

# H2Teesside Project

Planning Inspectorate Reference: EN070009/APP/5.8

Land within the boroughs of Redcar and Cleveland and Stockton-on-Tees, Teesside and within the borough of Hartlepool, County Durham

Document Reference: 5.8: Indicative Lighting Strategy (Operation)

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



**Applicant: H2 Teesside Ltd**

Date: March 2024

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## 1.0 EXECUTIVE SUMMARY

- 1.1.1 This Indicative Lighting Strategy (Operation) document discusses the type and level of lighting requirements and expected application areas for operation of the Proposed Development.
- 1.1.2 Section 2.0 introduces the Indicative Lighting Strategy (Operation) by providing an overview of the Proposed Development, the Applicant, the technology behind the Proposed Development and the DCO Order limits.
- 1.1.3 Section 3.0 provides an overview of the legislative background on light pollution, the planning policy context in National Policy Statements and the National Planning Policy Framework, before discussing international and national guidance available on limiting light pollution. A summary of the relevant technical and environmental lighting documents that are used to inform lighting design and mitigation strategies is set out.
- 1.1.4 Section 4.0 outlines the current baseline situation in terms of lighting character and identification of receptors sensitive to light near the Proposed Development Site and surrounding area, including residential and ecological.
- 1.1.5 Section 5.0 provides an overview of the overarching environmental requirements and advises on obtrusive light level limits that will be followed to minimise light spill and other obtrusive effects to receptors identified in Section 4.0.
- 1.1.6 Sections 6.0 discusses the Proposed Development Site lighting requirements for the operational phase of the Proposed Development.
- 1.1.7 Section 7.0 summarises a number of indicative impact avoidance measures which are to be adopted within the lighting strategy as good lighting design practice. Details of operational lighting will be confirmed at the detailed design stage, to be in substantial accordance with this Indicative Strategy, secured via a Requirement in the Draft DCO (EN070009/APP/4.1).
- 1.1.8 Section 8.0 discusses the expected performance outcome based on the Indicative Lighting Strategy (Operation) and in summary it is concluded that the Indicative Lighting Strategy (Operation) provides an appropriate outline of the lighting requirements for the Proposed Development as part of the Application and identifies measures which will be employed as required and which will adequately control obtrusive light through detailed design of the lighting scheme. The development and approval of these controls is secured through a Requirement in the Draft DCO (EN070009/APP/4.1).
- 1.1.9 Section 9.0 provides a summary of the references used to support this assessment.

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## 2.0 INTRODUCTION

### 2.1 Overview

- 2.1.1 This Indicative Lighting Strategy (Operation) (EN070009/APP/5.8) has been prepared on behalf of H2 Teesside Limited (the Applicant). It forms part of the application (the Application) for a Development Consent Order (a DCO), that has been submitted to the Secretary of State (the SoS) for the Department of Energy Security and Net Zero (DESNZ). The Applicant is seeking a DCO for the construction, operation (including maintenance where relevant) and decommissioning of the H2Teesside Project (the Proposed Development).
- 2.1.2 The Proposed Development is an up to 1.2-Gigawatt Thermal (GWth) Carbon Capture and Storage (CCS) enabled Hydrogen Production Facility, associated connections, temporary construction compound areas and landscape / ecological areas, on land in Redcar and Cleveland, Stockton-on-Tees, and Hartlepool (hereafter referred to as the Proposed Development Site).
- 2.1.3 The Hydrogen Production Facility together with the Hydrogen Pipeline Corridor will deliver low carbon H<sub>2</sub> to offtakers who may potentially use the H<sub>2</sub> in the future. The Hydrogen Production Facility has associated pipelines that are collectively referred to as the Connection Corridors. The Connection Corridors consist of the Carbon Dioxide (CO<sub>2</sub>) Export Corridor, Natural Gas Connection Corridor, Electrical Connection Corridor, Water Connection Corridor, and other gases connection pipelines which may be required for the transportation of compressed oxygen (O<sub>2</sub>) and nitrogen (N<sub>2</sub>) for use at the Production Facility (hereafter referred to as Other Gases Connection Corridor).

### 2.2 The Proposed Development Site

- 2.2.1 The Proposed Development Site covers an area of approximately 507 hectares (ha) and is located primarily within the administrative boundaries of Redcar and Cleveland Borough Council (RCBC) and Stockton-on-Tees Borough Council (STBC). The Hydrogen Pipeline Corridor extends further north-west to also include land within the administrative boundary of Hartlepool Borough Council (HBC). Refer to Figure 4-2: Parts of the Proposed Development Site (ES Volume II, EN070009/APP/6.3) to see the location of all components of the Proposed Development Site.
- 2.2.2 The Main Site, where the Hydrogen Production Facility will be located, comprises approximately 86 ha of former industrial land that was used for steel production, including a mix of industrial buildings. As of March 2024, much of the site infrastructure including industrial buildings and overhead pipes has either been demolished or is in the process of being dismantled. A combination of hardstanding and road networks remain on the Main Site, surrounded by informal vegetation (primarily grass), with occasional shrubs and small trees. Refer to Figure 4-1: Proposed Development Site (including location of the Main Site) (ES Volume II, EN070009/APP/6.3) for the location of the Main Site.

2.2.3 A more detailed description of the Site and its surroundings is provided at Chapter 3: Description of the Existing Environment in the Environmental Statement (ES) (ES Volume I, EN070009/APP/6.2).

## **2.3 The Proposed Development**

2.3.1 The Production Facility is an up to 1.2 GWth LHV (Lower Heat Value) (Phase 1, 600-Megawatt thermal (MWth) LHV and Phase 2, 600 MWth LHV) CCS enabled Hydrogen Production Facility with associated hydrogen transport pipeline network and utility connections, on land in Redcar and Cleveland, Stockton-on-Tees, and Hartlepool on Teesside.

2.3.2 The Hydrogen Production Facility and associated infrastructure which form part of the Proposed Development will be located on the Main Site. The Main Site is proposed to be located on land formerly part of the Redcar Steelworks.

2.3.3 The Connection Corridors will cross third-party land where required. Together, the Main Site and Connection Corridors are referred to as the Proposed Development Site. The Proposed Development Site, the location of the Main Site, Hydrogen Connection Corridor and the other Connection Corridors are shown on Figures 4-1 to 4-8 (ES Volume II, EN070009/APP/6.3).

2.3.4 Further detail on the Proposed Development is presented in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2).

## **2.4 Lighting Strategy Requirements**

2.4.1 The Proposed Development will require the installation of a number of luminaires to provide visual comfort, security and operational performance. This in turn will have the potential to introduce new obtrusive light effects to receptors which are sensitive to new or changed lighting within the night-time environment.

2.4.2 Key sensitive receptors that could be affected by a new lighting condition typically include:

- Residential amenity;
- Terrestrial and Marine Ecology; and
- Road / Rail users.

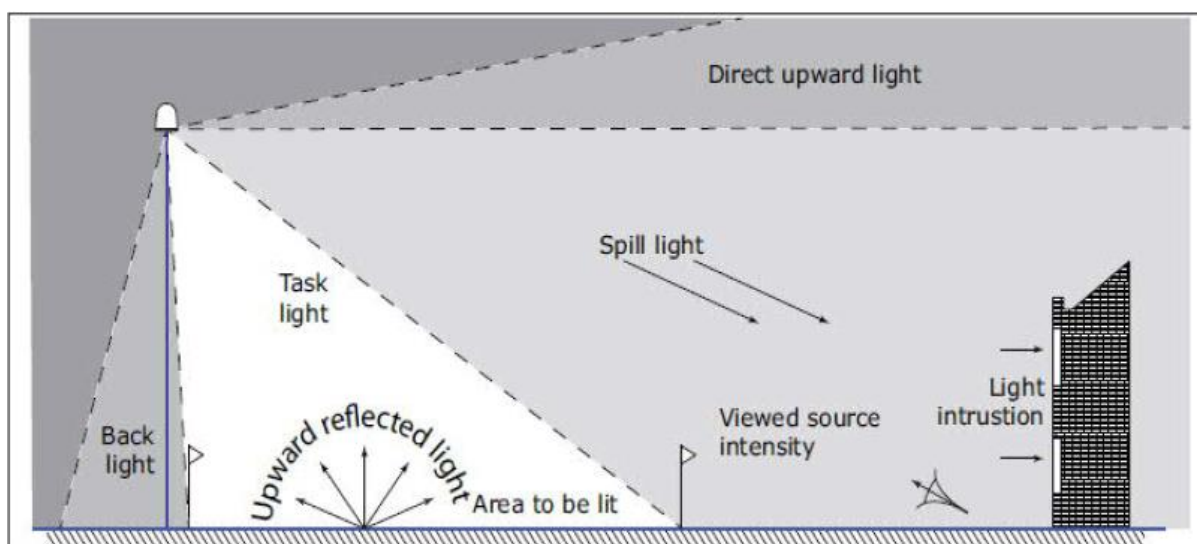
2.4.3 At the time of submission of the Application, the Engineering, Procurement and Construction (EPC) Contractor has not yet been appointed and detailed design work for the Proposed Development has not yet been carried out. Therefore, detailed information on the lighting to be used at the Proposed Development is not yet available. Nevertheless, it is recognised that to prevent potential nuisance from lighting, the Application should set out general proposals as to the purposes, types and levels of lighting required, to allow an appropriate level of control to be secured within the Application. In addition, the ES (in particular the landscape and visual, and ecology assessments) assumes that the measures to reduce obtrusive light at receptor locations as set out within this document are implemented.

## 2.5 Definition of Obtrusive Light

2.5.1 Obtrusive light, sometimes referred to as light pollution, whether it keeps someone awake through a bedroom window or impedes their view of the night sky, is a form of pollution, which may also be a nuisance in law and which can be substantially mitigated without detriment to the lighting requirements of the task.

2.5.2 Obtrusive light may be thought of as having three direct components; and are all forms of obtrusive light which may cause nuisance to others, adversely affect fauna and flora and waste money and energy. The three components of obtrusive light are as outlined below and illustrated on Plate 2-1; adapted from Figure 1 of the Institute of Lighting Professionals (ILP) Guidance Note 01 (GN01/21) (ILP, 2021):

- Sky glow - light that contributes to the brightening of the night sky, which is caused by direct upward light and upward reflected light;
- Glare – the uncomfortable brightness of a light source when viewed against a darker background (i.e. Viewed light source intensity); and
- Light intrusion (or light spill) – the spilling of light beyond the boundary of the property or area being lit.



**Plate 2-1: Types of Intrusive Light (Extract of Figure 1 in GN01/21 (ILP, 2021))**

2.5.3 The Indicative Lighting Strategy (Operation) is structured as followed:

- information on pertinent standards and guidance relating to obtrusive lighting and lighting design is outlined in Section 3.0;
- a description of the type and location of the light sensitive receptors in relation to the Proposed Development are presented in Section 4.0;
- obtrusive light limits for the Site that should be reflected when lighting is used, particularly near sensitive receptors are defined in Section 5.0;



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- operational lighting requirements for the Proposed Development are discussed in Sections 6.0;
  - proposed measures to avoid obtrusive light impacts are summarised in Section 7.0; and
  - Section 8.8.0 provides a summary and conclusions.
  - Section 9.9.0 provides a summary list of the reference documents within this report.

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## 3.0 LEGISLATION, POLICY, STANDARDS AND GUIDANCE

### 3.1 Legislative Background

3.1.1 Legislation addressing light pollution does not set out specific limiting criteria but does require that lighting not lead to a situation where a nuisance is created affecting human health, introducing harm to wildlife or introducing significant adverse effects on habitat/designated sites. Key legislation includes:

- Environmental Protection Act (HM Government, 1990);
- Clean Neighbourhoods and Environment Act 2005 (HM Government, 2005);
- Wildlife and Countryside Act (HM Government, 1981); and
- Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations) (HM Government, 2017a)

3.1.2 Light pollution was introduced within the Clean Neighbourhoods and Environment Act 2005 (HM Government, 2005) as a form of statutory nuisance under the Environmental Protection Act 1990 (the EPA) (HM Government, 1990) with the following nuisance definition:

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

3.1.3 It should be noted that although light has the potential to cause statutory nuisance (see also the Statutory Nuisance Statement (EN070009/APP/5.6), no prescriptive limits or rules are set for impact assessment purposes. ILP guidance GN01/21 (ILP, 2021) is a recognised guidance within the lighting industry that provides methodology and recommendations that support assessment. Therefore it has been used in developing appropriate limiting criteria for the lighting strategy.

3.1.4 Guidance produced by Department for Environment, Food and Rural Affairs (DEFRA, 2006) within the document Statutory Nuisance from Insects and Artificial Light on Section 101 to Section 103 of the Clean Neighbourhoods and Environment Act 2005 (HM Government, 2005) has also been referred to, which 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 Environmental Protection Act (EPA 1990) (HM Government, 1990), requiring that the nuisance cease or be abated within a set timescale.

3.1.5 It is a requirement of the Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations) (HM Government, 2017) that plans and projects are subject to an Appropriate Assessment if it is likely that they will lead to significant adverse effects on any European designated sites. As new lighting conditions will be considered an impact on ecological receptors. The measures in

this Indicative Lighting Strategy (Operation) have been developed to mitigate such impacts accordingly and are considered in the Report to Inform Habitats Regulations Assessment (HRA) (EN070009/APP/5.10).

### 3.2 Planning Policy

3.2.1 The following identify the current policies that are relevant to the topic of lighting and lighting impacts that need to be considered as part of a new lighting design, particularly those located in sensitive areas.

#### National Planning Policy

#### **The National Policy Statement for Energy (EN-1) (2023)**

3.2.2 The Overarching National Policy Statement (NPS) for Energy (EN-1) (DESNZ, 2023) states in paragraph 5.7.5:

*“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 Secretary of State 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.”

3.2.3 This Indicative Lighting Strategy (Operation) for the Proposed Development considers the lighting requirements with reference to relevant standards and guidance, and measures to avoid adverse effects on sensitive receptors, as required by NPS EN-1.

#### **National Planning Policy Framework**

3.2.4 The National Planning Policy Framework (NPPF) produced by the Department for Levelling Up, Housing and Communities (DLUHC, 2023) 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:

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

#### Aviation Lighting

- 3.2.5 An overview of the documentation informing Aviation lighting requirements is provided below, however please note that as aviation lighting requirements will be secured via a Requirement in the Draft DCO (EN070009/APP/4.1), aviation lighting is not covered in detail within this Strategy.

#### Civil Aviation Authority Policy Statement ‘Lighting of En-Route Obstacles and Onshore Wind Turbines’

- 3.2.6 The Civil Aviation Authority (CAA) Policy Statement (CAA, 2010) 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 2009 (superseded by Article 222 within UK Air Navigation Order 2016). 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”. 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.

#### The Air Navigation Order 2016

- 3.2.7 Article 222 of The Air Navigation Order (HM Government, 2016) 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.”*

3.2.8 Article 224 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 any 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.”*

### **3.3 Lighting Design Standards and Guidance**

3.3.1 The following documents identify the current standards and guidance that are relevant to the design and implementation of a new lighting design associated with the project.

3.3.2 Described below are certain relevant extracts of standards and guidance expected to be used when developing the exterior lighting design for the Proposed Development.

#### British Standards

3.3.3 British Standards (BS) are standards produced by the British Standards Institute (BSI) which provide a standard set of tools describing consistent requirements for design, installations, and use of different aspects of design. The following standards

are considered when developing and evaluating a new lighting installation, whether for construction or operational purposes:

- BS 5489-1:2020 Code of Practice for the Design of Road Lighting Part 1: Lighting of Roads and Public Amenity Areas (BSI, 2020);
- BS EN 13201-2:2015 – Code of Practice for the Design of Road Lighting – Part 2: Performance Requirements; and
- BS 12464-2: 2014 Lighting of Work Places – Outdoor Work Places (BSI, 2014).

3.3.4 All typical visual tasks which are likely to take place are considered and discussed further in Section 6.0.

#### Lighting Guidance

#### Chartered Institution of Building Services Engineers, Society of Light and Lighting Design Guidance

3.3.5 The Chartered Institution of Building Services Engineers (CIBSE) Society for Light and Lighting (SLL) has produced a series of lighting guides that address various approaches and requirements for lighting. The following guidance is considered when developing new exterior lighting installations:

- Lighting Guide 6 (LG6) – The Exterior Environment (2016);
- Lighting Guide 21 (LG21) – Protecting the Night-Time Environment (2021);
- The Society of Light and Lighting Handbook (2018); and
- The Society of Light and Lighting Code for Lighting (2022).

#### Institute of Lighting Professionals Guidance Notes

3.3.6 The ILP is the current body of the former Institute of Lighting Engineers (ILE). They have produced the following guidance documents which are considered when developing new lighting installations:

- Guidance Note 1 (GN01) – The Reduction of Obtrusive Light (2021); and
- Guidance Note 8 (GN08) – Bats and Artificial Lighting in the UK (2023).

#### International Commission on Illumination

3.3.7 The International Commission on Illumination is the international authority on light, illumination, colour, and colour spaces. They produce a number of guidance documents that coordinate with, or inform guidance used within the UK. The following are considered alongside the standards and guidance documents identified above:

- CIE:150: Guide on the limitation of the effects of obtrusive light from outdoor lighting installations (2017); and
- CIE 126: Guidelines for Minimising Sky Glow (1997).

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## 4.0 BASELINE CONDITIONS

### 4.1 Overview

- 4.1.1 Introduction of new lighting is anticipated to be restricted to gateways and the Main Site area, and in satellite Above Ground Installation (AGI) locations.
- 4.1.2 There are several categories of potentially light sensitive receptors in relation to the Proposed Development: these being, residential, ecological, and road, rail and public right of way users. Business/education/community facilities are excluded as they are typically used during the day when lighting is either not switched on, or if it is, when observed against a daylight background the effects are negligible.
- 4.1.3 As the Proposed Development design progresses, a computational light modelling exercise will be undertaken in order to ensure that obtrusive light is suitably controlled for permanent operational conditions. This will be provided as part of the detailed lighting strategy brought forward pursuant to DCO Requirement.

### 4.2 Receptors

- 4.2.1 This section sets out indicative light-sensitive receptor locations that are considered as part of the lighting strategy and will be used in evaluating environmental performance. The potential light sensitive receptors that have been identified are listed in Table 4-1 and described in more detail below. Figure 1 (Annex A), showing the Operational Lighting Receptor Range, provides an overview of the distance range for lighting receptors for the Main Site and AGI locations, which are identified within Table 4-1. Figure 2 (Annex A) gives the mapped location of sensitive ecological receptors and Figure 3 (Annex A) provides the location of railway lines, stations and public rights of way routes in the vicinity of the Site.
- 4.2.2 Please note these link to receptors identified within the ES. Figure 3-1: Environmental Constraints within 1 km of the Proposed Development Site (ES Volume II, EN070009/APP/6.3) displays the sensitive receptors identified within a 1 km radius of the Proposed Development Site for the purposes of the ES. Receptors have been selected based on proximity to the Proposed Development Site and likelihood of being sensitive to lighting impacts.
- 4.2.3 Ecological receptors have been identified and are summarised below. Further details can be found in Chapter 12: Terrestrial Ecology and Nature Conservation and Chapter 15: Ornithology (ES Volume I, EN070009/APP/6.2).

**Table 4-1: List of Light Sensitive Receptors within 1km of the lit areas of the Main Site and AGI locations within the Proposed Development Site,**

TYPE OF SITE	TITLE	LOCATION
<b>Ecological Receptors</b>		
<b>Statutory Designated Sites</b> -Special Protection Area (SPA) -Ramsar Site	1. Teemouth and Cleveland Coast SPA/Ramsar	1. North of Main Site
<b>Statutory National and Local Nature Conservation Designations</b> -Site of Special Scientific Interest (SSSI) -National Nature Reserve (NNR)	2. Teemouth and Cleveland Coast SSSI	2. Adjacent/north of Main Site, Site sits adjacent to an SSSI
<b>Non-Statutory Nature Conservation Designations</b> -Local Wildlife Sites (LWS) Other -RSPB Reserves	3. Eston Pumping Station LWS 4. Coatham Marsh LWS 5. Zinc Works Field LWS 6. Greenabella Marsh (1 and 2) LWS's 7. Greatham Creek North Bank Saltmarsh LWS 8. Cowpen Bewley Woodland Park LWS 9. Teessaurus Park LWS	3. Approx.. 1 km south of the Main Site, site overlaps the LWS. 4. Approx. 1.2 km east of the Main Site, site overlaps the LWS. 5. Approx. 2.5 km north-west of the Main Site, site approx. 1.5 km north-west of the LWS. 6. LWS up to 4.3 km west of the Main Site, site partially overlaps the LWS's. 7. Approx. 4 km west of the Main Site, site partially overlaps the LWS. 8. Approx. 6.9 km west of the Main Site, site partially overlaps the LWS. 9. Approx. 7.7 km south-west of the Main Site, site approx. 1 km west of the LWS.



TYPE OF SITE	TITLE	LOCATION
<b>Human and Other Receptors</b>		
<b>Human</b> Residential Receptors	10. Residential Properties	10. Cowpen Lane area
<b>Transportation</b> <b>Roads including:</b> -Primary Road/A Road -B Road -Minor Road/Local Road -Railway Tracks	11. A66, A1046, A1053, A1085, A1185 12. B1275, B1277 13. Seaton Carew Rd, Trunk Road, Foundry Road Passenger and commercial railway tracks	Within 1.0 km of the lit sites within the redline proposed development site
<b>Public Rights of Way</b> -Long Distance Routes -England Coast Path -Other Public Rights of Way	15. Footpaths, byways and bridleways 16. Cowpen Bewley Woodland Park	Within 1.0 km of the lit sites within the proposed development site

### 4.3 Context Brightness Conditions

- 4.3.1 Plate 4-1 provides an overview of the existing lighting baseline character and context conditions with reference satellite mapping that reflects typical area sky quality. The measurement taken as a magnitude per square arc-second that describes the scale of brightness for a given 'solid' area of the sky in terms of star visibility.
- 4.3.2 The sky quality measurements can be used to help define the prevailing lighting character of an area and is linked to lighting environmental zones as set out within good practice guidance by the ILP. The development site sits within an area of a measured sky quality (zenith sky brightness, measured in magnitude/arc second<sup>2</sup>) around 18.5 and below. This indicates that some areas are likely to be consistent with a sky quality associated with an environmental zone E2, while areas with a more concentrated industrial character are likely to be an environmental zone E3.
- 4.3.3 This is further explored in Section 5.0, including an indication of typical zenith sky brightness values for the different lighting environmental zones (Table 5-1).
- 4.3.4 It should be noted that sky conditions shown in this image are a representation of the effects of direct and indirect light on the sky. These do not describe the localised situation on the ground in all cases, therefore the satellite mapping is used to describe general brightness context and associated prevailing lighting character and additional zonal recommendations are then made using relevant receptor sensitivities.

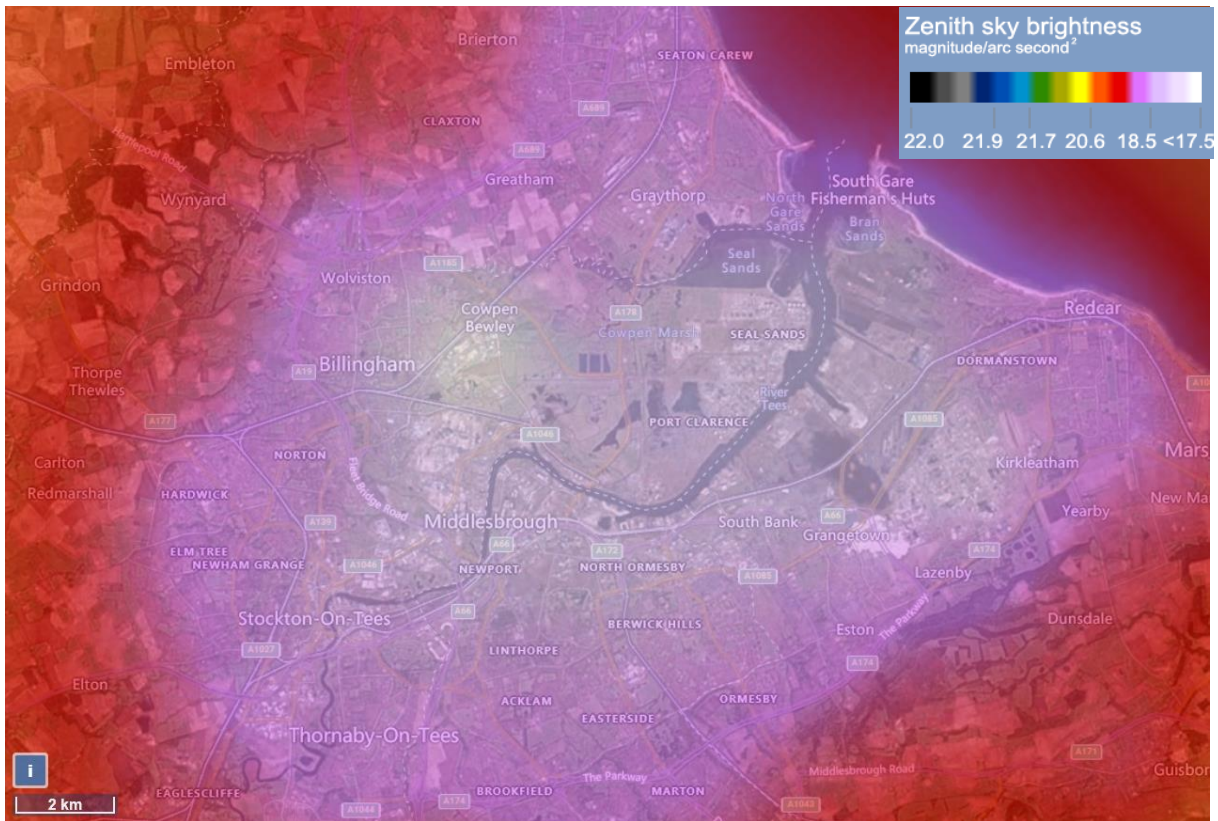


Plate 4-1: Local Area Sky Brightness Satellite Mapping by Jurij Stare, 2024 (based on Falchi et al, 2016)

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## 5.0 ENVIRONMENTAL LIGHTING PARAMETERS

### 5.1 Overview

- 5.1.1 Environmental parameters describe limiting criteria for particular expressions of obtrusive light. These are linked to lighting character of an area and the light sensitivity of receptors, therefore they will not change based on operational needs of the proposed development in the way that the technical lighting requirements do.
- 5.1.2 While technical lighting requirements reference standards that set out the minimum details for specific tasks and activities, it is the recommended maximum parameters for obtrusive light set out in GN01/21 (ILP, 2021) that must be considered alongside task lighting requirements to help mitigate particular obtrusive aspects.
- 5.1.3 The parameters are linked to an established lighting environmental classification which describes the brightness character of an area and sets out corresponding recommendations for metrics like light spill, sky glow and glare.
- 5.1.4 Additional criteria may also be advised for areas which have set ecological sensitivities relating to commuting, breeding, roosting / nesting or foraging activities. In some cases this may be lower than prevailing area conditions, however it is necessary to ensure good light control in sensitive areas to support protection of nature and conservation.
- 5.1.5 Achieving the recommended criteria is a result of the careful consideration and application of light. This includes, but is not limited to, the selection of luminaire, selection of light source, method of installation, when light is used and how it is controlled.

### 5.2 Lighting Zone Classification and Limiting Criteria

- 5.2.1 Establishing the lighting zone classification is an important step in determining the approach to design and mitigation of lighting impacts, and often there may be two areas of different character that are in close proximity to each other.
- 5.2.2 The overarching baseline lighting condition established from satellite records set out in Plate 4-1 shows where hotspots are most likely to occur in relation to existing development and receptors with a recognised light sensitivity.
- 5.2.3 Industrial areas tend to be categorised as areas with an E3 character brightness, whereas residential areas or those with limited habitation may be more consistent with a zone E2. Locations with a particular sensitivity toward ecology may target E1 or even E0 criteria.
- 5.2.4 Guidance advises that where there is more than one zone that is applicable to an area, the more stringent zone may be used to determine limiting characteristics of new lighting, where possible. As an example, if a site is an area that is a mixture of zone E3 and E2, zone E2 should be used to select the maximum obtrusive light criteria permitted as part of the design.

5.2.5 The following extracts, Tables 5-1 to 5-6 below, are taken from the ILP guidance which set out the identification of lighting environmental zones and their corresponding benchmark criteria for light spill, sky glow and glare. Additional notes and guidance can be found within the full document.

5.2.6 It should be noted that in Table 5-2 and Table 5-3 where a curfew period is set out, this typically refers to a time after 23:00.. In areas where 24 hour working is proposed, the obtrusive lighting assessment will review lighting designs against the post-curfew criteria level.

**Table 5-1: ILP Lighting Environmental Zone Classification Categories (extract of Table 2 in GN01/21 (ILP, 2021))**

ZONE	SURROUNDING	LIGHTING ENVIRONMENT	EXAMPLES
E0	Protected	Dark (Sky Quality Meter (SQM) 20.5+)	Astronomical observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

**Table 5-2: Maximum Vertical Illuminance on Surrounding Properties (Light Spill) (extract of Table 3 in GN01/21 (ILP, 2021))**

LIGHT TECHNICAL PARAMETER	APPLICATION CONDITIONS	ENVIRONMENTAL ZONE				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane ( $E_v$ )	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

**Table 5-3: Luminaire Brightness in the Field of View (Glare) (extract of Table 4 in GN01/21 (ILP, 2021))**

LIGHT TECHNICAL PARAMETER	APPLICATION CONDITIONS	LUMINAIRE GROUP (PROJECTED AREA $A_P$ IN $m^2$ )					
		$0 < A_P \leq 0.002$	$0.002 < A_P \leq 0.01$	$0.01 < A_P \leq 0.03$	$0.03 < A_P \leq 0.13$	$0.13 < A_P \leq 0.50$	$A_P > 0.5$
Maximum luminous intensity emitted by luminaire ( $I$ in $cd$ ) <sup>s</sup>	E0						
	Pre-curfew	0	0	0	0	0	0
	Post-curfew	0	0	0	0	0	0
	E1						
	Pre-curfew	0.29 <i>d</i>	0.63 <i>d</i>	1.3 <i>d</i>	2.5 <i>d</i>	5.1 <i>d</i>	2,500
	Post-curfew	0	0	0	0	0	0
	E2						
	Pre-curfew	0.57 <i>d</i>	1.3 <i>d</i>	2.5 <i>d</i>	5.0 <i>d</i>	10 <i>d</i>	7,500
	Post-curfew	0.29 <i>d</i>	0.63 <i>d</i>	1.3 <i>d</i>	2.5 <i>d</i>	5.1 <i>d</i>	500
	E3						
	Pre-curfew	0.86 <i>d</i>	1.9 <i>d</i>	3.8 <i>d</i>	7.5 <i>d</i>	15 <i>d</i>	10,000
	Post-curfew	0.29 <i>d</i>	0.63 <i>d</i>	1.3 <i>d</i>	2.5 <i>d</i>	5.1 <i>d</i>	1,000
E4							
Pre-curfew	1.4 <i>d</i>	3.1 <i>d</i>	6.3 <i>d</i>	13 <i>d</i>	26 <i>d</i>	25,000	
Post-curfew	0.29 <i>d</i>	0.63 <i>d</i>	1.3 <i>d</i>	2.5 <i>d</i>	5.1 <i>d</i>	2,500	

**Table 5-4: Limitations of Direct Upward Light (Sky Glow, ULR) (extract of Table 6 in GN01/21 (ILP, 2021))**

LIGHT TECHNICAL PARAMETER	ENVIRONMENTAL ZONES				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

**Table 5-5: Limitations of Direct/Indirect Upward Light (Sky Glow, UFR) (extract of Table 7 in GN01/21 (ILP, 2021))**

LIGHT TECHNICAL PARAMETER	TYPE OF INSTALLATION	ENVIRONMENTAL ZONES				
		E0	E1	E2	E3	E4
Upward flux ratio (UFR) / %	Road	n/a	2	5	8	12
	Amenity	n/a	n/a	6	12	35

LIGHT TECHNICAL PARAMETER	TYPE OF INSTALLATION	ENVIRONMENTAL ZONES				
		E0	E1	E2	E3	E4
	Sports	n/a	n/a	2	6	15

**Table 5-6: Limitations of Effects on Transport Systems (extract of Table 5 in GN01/21 (ILP, 2021))**

LIGHT TECHNICAL PARAMETER	ROAD CLASSIFICATION <sup>1</sup>			
	NO ROAD LIGHTING	M6 / M5	M4 / M3	M2 / M1
Veiling luminance <sup>2</sup> ( $L_v$ )	0.037 cd/m <sup>2</sup>	0.23 cd/m <sup>2</sup>	0.40 cd/m <sup>2</sup>	0.84 cd/m <sup>2</sup>
Threshold Increment	15% based on adaption luminance of 0.1 cd/m <sup>2</sup>	15% based on adaption luminance of 1.0 cd/m <sup>2</sup>	15% based on adaption luminance of 2.0 cd/m <sup>2</sup>	15% based on adaption luminance of 5 cd/m <sup>2</sup>

5.2.7 There are additional recommendations regarding the effects of signage and building illumination that are not anticipated to apply to this type of development.

### 5.3 Proposed Obtrusive Limits (Residential / Premises Receptors)

5.3.1 Impacts to residential receptors should be limited to at most a zone E2.

### 5.4 Proposed Limitation of Effects on Transport Systems and Public Rights of Way

5.4.1 Light spill and sky glow will typically have little influence on transport systems or Public Rights of Way (PRoW), however the effects of glare will need to be carefully considered. This is particularly relevant to avoid contributing to visual discomfort or disability for drivers and prevent the potential for things like lights/signal overrun or identification of obstacles. Though in the present context, rail use is generally low, and majority of the public roads are at a distance greater than 500 m, glare effects may still be experienced by users.

5.4.2 Limiting glare is also advised for PRoW so that route users can safely manage potentially changeable terrain and ground conditions. Light spill and sky glow will typically have little influence on transport systems (e.g. rail or road), however the effects of glare will need to be carefully considered to avoid contributing to discomfort for drivers using South Gare Road.

5.4.3 To minimise potential glare effects for both transport systems and PRoW, it is proposed that the avoidance measures as outlined in Section 7.0 be considered when developing the detailed lighting design.

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## 5.5 Proposed Obtrusive Light Limits (Ecological Receptors)

5.5.1 Ecological receptors will be limited to at most a zone E1 or lower. Additional requirements to criteria set out in ILP guidance may be advised by the project ecologist to create minimal disturbance.

## 6.0 OPERATIONAL SITE LIGHTING REQUIREMENTS

### 6.1 Design Overview

- 6.1.1 A variety of operational activities may be required across the site, although it is expected that the majority of normal-use lighting will be restricted to gateways and the Main Site area, or in the satellite AGI locations.
- 6.1.2 Operational lighting is needed to support safe site access and egress, in addition to undertaking specific tasks safely, efficiently and accurately when insufficient daylight is available.
- 6.1.3 The quality of light will be as important as the quantity of light provided to task areas, meaning that there will be advisable average light levels and uniformities that should be provided to support visual comfort, task visibility and eye adaptation.

### 6.2 Recommended Operational Lighting Design Parameters

- 6.2.1 Recommendations for maintained average light levels ( $\overline{E}_m$ ), uniformity ( $U_0$ ), glare ( $R_{GL}$ ) and light colour ( $R_a$ ) are provided by BS EN 12464-2:2014 (BSI, 2014) for different areas, tasks and activities.
- 6.2.2 Please note that the light levels provided should be the minimum required for the activity or task to prevent over-lighting and contributing to obtrusive effects.
- 6.2.3 The following extracts, Tables 6-1 to 6-4 below, inform the minimum light level requirements that would apply for Site tasks or activities. While not exhaustive, they do accommodate a range of activities and associated light levels that may be necessary for safe site use and access.

**Table 6-1: General Requirements for Areas and Cleaning of Outdoor Workplaces (extract of Table 5.1 in BS EN 12464-2 (BSI, 2014))**

REF. NO.	TYPE OF AREA, TASK, OR ACTIVITY	$\overline{E}_m$ lx	$U_0$ –	$R_{GL}$ –	$R_a$ –	SPECIFIC REQUIREMENTS
5.1.1	Walkways, exclusively for pedestrians	5	0,25	50	20	
5.1.2	Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0,40	50	20	
5.1.3	Regular vehicle traffic (max 40 km/h)	20	0,40	45	20	At shipyards and in docks $R_{GL}$ may be 50
5.1.4	Pedestrian passages, vehicle turning, loading and unloading points	50	0,40	50	20	



REF. NO.	TYPE OF AREA, TASK, OR ACTIVITY	$\overline{E}_m$ lx	$U_0$ –	$R_{GL}$ –	$R_a$ –	SPECIFIC REQUIREMENTS
5.1.5	Cleaning and servicing	50	0,25	50	20	All relevant surfaces

**Table 6-2: Parking Areas (extract of Table 5.9 in BS EN 12464-2 (BSI, 2014))**

REF. NO.	TYPE OF AREA, TASK, OR ACTIVITY	$\overline{E}_m$ lx	$U_0$ –	$R_{GL}$ –	$R_a$ –	SPECIFIC REQUIREMENTS
5.9.1	Light traffic, e.g. parking areas of shops, terraced and apartment houses; cycle parks	5	0.25	55	20	
5.9.2	Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes	10	0,25	50	20	
5.9.3	Heavy traffic, e.g. parking areas of major shopping centres, major sports and multipurpose building complexes	20	0,25	50	20	

**Table 6-3: Industrial Sites and Storage Areas (extract of Table 5.7 in BS EN 12464-2 (BSI, 2014))**

REF. NO.	TYPE OF AREA, TASK, OR ACTIVITY	$\overline{E}_m$ lx	$U_0$ –	$R_{GL}$ –	$R_a$ –	SPECIFIC REQUIREMENTS
5.7.1	Short term handling of large units and raw materials, loading and unloading of solid bulk goods	20	0,25	55	20	
5.7.2	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	
5.7.3	Reading of addresses, covered loading platforms, use of tools, ordinary reinforcement and casting tasks in concrete plants	100	0,50	45	20	

REF. NO.	TYPE OF AREA, TASK, OR ACTIVITY	$\overline{E}_m$ lx	$U_o$ –	$R_{GL}$ –	$R_a$ –	SPECIFIC REQUIREMENTS
5.7.4	Demanding electrical, machine and piping installations, inspection	200	0,50	45	60	Use local lighting

**Table 6-4: Oil and Other Chemical Industries (extract of Table 5.10 in BS EN 12464-2 (BSI, 2014))**

REF. NO.	TYPE OF AREA, TASK, OR ACTIVITY	$\overline{E}_m$ lx	$U_o$ –	$R_{GL}$ –	$R_a$ –	SPECIFIC REQUIREMENTS
5.10.1	Handling of servicing tools, utilization of manually regulated valves, starting and stopping motors, lighting of burners	20	0,25	55	20	
5.10.2	Filling and emptying of container trucks and wagons with risk free substances, inspection of leakage, piping and packing	50	0,40	50	20	
5.10.3	Filling and emptying of container trucks and wagons with dangerous substances, replacements of pump packing, general service work, reading of instruments	100	0,40	45	40	
5.10.4	Fuel loading and unloading sites	100	0,40	45	20	
5.10.5	Repair of machines and electric devices	200	0,50	45	60	Use local lighting

### 6.3 Recommended Lighting Typology Characteristics

#### Luminaire Composition

- 6.3.1 The choice of luminaire should be carefully considered so that the optimal distribution of light from the fitting is provided at the right mounting location and height.
- 6.3.2 The use of full horizontal cut-off luminaires installed at 0° tilt with flat glass lenses, back reflectors and internal baffles designed to limit views of the lamp and glare and direct light in a controlled pattern are recommended.
- 6.3.3 Where full cut-off type luminaires installed at a 0° tilt are not suitable for a particular application, such as floodlighting over large areas, it is recommended to use shields, hoods, cowls, or baffles to aid in controlling how light is distributed.

### Light Source

- 6.3.4 LED lighting is recommended over traditional light sources. It is prevalent for the majority of lighting types and is typically an efficient source of light, having a good lumen to Watt ratio.
- 6.3.5 LED may also more easily support different lighting control scenarios where dimming is required.
- 6.3.6 LED presents a greater potential to control the spectral composition of emitted light, such as the reduction of blue wavelengths which could have a negative impact on insects and wildlife.

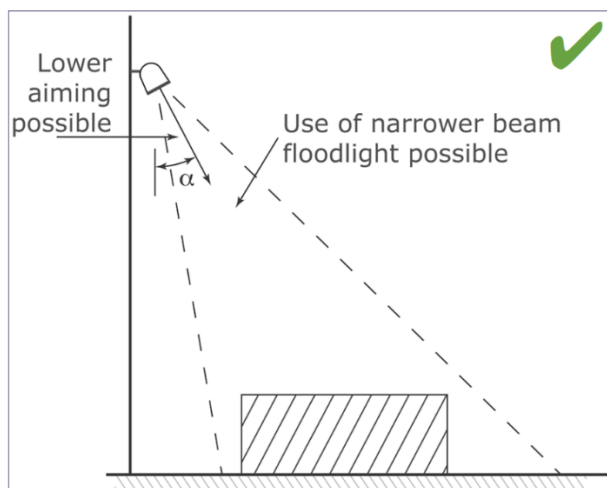
### Light Colour

- 6.3.7 Light colour and spectral composition should respond to area character and ecology recommendations. A maximum of 3000 Kelvin (K) is proposed, although 2700 K may be more desirable near areas of particular sensitivity to reduce the overall UV component of new installations through limiting blue spectrum light. The colour of the light and spectral composition is considered less visually intrusive, and the restricted UV spectrum limits potential effects to local wildlife or their food sources.

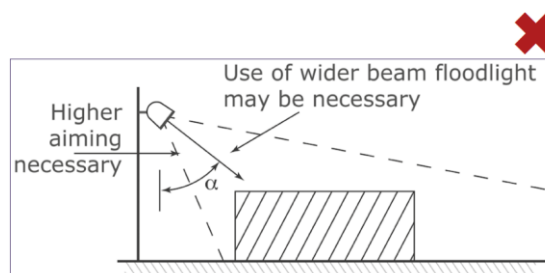
## 6.4 Recommended Installation Approaches

### Mounting Height

- 6.4.1 Using as high a mounting height as possible is normally desirable so that aiming angles to provide sufficient light coverage to task areas without contributing to light spill, sky glow or glare.



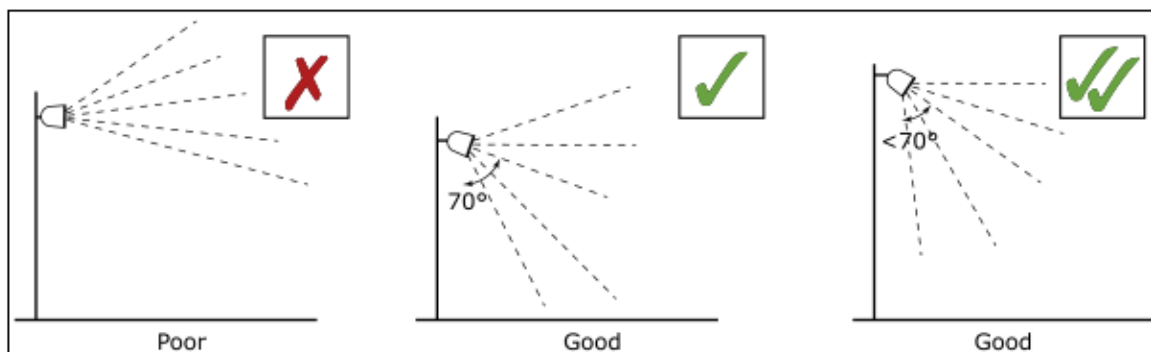
**Plate 6-1: Higher Mounting Height - Less Spill Light and Glare (extract of Figure 2 in GN01/21 (ILP, 2021))**



**Plate 6-2: Lower Mounting Height – 270re Spill Light and Glare (extract of Figure 2 in GN01/21 (ILP, 2021))**

### Aiming and Orientation

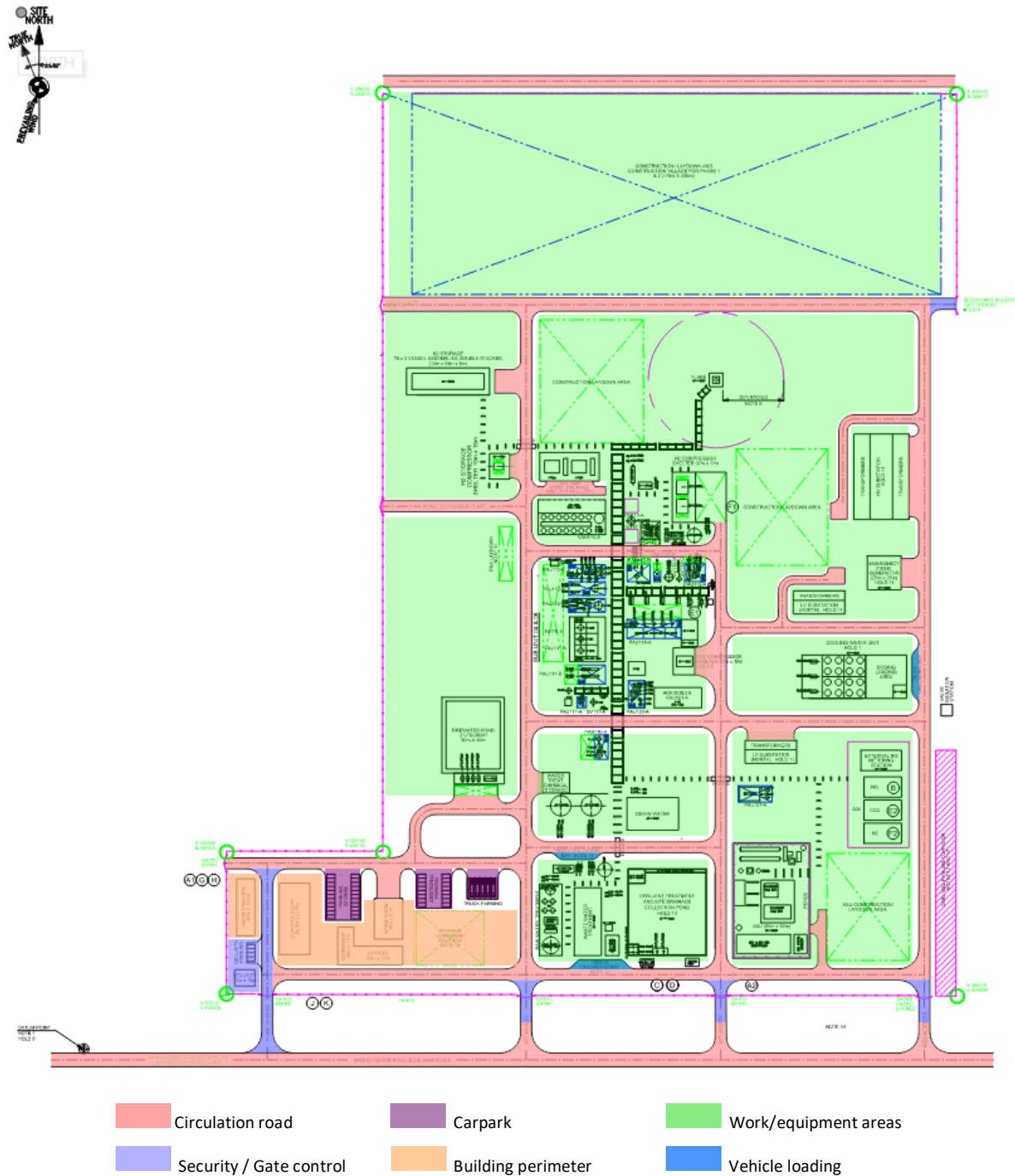
- 6.4.2 The correct aiming and orientation of lighting ensures that obtrusive lighting effects can be controlled and reducing the potential for light spill, sky glow and glare.
- 6.4.3 Lighting should be directed away from sensitive locations to reduce the potential to create disturbance. Given the site location and the extent of the DCO order limits, this is particularly relevant for designation sites and areas with a confirmed ecological sensitivity.
- 6.4.4 Luminaires should normally be mounted with no or minimal angle (tilt) above the horizontal to ensure that all light is provided to task areas and reducing the potential for light to be contributed to the sky.
- 6.4.5 It is recognised that this may not be possible in all situations and an aiming angle of no more than 70 degrees above the horizontal is recommended unless this is not reasonably practicable.
- 6.4.6 Where an angle is necessary, shields, hoods, cowls, or baffles may be necessary.



**Plate 6-3: Recommended Aiming Angles (extract of Figure 3 in GN01/21 (ILP, 2021))**

## **6.5 Indicative Lighting Strategy (Operation)**

- 6.5.1 Lighting for operational requirements is expected to include the following:
- Column mounted lighting;
  - Building mounted lighting;
  - Handrail lighting; and
  - Flood lighting.
- 6.5.2 Plate 6-4 provides an overview of the indicative lighting zoning and levels for the Main Site based on illustrative layouts.



**Plate 6-4: Indicative Lighting Zoning and Levels – Main Site (Extract of drawing 415000-00232-0B-PI-DSK-00103 Rev B)**

6.5.3 An overarching lighting strategy is proposed based on development types, receptor locations and the design approaches described below. Please note that lighting placements and mounting heights will be confirmed as part of the detailed design development and lighting calculations to ensure the required light levels and uniformity are correct, based on operator requirements.





- The main road and access roads which have permanent lighting requirements will be lit with streetlight style luminaires mounted on poles with a minimum height of 8 m;
- Security gates and entrance areas may have additional lighting with pole mounted floodlights or streetlight luminaires mounted on 8 m high poles;
- Dedicated car parking areas to feature 6 m height lighting poles with streetlight luminaire heads to best achieve a uniformly lit effect;
- Vehicle loading / turning areas will be lit from 6-10 m height floodlights or streetlight style luminaires around the perimeter with additional floodlights for trailer loading, all ideally mounted onto pipe racks so as to minimise dedicated poles and thereby reduce clutter;
- Working / equipment in temporary construction compounds will be lit by floodlights on 8-12 m height poles;
- Where additional lighting is needed near site buildings, bulkhead luminaires will be mounted onto the building perimeter wall.

## 6.6 Indicative Lighting Details

6.6.1 Table 6-5 sets out indicative luminaire typologies that are likely to be used for operational requirements. The final luminaire type, lumen output and mitigation will be finalised as part of detailed lighting strategy as such the below typologies are not mandatory.

**Table 6-5: Indicative luminaire typologies**

INDICATIVE AREA	SAMPLE IMAGE	PRODUCT TYPE	LAMP DETAILS	TILT ANGLE
		Street light - pole mounted at height 8 to 10 m THORN R2L2 M shown	LED 3000 K (max) CRI 80+	0°
		Flood light – pole mounted at height 8 to 12 m THORN AFP M shown	LED 3000 K (max) CRI 80+	15° (max)
		Flood light explosion proof – pole mounted at height 8 to 12 m STAHL Floodlight LED series 6125/2 shown	LED 3000 K (max) CRI 70+ IK10+	15° (max)

INDICATIVE AREA	SAMPLE IMAGE	PRODUCT TYPE	LAMP DETAILS	TILT ANGLE
		Linear light explosion proof – surface or suspension mount at height 8 to 10 m STAHL Linear LED series 6002/4 shown	LED 3000 K (max) CRI 70+ IK10+	0°
		Bulkhead light with forward throw optic - building wall mounted at height 2.3 to 3.0 m ABACUS Revati shown	LED 3000 K (max) CRI 70+	0°

## 6.7 Indicative Lighting Control Strategy

6.7.1 The lighting in operational areas is to be controlled under two service categories, normal and emergency lighting:

- Emergency lighting is 30 % of the lighting required for the operation of the site and is to be back-up by an emergency power (diesel) generator. It is proposed that emergency lighting remains on for 24 hours a day if it is dark enough for artificial lighting to be required.
- Normal lighting will support day to day activities and will apply to the process plant, storage areas and pipe racks. This state is considered to utilise 100% of illuminance capacity, although this will need to be revisited once the final design and equipment selection has been made to prevent over-lighting in exterior areas.

6.7.2 Photoelectric cells and timers are to be used as the primary control on all exterior lighting so that no luminaires will remain switched on when adequate daylight is available to support operations. Therefore, normal lighting will only come on if required between 06:00 and 23:00. After 23:00, lighting will drop down to emergency lighting levels as indicated above.

6.7.3 Streetlights, carpark and building perimeter lighting are to be controlled by a timer and photo electric cell so that the lights can only come on during set hours and only if it is dark enough for artificial lighting to be required for safe movement around site, with manual override as required.

6.7.4 A manual override switch integral to the lighting electrical distribution board shall also be incorporated to control the exterior lighting in the event of an emergency.

6.7.5 In the event a distribution board is regulated by a photocell, the photocell is to be located outside the building housing the board.

6.7.6 Site training on lighting control and monitoring to be provided to all staff during site inductions.

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## 7.0 GENERAL OBTRUSIVE LIGHT IMPACT AVOIDANCE MEASURES

7.1.1 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 and / or agreement with the Local Authority.

7.1.2 General obtrusive lighting impact avoidance measures may include:

- adopting a lighting control strategy that turns lights off or dims as necessary without compromising site safety and security;
- using photocells as a primary means of control to prevent light from being used when sufficient daylight is available;
- where possible, adopting LED luminaires to control obtrusive light due to their high directionality and accordingly the achievable ratio of useful light to spill light;
- careful consideration of placement of lighting column and luminaire positioning;
- adopting luminaires with minimal upward lighting ratio and full cut-off, where possible;
- not tilting luminaires to have uplift above the horizontal, if this is not possible add shielding, hoods baffles, louvres as necessary to ensure potential upward light is controlled;
- optimising column heights to allow for sufficient light coverage and minimal tilt of luminaires;
- minimising building mounted luminaire heights;
- adopting lamps with similar correlated colour temperatures;
- using lamps with a limited UV spectrum in locations which might affect ecological receptors;
- using shields and baffles to luminaires;
- lighting the site boundaries with low power periphery lighting with an asymmetric forward optic having good back-light cut-off characteristics; and
- directing luminaires away from ecologically sensitive receptors.



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## 8.0 SUMMARY AND CONCLUSIONS

- 8.1.1 This indicative Operational Lighting Strategy has been prepared in order to support the Application for the Proposed Development.
- 8.1.2 At the time of submission of the Application, the EPC Contractor(s) has not been appointed and detailed design work for the Proposed Development has not been carried out. 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 environmental 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.
- 8.1.3 This document therefore sets out the indicative Lighting Strategy (Operation) in the form of an outline lighting requirements specification for operational site lighting. It also addresses the management of obtrusive lighting by means of specifying off-site obtrusive lighting constraints. The report identifies potential measures and guidance that may be taken to control obtrusive light through the detailed design of the Proposed Development lighting scheme and management of lighting used during operation. At the detailed design stage, a computational light modelling validation exercise will be undertaken to inform the detailed lighting strategy. This will ensure that the Site is adequately lit and that obtrusive light is suitably controlled, in accordance with this Strategy.
- 8.1.4 In summary, it is concluded that the Indicative Lighting Strategy (Operation) provides an appropriate outline of the lighting requirements for the Proposed Development as part of the Application and identifies measures which can be employed as required and which will adequately control obtrusive light through detailed design of the Proposed Development. The controls are secured via a Requirement in the Draft DCO (EN070009/APP/4.1).

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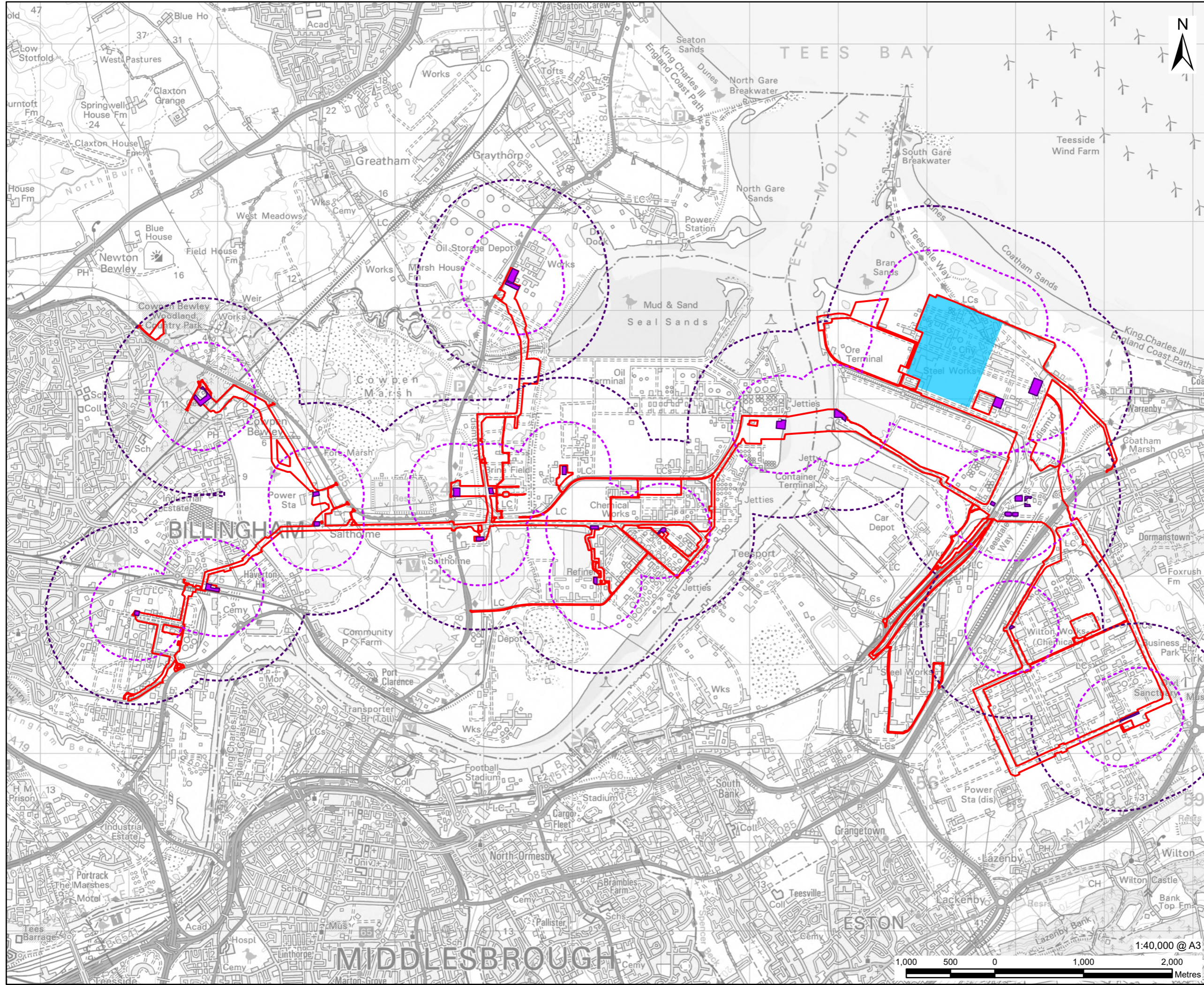
## 9.0 REFERENCES

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## ANNEX A: FIGURES



**PROJECT**  
H2 Teesside DCO

**APPLICANT**  
H2 Teesside Limited

**CONSULTANT**  
AECOM Limited  
100 Embankment,  
Cathedral Approach,  
Manchester, M3 7FB  
www.aecom.com

**LEGEND**

- Proposed Development Site
- Main Site
- AGIs
- Lighting Receptor Range**
- 500 m
- 1000 m

**NOTES**

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**ISSUE PURPOSE**  
5.8 Indicative Lighting Strategy (Operation)

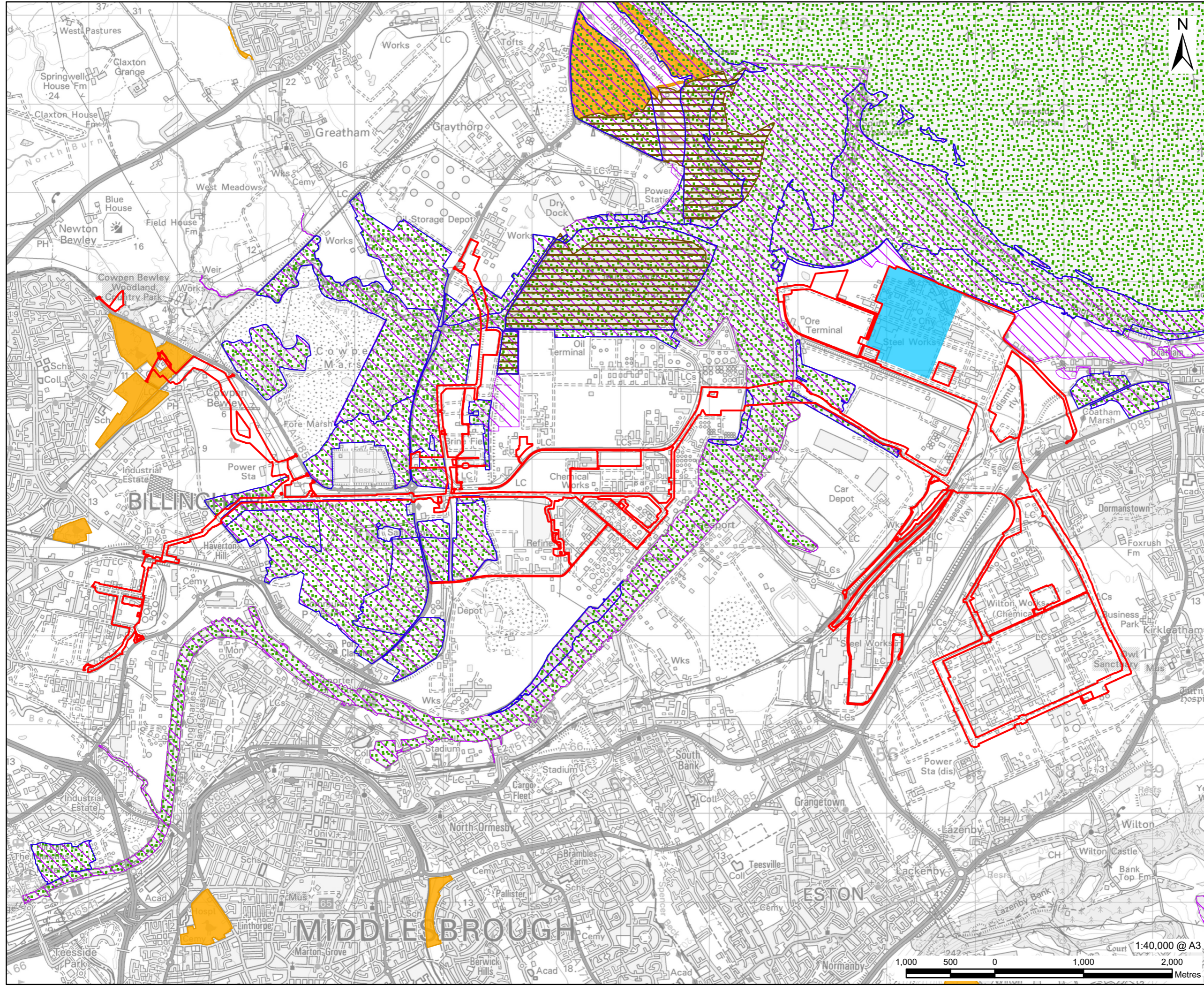
**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Operational Lighting Receptor Range

**FIGURE NUMBER**  
Figure 1



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**LEGEND**

- Proposed Development Site
- Main Site
- Local Nature Reserve (LNR)
- National Nature Reserve (NNR)
- Ramsar
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)

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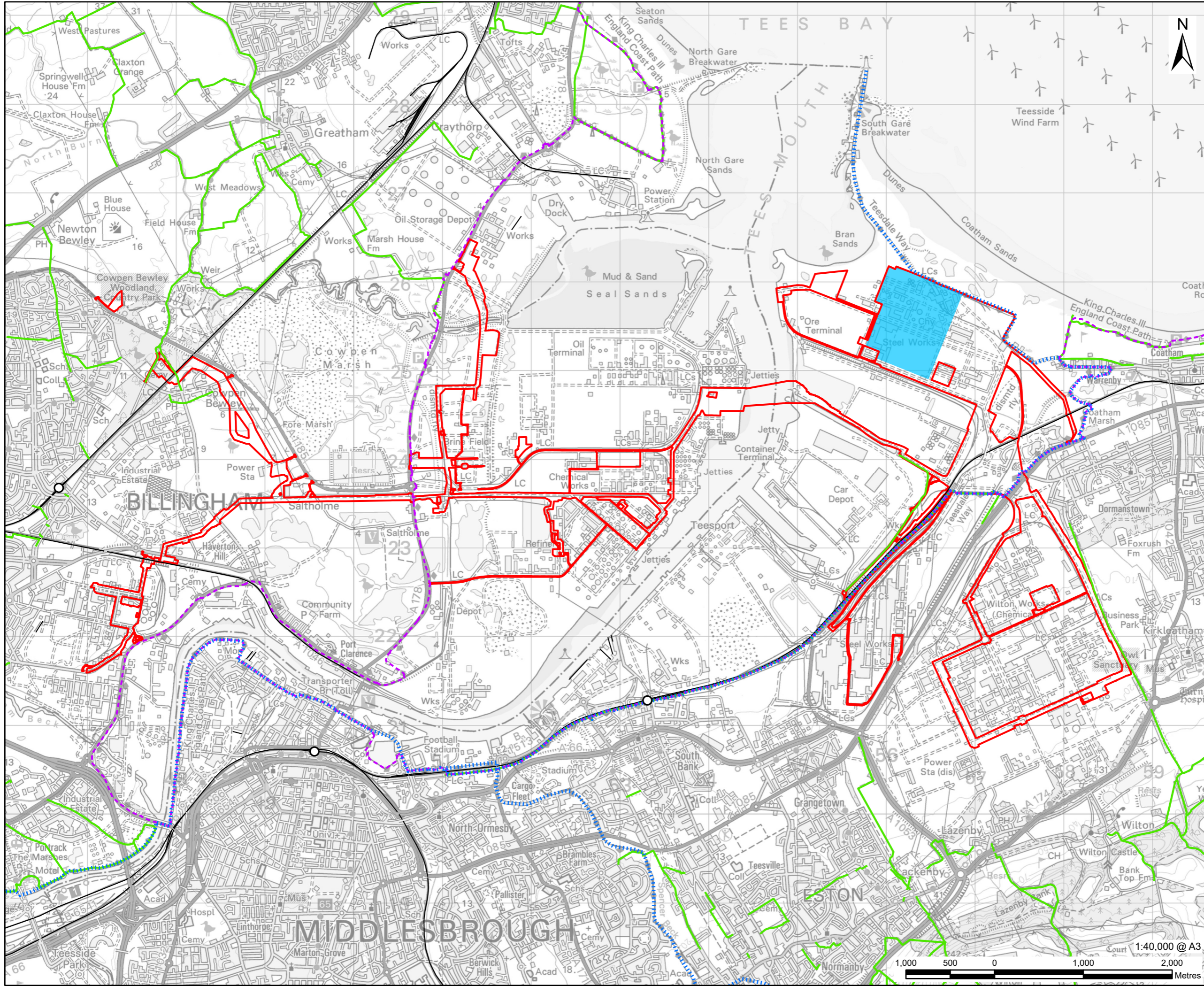
**ISSUE PURPOSE**  
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**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Summary of Sensitive Ecological Receptor Locations

**FIGURE NUMBER**  
Figure 2

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**PROJECT**  
H2 Teesside DCO

**APPLICANT**  
H2 Teesside Limited

**CONSULTANT**  
AECOM Limited  
100 Embankment,  
Cathedral Approach,  
Manchester, M3 7FB  
www.aecom.com

- LEGEND**
- Proposed Development Site
  - Main Site
  - Railway Station
  - Railway Track
  - England Coast Path
  - Long Distance Route
  - Public Rights of Way

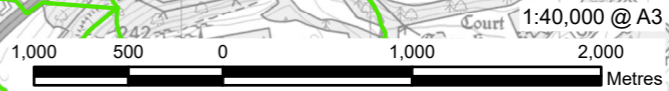
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**ISSUE PURPOSE**  
5.8 Indicative Lighting Strategy (Operation)

**PROJECT NUMBER**  
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**FIGURE TITLE**  
Summary of Railway and Public Right of Way Receptors

**FIGURE NUMBER**  
Figure 3



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