

# H2Teesside Project

Planning Inspectorate Reference: EN070009/APP/5.12.3

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

Document Reference: 5.12.3: Construction Environmental Management Plan

Appendix C: Indicative Lighting Strategy (Construction)

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



Applicant: H2 Teesside Ltd

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## 1.0 INTRODUCTION

### 1.1 Overview

1.1.1 This Indicative Lighting Strategy (Construction) has been prepared on behalf of H2 Teesside Limited (the Applicant). It forms part of the application (the Application) for a Development Consent Order (DCO), that has been submitted to the Secretary of State (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).

1.1.2 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).

1.1.3 The Applicant is H2 Teesside Limited, a bp company. H2 Teesside Limited will be the lead developer of the Proposed Development and bp will be appointed as the operator of the Proposed Development.

1.1.4 The Hydrogen Production Facility together with the Hydrogen Pipeline Corridor will deliver low carbon H<sub>2</sub> (hydrogen) 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 Corridor 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.

### 1.2 The Site

1.2.1 The Proposed Development Site covers an area of 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.

1.2.2 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:

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- Proposed Development Site Boundary (including location of the Main Site) (ES Volume II, EN070009/APP/6.3) for the location of the Main Site.
- 1.2.3 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).
- 1.3 The Proposed Development
- 1.3.1 The Production Facility is an up to 1.2 GWth LHV (Lower heating value) (Phase 1, 600-Megawatt thermal (MWth) LHV and Phase 2, 600 MWth LHV) Carbon, Capture and Storage (CCS) enabled Hydrogen Production Facility with associated hydrogen transport pipeline network (Hydrogen Pipeline Corridor) and utility connections, on land in Redcar and Cleveland, Stockton-on-Tees, and Hartlepool on Teesside.
- 1.3.2 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.
- 1.3.3 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 boundary, 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).
- 1.3.4 Further detail on the Proposed Development is presented in Chapter 4: Proposed Development (ES Volume I, EN070009/APP/6.2).
- 1.4 Construction Lighting Strategy Requirements
- 1.4.1 Construction phase works for the Proposed Development will require the use of a number of luminaires to provide visual comfort, safety, security and the undertaking of site works. Construction lighting typically consists of area floodlights to provide general light, supplemented by task lighting. This 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.
- 1.4.2 Construction lighting use will gradually be replaced by permanent lighting or removed under operational conditions.
- 1.4.3 Key sensitive receptors that could be affected by a new lighting condition typically include:
- Residential amenity;
  - Terrestrial and Marine Ecology; and
  - Road / Rail users
  - Public Right of Ways (PROWs)
- 1.4.4 At the time of submission of the Application; the Engineering, Procurement and Construction (EPC) Contractor(s) has not yet been appointed and detailed design work for the Proposed Development has not yet been carried out. Therefore,
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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 Environmental Statement (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.

- 1.4.5 Section 7.0 summarises a number of indicative impact avoidance measures which are to be adopted within the construction lighting strategy as good lighting design practice. Details will be confirmed at the detailed design stage, to be in accordance with this Indicative Strategy, secured via the Final CEMP(s) for construction.
- 1.5 Definition of Obtrusive Light
- 1.5.1 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.
- 1.5.2 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 C-1; taken from the Institute of Lighting Professionals (ILP) Figure 1, 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.

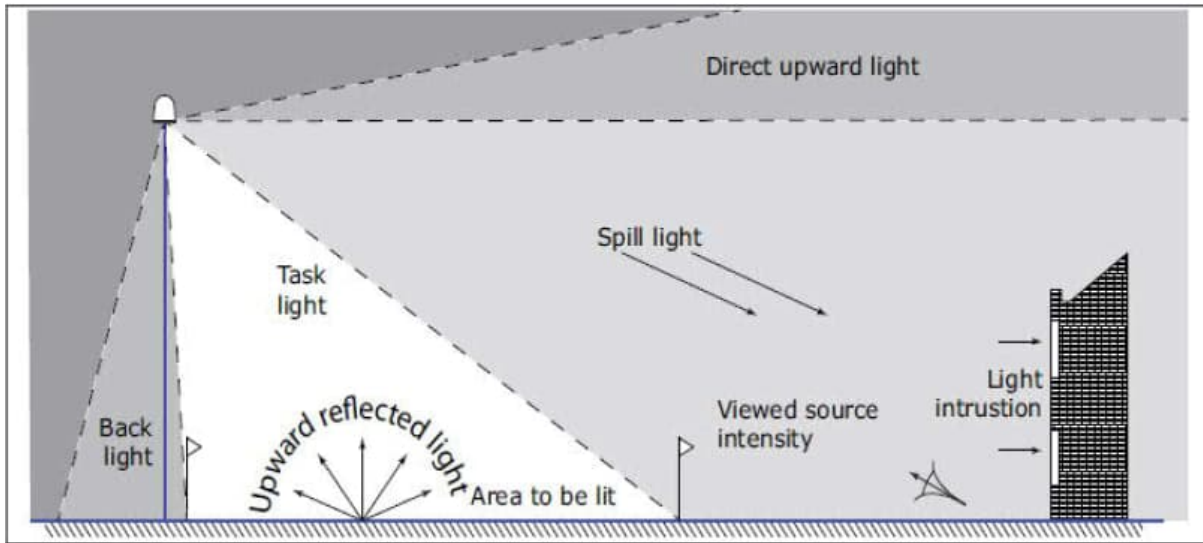


Plate C-1: Types of Intrusive Light

(Extract of Figure 1 in GN01/21 (ILP, 2021))

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## 2.0 LEGISLATION, POLICY, STANDARDS AND GUIDANCE

### 2.1 Legislation

2.1.1 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, 2017)

2.1.2 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, been used in developing appropriate limiting criteria for the lighting strategy.

### 2.2 Planning Policy

#### National Planning Policy

2.2.1 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.

- The National Policy Statement for Energy (EN-1) (DECC, 2023); and
- National Planning Policy Framework, Department for Levelling Up, Housing and Communities (DLUHC, 2023).

### 2.3 Guidance to Crane Operators on Aviation Lighting and Notification

2.3.1 Guidance to Crane Operators on Aviation Lighting and Notification (CAP 1096) (CAA, 2021) 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.

2.3.2 As the details of aviation lighting requirements are set out in legislation and CAA guidance, and will be secured via a Requirement in the Draft DCO (EN070009/APP/4.1), aviation lighting is not discussed further in this Strategy.

### 2.4 Lighting Design Standards and Guidance

2.4.1 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.



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2.4.2 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

2.4.3 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).

#### Lighting Guidance

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

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

##### Institute of Lighting Professionals Guidance Notes

2.4.5 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 (ILP, 2021); and
- Guidance Note 8 (GN08) - Bats and Artificial Lighting in the UK (ILP, 2023).

##### International Commission on Illumination

2.4.6 The International Commission on Illumination is the international authority on light, illumination, colour, and colour spaces. There are a number of guidance documents they have produced 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 (CIE, 2017); and
- CIE 126: Guidelines for Minimising Sky Glow (CIE, 1997).

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## 3.0 BASELINE CONDITIONS

### 3.1 Overview

3.1.1 Introduction of new lighting is anticipated to be restricted to gateways and the Main Site area, and in satellite locations within the Proposed Development Site such as construction compounds and trenchless crossing launch and receiver locations set along the hydrogen pipeline corridor.

3.1.2 There are several categories of light sensitive receptors that are considered when developing lighting strategies and light management plans: 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.

3.1.3 It is expected that a computational light modelling exercise will be undertaken prior to construction works taking place in sensitive areas, in terms of selecting and placing temporary lighting, to ensure that obtrusive light is suitably controlled during the construction phase and that effects to receptors are adequately managed. This would support the methodology and monitoring requirements set out in the Final Construction Environmental Management Plan.

### 3.2 Receptors

3.2.1 This section sets out indicative light-sensitive receptor locations that are considered as part of the construction lighting strategy and will be used in evaluating environmental performance. The potential light sensitive receptors that have been identified are listed in Table C-1 and described in more detail below. Figure C-1 (Annex A) provides an overview of the distance range for lighting receptors, which are identified within the table. Figure 2 of the Indicative Lighting Strategy (Operation) (EN070009/APP/5.8) gives the mapped location of sensitive ecological receptors and Figure 3 of the Indicative Lighting Strategy (Operation) (EN070009/APP/5.8) provides the location of railway lines, stations and public rights of way routes in the vicinity of the Site.

3.2.2 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. Receptors have been selected based on proximity to the Proposed Development Site and likelihood of being sensitive to lighting impacts.

3.2.3 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 C-1: List of Light Sensitive Receptors within 1km of areas likely to be lit within the Proposed Development Site

TYPE OF SITE	TITLE	LOCATION
Ecological Receptors		
Statutory Designated Sites -Special Protection Area (SPA) -Ramsar Site	1. Teesmouth and Cleveland Coast SPA/Ramsar	1. North of Main Site
Statutory National and Local Nature Conservation Designations -Site of Special Scientific Interest (SSSI) -National Nature Reserve (NNR)	2. Teesmouth and Cleveland Coast SSSI	2. Adjacent/north of Main Site, Site sits adjacent to an SSSI
Non-Statutory Nature Conservation Designations -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.
Human and Other Receptors		
Human Residential Receptors	10. Residential Properties	10. Cowpen Lane area

TYPE OF SITE	TITLE	LOCATION
Transportation Roads including: -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 14. Passenger and commercial railway tracks	Within 1.0 km of the lit sites within the redline boundary
Public Rights of Way Long Distance Routes (including Teesdale Way) -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 redline boundary

### 3.3 Context Brightness Conditions

- 3.3.1 Plate C-2 provides an overview of the existing lighting baseline character and context conditions with reference satellite mapping that reflects typical area sky quality (Fabio et al, 2016). 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.
- 3.3.2 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.
- 3.3.3 This is further explored in Section 4.2, including an indication of typical zenith sky brightness values for the different lighting environmental zones (Plate C-2).
- 3.3.4 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.

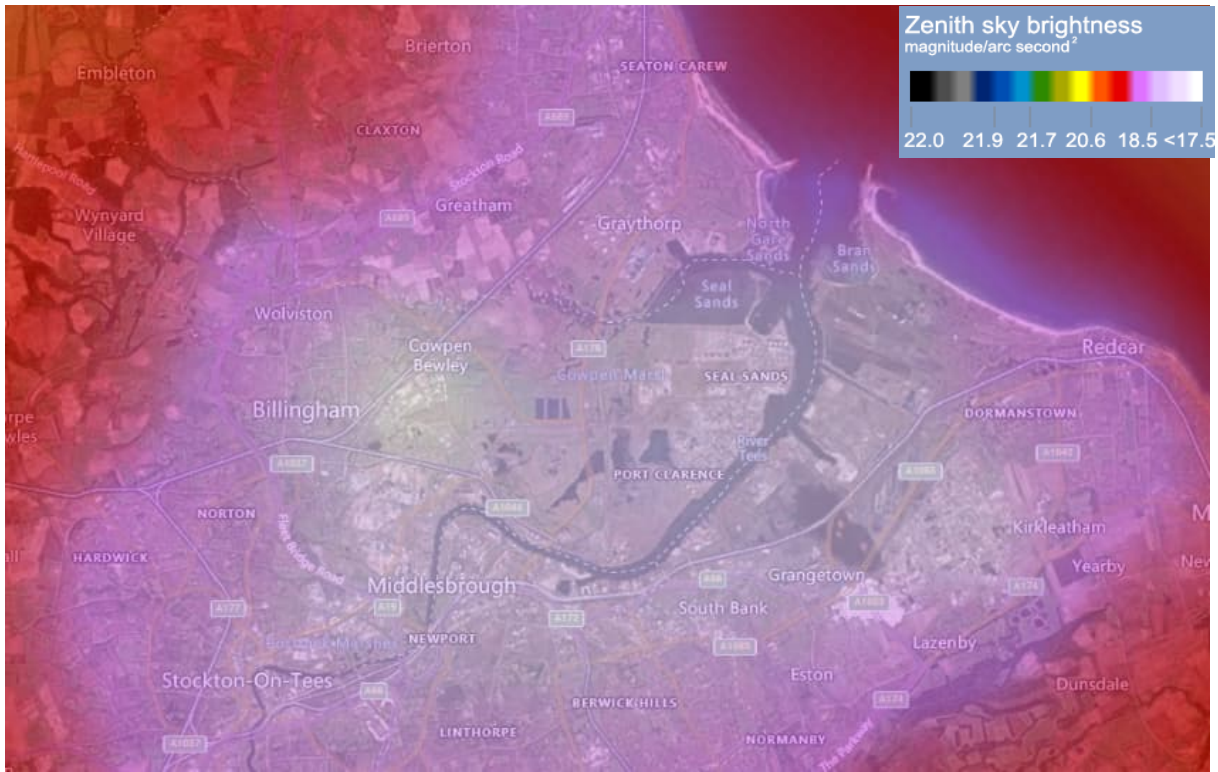


Plate C-2: Local Area Sky Brightness Satellite Mapping by Jurij Stare, 2024 ( based on Falchi et al, 2016)

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## 4.0 ENVIRONMENTAL LIGHTING PARAMETERS

### 4.1 Overview

4.1.1 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 task or activity requirements in the way that the technical lighting requirements do.

4.1.2 While technical lighting requirements reference standards that set out the minimum details for specific tasks and activities as covered in Section 1.2, it is the recommended maximum parameters for obtrusive light set out in GN01/21 (ILP, 2021) that must be considered alongside the identified task lighting requirements to help mitigate particular obtrusive aspects.

4.1.3 The parameters are linked to an established lighting environmental classification system which describes the brightness character of an area and sets out corresponding recommendations for metrics like light spill, sky glow and glare.

4.1.4 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.

4.1.5 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.

### 4.2 Lighting Zone Classification and Limiting Criteria

4.2.1 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.

4.2.2 The overarching baseline lighting condition established from satellite records set out in Figure C-1 (Annex A) shows where hotspots are most likely to occur in relation to existing development and receptors with a recognised light sensitivity.

4.2.3 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.

4.2.4 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.

4.2.5 The following extracts, Tables C-2 to C-7 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.

4.2.6 It should be noted that in Table C-2 and Table C-3 where a curfew period is set out, this typically refers to a time after 23:00, at which time a more stringent criteria is applied. Typically this will end at sunrise. In areas where 24 hour working is proposed, the obtrusive lighting assessment will review lighting designs against the post-curfew criteria level.

Table C-2: 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, UNIESCO 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 C-3: 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 C-4: 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>	0.1 <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 C-5: 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 C-6: 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
	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
Upward flux ratio (UFR) / %	Sports	n/a	n/a	2	6	15

Table C-7: Limitations of Effects on Transport System (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 <sub>v</sub> )	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>

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

Proposed Obtrusive Limits (Residential/ Premises Receptors)

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

Proposed Limitation of effects on Transport Systems and Public Rights of Way

4.2.9 Light spill and sky glow will typically have little influence on transport systems or 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 in the vicinity of the Proposed Development Site 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.

4.2.10 Limiting glare is also advised for PRow so that route users can safely manage potentially changeable terrain and ground conditions.

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

Proposed Obtrusive Light Limits (Ecological Receptors)

- 4.2.12 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.

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## 5.0 SITE CONSTRUCTION LIGHTING REQUIREMENTS

### 5.1 Introduction

5.1.1 The construction phase lighting strategy sets out a typical application of construction lighting for a range of site tasks and activities that will be carried out within the Site Boundary.

5.1.2 A variety of construction activities may be required across the Proposed Development Site to support safe site access and egress, in addition to undertaking specific tasks safely, efficiently, and accurately when insufficient daylight is available.

5.1.3 For daytime/core hour construction schedules, construction lighting is still likely to be necessary for site activities undertaken during winter months, and for any days throughout the year where works must continue through to completion once they have begun, which may result in 24-hour working, such as Horizontal Directional Drilling (HDD). Other site activities undertaken during hours of darkness and/or are required to occur on 24 hour construction schedules may include, but are not limited to:

- Vehicle access / egress for slow moving traffic;
- Vehicle turning and unloading;
- Excavation;
- Drilling;
- Fabrication;
- Loading and unloading of goods and equipment;
- Radiography; and
- Testing.

5.1.4 Additional lighting may be necessary to support accesses to the works from strategic locations or to integrate with local road networks to allow for a safe transition between locations and traffic type. Once these requirements are established, this shall be considered as part of the detailed lighting assessment.

5.1.5 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.

### 5.2 Recommended Lighting Design Parameters (Construction Activities)

5.2.1 Recommendations for maintained average light levels ( $\bar{E}_m$ ), uniformity ( $U_o$ ), glare ( $R_{gl}$ ) and light colour ( $R_a$ ) are provided by BS EN 12464-2:2014 (BSI, 2014) for different areas, tasks and activities.

- 5.2.2 Please note that the light levels provided should be the minimum required for the activity or task to prevent overlighting and contributing to obtrusive effects.
- 5.2.3 The following extracts, Tables C-8 to C-11 below, inform the minimum light level requirements that would apply to the construction sites and construction 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 C-8: 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	
5.1.5	Cleaning and servicing	50	0,25	50	20	All relevant surfaces

Table C-9: Building Sites (extract of Table 5.3 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
5.3.1	Clearance, excavation and loading	20	0,25	55	20	
5.3.2	Construction areas, drain pipes mounting, transport, auxiliary and storage tasks	50	0,40	50	20	
5.3.3	Framework element mounting, light reinforcement work, wooden mould and framework mounting, electric piping and cabling	100	0,40	45	40	
5.3.4	Element jointing, demanding electrical machine and pipe mountings, concrete pouring, steel erection, piping installation, cable pulling and testing.	200	0,50	45	40	

Table C-10: 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	
5.7.4	Demanding electrical, machine and piping installations, inspection	200	0,50	45	60	Use local lighting

Table C-11: 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	

---

### 5.3 Recommended Lighting Typology Characteristics

#### Lighting Construction

5.3.1 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.

5.3.2 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.

5.3.3 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

5.3.4 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.

5.3.5 LED may also more easily support different lighting control scenarios where dimming is required.

5.3.6 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

5.3.7 Light colour and spectral composition should respond to area character and ecology recommendations. It is expected that this will involve a warmer white, at a maximum of 3000 Kelvin (K), 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.

5.3.8 The colour of the light and spectral composition is traditionally considered to be less visually intrusive, as well as have a more restricted UV spectrum which limits potential effects to local wildlife or their food sources.

5.3.9 In some cases, a whiter light in the region of 4000 K may be necessary in areas which have strict requirements for working or space use during the hours of darkness.

### 5.4 Recommended Installation Approaches

#### Mounting Height

5.4.1 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 C-3 and Plate C-4).

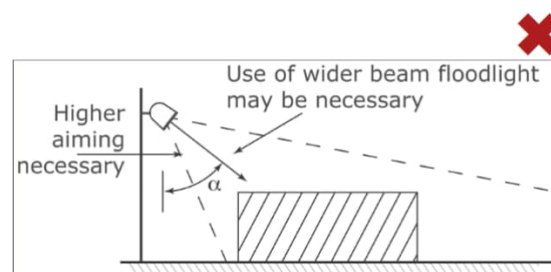
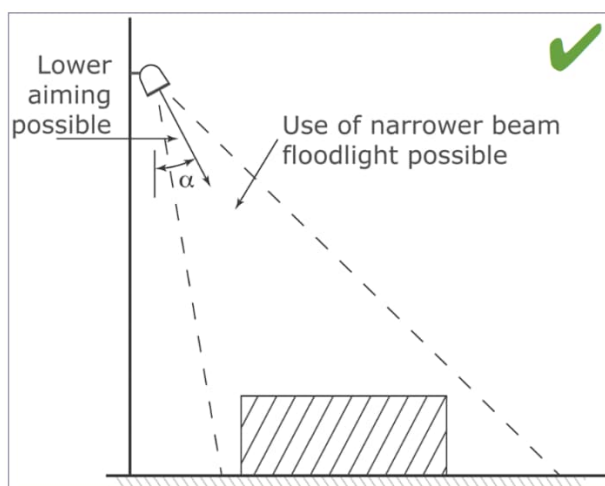


Plate C-4: Higher Mounting Height - Less Spill Light and Glare (Extract of Figure 2 in GN01/21 (ILP, 2021))

Plate C-3: Lower Mounting Height - More Spill Light and Glare (Extract of Figure 2 in GN01/21 (ILP, 2021))

### Aiming and Orientation

- 5.4.2 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.
- 5.4.3 Lighting should be directed away from sensitive locations to prevent or minimise light disturbance to nearby residents, ecological receptors, as well as motorists and rail and marine operations. This provision would apply particularly to sites where night working or security is required.
- 5.4.4 Where lighting is used to illuminate surrounding footpaths, roads or amenity areas, precautions will be taken to avoid excessive shadowing.
- 5.4.5 Luminaires should normally be mounted with no or minimal angle (or tilt) above the horizontal to ensure that all light is provided to task areas and to reduce the potential for light to be contributed to the sky.
- 5.4.6 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 (Plate C-5).
- 5.4.7 Where an angle is necessary, shields, hoods, cowls, or baffles may be necessary.



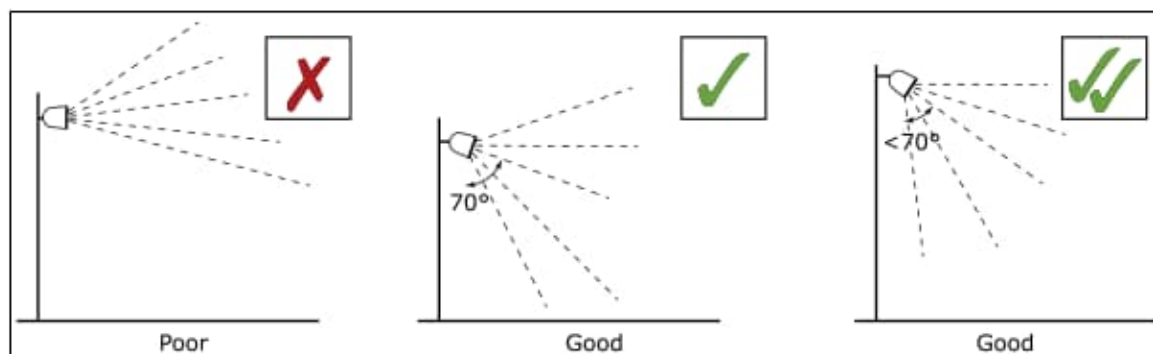


Plate C-5: Recommended Aiming Angles (Extract of Figure 3 in GN01/21 (ILP, 2021))

## 5.5 Indicative Lighting Strategy (Construction)

5.5.1 Lighting that is expected to be used during construction phase works includes the following:

- Column mounted lighting;
- Building mounted lighting;
- Handrail lighting; and
- Mobile lighting (task, fixed tower or telescopic mast).

5.5.2 An overarching lighting strategy is to be developed based on the above design parameters, lighting zones characterised by activity/area function, as well as the site arrangements, receptor locations and the design approaches described below. Final mounting heights and locations will be confirmed by lighting calculations, to ensure the required light levels and uniformity are met once contractor requirements and detailed construction site layouts have been established.







- Temporary lighting will be provided by mobile task lighting for small area coverage or mobile tower lighting where larger areas of illumination must be provided (e.g. trenchless crossing launch or receiver pits/shafts);
- The main road and access roads which have semi-permanent lighting requirements throughout the construction phase will be lit mainly 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 areas will be lit by floodlights on 8-12 m height poles;

- Where necessary, lighting at the site boundary should be provided to ensure safe egress for the public; and
- Where additional lighting is needed near site/temporary buildings, bulkhead luminaires will be mounted onto the building perimeter wall.

### Indicative Lighting Details

5.5.3 Table C-12 sets out indicative luminaire typologies that are likely to be used for construction phase works; please refer to Figure C-6 (Annex A) for an indicative lighting arrangement for key areas within the Main Site. Note that the final luminaire type, lumen output and mitigation will be finalised as part of the final CEMP(s).

Table C-12: Indicative Luminaire Typologies

DRAWING SYMBOL	SAMPLE IMAGE	PRODUCT TYPE	LAMP DETAILS	INSTALLATION METHOD
		Column mounted street light style head THORN R2L2M shown	3000 K max LED CRI 70+	Pole mounted at height 6 - 8 m Tilt angle 0° above the horizontal
		Telescoping mobile unit, 4-flood diesel or 2-flood plugin MIDSTREAM Mobile Tower shown	3000 K max LED CRI 70+	Telescoping Extension 6-9 m typical
		Industrial perimeter bulkhead (IP65) LEDBRITE Bulkhead shown	Red LED or 4000 K with Red diffuser	Mounted to the hoarding / fence at 2 m above ground on 3-4 m intervals

### 5.6 Indicative Lighting Controls

- 5.6.1 Building and column mounted lighting will be switched using a photocell to prevent dawn to dusk operation when sufficient daylight is available, and manual override.
- 5.6.2 Mobile lighting will be oriented manually on-site, and standard operation utilises a photocell or on/off control for switching. Use of mobile tower lighting will be managed and monitored throughout each phase of works.
- 5.6.3 Perimeter lighting will be switched using a photocell and have a manual override.
- 5.6.4 Where appropriate, motion sensors will be employed to prevent unnecessary usage.

---

## 5.7 Hours of Operation

### Standard Working Hours

- 5.7.1 Standard working hours apply to all construction works authorised under the DCO unless they fall within the scope of works requiring extended hours as described in the Framework CEMP.
- 5.7.2 Standard construction working hours are defined as Monday to Friday 07.00 – 19.00 and Saturday 07.00 to 16.00.
- 5.7.3 There may be up to one hour before and/or after the standard working hours set out to accommodate start-up/shut-down mobilisation procedures.
- 5.7.4 Mobilisation typically includes activities that would not create a disturbance to sensitive receptors, however there may be activities that could incorporate lighting. Therefore, use of light during these periods should be closely monitored.

### Extended Working Hours

- 5.7.5 Extended working hours may be necessary and the duration of these works varies based on activities being undertaken. These would be employed due to the nature of the activity or in an effort to reduce risk or impact to the public, infrastructure, or reduce risk associated with other work requirements. The activities that may need to be undertaken during extended working hours are specified in the Framework Construction Environmental Management Plan (EN070009/APP/5.12).
- 5.7.6 Other extended working hours may be required, but where not identified and accommodated within the final CEMP(s) will need to be agreed with the local authority.

## 6.0 INDICATIVE LIGHTING MODELLING

### 6.1 Methodology

6.1.1 Lighting performance of construction lighting and its potential for obtrusive lighting effects was modelled using an indicative mobile lighting tower arrangement with target illuminance levels to average 50 lux on the ground plane, as this type of lighting is likely to yield the most noticeable potential effects on nearby receptors. This was undertaken to indicate the level of effect that could occur prior to application of the mitigation strategies outlined in this Strategy.

6.1.2 The modelling consider only a bare-earth scenario, screening and obstruction by buildings or other structures was not considered in the lighting calculations to present a worst-case scenario but are considered as context mitigation for any effects identified.

6.1.3 Additionally, in accordance with standard practice and in line with the bare-earth approach, variable screening that might be provided by mature trees, shrubbery or other vegetation is not included within the assessment, although it is recognised that there may be landscape elements like trees along certain areas of the Site boundary. These may create some degree of screening throughout the year and further reduce reported effects (where effects are noted from off-Site locations).

6.1.4 Maintenance factors are determine based on the operational life of a luminaire, environment, and maintenance regime, which affects light output over a period of time. A maintenance factor of 0.8 was used in the calculations.

6.1.5 Figure C-6 and Figure C-7 (Annex A) provide a high-level overview of the complete lighting calculation undertaken for the Greatham Creek trenchless crossing sites and the Main Site, respectively.

### 6.2 Simulation Results

6.2.1 All areas identified were found to meet the design criteria assumed for light levels. Table C-13 provides a summary of the simulation results.

Table C-13: Lighting Design Results

SITE AREA	LIGHT LEVEL (LUX) TARGET	LIGHT LEVEL (LUX) RESULT	COMMENTS
Greatham Creek Stringing Site	50	52	Meets lux level criteria, slightly low uniformity but will be infilled by existing lighting from the existing access arrangements
Greatham Creek Drilling Site	50	53	Meets design criteria
Main Site	50	18.8	Meets design criteria

- 
- 6.2.2 It should be noted that building illumination does not form part of the design, and any light contribution from existing light to the unit facades is a by-product of luminaire placements and not the intent to illuminate the buildings.
- 6.3 Light Spill
- 6.3.1 Light levels for the Stringing and Drilling Sites will result in light that extends beyond the site boundary which gives the following:
- Horizontal light fall off at ground to below 2 lux happens typically within 25 to 60 m of columns, depending on orientation of the lights.
  - Horizontal light fall off at ground to below 1 lux happens typically within 50 to 75 m of columns, depending on orientation of the lights.
  - Vertical light maximum will be approximately 20 lux at 20 m from the site boundary is column locations are placed at the edge of the boundary. At around 50 m from the boundary the maximum is down to around 12 lux and at 120 m distance this drops to 2 lux.
- 6.3.2 At the Main Site where proposed construction lighting is set back from the site boundary, horizontal light fall off occurs with the same distances as noted above. Vertical light maximum at 50 m from the eastern site boundary will be under 3 lux, 50 m from the southern boundary will be 0.4 lux, 50 m from the western boundary will be 0.3 lux, and 50 m from the northern boundary will be under 2 lux.
- 6.3.3 It is likely that light will exceed 2 lux beyond the boundary potentially impacting on nearby sensitive ecological areas, referencing the recommended threshold for light spill for zone E1 pre-curfew conditions, the impact is not a considerable amount above this threshold, but referencing the 0.1 lux post-curfew condition the impact would be a noticeable change.
- 6.3.4 Floodlighting on mobile towers is therefore recommended to be fitted with cowls to provide additional control of light distribution and reduce the amount of light spillage beyond the Site boundaries.
- 6.4 Sky Glow
- 6.4.1 The mobile tower floodlight design utilises floodlights at a typical 20-30 degree tilt, which is necessary to provide sufficient distribution of light around the work sites. Without mitigative strategies in place, contribution of light shining directly into the sky from the Greatham Creek sites is calculated to be approximately 3.5 % ULR, and from the Main Site it is 5.0% ULR. Both meet recommendations for zone E3 but exceed the more stringent requirements for a zone E2.
- 6.5 Glare
- 6.5.1 There is greater potential for glare from some viewing directions within distances of 50-500 m and possibly light sources may be visible from 1000m or more, though the relative viewing size will diminish the effect and intervening landscapes, building and terrain will have a shielding effect. This will be somewhat difficult to control, however the majority of viewing locations would be pedestrians on the
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Teesdale Way along South Gare and past Coatham Sands to the north of the Main Site or drivers on low-traffic volume access roads near the Main Site. Impacts from the Greatham Crossing sites may also be noticeable on Seaton Carew Rd but generally when drivers are viewing from an oblique angle, which is when they are at distances greater than 500 m so intensity will be somewhat curtailed.

6.5.2 Strategies for mitigation of obtrusive effects of glare are provided below in Section 7.0.

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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 equipment 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, where columns are used, 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, where boundary lighting is required such as along perimeter hoarding, 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

- 8.1.1 This Indicative Lighting Strategy (Construction) 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 during the construction phase is currently unknown. Nevertheless, it is recognised that potential nuisance from lighting required for construction works may be a concern for local communities and environmental consultees, particularly when this is needed throughout the night. 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 during the construction phase.
- 8.1.3 This document therefore sets out the Indicative Lighting Strategy (Construction) in the form of an outline lighting requirements specification for construction site lighting. It also addresses the management of obtrusive lighting by means of specifying off-site obtrusive lighting constraints.
- 8.1.4 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. Prior to undertaking construction works near sensitive locations, a computational light modelling validation exercise will be undertaken to inform the setting out of lighting equipment and identify any need for additional mitigation or monitoring. This will ensure that works areas are adequately lit, and that obtrusive light is suitably controlled, in accordance with this Strategy.
- 8.1.5 In summary, it is concluded that the Indicative Lighting Strategy (Construction) provides an appropriate outline of the lighting requirements for construction phase works associated with the Proposed Development as part of the Application and identifies measures which can be employed as required and which will adequately control obtrusive light. The development of these controls are secured via a Requirement in the DCO.



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## 9.0 REFERENCES

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## ANNEX A FIGURES

Figure C-1: Lighting Receptor Range (Construction)

Figure C-2: Layout Overview – Greatham Creek

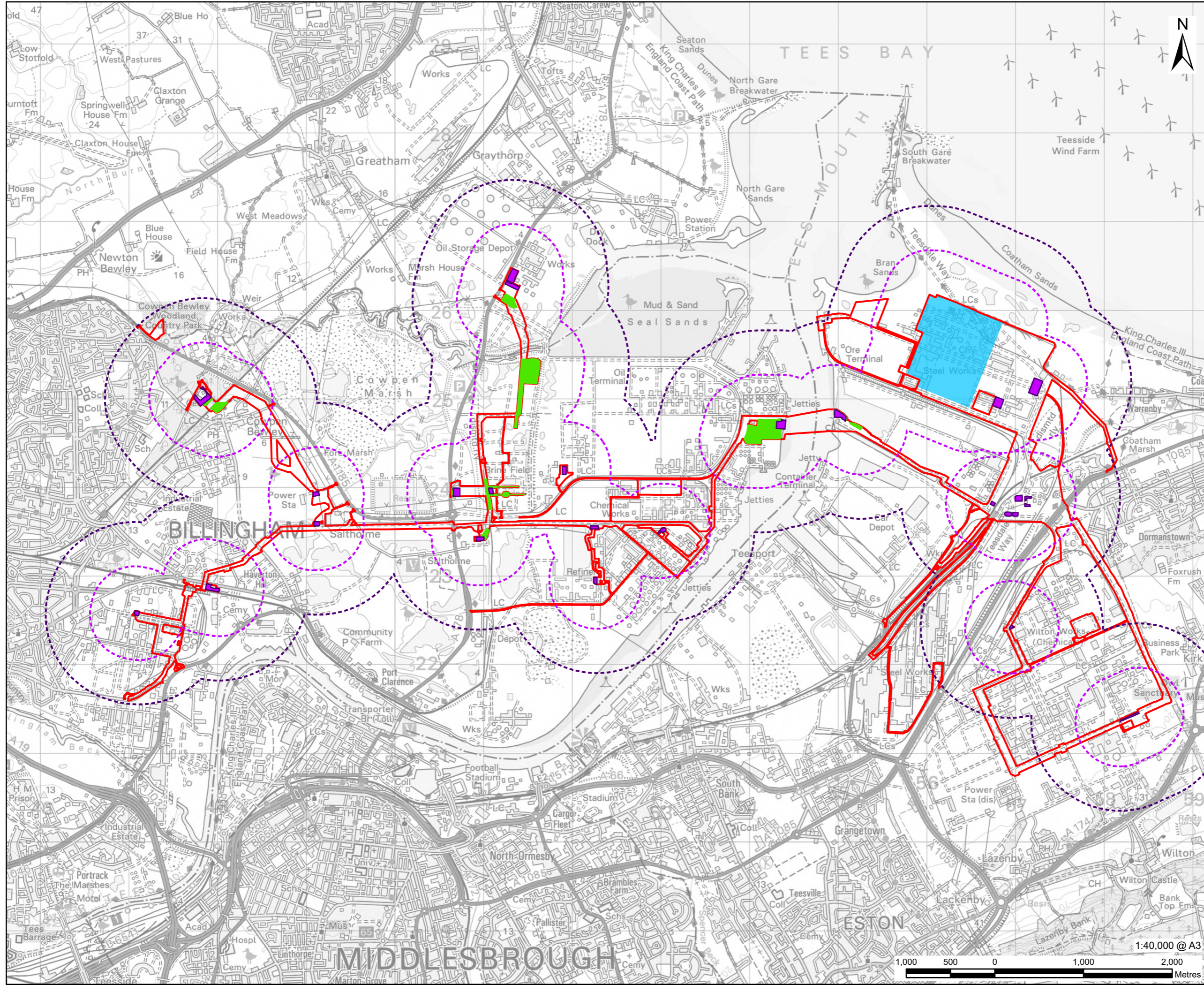
Figure C-3: Strategy for Key Areas - Greatham Creek Drilling Site

Figure C-4: Strategy for Key Areas - Greatham Creek Stringing Site

Figure C-5: Strategy for Key Areas - Main Site

Figure C-6: Greatham Creek Proposed Construction Lighting Performance – Light Distribution

Figure C-7: Main Site Proposed Construction Lighting Performance – Light Distribution



**PROJECT**  
H2 Teesside DCO

**APPLICANT**  
H2 Teesside Limited

**CONSULTANT**  
AECOM Limited  
100 Embankment,  
Cathedral Approach,  
Manchester, M3 7FB  
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- LEGEND**
- Proposed Development Site
  - Main Site
  - AGIs
  - Trenchless Crossing Area HDD Exit
- Lighting Receptor Range**
- 500 m
  - 1000 m

**NOTES**

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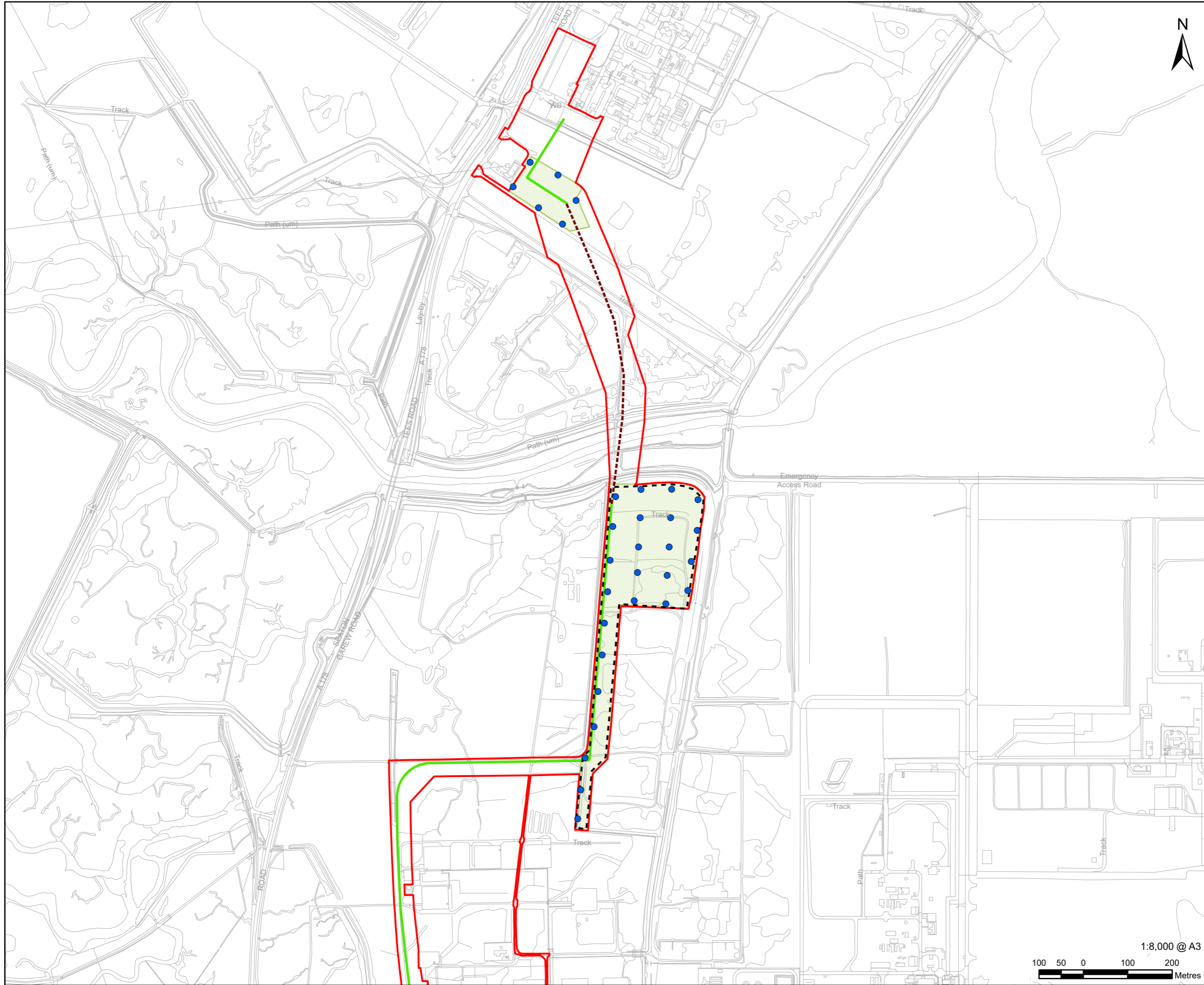
**ISSUE PURPOSE**  
C-1 Indicative Lighting Strategy (Construction)

**PROJECT NUMBER**  
60689030

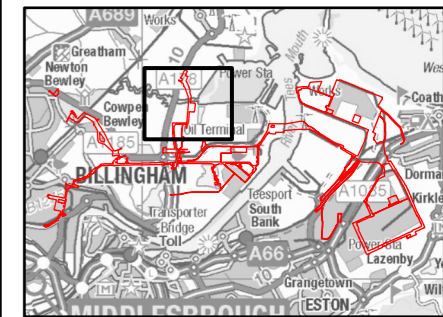
**FIGURE TITLE**  
Lighting Receptor Range

**FIGURE NUMBER**  
Figure C-1

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- LEGEND**
- Proposed Development Site
  - Telescoping Mobile Unit
  - Industrial Perimeter Bulkhead
  - Trenchless Crossing Area HDD Exit
  - Indicative Pipeline Routing (Construction Type)**
  - Buried
  - Trenchless Crossing



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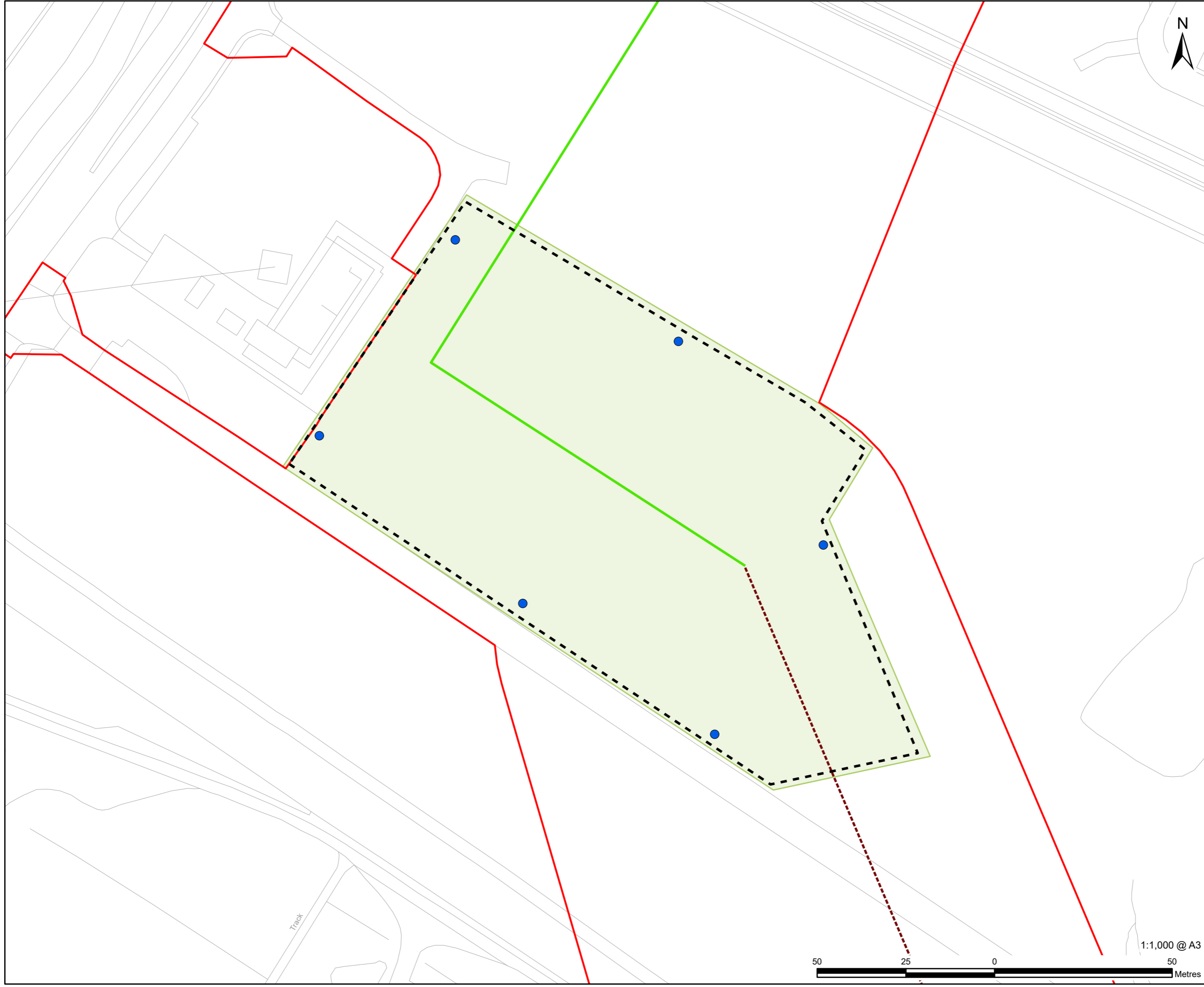
**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Layout Overview – Greatham Creek

**FIGURE NUMBER**  
Figure C-2



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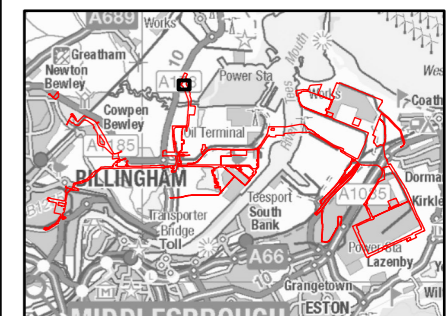
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**PROJECT**  
H2Teesside DCO

**APPLICANT**  
H2 Teesside Limited

**CONSULTANT**  
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100 Embankment,  
Cathedral Approach,  
Manchester, M3 7FB  
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- LEGEND**
- Proposed Development Site
  - Telescoping Mobile Unit
  - Industrial Perimeter Bulkhead
  - Trenchless Crossing Area HDD Exit
- Indicative Pipeline Routing (Construction Type)**
- Buried
  - Trenchless Crossing



**NOTES**

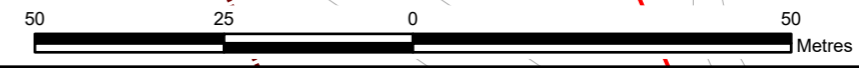
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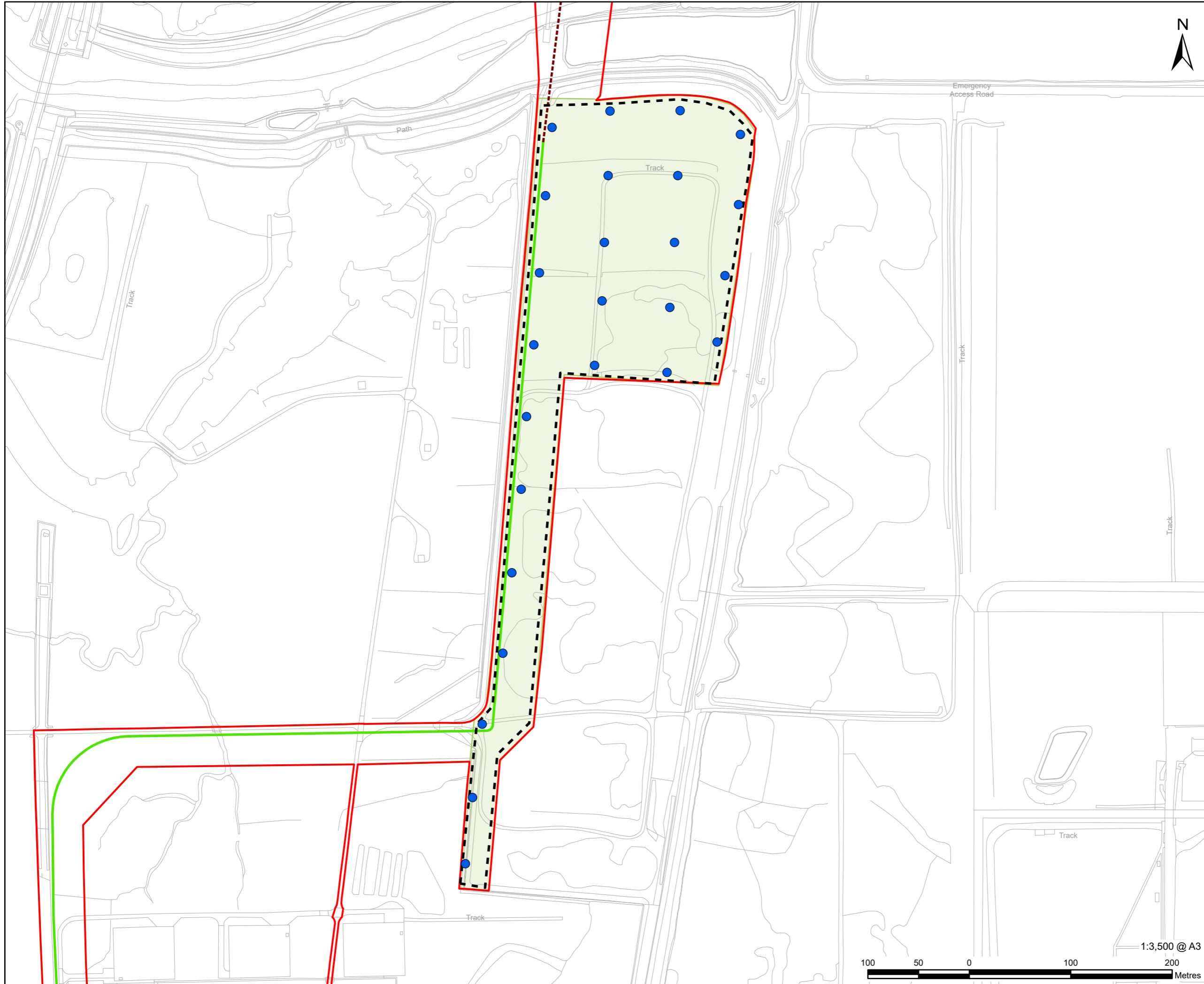
**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Strategy for Key Areas - Greatham  
Creek Drilling Site

**FIGURE NUMBER**  
Figure C-3



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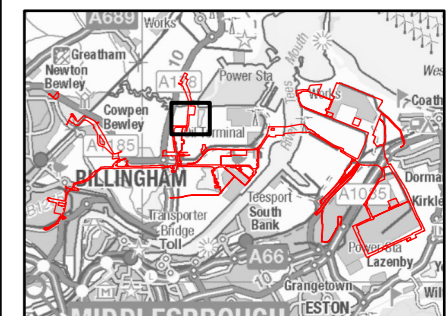
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- LEGEND**
- Proposed Development Site
  - Telescoping Mobile Unit
  - Industrial Perimeter Bulkhead
  - Trenchless Crossing Area HDD Exit
  - Indicative Pipeline Routing (Construction Type)**
  - Buried
  - Trenchless Crossing



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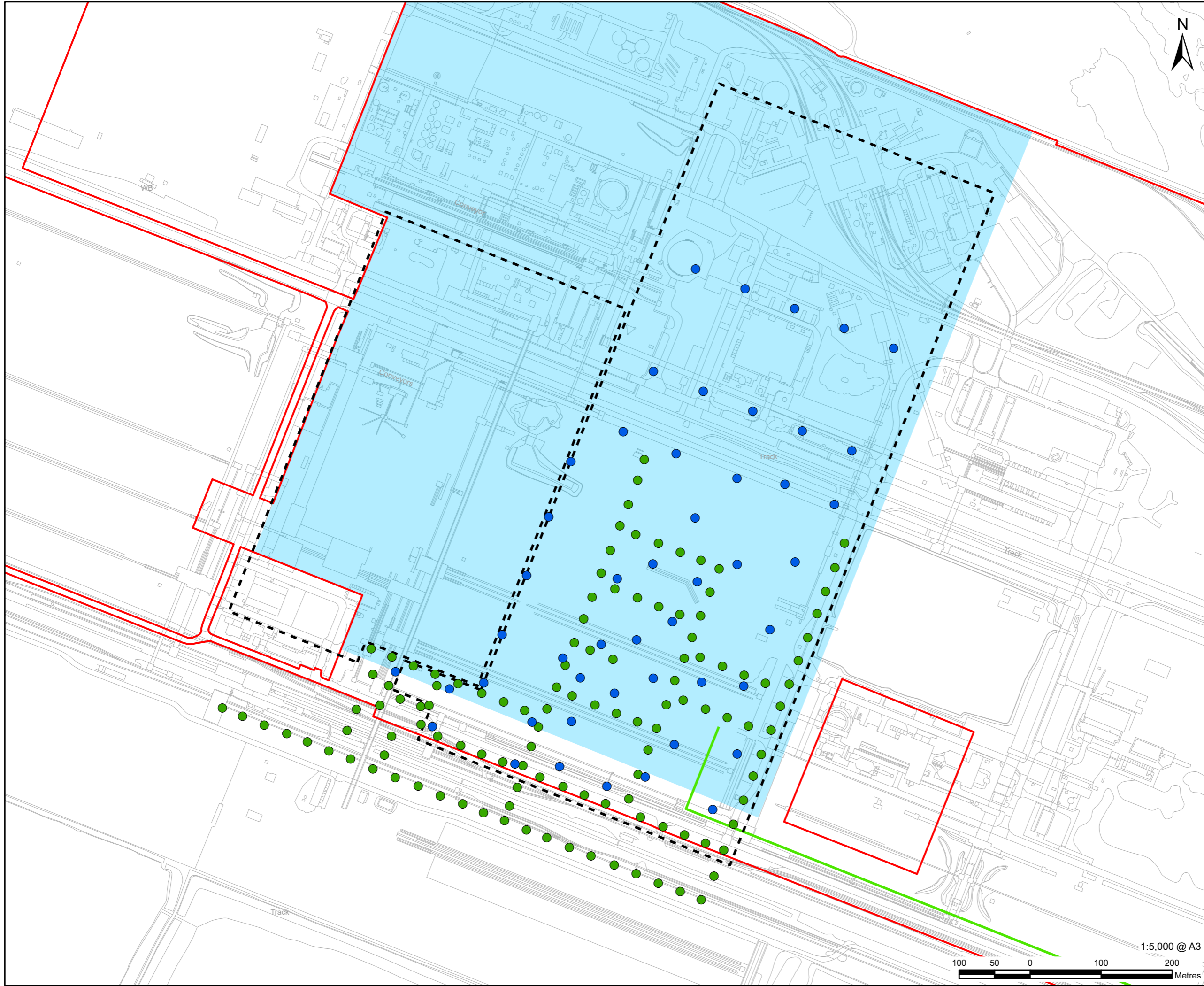
**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Strategy for Key Areas - Greatham  
Creek Stringing Site

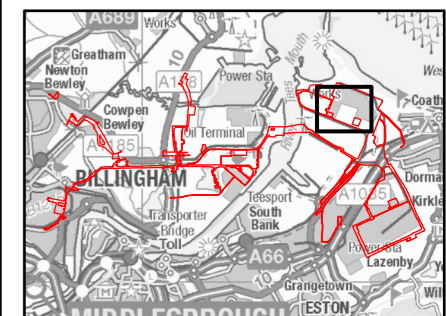
**FIGURE NUMBER**  
Figure C-4



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- LEGEND**
- Proposed Development Site
  - Main Site
  - Column Mounted Street Light Style Head
  - Telescoping Mobile Unit
  - Industrial Perimeter Bulkhead
  - Indicative Pipeline Routing (Construction Type)
  - Buried



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CEMP Lighting Strategy Appendix

**PROJECT NUMBER**  
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**FIGURE TITLE**  
Strategy for Key Areas - Main Site

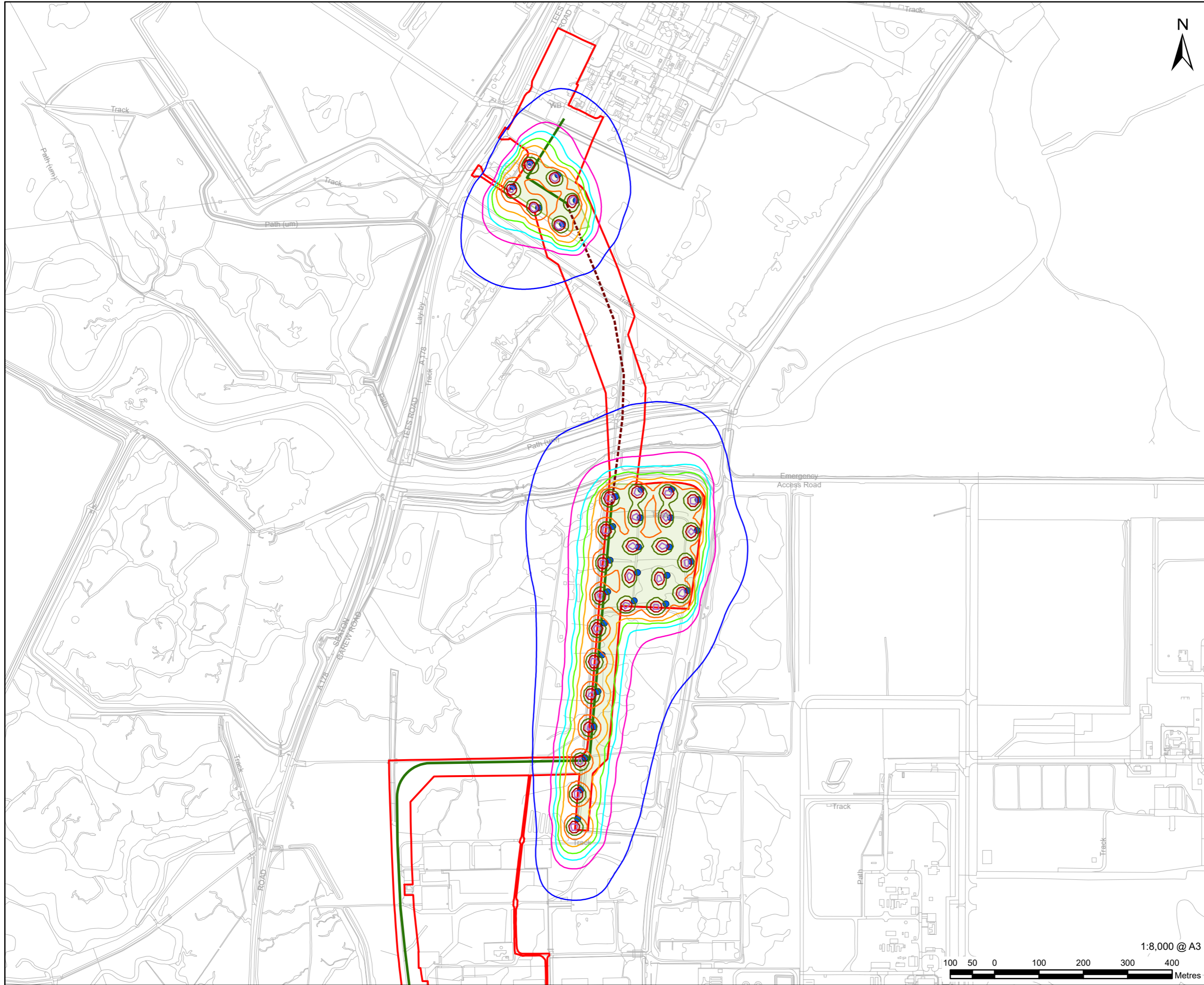
**FIGURE NUMBER**  
Figure C-5

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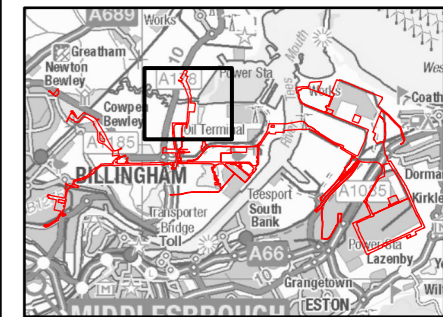
1:5,000 @ A3







- LEGEND**
- Proposed Development Site
  - Telescoping Mobile Unit
  - Trenchless Crossing Area HDD Exit
  - Indicative Pipeline Routing (Construction Type)**
  - Buried
  - Trenchless Crossing
  - Isoline (Ix)**
  - 0.1
  - 0.5
  - 1
  - 2
  - 5
  - 20
  - 50
  - 100
  - 150



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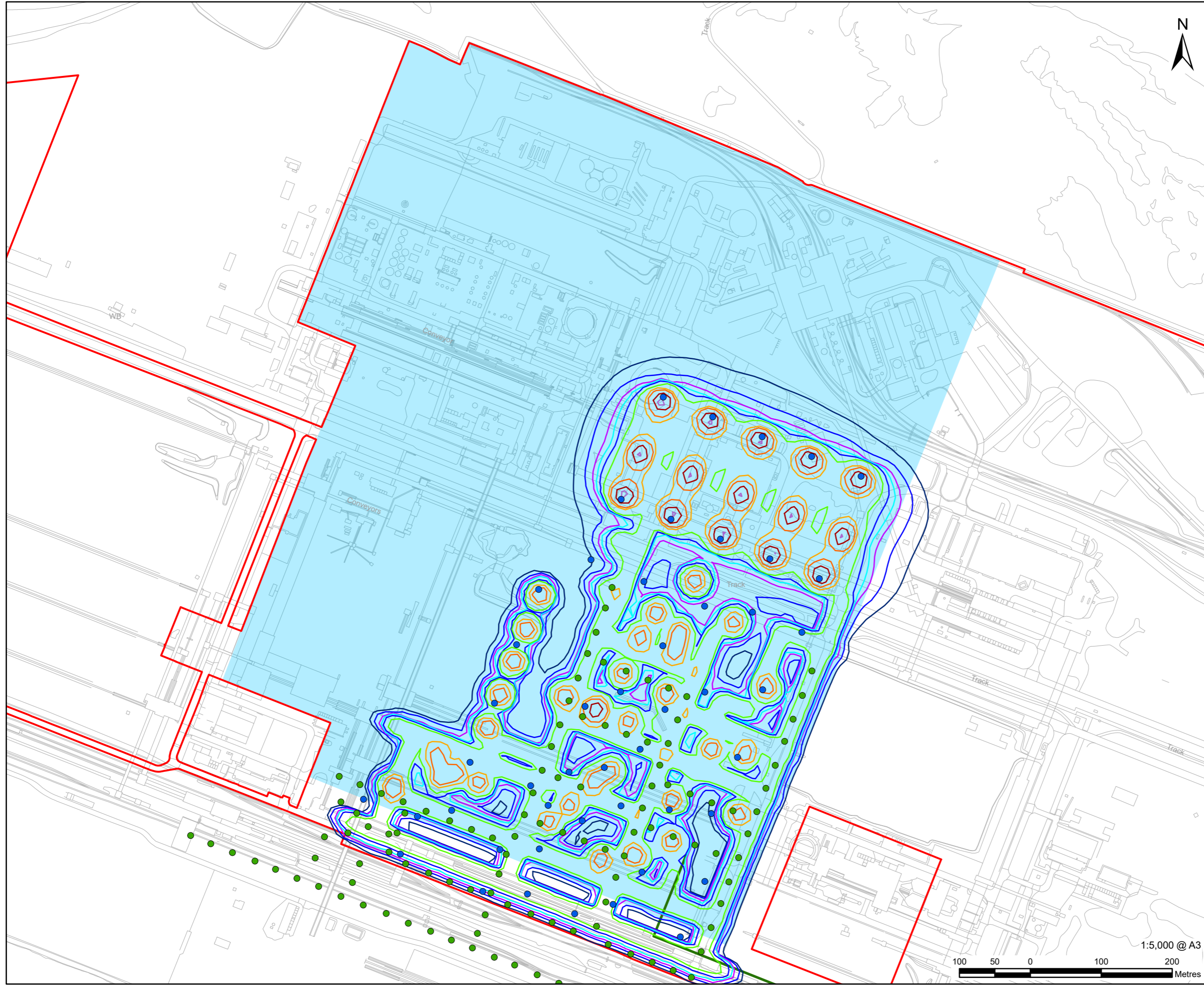
**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Greatham Creek Proposed  
Construction Lighting Performance –  
Light Distribution

**FIGURE NUMBER**  
Figure C-6



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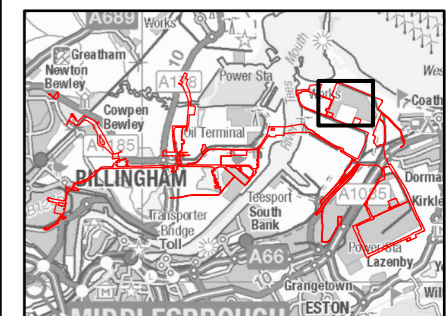


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- LEGEND**
- Proposed Development Site
  - Main Site
  - Column Mounted Street Light Style Head
  - Telescoping Mobile Unit
- Indicative Pipeline Routing (Construction Type)**
- Buried
- Isolines (lx)**
- 0.5
  - 1
  - 2
  - 5
  - 10
  - 30
  - 50
  - 100
  - 150



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**ISSUE PURPOSE**  
CEMP Lighting Strategy Appendix

**PROJECT NUMBER**  
60689030

**FIGURE TITLE**  
Main Site Proposed Construction  
Lighting Performance – Light  
Distribution

**FIGURE NUMBER**  
Figure C-7



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