEMP	Construction Environmental Management Plan
CIBSE	The Chartered Institute of Building Services Engineers
CIE	Commission Internationale de L'Eclairage
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
Eh	Horizontal Illuminance in Lux (lx)
EIA	Environmental Impact Assessment.
EN	European
EPA	Environmental Protection Act
ES	Environmental Statement
Ev	Vertical Illuminance in Lux (lx)
I	Light Intensity in Candelas (cd)
ILP	The Institute of Lighting Professionals
L	Luminance in Candelas per square meter (cdm-2)
LG	Lighting Guide
Lv	Veiling Luminance
NPPF	National Planning Policy Framework
NSIP	Nationally Significant Infrastructure Project
PINS	Planning Inspectorate
PA	Planning Act
RGL	Glare Rating Limit
SLL	Society of Light and Lighting
TI	Threshold Increment
ULR	Upward Lighting Ratio

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## 1.0 INTRODUCTION

### 1.1 Overview

- 1.1.1 This Indicative Lighting Strategy (Application Document Ref: 5.6) has been prepared on behalf of VPI Immingham B Ltd. ('VPIB' or the 'Applicant'). It forms part of the application (the 'Application') for a Development Consent Order (a 'DCO'), submitted to the Secretary of State (the 'SoS') for Business, Energy and Industrial Strategy, under Section 37 of 'The Planning Act 2008' (the 'PA 2008').(Ref 1-1)
- 1.1.2 VPIB is seeking development consent for the construction, operation and maintenance of a new gas-fired electricity generating station with a gross output capacity of up to 299 megawatts ('MW'), including electrical and gas supply connections, and other associated development (the 'Proposed Development'). The Proposed Development is located primarily on land (the 'Site') to the north of the existing VPI Immingham Power Station, Rosper Road, South Killingholme, North Lincolnshire, DN40 3DZ.
- 1.1.3 A DCO is required for the Proposed Development as it falls within the definition and thresholds for a 'Nationally Significant Infrastructure Project' (a 'NSIP') under Sections 14 and 15(2) of the PA 2008.
- 1.1.4 The DCO, if made by the SoS, would be known as the 'Immingham Open Cycle Gas Turbine Order' (the 'Order').

### 1.2 VPI Immingham LLP and VPIB

- 1.2.1 VPI Immingham LLP ('VPI LLP') owns and operates the existing VPI Immingham Power Station, one of the largest combined heat and power ('CHP') plants in Europe, capable of generating 1,240 MW (about 2.5% of UK peak electricity demand) and up to 930 tonnes of steam per hour (hereafter referred to as the 'Existing VPI CHP Plant'). The steam is used by nearby oil refineries to turn crude oil into products, such as gasoline. The land comprising the Existing VPI CHP Plant is hereafter referred to as the 'Existing VPI CHP Plant Site'.
- 1.2.2 VPI LLP is a wholly owned subsidiary of the Vitol Group ('Vitol'), founded in 1966 in Rotterdam, the Netherlands. Since then Vitol has grown significantly to become a major participant in world commodity markets and is now the world's largest independent energy trader. Its trading portfolio includes crude oil, oil products, liquid petroleum gas, liquid natural gas, natural gas, coal, electricity, agricultural products, metals and carbon emissions. Vitol trades with all the major national oil companies, the integrated oil majors and independent refiners and traders. For further information on VPI LLP and Vitol please visit:
- <https://www.vpi-i.com/>
- 1.2.3 VPIB has been formed as a separate entity for the purposes of developing and operating the Proposed Development.

### 1.3 The Site

- 1.3.1 The Site is primarily located on land immediately to the north of the Existing VPI CHP Plant Site. Immingham Dock is located approximately 1.5 kilometres ('km') to the south

east of the Site at its closest point. The Humber ports facility is located approximately 500 metres ('m') north and the Humber Refinery is located approximately 500m to the south.

1.3.2 The villages of South Killingholme and North Killingholme are located approximately 1.4 km and 1.6 km to the west of the Site respectively, and the town of Immingham is located approximately 1.8 km to the south east. The nearest residential property comprises a single house off Marsh Lane, located approximately 325 m to the east of the Site.

1.3.3 The Site comprises the following main parts:

- OCGT Power Station Site;
- Access Site;
- Temporary Construction and Laydown Site;
- Gas Connection Site;
- Electrical Connection Site; and
- Utilities and Services Connections Site.

1.3.4 The Site is located entirely within the boundary of the administrative area of North Lincolnshire Council ('NLC'), a unitary authority. The different parts of the Site are illustrated in the Works Plans (Application Document Ref: 4.3).

1.3.5 A more detailed description of the Site is provided in Environmental Statement ('ES') Volume 1 Chapter 3 'Description of the Site' (Application Document Ref: 6.2).

## **1.4 The Proposed Development**

1.4.1 The main components of the Proposed Development are summarised below, as set out in the draft DCO (Application Document Ref: 2.1):

- Work No. 1 – an OCGT power station (the 'OCGT Power Station') with a gross capacity of up to 299MW;
- Work No. 2 – access works (the 'Access'), comprising access to the OCGT Power Station Site and access to Work Nos. 3, 4, 5 and 6;
- Work No. 3 – temporary construction and laydown area ('Temporary Construction and Laydown') comprising hard standing, laydown and open storage areas, contractor compounds and staff welfare facilities, vehicle parking, roadways and haul routes, security fencing and gates, gatehouses, external lighting and lighting columns;
- Work No. 4 – gas supply connection works (the 'Gas Connection') comprising an underground and/or overground gas pipeline of up to 600 millimetres (nominal internal diameter) and approximately 800 m in length for the transport of natural gas from the Existing Gas Pipeline to Work No. 1;
- Work No. 5 – an electrical connection (the 'Electrical Connection') of up to 400 kilovolts and associated controls systems; and
- Work No 6 – utilities and services connections (the 'Utilities and Services Connections').

1.4.2 It is anticipated that subject to the DCO having been made by the SoS and a final investment decision by VPIB, construction work on the Proposed Development would

commence in early 2021. The overall construction programme is expected to last approximately 21 months and is anticipated to be completed in late 2022, with the Proposed Development entering commercial operation later that year or early the following year

1.4.3 A more detailed description of the Proposed Development is provided at Schedule 1 'Authorised Development' of the draft DCO (Application Document Ref: 2.1) and ES Volume 1, Chapter 4 'The Proposed Development' (Application Document Ref: 6.2.4).

1.4.4 The areas within which each of the main components of the Proposed Development are to be built are shown by the coloured and hatched areas on the Works Plans (Application Document Ref: 4.3).

## **1.5 The Purpose and Structure of this Document**

1.5.1 The Proposed Development will require the installation of a number of luminaires to provide visual comfort, safety and operational performance, which in turn will have the potential to result in obtrusive light at receptor locations.

1.5.2 At the time of submission of the DCO application, the contractor has not been appointed and detailed design work for the Proposed Development has not been completed. Therefore, detailed information on the lighting to be used at the Proposed Development is currently unknown. Nevertheless, it is recognised that potential nuisance from lighting of the Proposed Development may be a concern for members of the public and could potentially impact upon the nearby ecological receptors. Therefore, the Applicant has commissioned this strategy in order to provide definition to the type and level of lighting that will be employed at the Proposed Development.

1.5.3 The following stages have therefore been undertaken in order to consider and define potential constraints on the lighting scheme associated with the Proposed Development:

- A review of pertinent standards and guidance;
- Identification of the type and location of the light sensitive receptors;
- Classification of the surrounding area with regard to the Environmental Zones as set out in the Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light (Ref 10);
- Setting obtrusive light limits for the exterior lighting installation;
- Providing a general lighting strategy that is capable of providing visual comfort and performance for various tasks undertaken by site personnel within exterior areas;
- Providing a general lighting strategy for the exterior lighting installation that is capable of achieving the obtrusive light limits;
- Providing a general lighting control strategy that enables part lighting to be used at specific locations and at set times in order to facilitate the use of infrared closed circuit television (CCTV) in lieu of security lighting; and
- Providing a general strategy for mitigation measures to adequately control obtrusive light.

1.5.4 At the detailed design stage, a computational light modelling exercise will be undertaken. This will ensure that the Site is adequately lit and also that obtrusive light is suitably

controlled, in accordance with this Strategy. The Applicant proposes that these matters are secured by requirement attached to the Draft DCO (Application Document Ref. 2.1).

## 2.0 OBTRUSIVE LIGHT STANDARDS AND GUIDANCE

### 2.1 Legislative Background

2.1.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act 2005 (Ref 1) as a form of statutory nuisance under the Environmental Protection Act 1990 (the 'EPA') which was amended in 2006 to include the following nuisance definition:

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

2.1.2 Although light was described as having the potential to cause statutory nuisance, no prescriptive limits or rules were set for impact assessment purposes. Guidance notes for the Reduction of Obtrusive Light produced by the Institute of Lighting Professionals (ILP, 2012) (Ref 10) have, therefore, been referred to for the purposes of this assessment.

2.1.3 Guidance produced on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005 places a duty on local authorities to ensure that their areas are checked periodically for existing and potential sources of statutory nuisances, including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or reoccur, local authorities must issue an abatement notice (in accordance with Section 80(2) of the EPA 1990), requiring that the nuisance cease or be abated within a set timescale.

### 2.2 Planning Policy Context

#### National Policy Statements

2.2.1 The overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change, 2011) (NPS EN-1) states:

*“The applicant should assess the potential for...artificial light to have a detrimental impact on amenity, as part of the Environmental Statement.*

- *In particular, the assessment provided by the applicant should describe:*
- *the type, quantity and timing of emissions;*
- *aspects of the development which may give rise to emissions;*
- *premises or locations that may be affected by the emissions;*
- *effects of the emission on identified premises or locations; and*
- *measures to be employed in preventing or mitigating the emissions.”*

and

*“The IPC should satisfy itself that:*

- *an assessment of the potential for artificial light...to have a detrimental impact on amenity has been carried out; and*
- *that all reasonable steps have been taken, and will be taken, to minimise any such detrimental impacts.”*



## National Planning Policy Framework

- 2.2.2 The National Planning Policy Framework (NPPF) (Department for Communities and Local Government (DCLG), 2019) states that the purpose of the planning system is to contribute to the achievement of sustainable development and constitute the Government's view on what sustainable development in England means in practice for the planning system. A principal concept contained within the NPPF is the presumption in favour of sustainable development and with regard to artificial lighting, the NPPF states:

*"...By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation..."*

## 2.3 International Guidance

- 2.3.1 The Commission Internationale De L'eclairage (CIE) 150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (the 'CIE 150') (CIE, 2003) (Ref 6) is an aid to formulating guidelines for assessing the environmental effects of exterior lighting and provides limits for relevant lighting parameters to control the obtrusive effects of exterior lighting to tolerable levels. CIE 150 refers to the potentially adverse effects of exterior lighting on both natural and man-made environments.
- 2.3.2 CIE 126: Guidelines for Minimising Sky Glow (CIE, 1997) (Ref 5) gives general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for exterior lighting installations. These values are regarded as limiting values. Lighting designers should strive to meet the lowest criteria for the design. Practical implementation of the general guidance is left to national regulations.

## 2.4 National Guidance

### ILP Guidance Notes

- 2.4.1 The ILP Guidance Notes (ILP, 2012) (Ref 10) propose lighting guidance and criteria for local authorities with a recommendation that these are incorporated at the local plan level. The ILP Guidance Notes define various forms of light pollution and describe a series of environmental zones. The ILP Guidance Notes provide suitable criteria against which the effects of artificial lighting can be assessed. This assessment has been based upon these criteria.

### ILP Criteria (General Observers)

- 2.4.2 The obtrusive lighting constraints for the Site are based on statutory guidance issued by the Department for the Environment, Food and Rural Affairs (Defra, 2006) to support the implementation of the Clean Neighbourhoods and Environment Act 2005 and non-statutory guidance on obtrusive light limits published by the ILP. The limits are set out in the ILP Guidance Notes (ILP, 2012).
- 2.4.3 The ILP has developed an Environmental Zone classification system for the categorisation of receptor locations. This is summarised in Table 2.1 below.

**Table 2.1 - ILP Environmental Zone Classifications**

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark landscapes	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness areas	Rural, small village, or relatively dark urban locations
E3	Suburban	Medium district brightness	Small town centres or urban locations
E4	Urban	High district brightness areas	Town/city centres with high levels of night-time activity

2.4.4 For each Environmental Zone, obtrusive light limits for exterior lighting installations are specified and are summarised in Table 2.2 below. These are intended to support decision makers in establishing whether obtrusive lighting is detrimental to local amenity or a potential statutory nuisance.

**Table 2.2 - ILP Obtrusive Light Limits for Exterior Lighting Installations**

Environmental Zone	Max Sky Glow ULR %	Light Trespass (into windows) $E_v$ (lx)		Source Intensity I (kcd)	
		Pre-curfew*	Post-curfew	Pre-curfew	Post-curfew
E0	0	0	0	0	0
E1	0	2	1	2.5	0
E2	2.5	5	1	7.5	0.5
E3	5.0	10	2	10	1.0
E4	15.0	25	5	25	2.5

\*Curfew: The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by a government controlling authority, usually the local government. If not otherwise stated – 23:00hrs is suggested.

2.4.5 There are also criteria within the ILP Guidance Notes (ILP, 2012) (Ref 10) relating to limiting levels of luminance to buildings i.e. controlling how brightly they are luminated. However, the Site does not have any buildings which are intentionally lit by design and so the luminance criteria are not applicable in this case. As a matter of good lighting design practice however, lighting will be selected, positioned and aimed such that any building luminance is limited.

### ILP Criteria (Road Users)

2.4.6 Disability and discomfort glare arising from obtrusive light affecting road users is also addressed within the ILP Guidance Notes (ILP, 2012). Table 2.3 below sets out the threshold increment requirements and the veiling luminance limits.

**Table 2.3 - ILP Glare Limits for Exterior Lighting Installations (road users)**

Obtrusive Light Limits for Exterior Lighting Installations – Road Users		
Road Classification	Threshold Increment (TI)	Veiling Luminance (L <sub>v</sub> )
No road lighting	15% based on adaptation luminance of 0.1 cd/m <sup>2</sup>	0.04
ME6 / ME5	15% based on adaptation luminance of 1 cd/m <sup>2</sup>	0.25
ME4 / ME3	15% based on adaptation luminance of 2 cd/m <sup>2</sup>	0.40
ME2 / ME1	15% based on adaptation luminance of 5 cd/m <sup>2</sup>	0.84

### BS EN 12464-2: 2014 Glare Criteria (Railways)

2.4.7 Disability and discomfort glare affecting railway users is addressed in BS EN 12464-2: 2014 (BSI, 2014). It is considered a reasonable approach to adopt the lighting scheme glare limits as suitable obtrusive light limits. Table 2.4 below sets out the glare rating limits for the railways.

**Table 2.4 - BS EN 12464-2: 2014 Glare Rating Limits for railways and tramways**

Type of area, task or activity	R <sub>GL</sub>
Freight track, short duration operations	50
Walkways in railway areas, open footbridges	50
Freight track, continuous operation	50
Open platforms in freight areas	50
Railway yards handling areas	50
Coupling area	45

### 3.0 LIGHTING DESIGN STANDARDS AND GUIDANCE

#### 3.1 British Standards

BS EN 12464-2: 2014 'Light and lighting – Lighting of workplaces. Part 2: Outdoor work places' (British Standards Institute, 2014) (Ref 1)

3.1.1 This standard specifies lighting requirements for outdoor work places, which meet the needs for visual comfort and performance. All usual visual tasks are considered. Criteria that are potentially relevant to the Site are given in Tables 3.1 to 3.8 below.

**Table 3.1 - BS EN 12464-2: 2014 General requirements for areas and for cleaning at outdoor work places**

Type of area, task or activity	Average $E_m$ lx	$U_o$	$R_{GL}$	$R_a$
Walkways exclusively for pedestrians	5	0.25	50	20
Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0.40	50	20
Regular vehicle traffic (max. 40 km/h)	20	0.40	45	20
Pedestrian passages, vehicle turning, loading and unloading points	50	0.40	50	20
Cleaning and servicing	50	0.25	50	20

**Table 3.2 - BS EN 12464-2: 2014 General requirements for building sites**

Type of area, task or activity	Average $E_m$ lx	$U_o$	$R_{GL}$	$R_a$
Clearance, excavation and loading	20	0.25	55	20
Construction areas, drain pipes mounting, transport, auxiliary and storage tasks	50	0.40	50	20
Framework element mounting, light reinforcement work, wooden mould and framework mounting, electric piping and cabling	100	0.40	45	40
Element jointing, demanding electrical, machine and pipe mountings	200	0.50	45	40

**Table 3.3 - BS EN 12464-2: 2014 General requirements for industrial sites and storage areas**

Type of area, task or activity	Average $E_m$ lx	$U_o$	$R_{GL}$	$R_a$
Short-term handling of large units and raw materials, loading and unloading of solid bulk goods	20	0.25	55	20
Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms	50	0.40	50	20

Type of area, task or activity	Average E <sub>m</sub> lx	U <sub>o</sub>	R <sub>GL</sub>	R <sub>a</sub>
Reading of addresses, covered loading platforms, use of tools, ordinary reinforcement and casting tasks in concrete plants	100	0.50	45	20
Demanding electrical, machine and piping installations, inspection	200	0.50	45	60

**Table 3.4 - BS EN 12464-2: 2014 General requirements for parking areas**

Type of area, task or activity	Average E <sub>m</sub> lx	U <sub>o</sub>	R <sub>GL</sub>	R <sub>a</sub>
Light traffic, e.g. parking areas of shops, terraced and apartment houses; cycle parks	5	0.25	55	20
Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes	10	0.25	50	20
Heavy traffic, e.g. parking areas of major shopping centres	20	0.25	50	20

**Table 3.5 - BS EN 12464-2: 2014 General requirements for power, electricity, gas and heat plants**

Type of area, task or activity	Average E <sub>m</sub> lx	U <sub>o</sub>	R <sub>GL</sub>	R <sub>a</sub>
Pedestrian movements within electrically safe areas	5	0.25	50	20
Handling of servicing tools, coal	20	0.25	55	20
Overall inspection	50	0.40	50	20
General servicing work and reading of instruments	100	0.40	45	40
Repair of electric devices	200	0.50	45	60

**Table 3.6 -BS EN 12464-2: 2014 General requirements for railways and tramways**

Type of area, task or activity	Average E <sub>m</sub> lx	U <sub>o</sub>	R <sub>GL</sub>	R <sub>a</sub>
Freight track, short duration operations	10	0.25	50	20
Walkways in railway areas, open footbridges	10	0.25	50	20
Freight track, continuous operation	20	0.40	50	20
Open platforms in freight areas	20	0.40	50	20
Railway yards handling areas	30	0.40	50	20
Coupling area	30	0.40	45	20

### 3.2 Guidance and Reference Documents

#### The Society of Light & Lighting (SLL) Handbook (SLL, 2009)

3.2.1 Aimed at lighting practitioners, specifiers and students of lighting, this handbook summarises the fundamentals of light and vision, the technology of lighting and guidance on a wide range of applications, both interior and exterior. It is intended to act as a link between the SLL's 'Code for Lighting' and the Lighting Guides (LG). The handbook also includes a chapter dedicated to exterior workplace lighting (Chapter 17) which has been referred to in the production of this report. Criteria that are potentially relevant to the Site are given in Tables 11 and 12 below.

**Table 3.7 SLL Handbook illuminance recommendations for exterior workplaces**

Activity	Minimum maintained illuminance (lx)	Illuminance uniformity
Safe pedestrian movement in low risk areas	5	0.15
Safe movement of slow vehicles	10	0.25
Safe movement in medium risk areas	20	0.25
Normal traffic	20	0.4
Very rough work	20	0.25
Rough work	50	0.25
Safe movement in high risk areas	50	0.4
Normal work	100	0.4
Fine work	200	0.5

**Table 3.8 - SLL Handbook recommendations for loading**

Application	Horizontal illuminance (lx)	Horizontal illuminance uniformity	Maximum glare rating	Minimum colour rendering index
Loading bay	150	-	-	40
Outdoor loading area	100	0.5	45	20

#### The SLL Code for Lighting: 2012 (SLL, 2012)

3.2.2 The SLL Code for Lighting provides information on three areas of lighting practice:

- 1) A summary of the effects of lighting on task performance, behaviour, safety, perception, health, and its financial and environmental costs;
- 2) A compendium of lighting recommendations relevant to the UK, and
- 3) Detailed descriptions of the calculations required for quantitative lighting design.

3.2.2 The lighting requirements for workplaces as set out in the SLL Code are very much aligned with those as set out in BS EN 12464-2: 2014 and so are not expanded on in this section.

### 3.3 Civil Aviation Authority Requirements

#### **Civil Aviation Authority (CAA) Policy Statement ‘Lighting of En-Route Obstacles and Onshore Wind Turbines’ (CAA, 2010)**

3.3.1 This Policy Statement provides an overview of the more generic need for aviation warning lighting on ‘tall structures’ and onshore wind turbines as set out at Article 219 of the UK Air Navigation Order (ANO) 2009. The CAA Policy Statement clarifies,

*“Notwithstanding the Article 219 requirements, some structures of a height of less than 150 metres might need aviation warning lights”.*

3.3.2 Whilst structures of such heights are not routinely lit for civil aviation purposes, it is possible that aviation stakeholders, including the CAA, may make a case for aviation warning lighting where a structure is considered, by virtue of its location and nature, a significant navigational hazard.

#### **Air Navigation: The Order and the Regulations CAP 393 (CAA, 2014a)**

3.3.3 Article 219 of the Air Navigation Order sets out the requirements for the lighting of en-route obstacles and is reproduced below:

*“(1) The person in charge of an en-route obstacle must ensure that it is fitted with medium intensity steady red lights positioned as close as possible to the top of the obstacle and at intermediate levels spaced so far as practicable equally between the top lights and ground level with an interval of not more than 52 metres.*

*(2) The person in charge of an en-route obstacle must, subject to paragraph (3), ensure that by night the lights required to be fitted by this article are displayed.*

*(3) In the event of the failure of any light which is required by this article to be displayed by night the person in charge must repair or replace the light as soon as reasonably practicable.*

*(4) At each level on the obstacle where lights are required to be fitted, sufficient lights must be fitted and arranged so as to show when displayed in all directions.*

*(5) In any particular case the CAA may direct that an en-route obstacle must be fitted with and must display such additional lights in such positions and at such times as it may specify.*

*(6) A permission may be granted for the purposes of this article for a particular case or class of cases or generally.*

*(7) This article does not apply to any en-route obstacle for which the CAA has granted a permission to the person in charge permitting that person not to fit and display lights in accordance with this article.*

*(8) In this article, an ‘en-route obstacle’ means any building, structure or erection, the height of which is 150 metres or more above ground level, but it does not include a building, structure or erection:*

*(a) Which is in the vicinity of a licensed aerodrome; and*

*(b) to which section 47 of the Civil Aviation Act 1982(a) (warning of presence of obstructions near licensed aerodromes) applies.”*

3.3.4 Article 221 of the Air Navigation Order sets out the restrictions on lights liable to endanger and is reproduced below:

*“(1) A person must not exhibit in the United Kingdom and light which:*

*(a) by reason of its glare is liable to endanger aircraft taking off from or landing at an aerodrome; or landing at an aerodrome; or*

*(b) by reason of its liability to be mistaken for an aeronautical ground light is liable to endanger aircraft.*

*(2) If any light which appears to the CAA to be a light described in paragraph (1) is exhibited, the CAA may direct the person who is the occupier of the place where the light is exhibited or who has charge of the light, to take such steps within reasonable time as are specified in the direction:*

*(a) to extinguish or screen the light; and*

*(b) to prevent in the future, the exhibition of any other light which may similarly endanger aircraft.*

*(3) The direction may be served either personally or by post, or by affixing it in some conspicuous place near to the light to which it relates.”*

*CAP 1096: Guidance to Crane Operators on Aviation Lighting and Notification (CAA, 2014b)”*

3.3.5 This briefing sets out the requirements for aviation warning lighting to cranes and sets out the potential requirement for crane activity to be notified to the aviation community.



## 4.0 OBTRUSIVE LIGHT RECEPTORS

### 4.1 Introduction

4.1.1 There are several 'categories' of potentially light sensitive receptors: these being, commercial, residential, ecological, road and rail. As the design of the Proposed Development progresses, it will be necessary to scope current and possibly future receptors and undertake a computational light modelling exercise in order to ensure that obtrusive light is suitably controlled. This section sets out indicative light-sensitive receptor locations for consideration when undertaking such an obtrusive light assessment, The indicative light-sensitive receptors are also illustrated in Figure 1 of this report.

### 4.2 Commercial receptors

4.2.1 Lindsey Oil Refinery's (TLOR) car park and office portacabins are neighbouring the site boundary.

### 4.3 Residential Receptors

4.3.1 Residential light-sensitive receptor locations have been identified at the following locations:

- A single residential property on Marsh Lane, east of the Site;
- The villages of South and North Killingholme, located approximately 1.4km and 1.6km west/ southwest of the Site respectively;
- The town of Immingham, located approximately 1.8km south of the Site; and
- Residential properties in the vicinity of Chase Hill Road, located approximately 2.2km northwest of the Site.

### 4.4 Road Receptors

4.4.1 Rosper Road runs approximately north-south immediately east of the Site. Rosper Road joins Humber Road approximately 480m to the southeast of the Site at a recently improved gyratory junction. Humber Road then passes underneath the railway line before joining the A160 at a roundabout. The A160 is dualled in both directions westwards from this roundabout towards the A180 and M180.

### 4.5 Rail Receptors

4.5.1 A rail line runs south east and west of the Site.

### 4.6 Ecological Receptors

4.6.1 There are a number of statutory and non-statutory nature conservation sites in the vicinity of the Site. These include the following:

- Fields on the other side of Rosper Road supporting birds from the European site (Estuary)
- Humber Estuary Special Conservation Area (SAC), Special Protection Area (SPA), Ramsar site, and Site of Special Scientific Interest (SSSI) located 1.4km north east of the Site;

- North Killingholme Haven Pits (SSSI) located 2km north of the Site, overlapping with the Humber Estuary Ramsar and SPA site;
- Eastfield Road Railway Embankment Local Wildlife Site (LWS), located 1km west of the Site;
- Burkinshaw's Covert LWS, located 400m north east of the Site;
- Station Road Field LWS, located 400m north of the Site; and
- Rosper Road Pools LWS, located 245m south of the Site.

## 5.0 OPERATIONAL OBTRUSIVE LIGHT LIMITS

### 5.1 Proposed Obtrusive Light Limits (Residential Receptors)

5.1.1 It is considered appropriate for the purposes of controlling obtrusive light affecting residential receptors that suitable obtrusive lighting level limits with regard to the ILP Environmental Zone for the areas surrounding the Site would be those as set out in Zone E3 i.e. a suburban area of medium district brightness.

5.1.2 Therefore, the proposed permitted obtrusive light level limits for residential receptors are as follows:

- An on-site Upward Lighting Ratio of 5%;
- A light trespass limit at residential windows of 10 lx. If the ILP curfew levels were imposed, then this limit would reduce to 2 lx post-curfew; and
- A source intensity limit when viewed from receptor locations of 10 kcd. If the ILP curfew levels were imposed, then this limit would reduce to 1 kcd post-curfew.

### 5.2 Proposed Obtrusive Light Limits (Road Users)

5.2.1 The Rosper Road has the potential to be affected by disability glare and veiling luminance associated with the Proposed Development lighting scheme, The constraints criteria to be adopted will be confirmed at a later date upon further analysis that considers the lighting classes already in place. It is important that a suitably segmented analysis is undertaken that accounts for variations in lighting class along this stretch of road.

5.2.2 The proposed permitted obtrusive light level limits for road users are as follows:

- No road lighting: threshold increment of 15% based on adaptation luminance of 0.1 cd/m<sup>2</sup> and veiling luminance of 0.04;
- ME6/ ME5: threshold increment of 15% based on adaptation luminance of 1 cd/m<sup>2</sup> and veiling luminance of 0.25;
- ME4/ ME3: Threshold increment of 15% based on adaptation luminance of 2 cd/m<sup>2</sup> and veiling luminance of 0.40; and
- ME2/ ME1: Threshold increment of 15% based on adaptation luminance of 5 cd/m<sup>2</sup> and veiling luminance of 0.84.

### 5.3 Proposed Obtrusive Light Limits (Railway)

- The existing railway has the potential to be affected by glare associated with the Site lighting scheme. The proposed permitted obtrusive light level limits for the railway are as follows:
- Glare rating limit of RGL = 50 to general railway areas; and
- Glare rating limit of RGL = 45 to coupling areas.

### 5.4 Proposed Obtrusive Light Limits (Ecological Receptors)

5.4.1 The Site lighting scheme will be designed to generally minimise any impact on ecological receptors by means of minimising illuminance at the receptors, along with the 'viewed'

source intensity. The permitted obtrusive light level limits for the ecological receptors will be reviewed at detailed design stage and updated if necessary following pre-construction ecological surveys. As indicative constraints for the Proposed Development's lighting design, the following criteria are suggested as being reasonable at this stage, given the relatively low sensitivity of the identified ecological receptors:

- Target illuminance levels of less than 1 lx;
- An upper limit illuminance level of 3 lx; and
- Source intensity values not to exceed ILP human receptor criteria.

## 6.0 SITE LIGHTING REQUIREMENTS - CONSTRUCTION PHASE

### 6.1 Introduction

6.1.1 Construction site lighting will be required as part of on-site security and health and safety requirements. The associated potential obtrusive light effects towards surrounding receptors would be minimised through the controlled application of lighting in accordance with current best practice. It is anticipated that the key temporary lighting sources during the construction phase will be the following:

- General floodlighting and security lighting associated with meeting health & safety and security requirements in temporary parking areas;
- Security and health & safety lighting associated with specific on-going working areas, where equipment is stored and safety hazards may be present; and
- Lighting required for operational purposes associated with any construction work around and after sunset.

6.1.2 Artificial site lighting is capable of resulting in obtrusive light if poorly controlled. However, when careful consideration is given to the type, location and aiming of construction lighting, its impact, in considering magnitude and duration can be considerably reduced.

6.1.3 Some night-time construction work may be required, and lighting during normal working hours will be necessary during winter months.

6.1.4 Obtrusive lighting can be suitably controlled by adopting the general mitigation measures as set out in this report. The control of obtrusive construction lighting will be dealt with by the Construction Environmental Management Plan (CEMP), a framework of which is included within Appendix 4A of ES Volume III (Application Document Ref No. 6.4).

### 6.2 Recommended Lighting Values

6.2.1 The lighting strategy for the Site during construction is given in the form of a lighting requirements specification below. This is intended to be an outline design strategy only rather than a detailed design solution for the reasons presented in Section 2.

### 6.3 Site Lighting Levels

6.3.1 The following lighting levels are considered appropriate for the Proposed Development during the Construction Phase:

- Clearance, excavation and loading: 20 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 55, minimum colour rendering index of Ra 20;
- Construction areas, drain pipes mounting, transport, auxiliary and storage tasks: 50 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
- Framework element mounting, light reinforcement work, wooden mould and framework mounting, electric piping and cabling: 100 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 45, minimum colour rendering index of Ra 40; and

- Element jointing, demanding electrical, machine and pipe mountings: 200 lx maintained average horizontal illuminance, 0.50 minimum uniformity, glare rating limit of RGL 45, minimum colour rendering index of Ra 40.

## **6.4 Aviation Warning Lighting**

- 6.4.1 Cranes in excess of 150 m high above local ground level, if required, will be fitted with 'medium intensity' (2 kcd) steady 'red lights', mounted as close as possible to the top of the structure, the extremes of the jib, and also at intermediate levels not exceeding 52 m apart. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. The lighting will operate from half an hour after sunset until half an hour before sunrise.
- 6.4.2 Cranes that are between 90 m and 150 m high above local ground level will be fitted with 'medium intensity' (2 kcd) steady 'red lights', mounted as close as possible to the top of the structure and the extremes of the jib. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. The lighting will operate from half an hour after sunset until half an hour before sunrise.
- 6.4.3 Cranes that are between 60 m and 90 m high above local ground level will be fitted with 'low intensity' steady 'red lights', mounted as close as possible to the top of the structure and the extremes of the jib. For tower cranes the lighting will be fixed to the top of the fixed structure. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. Lighting will be activated Dusk to Dawn and in the event of inclement weather and low ambient lighting levels As a recommendation, the lighting will operate when levels fall below 70 lux and be switched off when light levels rise above 35 lux. This can be agreed with the local authority.
- 6.4.4 The contractor will be responsible for informing the CAA and the Defence Geographic Agency as required by CAA CAP 1096 (CAA, 2014b).

## 7.0 SITE LIGHTING REQUIREMENTS - OPERATIONAL PHASE

### 7.1 Introduction

7.1.1 The Proposed Development will require the installation of a number of luminaires to provide visual comfort, safety and performance. This section sets out the general strategy for the operational site lighting.

### 7.2 Recommended Operational Lighting Values

7.2.1 The lighting strategy for the Site when operational is given in the form of a lighting requirements specification below. This is intended to be an outline design strategy only rather than a detailed design solution.

### 7.3 Operational Site Lighting Levels

7.3.1 The following lighting levels are considered appropriate for the Proposed Development during the Operational Phase:

- Designated walkways - walkways exclusively for pedestrians: 5 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
- Site roads - regular vehicle traffic (max. 40 km/h): 20 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 45, minimum colour rendering index of Ra 20;
- Pedestrian routes intersecting and bounding site roads, lorry parking area - pedestrian passages, vehicle turning, loading and unloading points: 50 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
- Car park, possible car parking - car parks: 10 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
- Container storage area - short-term handling of large units and raw materials, loading and unloading of solid bulk goods: 20 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 55, minimum colour rendering index of Ra 20; and
- Gatehouse, weighbridges – normal work: 100 lx maintained average horizontal illuminance, 0.4 minimum uniformity.

7.3.2 Unlike some categories of artificially lit exterior areas, for example a retail car park, for which post-store closure may only have requirements for security lighting, at the Site there is no definite time for beyond which the lighting needs will reduce for the remainder of the night, as the plant will operate 24 hours a day.

7.3.3 At the Site, there will therefore be the need to provide visual comfort and performance throughout an entire period of darkness or reduced daylighting. For this reason it is considered that imposing a lighting curfew for obtrusive lighting would be unreasonable and would have the potential to conflict with achieving the required visual performance at the Site for safety and operational reasons.

- 7.3.4 This is in line with the ILP Obtrusive Light Guidance, which states; *“the notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced”*.
- 7.3.5 BS EN 12464-2: 2014 (BSI, 2014) states the following with regard to obtrusive illuminance pre and post curfew regulations, *“In case no curfew regulations are available, the higher values shall not be exceeded and the lower values should be taken as preferable limits”*.
- 7.3.6 It is considered that a part-lighting strategy could be suitable for the Site. This will not only result in reduced impact of obtrusive lighting due to a reduced on-time but will also serve to reduce energy costs. The lighting could be split into two circuits: 1) security lighting and 2) amenity lighting. Amenity lighting could be split further into amenity for deliveries and amenity for staff. This would allow a part lighting strategy to be adopted across the Site, thus minimising the light impact on the surrounding receptors.
- 7.3.7 During hours of darkness, a reduction in total lumen output from the lighting scheme may be achieved if controls and sensors are adopted in certain areas. The exact luminaires to be switched off during these times will be carefully considered once staff working patterns and areas to be accessed have been finalised to ensure that suitable lighting levels are maintained.
- 7.3.8 Photocells are to be used as a primary control on all exterior lighting so that no luminaires will remain switched on during hours of daylight. In addition, programmable timers will be included so that amenity lighting circuits can be programmed to turn on/off as and when needed to suit the delivery times and staff working patterns.
- 7.3.9 A manual override switch shall be provided to override all control of exterior lighting in the event of an emergency.
- 7.4 Operational Aviation Warning Lighting**
- 7.4.1 As the stack for the Proposed Development has a maximum height of 50m Above Ground Level and does not represent the tallest structure in the area, there are no plans to install aviation warning lighting.



## **8.0 GENERAL OBTRUSIVE LIGHT IMPACT AVOIDANCE MEASURES**

8.1.1 Through the adoption of good lighting design practice, incorporating general obtrusive lighting impact avoidance measures such as those described below, obtrusive light will be suitably controlled. It should be noted that the measures listed below are indicative only, and the final measures will be subject to detailed design.

8.1.2 General obtrusive lighting impact avoidance measures may include:

- Adopting a part lighting strategy;
- Using photocells as a primary means of control;
- Where possible, adopting LED luminaires to control obtrusive light due to its high directionality and accordingly the achievable ratio of useful to spill light;
- Careful consideration to column locations and luminaire positioning;
- Adopting luminaires with minimal upward lighting ratio;
- Not tilting luminaires to have uplift above the horizontal;
- Optimising column heights;
- Minimising building mounted luminaire heights;
- Angling building mounted luminaires to limit the level of building luminance;
- Adopting lamps with similar correlated colour temperatures;
- Using shields and baffles to luminaires; and
- Lighting the site boundaries with low power periphery lighting with an asymmetric forward optic having good rear spill cut-off characteristics.

## 9.0 CONCLUSIONS

- 9.1.1 This Indicative Lighting Strategy has been prepared in order to support the Application for the Proposed Development.
- 9.1.2 At the time of submission of the Application, the contractor has not been appointed and detailed design work for the Proposed Development has not been completed. Therefore, detailed information on the lighting to be used at the Proposed Development is currently unknown. Nevertheless, it is recognised that potential nuisance from lighting of the Proposed Development may be a concern for local communities and certain statutory consultees. Therefore, the Applicant has commissioned this strategy in order to provide some definition to the type and level of lighting that will be employed at the Proposed Development.
- 9.1.3 This document therefore sets out the lighting strategy in the form of an outline lighting requirements specification for site lighting. It also addresses obtrusive lighting by means of specifying off-site obtrusive lighting constraints.
- 9.1.4 The report also identified potential measures that may be taken to control obtrusive light through the detailed design of the Proposed Development lighting scheme.

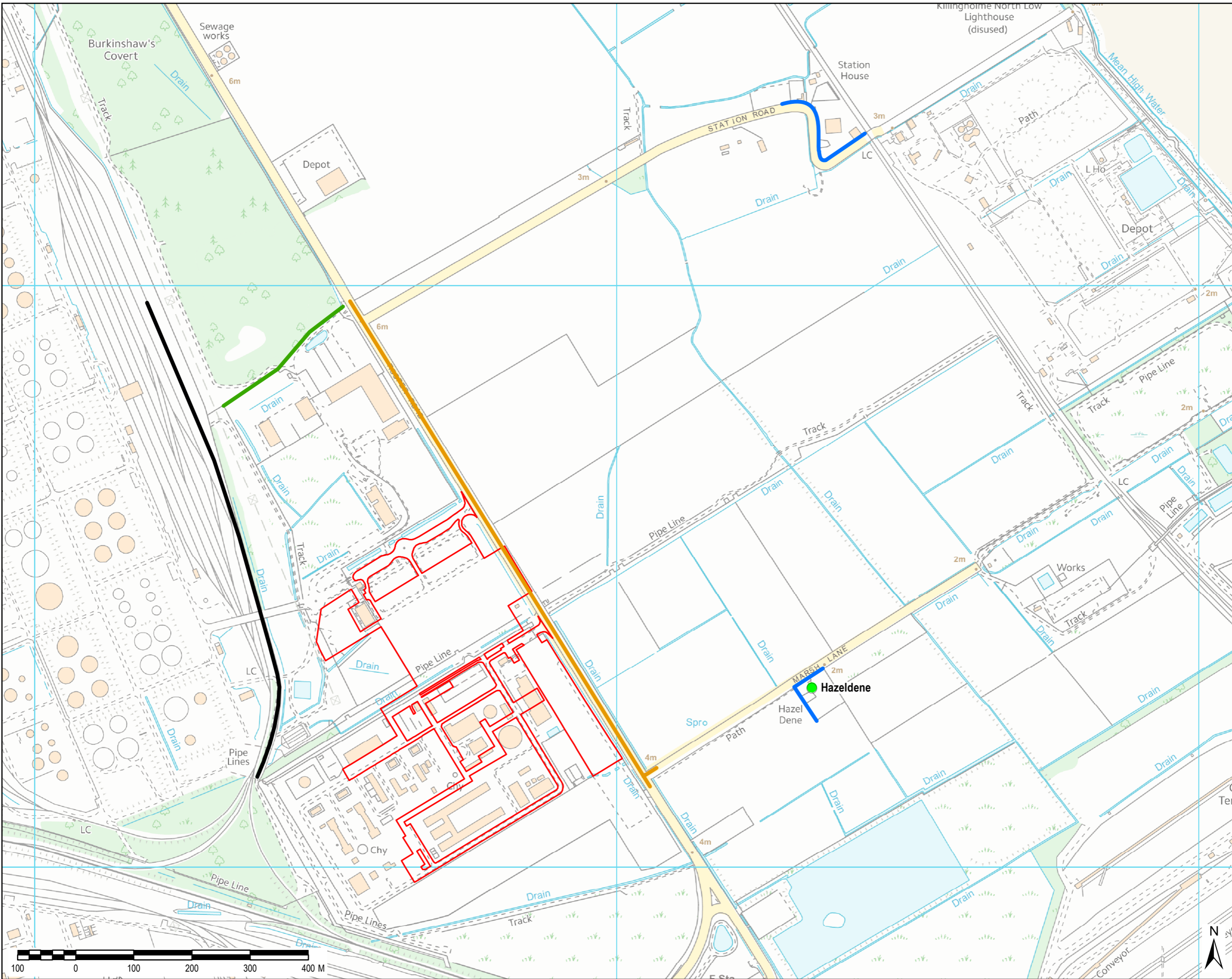
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## 10.0 REFERENCES

- Ref 1 - British Standards Institute (2014) *BS EN 12464-2: 2014 'Light and lighting – Lighting of workplaces. Part 2: Outdoor work places'*.
- Ref 2 - Civil Aviation Authority (2010) Policy Statement: Lighting of En-Route Obstacles and Onshore Wind Turbines.
- Ref 3 - Civil Aviation Authority (2014a) CAP 393 Air Navigation: The Order and The Regulations.
- Ref 4 - Civil Aviation Authority (2014b) CAP 1096: Guidance to Crane Operators on Aviation Lighting and Notification.
- Ref 5 - Commission Internationale De L'Eclairage (1997) CIE 126: Guidelines for Minimising Sky Glow.
- Ref 6 - Commission Internationale De L'Eclairage (2003) CIE 150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations.
- Ref 7 - Department for Communities and Local Government (2012) National Planning Policy Framework.
- Ref 8 - Department of Energy and Climate Change (2011) Overarching National Policy Statement for Energy (EN-1)
- Ref 9 - Department for Environment, Food and Rural Affairs (2006) Statutory Nuisance from Insects and Artificial Light: Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005
- Ref 10 - Institute of Lighting Professionals (2012) Guidance Notes for the Reduction of Obtrusive Light.
- Ref 11 - Society of Light and Lighting (2009) The Society of Light & Lighting Handbook.
- Ref 12 - Society of Light and Lighting (2012) The Society of Light & Lighting Code for Lighting.

**Figure 1: Lighting Strategy Plan**

File Name: K15004 - Information Systems\60547702\Immingham Gas Pipeline\02\_Maps\Power Plant Site\OCGT Full ES 2019\Lighting Scheme\Figure 5.9 Lighting Receptors.mxd



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

- LEGEND**
- Red Line Boundary
  - Residential Light Sensitive Receptor
  - Lighting Receptor
  - Ecological
  - Rail User
  - Residential User
  - Road User

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Purpose of Issue  
**INDICATIVE LIGHTING STRATEGY**

Client  
**VPI IMMINGHAM B LTD**

Project Title  
**PROPOSED 299MW OCGT POWER STATION**

Drawing Title  
**LIGHTING RECEPTORS  
FIGURE 2**

Drawn JW	Checked DH	Approved MS	Date 25/03/2019
AECOM Internal Project No. 60547702		Scale @ A3 1:6,000 / 1:5,000	Inset Map

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