Land Adjacent to the Westgate Entrance, Port of Immingham

Lighting Assessment

Associated British Ports (ABP)

Project number: 60666960

June 2022

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Megan O'Loughlin Senior Lighting Designer	Patricia Brock Technical Director Lighting	Lee Barker-Field Director Lighting	Kirsty Cobb Technical Director Environment

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	June 2022	Planning application	K Cobb	Kirsty Cobb	Technical Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Associated British Ports (ABP)

Prepared by:

Megan O'Loughlin
Senior Lighting Designer
M: +44 7799136809
E: megan.oloughlin@aecom.com

AECOM Limited
5th Floor, 2 City Walk
Leeds LS11 9AR
United Kingdom

T: +44 (0)113 391 6800
aecom.com

Table of Contents

Figures

Tables

1. Introduction

1.1 Associated British Ports (ABP) proposes to develop a vacant plot of land ('the Site') adjacent to the Port of Immingham in North Lincolnshire for port related use. The Site comprises a triangular parcel of land of approximately 9.2 ha adjoining the northern boundary of the Port of Immingham, within the administrative boundary of North Lincolnshire Council. The Site is located outside of, but adjacent to, the boundary of the operational port, close to the West Gate entrance.

1.2 The Site is bound to the north by a Local Wildlife Site (LWS), to the east by existing operational port land and to the west and south by an existing drainage channel, which separates the Site from Humber Road. Access to the Site for maintenance purposes is currently provided from Humber Road via a bridge over the drainage ditch on the south-western boundary.

1.3 The Site is allocated in the North Lincolnshire Housing and Employment Land Allocations Development Plan Document (North Lincolnshire Council, 2016) for development as part of Employment Site SHBE-1. Planning consent was previously granted in 2011 for the development of a 290 megawatt renewable energy plant on the Site, but this development has not progressed.

1.4 The Port of Immingham operates close to capacity, with operations expected to be further maximised as a result of pending development proposals. ABP have terms agreed to acquire the Site to enable the expansion of the Port.

1.5 This report accompanies a hybrid planning application to North Lincolnshire Council – a full application for port-related open storage uses on the Site (which is the proposed use in the short to medium term) and an outline application for buildings (the long term objective for the Site).

1.6 Two indicative lighting proposals have been developed to support the two phases of the hybrid application, of which both have a lighting requirement to allow for safe site use and access. This Lighting Assessment provides an overview of design and performance for each.

Documents Referenced

1.7 This assessment references design drawings, calculation and data within the assessment.

Drawings

- Drawing 18150-110 rev D – Storage Masterplan
- Drawing 18150-112 rev A – Parameter Plan
- Drawing 18150-113 rev D – Indicative Masterplan

Calculations

- Drawing– Kingfisher drawing of Option 1 lighting proposal with indicative containers
- Drawing– Kingfisher drawing of Option 1 lighting proposal without indicative containers
- Drawing D46334/JB/B – Kingfisher drawing of Option 2 lighting proposal for Humber Road, Immingham for ABP

Luminaire Data

- Kingfisher Semita Urban Bulkhead
- Kingfisher Zactis
- Kingfisher Viva City Pro
- Kingfisher Viva City Flood
- Kingfisher Amnis Flood

2. Legislation, Policy, Standards and Guidance

2.1 The following documents identify the current policy, standards and guidance that are relevant to the design and implementation of a new lighting design associated with the proposed development at Humber Road, Immingham.

Legislation

Clean Neighbourhoods and Environment Act 2005

2.2 The Clean Neighbourhoods and Environment Act 2005 provides consideration of artificial lighting. Clause 102 defines statutory nuisance from artificial lighting as *"artificial lighting emitted from premises so as to be prejudicial to health or nuisance"*. The clause also includes guidance for local authorities to control exterior lighting, depending on the specific context.

Policy

National Planning Policy Framework NPPF 2021

2.3 The National Planning Policy Framework (NPPF) (15), published 27th March 2012, revised on 24th July 2018 and 19th February 2019 and replaced with the current framework in July 2021. This details the Government's planning policies for England and how these are expected to be applied. Set out in Ground conditions and pollution, paragraph 185 (c) states:

> *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site and wider area impacts that could arise from the development. In doing so they should: …*
>
> *c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

Planning Practice Guidance, 2017

2.4 The Planning Practice Guidance (PPG) published March 2014 and amended July 2017. The section "Advice on how to consider light within the planning system" was updated November 2019. Matters of relevance to the lighting assessment include practical guidance on light pollution and advice for local authorities on when and how to consider light within the planning system. It also outlines which factors are relevant when considering possible ecological impacts of a new or changed lighting system. The PPG states:

> *"Artificial light provides valuable benefits to society... However for maximum benefit, it is important to get the right the right light, in the right place and providing light at the right time."*

North Lincolnshire Local Plan

2.5 The North Lincolnshire Local Plan was adopted in May 2003 and is used to make planning decisions. This was replaced by the Local Development Framework set out in the Core Strategy and associated area development plans. Policy DS12 set out under Development Standards covers Light Pollution is a saved policy that is retained from the Local Plan.

2.6 Policy DS12 states:

> *"Planning applications which involve light generating development including floodlighting will only be permitted where it can be demonstrated that there would be no adverse impact on local amenities."*

and further advises:

"Appropriate planning conditions may be attached to a planning permission which control and moderate the impact of light generating development including floodlight and external illumination of advertisements."

North Lincolnshire Validation Checklist

2.7 With reference to the validation checklist set out in 2018 that references both the NPPF and Policy DS12, where external lighting is proposed in a location that is classified as a residential or conservation area, where designated sites or protected or priority species of wildlife may be affected or there are sensitive landscapes, a lighting assessment is required. The assessment will need to confirm:

- Lighting scheme including hours of use;
- Light pollution/ trespass;
- Light output ratio (ULOR); and
- Overall lighting levels.

British Standards

2.8 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 a new lighting installation:

- 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).

Good Practice Guidance

CIBSE SLL Lighting Guidance

2.9 The Chartered Institution of Building Services Engineers (CIBSE) through the Society of 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 and SLL, 2016) – Lighting guide addressing light pollution, energy use and long-term sustainability in lighting for the exterior environment; and
- Lighting Guide 21 (LG21) – Protecting the night-time environment (CIBSE and SLL, 2011) – Lighting guide outlining causes and consequences of obtrusive light and how good design can minimise these effects to people and the environment.

Institute of Lighting Professionals (ILP) guidance

2.10 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 (GN) 01/21: The reduction of obtrusive light (ILP, 2021) – Guidance which is used throughout the industry that presents limiting criteria for direct obtrusive lighting effects (such as light spill, sky glow and glare) suitable to a given area brightness condition as well as good practice design approaches; and
- Guidance Note GN08/18: Bats and artificial lighting in the UK (ILP and the Bat Conservation Trust, 2018) – Guidance provided for light levels and colour temperature impacts on different bat species. It also looks at potential solutions to avoid and reduce this harm.

3. Scope of Assessment

3.1 New lighting is required for the Proposed Development to provide for safe access and site use when adequate daylight is not available during both construction and operational phases.

3.2 This needs to be balanced against the character of the wider setting which is balanced between industrial development and a more natural setting with trees, hedges and agricultural land. There is potential for wildlife to be present given the location of the fields and existing landscape features relative to the Site.

3.3 There are two phases of development proposed for the Site:

- Phase 1 – Storage masterplan with external surface level storage on hard standing, 16.40 acres; and
- Phase 2 – Up to 26,096 sqm of port related employment floorspace, access roads, car parks, service yards and other associated infrastructure.

3.4 The assessment addresses potential effects stemming from the following for Phase 1:

- Column mounted lighting with street-light style luminaires or high power floodlights.

3.5 The assessment addresses potential effects stemming from the following for Phase 2:

- Building perimeter lighting;
- Column mounted floodlighting for service yards;
- Column mounted street-light style lighting for access roads and car parks.

3.6 The assessment will consider the effect created by the Proposed Development on key obtrusive light metrics:

- Light spill – light reaching beyond the area that is being lit, to adjacent land, habitat or windows;
- Sky glow – light shining into the night sky from direct light (expressed as an upward light ratio, ULR) and from direct/indirect light (expressed as an upward flux ratio, UFR); and
- Glare – noticeably bright light against a dark surround or direct views of light sources.

3.7 While the effects of a lighting installation may be commented on in terms of technical performance, visual impact does not form part of the analysis.

3.8 The lighting assessment is undertaken as a desktop exercise and design information and mapping were obtained via the design team with lighting design information provided by Kingfisher.

3.9 A worst-case condition is used for the assessment that assumes lighting will be needed to cover all areas of the Proposed Development rather zoned to accommodate site use patterns throughout the year. It is, however, expected that during the post-curfew period (11pm – 6am) lighting will be dimmed or turned off where it is not required for safe site use or security purposes.

3.10 The report gives recommendations about maximum permissible values of obtrusive effects based on good practice guidance for exterior lighting installations. These values are regarded as limiting values, and the lighting scheme strives to meet the lowest criteria for the design.

Consultation

3.11 Consultation was undertaken with the Environmental Protection Team on 14 June 2022. They have confirmed that any lighting assessment should:

- Identification of sensitive receptors likely to be impacted upon by light nuisance, with a determination of the proposed scheme's compliance with the design guidance in the Institution of Lighting Professionals Document: Guidance Notes for the Reduction of Obtrusive Light. https://www.theilp.org.uk/documents/obtrusive-light/ ; and
- A lighting scheme which proposes methods of mitigation against potential light nuisance, including potential glare and light spill, on sensitive receptors.

4. Proposed Development Overview

4.1 The facilities that will be provided within the Site vary between the two phases of development.

4.2 Both the Short Term and Long Term site arrangements have a requirement for exterior lighting to support safe use and access for contractors and staff. For each, lighting will be required for all exterior areas, including the new access route off of the ABP Immingham junction, but will not alter roadway design.

Site Location and Development Layout

4.3 The local context for the overall Site is predominantly industrial/ rural, with the Immingham docks directly to the east, and the Humber oil refinery and other industrial development to the west.

4.4 Immingham West Fire Station lies across Humber Road from the immediate western Site boundary. The remaining boundaries to the north and extended south are greenfield or arable farmland. Rosper Road Pools sits directly to the north of the Site along the majority of the north boundary.

4.5 The residential town of Immingham is located approximately 1 km to the south of the Proposed Development.

4.6 The Rosper Road Local Wildlife Site is to the north, which is an area of land that is designated as being especially important for its wildlife and local conservation value.

4.7 Figure 1 provides an overview of the Site location of the development indicated by a red hatch.

Figure 1 Site Location

Source: Google earth overlay

Redline boundary Proposed Development Area

Proposed Development Layout

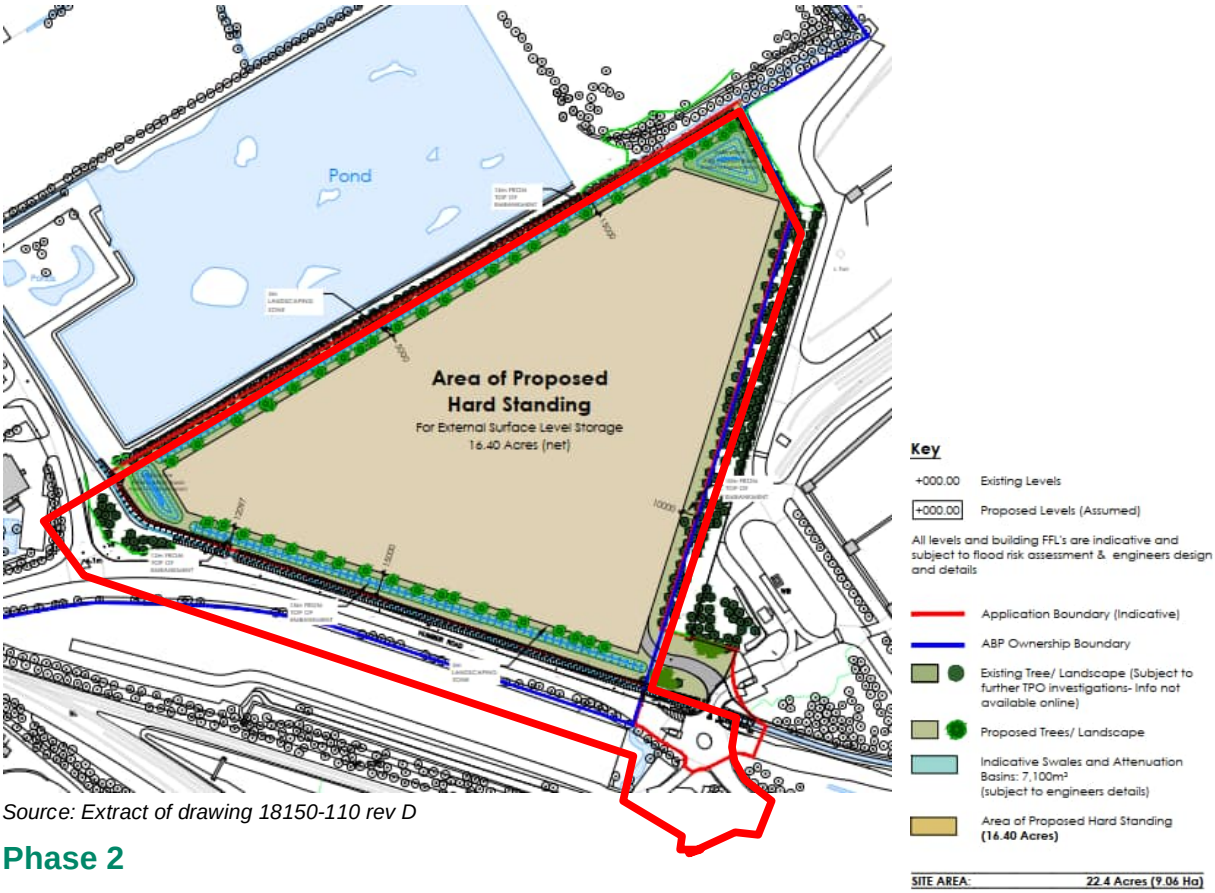
Phase 1

4.8 The Phase 1 design contains only hard standing within the Site and no permanent building structures. This proposal does include for additional landscape at the perimeter as well as swales and attenuation basins to the north, south and west, subject to design. Full planning permission is sought for Phase 1.

4.9 This arrangement would allow for storage containers to be stacked to a maximum expected height of 4 containers, or 12m using a 3m container height, and a typical stacking height of 3 containers, with drive routes set through the stacks and a perimeter access lane.

4.10 Figure 2 shows the Phase 1 Site arrangements in plan.

Figure 2 Proposed Site arrangements – Short Term plan



Source: Extract of drawing 18150-110 rev D

Phase 2

4.11 The Phase 2 development comprises the erection of up to 26,096 sqm of port-related employment floorspace. Outline planning permission is sought for Phase 2, which seeks to establish maximum development parameters (maximum floorspace, building heights, developable areas etc.).

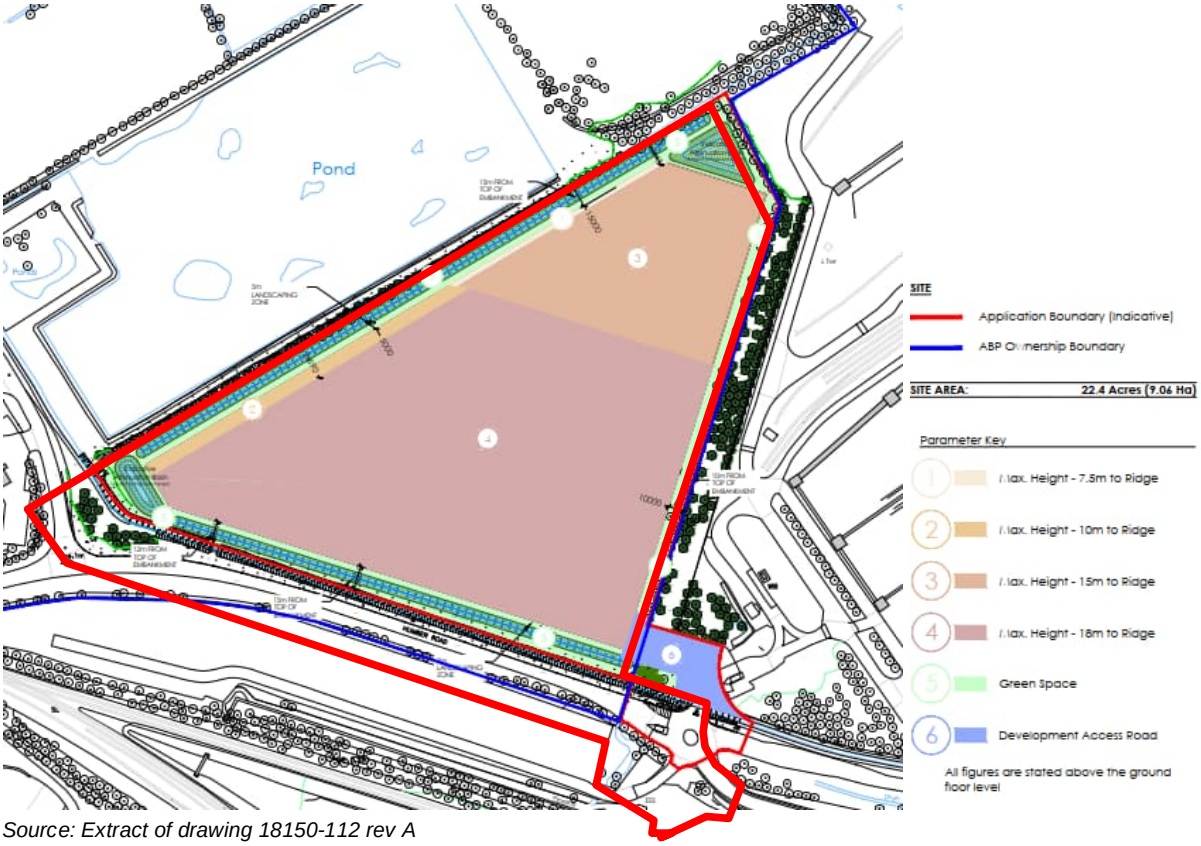
4.12 Figure 3 shows the parameter plan for Phase 3. This provides an overview of maximum heights for new buildings in different parts of the Site in addition to areas used for green space and access only. Tall site elements of up to 18m are allowed over a substantial part of the Site toward Humber Road.

4.13 The parameters have been used to develop an illustrative scheme (Figure 4) that is used in this assessment which provides:

- Hardstanding to support vehicular access into and through the Site, car parking (with cycle spaces), service yards and fire track;
- Unit 1 with 18,325 sq.m GIA hosting offices at first floor and a Drivers Office Hub in addition to storage facility;
- Unit 2 with 8,570 sq.m GIA hosting offices at first floor and a Drivers Office Hub in addition to storage facility;
- Gatehouse to the north of Unit 1;
- Perimeter landscaping; and
- Swales and attenuation basins, subject to design.

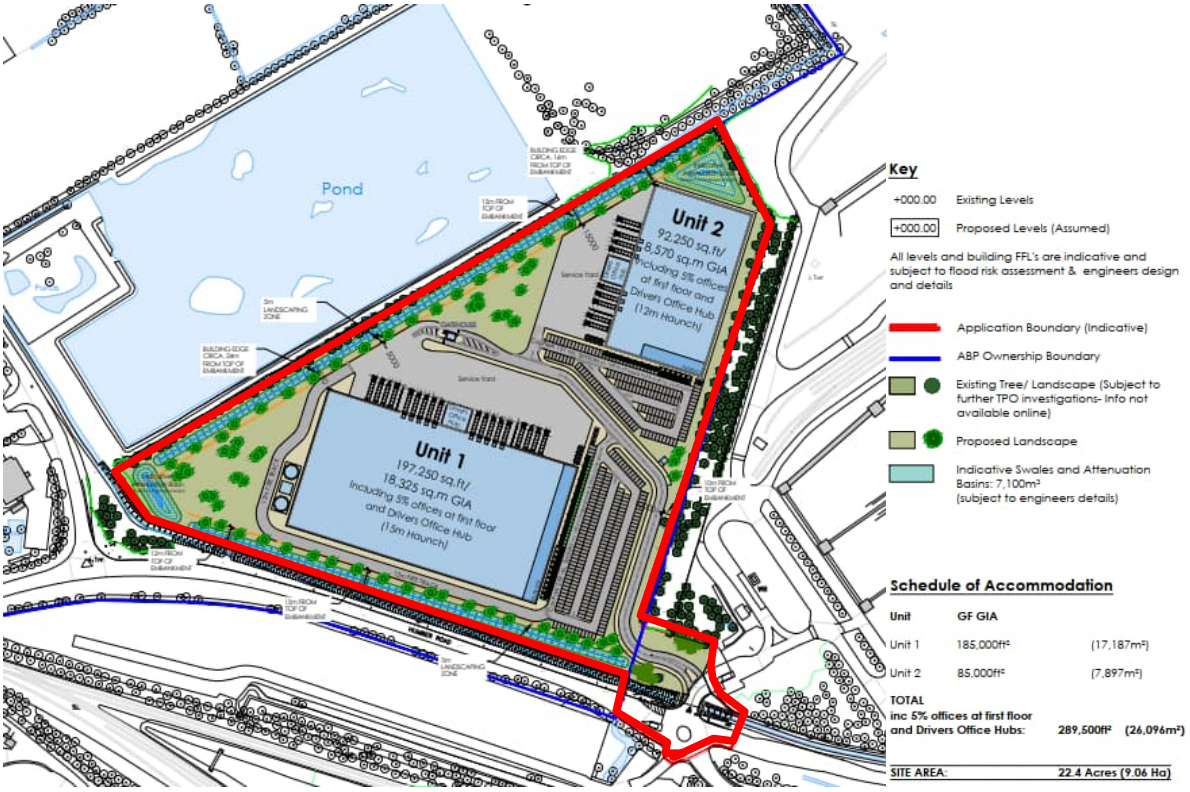
4.14 The final form and layout of development will be subject to the submission of an application for the approval of reserved matters. Final details of the lighting scheme for Phase 2 will be secured at this stage.

Figure 3 Proposed Site arrangements – Phase 2 Parameters



Source: Extract of drawing 18150-112 rev A

Figure 4 Proposed Site arrangements – Phase 2 Indicative Masterplan



Source: Extract of drawing 18150-113 rev D

Site Context

4.15 The Site as it stands is relatively flat and open and described as a semi-natural habitat providing a combination of grassland, scrub and hedgerows.

Receptors

Residential Properties

4.16 There is one nearby residence 400m to the north which has a moderately dense treeline providing local screening. There are no other residential properties near the Site and none that would have direct views inside the perimeter.

Ecology

4.17 Rosper Road Pools Local Wildlife Site (LWS) and the fields to the north of Rosper Road are identified as areas of ecological sensitivity.

4.18 Rosper Road Pools LWS includes open water habitat surrounded by reedbed and punctuated by small islands. This is a shallow drainage lagoon, which is linked to the surrounding network of ditches that outfall into the estuary at the northern end of Immingham Docks.

4.19 The Pools have had some habitat enhancement works to create small islands for nesting avocet, and they support other wetland birds at all times of year. For this reason, they are regarded as being functionally linked to the Humber Estuary SPA and Ramsar, because there is a high probability that they provide a supporting role in the function and integrity of those designations.

4.20 The fields to the north of Rosper Road, commonly referred to as “Rosper Road Fields” or “North Killingholme Marshes” include damp pasture and arable, divided by a network of hedgerows. This area is widely regarded as functionally linked to the Humber Estuary SPA and Ramsar as it is regularly used by qualifying species for which those sites are designated. The area also supports an assemblage of breeding birds.

4.21 Further detail can be found in the Habitat Regulations Assessment (HRA) Report and Ecological Impact Assessment (EcIA) Report.

Hours of Operation

Construction

4.22 Construction, demolition and site clearance programmes are to be confirmed, however for the purposes of assessment it is assumed that they will be limited to predominantly daylight hours. The anticipated construction schedule on that basis is set out as:

- 08:00 to 18:00 Monday to Friday;
- 08:00 to 13:00 Saturday; and
- No works are to be undertaken on Sundays or public holidays.

4.23 It is expected that there could be up to an hour before and after the start of works to accommodate start-up and shut-down procedures during the day. Otherwise, no lighting during the construction phase will be used unless it is required to deal with an emergency on-site.

4.24 As this will be primarily a daytime schedule it is not expected that there will be a significant amount of high power floodlighting in use normally except to extend the workday where demolition or construction takes place during winter months or when there is inclement weather and sufficient daylight is not available to safely undertake tasks.

Operation

4.25 The port will be in operation seven (7) days a week and may have traffic up to 24 hours a day, daily.

4.26 This lighting strategy supports health and safety when ambient light levels are low, for emergency purposes, and the operational period during winter months.

5. Existing Lighting Context

5.1 There is a mix of lighting installation in the area local to the Site, although the majority that is easily seen runs along Humber Road or in adjacent car parks, provided by street light style luminaires mounted to 10-12 m columns in a single head configuration either in a post top mounting or using a bracket arm. There is a combination of lamp types along the route including LED, Metal Halide and High Pressure Sodium.

5.2 Humber Road is a 30mph traffic route with a moderate to high level of illumination which is increased in brightness near the security booth at the ABP West Gate roundabout. Some lighting was observed to be in use during daylight hours.

5.3 Industrial sites in the area trend toward columns utilising street light style luminaires and floodlighting in addition to building mounted perimeter and floodlighting.

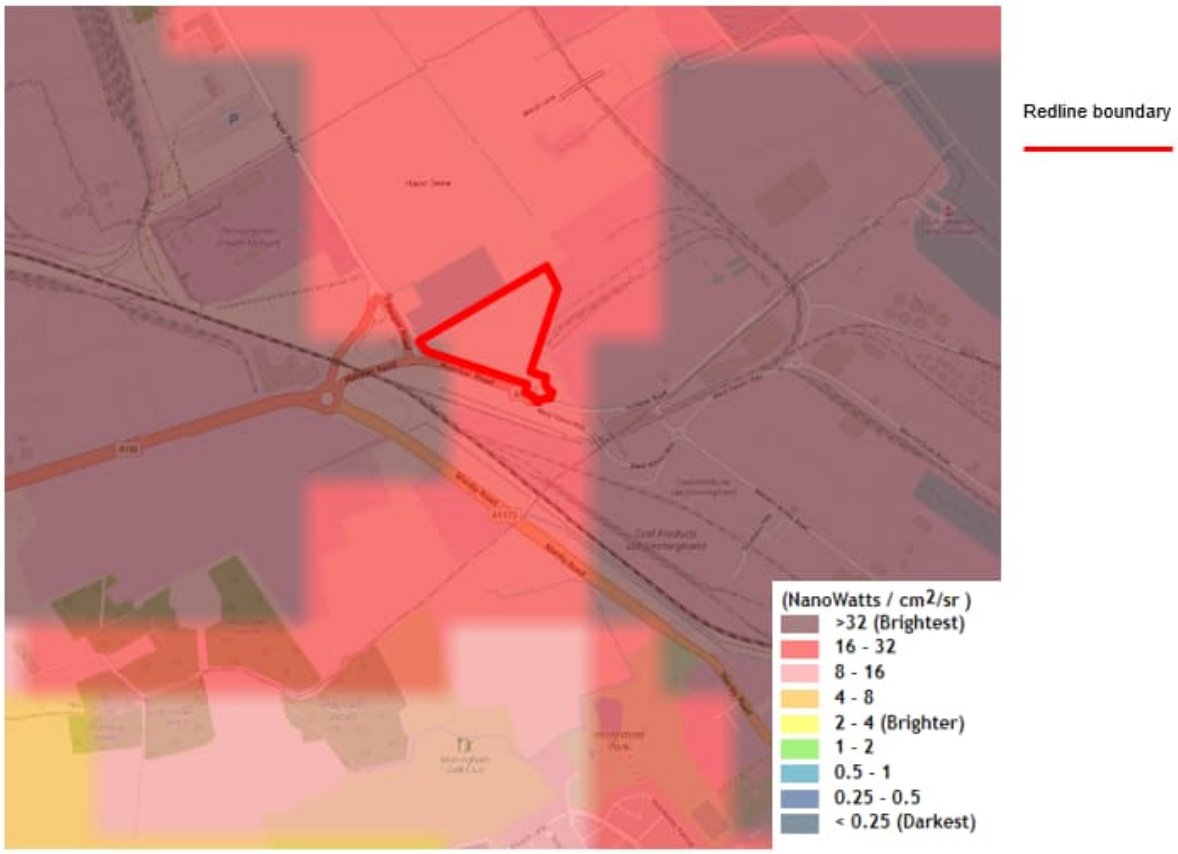
5.4 The Site is unlit but is subject to effects from lighting conditions associated with local developed areas.

Associated Brightness Conditions

5.5 Light mapping from the Campaign for the Protection of Rural England (CPRE) shows that the area around the Site has a moderate to high characteristic brightness as a result of the industrial development prevalent in the area. These developments tend to require more light for safely undertaking exterior tasks and supporting appropriate security measures. These types of areas tend to be equivalent to be at the higher end of environmental zones as defined by the ILP.

5.6 Figure 5 provides an overview of the intensity of light local to the Site where the blocks shown depict the level of radiance that shines up into the night sky. This is a combined result of light shining directly upward and light reflecting upward from the ground or other surfaces.

Figure 5 England light pollution and dark skies mapping (CPRE)



Source: https://nightblight.cpre.org.uk/maps/

6. Lighting Strategy and Design

6.1 The exterior lighting strategy for new exterior lighting for the proposed port development has been developed to reflect the different requirements presented by each phase. Full details of each phase of the Proposed Development are provided in Appendix A.

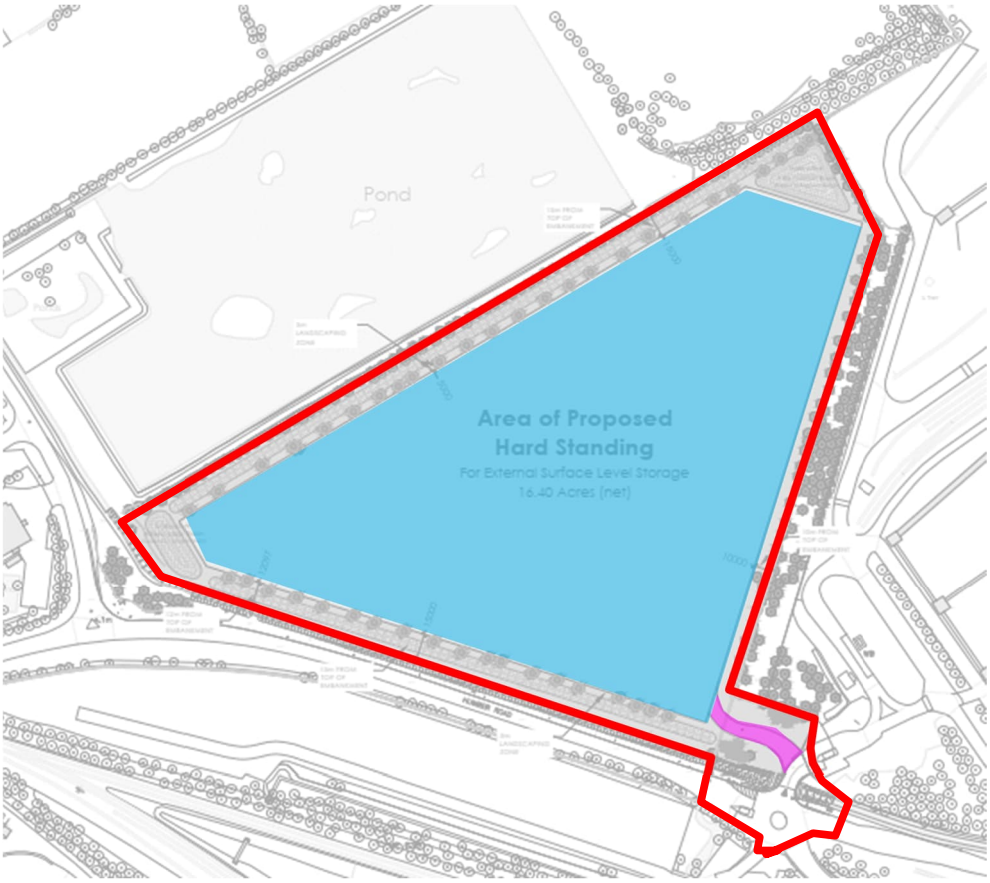
6.2 The lighting assessment reviews these strategies and their performance in relation to obtrusive light, in particular light spill, sky glow and glare, based on identified constraints, where present, and the local area lighting character.

Option Overview

Phase 1 Strategy

6.3 The Phase 1 Site arrangements introduce a large area of hardstanding that serves multiple needs flexibly within the space. The primary aspects of design that would influence the selection and design of lighting include site access, parking, accommodation for storage containers to include access and handling of goods, and security. Figure 6 presents an overview of the proposed lighting zoning areas for the Short Term plan within the redline boundary.

Figure 6 Proposed lighting zoning – Phase 1 plan



Source: Extract of drawing 18150-110 rev D

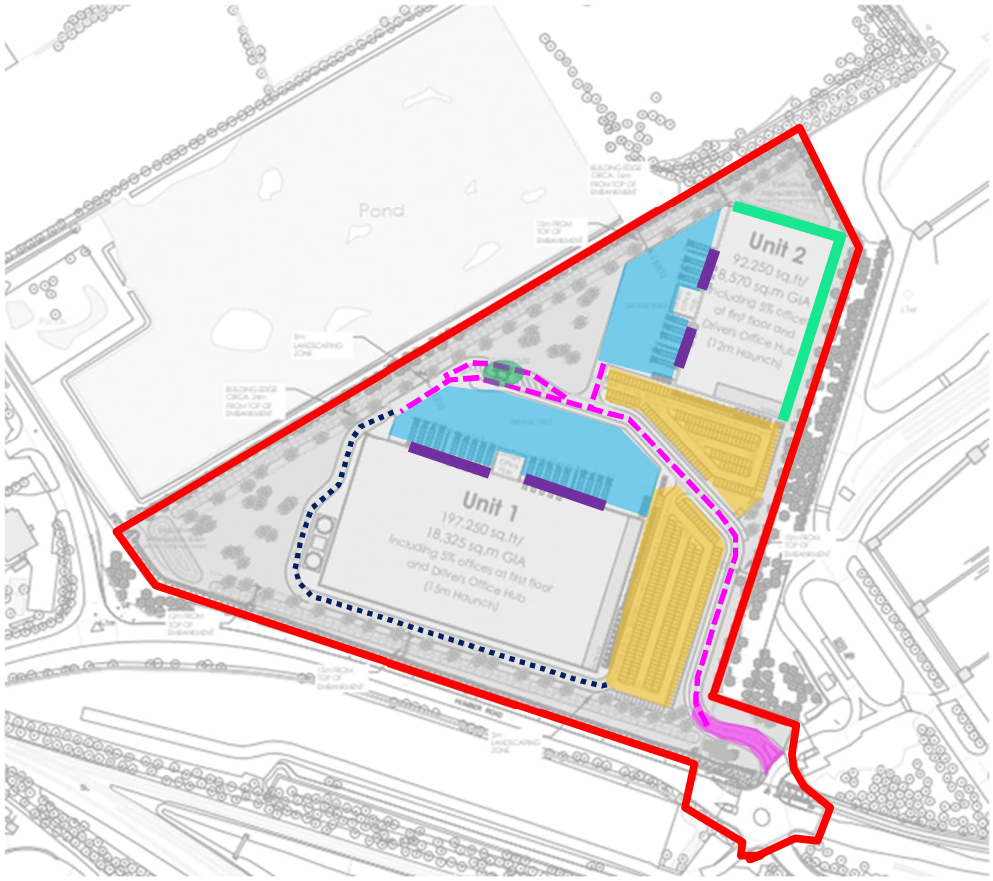
Open Storage Area Access Road Redline boundary

Phase 2 Strategy

6.4 An indicative masterplan has been prepared for Phase 2, based on the maximum development parameters proposed. The indicative lighting scheme for Phase 2 is based on this indicative masterplan. The Phase 2 Site arrangements utilise buildings for storage and further divides the Site into dedicated areas for access, parking and service. This creates the need for a different lighting approach than for the

Phase 1 plan. Figure 7 presents an overview of the lighting application areas for the Phase 2 plan within the redline boundary. Final lighting details will form part of any subsequent reserved matters application.

Figure 7 Proposed lighting zoning – Phase 2 plan



Source: Extract of drawing 18150-113 rev D

Lighting Design Technical Requirements

6.5 The Proposed Development requires lighting to support safe use and access of the facility. The following table extracts provide an overview of what lighting may be required to support Site activities.

Table 1 General lighting requirements for areas and for cleaning at outdoor workplaces

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	U_o –	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

Source: extract BS EN 12464-2:2014, Table 5.1

Table 2 Industrial site and storage areas

Ref. no.	Type of area, task or activity	$\overline{E}_m$ lx	U_o –	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

Source: extract BS EN 12464-2:2014, Table 5.7

Table 3 Parking areas

Ref. no.	Type of area, task or activity	$\overline{E}_m$ lx	U_o –	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	

Source: extract BS EN 12464-2:2014, Table 5.9

Lighting Design Parameters

6.6 The following lighting targets are used to develop a lighting strategy to support the operation of the Proposed Development with design areas covered for both the Short Term and Long Term Site arrangements. Table 4 sets out the design performance criteria established by BS requirements and CIBSE good practice guidance.

Table 4 Lighting design criteria

Site area	Light level (lux)	Uniformity	Colour rendering (min)	Glare ratio	Comments
Access Road	20	0.4	20	50	
Bin Store	10	0.4	20	50	
Car Park	10	0.25	20	50	Medium traffic volume
Cycle Store	5	-	20	50	
Fire Track	10	0.25	20	50	Emergency access
Gatehouse	50	0.4	50	50	
Loading Bay	50	0.4	50	50	
Service Yard	20	0.4	20	50	
Building Perimeter	5	0.25	20	50	
Open Storage	50	0.4	20	50	To accommodate traffic routes

6.7 Installed lighting and light levels will support CCTV operation.

Environmental Requirements

6.8 The ILP document GN01 Guidance Notes for the Reduction of Obtrusive Light (ILP, 2021) advises that lighting which has the same characteristics as the overall area lighting condition are less likely to cause disturbance, as well as minimise instances of light pollution.

6.9 The guidance describes design approaches and different types of brightness characteristics expressed by limiting criteria for obtrusive light. This is done through defining environmental zones which set out the recommended limiting criteria for a new or changed lighting installation.

6.10 The local area lighting characteristics have been established as similar to those associated with industrial type development which is typically environmental zone E3. While adjacent areas are likely to be brighter overall characteristics based on historic installations that have grown over time, it is not recommended for the proposed development to be similarly performing and a zone E3 is used to set the limiting criteria.

Environmental Target Criteria

6.11 The following tables are extracts of ILP GN01 (ILP, 2021) which give an overview toward how brightness characteristics are considered and what targets are recommended. Note that for any criteria indicating a curfew, the curfew is assumed to be around 11pm.

6.12 Additional information for each table is provided within the guidance document.

Table 5 Lighting environmental zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (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

Source: extract ILP GN01 2021, Table 2

Table 6 Lighting threshold criteria – Maximum vertical illuminance on properties (light spill)

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

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

Source: extract ILP GN01 2021, Table 3

Table 7 Lighting threshold criteria – Limits for luminous intensity (glare)

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m²)					
		$0<A_p \leq 0.002$	$0.002<A_p \leq 0.01$	$0.01<A_p \leq 0.03$	$0.03<A_p \leq 0.13$	$0.13<A_p \leq 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd)[5]	E0 Pre-curfew Post-curfew	0 0	0 0	0 0	0 0	0 0	0 0
	E1 Pre-curfew Post-curfew	0.29 d 0	0.63 d 0	1.3 d 0	2.5 d 0	5.1 d 0	2,500 0
	E2 Pre-curfew Post-curfew	0.57 d 0.29 d	1.3 d 0.63 d	2.5 d 1.3 d	5.0 d 2.5 d	10 d 5.1 d	7,500 500
	E3 Pre-curfew Post-curfew	0.86 d 0.29 d	1.9 d 0.63 d	3.8 d 1.3 d	7.5 d 2.5 d	15 d 5.1 d	10.000 1,000
	E4 Pre-curfew Post-curfew	1.4 d 0.29 d	3.1 d 0.63 d	6.3 d 1.3 d	13 d 2.5 d	26 d 5.1 d	25,000 2,500

Source: extract ILP GN01 2021, Table 4

Table 8 Lighting threshold criteria – Limits for upward light (sky glow)

Light technical parameter	Environmental zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

Source: extract ILP GN01 2021, Table 5

Table 9 Lighting threshold criteria – Limits for upward flux (sky glow)

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
	Sports	n/a	n/a	2	6	15

Source: extract ILP GN01 2021, Table 7

Table 10 Lighting threshold criteria – Limits for building and signage luminance

Light technical parameter	Application conditions	Environmental zones				
		E0	E1	E2	E3	E4
Building façade luminance (L_b)	Taken as the product of the design average illuminance and reflectance divided by π	< 0.1 cd/m²	< 0.1 cd/m²	5 cd/m²	10 cd/m²	25 cd/m²
Sign luminance (L_s)	Taken as the product of the design average illuminance and reflectance divided by π (pi), or for self-luminous signs, its average luminance	< 0.1 cd/m²	50 cd/m²	400 cd/m²	800 cd/m²	1.000 cd/m²

Source: extract ILP GN01 2021, Table 8

Lighting Design Environmental Parameters

6.13 The following lighting targets are used to develop a lighting strategy to support the operation of the Proposed Development. Table 11 sets out the environmental performance criteria established by ILP good practice guidance for a zone E3. As some of the areas near the Site do not contain lighting there is potential to look at the next level down for environmental criteria, that associated with a zone E2. Where possible, it is recommended to aim for the more stringent requirements to try and further limit increases in local area lighting conditions.

Table 11 Environmental design criteria

Metric	Zone E2	Zone E3
Light spill (pre-curfew)	5 lux	10 lux
Light spill (post-curfew)	1 lux	2 lux
Sky glow (ULR)	2.5%	15%
Upward Flux (road, UFR)	5%	8%
Glare (pre-curfew)	7500cd	10000cd
Glare (post-curfew)	500cd	1000cd

Lighting Strategy

6.14 The lighting strategy options developed need to balance achieving suitable light levels for the exterior areas and controlling obtrusive lighting effects. In order to ensure that the final design is able to meet the technical and environmental criteria, general approaches to the development of the lighting designs are set out below.

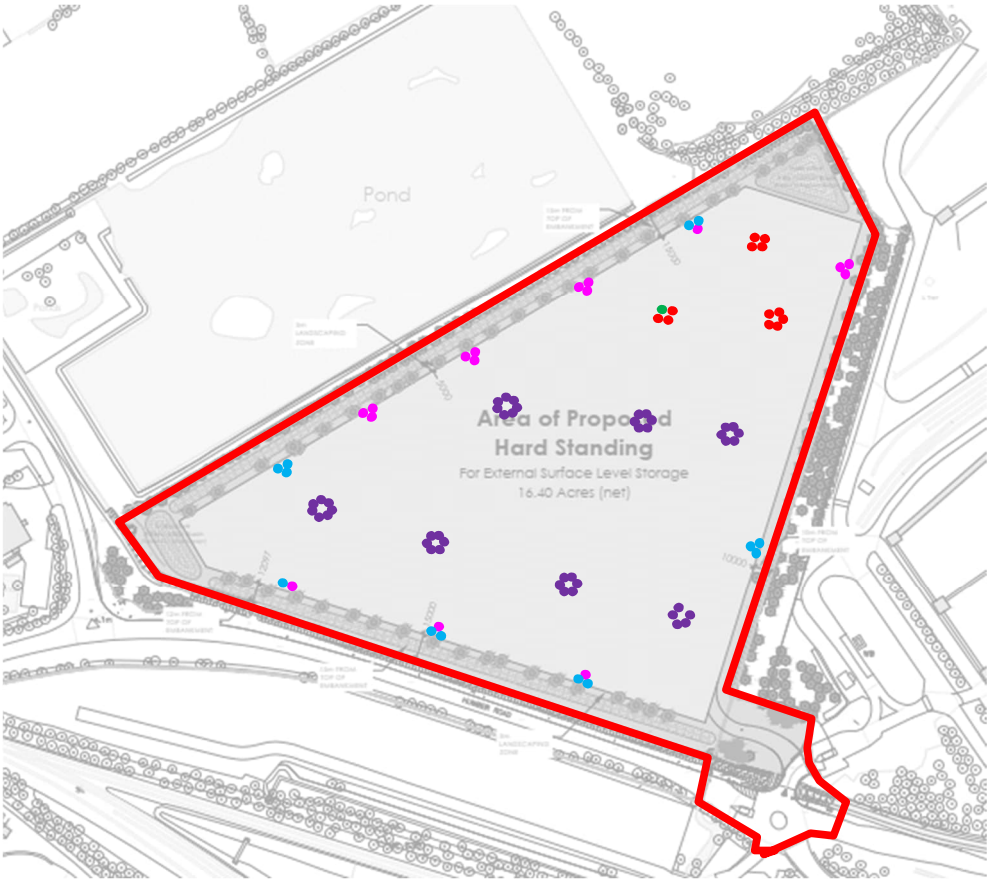
6.15 These lighting strategies consider where the light shines, when the light shines, how much light shines, and the possible ecological impact of lighting used for an open site configuration.

Phase 1 Strategy

Lighting Arrangements

6.16 A lighting strategy for an open storage design (Phase 1) has been produced for assessment and considers the lighting requirements for the overall Site as described above. Figure 8 presents an overview of the proposed arrangements in plan.

Figure 8 Proposed lighting layout – Phase 1 strategy



Source: Extract of drawing 18150-110 rev D

Lighting Details

6.17 The proposed lighting strategy for Phase 1 utilises a combination of column mounted street light style luminaires and floodlighting to meet the established design criteria. All lighting is LED that provides an efficiency around or above 100lm/W and is subject to a control strategy to avoid unnecessary energy consumption.

6.18 Table 12 sets out the luminaire typologies that have been used for the development of the lighting strategy.

Table 12 Luminaire typologies – Short Term equipment selection

Symbol	Image	Product (or equivalent)	Lamp	Light colour	Colour Rendering	Lumen output	Installation
●		Kingfisher Amnis Match Flood	LED	4000K	70+	WST optic, ~63,450 lm, 450W	Bracket / ring mount to 30m mast, cowls will be applied to fittings along the north boundary at 0 degree tilt
●		Kingfisher Amnis Match Flood	LED	4000K	70+	WST optic, ~63,450 lm, 450W	Bracket / ring mount to 35m mast at 0 degree tilt
●		Kingfisher Amnis Flood	LED	4000K	70+	WST optic, 125,000 lm, 900W	Bracket / ring mount to 30m mast, cowls will be applied to fittings along the north boundary at 0 degree tilt

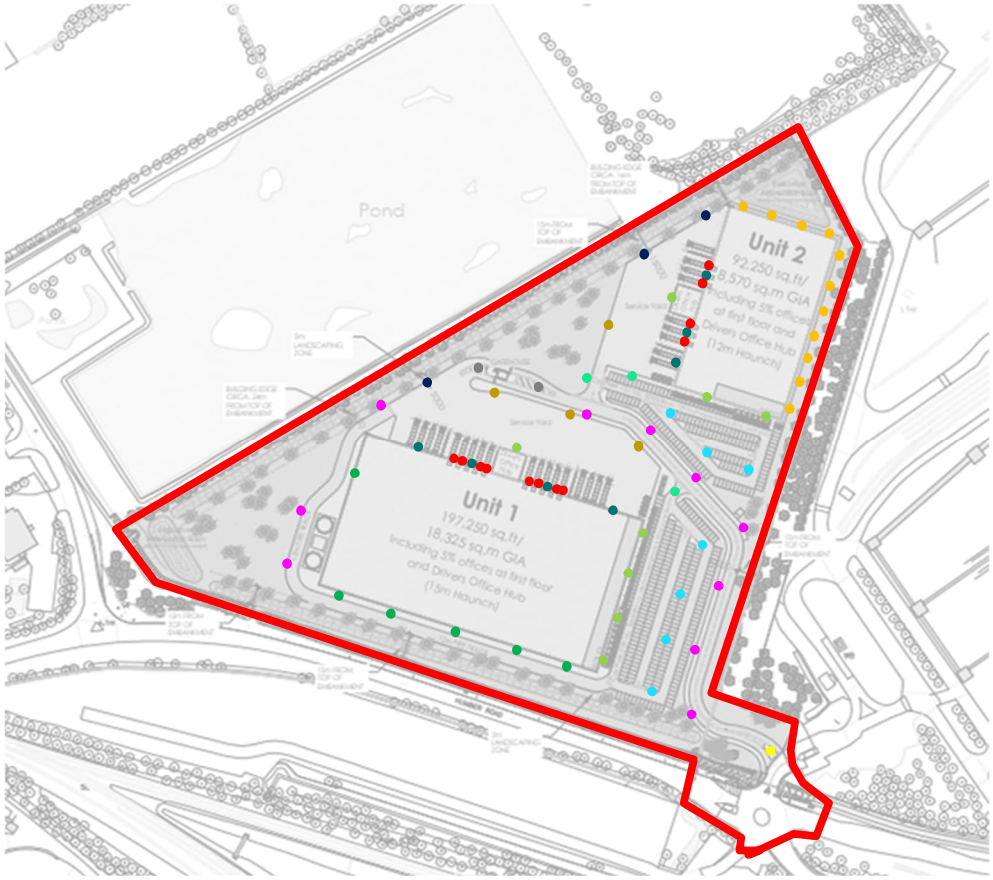
Symbol	Image	Product (or equivalent)	Lamp	Light colour	Colour Rendering	Lumen output	Installation
●		Kingfisher Amnis Flood	LED	4000K	70+	WST optic, 125,000 lm, 900W	Bracket / ring mount to 35m mast at 0 degree tilt
●		Kingfisher Amnis Flood	LED	4000K	70+	WST optic, 125,000 lm, 900W	Bracket / ring mount to 40m mast at 0 degree tilt
Not shown		Kingfisher, Viva City Pro, 805mA, IP66	LED	4000K	70+	AY70 optic, 11,140lm per head, 2x80W	Post top mount to column at 8m, twin configuration, 0 degree tilt

Phase 2 Strategy

Lighting Arrangements

6.19 A lighting strategy for Phase 2 has been produced for assessment based on the indicative masterplan and considers the lighting requirements for the overall Site as described above. Figure 9 presents an overview of the proposed arrangements in plan. Further detail on the proposed arrangements is found in Appendix A.

Figure 9 Proposed lighting layout – Phase 2 strategy



Source: Extract of drawing 18150-113 rev D

Lighting Details

6.20 The proposed lighting strategy for Phase 2 utilises a mixture of building mounted adjustable floodlights, building mounted perimeter lighting and column mounted street-light style luminaires or floodlights to meet the established design criteria. All lighting is LED that provides an efficiency around or above 100lm/W and is subject to a control strategy to avoid unnecessary energy consumption.

6.21 Table 13 sets out the luminaire typologies that have been used for the development of the lighting strategy. Further detail for the products specified is found in Appendix B.

Table 13 Luminaire typologies – Long Term equipment selection

Symbol	Image	Product (or equivalent)	Lamp	Light colour	Colour Rendering	Lumen output	Installation
●		Kingfisher, Semita Urban Bulkhead, IP66	LED	4000K	70+	Flood optic, 3,000lm, 24W	Wall mount at 5m
●		Kingfisher, Semita Urban Bulkhead, IP66	LED	4000K	70+	Cycle optic, 802lm, 6W	Wall mount at 3.5m
●		Kingfisher, Zactis Floodlight, 808mA, IP65	LED	4000K	70+	FW70 optic, 44,165lm, 320W	Post top mount to column at 10m, single configuration, 0 degree tilt
●		Kingfisher, Zactis Floodlight, 808mA, IP65	LED	4000K	70+	FW70 optic, 44,165lm, 320W	Wall mount at 10m, 0 degree tilt
●		Kingfisher, Zactis Floodlight, 808mA, IP65	LED	4000K	70+	FW70 optic, 44,165lm, 320W	Post top mount to column at 10m, with spill shield, single configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 624mA, IP66	LED	4000K	70+	AYB70 optic, 10,581lm, 120W	Post top mount to column at 8m, with internal spill shield, single configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 620mA, IP66	LED	4000K	70+	FW70 optic, 17,828lm, 120W	Post top mount to column at 8m, single configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 805mA, IP66	LED	4000K	70+	AY70 optic, 11,140lm per head, 2x80W	Post top mount to column at 8m, twin configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 805mA, IP66	LED	4000K	70+	FY70 optic, 11,140lm per head, 2x80W	Post top mount to column at 8m, twin configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 805mA, IP66	LED	4000K	70+	AY70 optic, 11,120lm, 80W	Post top mount to column at 8m, single configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 805mA, IP66	LED	4000K	70+	AY70 optic, 17,828lm, 120W	Post top mount to column at 8m, twin configuration, 0 degree tilt
●		Kingfisher, Viva City Pro, 610mA, IP66	LED	4000K	70+	AY70 optic, 17,828lm per head, 2x120W	Post top mount to column at 8m, twin configuration, 0 degree tilt
●		Kingfisher, Viva City Flood, 780mA, IP66	LED	4000K	70+	FY70 optic, 17,760lm, 120W	Wall mount at 8m, 0 degree tilt

Symbol	Image	Product (or equivalent)	Lamp	Light colour	Colour Rendering	Lumen output	Installation
●		Kingfisher, Viva City Flood, 780mA, IP66	LED	4000K	70+	AY70 optic, 17,760lm, 120W	Wall mount at 8m, 0 degree tilt

Lighting Controls

6.22 Photocells are to be used as a primary control on all exterior lighting so that no luminaires will remain switched on during daylight hours. A time clock override will be used, as well as manual override switch to control of exterior lighting in the event of an emergency.

6.23 Time clock override will allow for lighting that is not used for safety or security to be turned on/off or dimmed as and when needed to suit service schedules and staff working patterns in relation to the standard hours of work.

6.24 This will aid in reducing the potential obtrusive lighting effects as they would be on for less time and will contribute to an energy savings as compared to operation throughout the night.

7. Technical Assessment

7.1 Lighting performance was determined from calculations provided by Kingfisher. Please note that variable screening that might be provided by mature trees or shrubbery is not included within the assessment, although it is recognised that there will be landscape elements along the Site boundary for each design option. These will create some degree of variable screening throughout the year and further reduce reported effects, where effects are noted from off-site locations.

7.2 A perimeter fence is set at the edge of the development area. This is also not included in the assessment, although it is expected that for lux values reported at or beyond the Site boundary in a bare earth scenario will be reduced based on the ratio of solid to open presented by the fence materials.

Maintenance and Maintenance Factor

7.3 Maintenance considers guidance provided by BS 5489-1:2020. A maintenance factor of 0.9 was used to represent a projected long life for fittings, an assumed less than 3 year cleaning cycle and commitment to regular inspection and upkeep of exterior lighting, to include replacement where necessary in case of lamp failure, so that the lighting condition will be consistent for the time it is used.

7.4 The simulation images reflect this performance. Day 1 conditions are usually brighter, but this initial brightness can be controlled by using a constant current system that adjusts to provide a consistent light output over time.

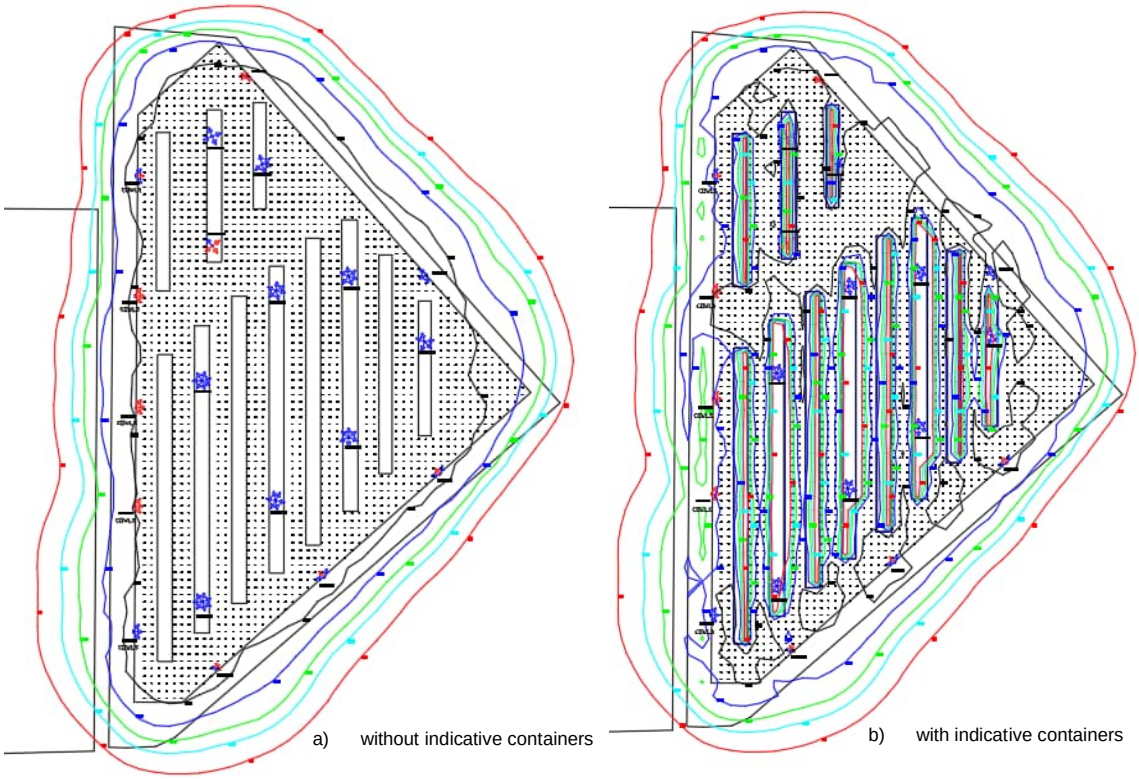
Phase 1 Lighting Performance

7.5 Two calculations have been developed to support the Phase 1 development arrangements:

- Calculation 1 – shows an open site with no obstruction, i.e. there are no trees, fencing, bins, containers, lorries or other low height structures or objects are considered within the assessment. The addition of these objects, particularly lorries and containers, during operation will introduce some obstruction that will block light.
- Calculation 2 – does show the effects of standing containers set in regular placements within the Site and resulting light levels.

7.6 Figure 10 provides an overview of the lighting calculation and shows light distribution in plan using point readings for design areas and iso-contour lines at the perimeter using a range of 5 – 50 lux both a) without indicative containers and b) with indicative containers.

Figure 10 Proposed Site lighting performance –Phase 1 light distribution



Source: extract of Kingfisher document (Appendix A)

Simulation Results

7.7 Areas identified were found to meet the design criteria assumed for light levels and uniformity. Table 14 provides a summary of the simulation results.

Table 14 Lighting design results

Site area	Light level (lux) target	Uniformity target	Light level (lux) result	Uniformity result	Comments
Open Storage (without indicative container)	50	0.4	90.2	0.25	Meets design criteria
Open Storage (with indicative containers)	50	0.4	50.5	0.4	Meets design criteria
Access Road	20	0.4	22.8	0.26	Meets lux level criteria, slightly low uniformity but will be infilled by existing lighting from the existing access arrangements

Light Spill

7.8 Light levels for the open storage design will result in light that extends beyond the site boundary of up to 25 lux in some places along the north and west boundaries, and up to 50 lux at the east boundary.

7.9 Floodlighting on high masts to the north will be fitted with cowls to provide additional control of light distribution and reduce the amount of light beyond the Site boundary. It is likely that light will still exceed 2 lux beyond the boundary and into the pool, which references the recommended threshold for light spill for zone E3 post-curfew conditions.

Sky Glow

7.10 The high mast design utilises floodlights at a 0 degree tilt, therefore no light shines directly into the sky meeting recommendations for zone E3 and the more stringent requirements for a zone E2.

Glare

7.11 There is potential for glare resulting from views of light sources from some viewing directions due to the mounting height of floodlights, although these will be at greater distances from the Site. This will be somewhat difficult to control, however the majority of viewing locations would be from Humber Road or other illuminated areas, so effects will be somewhat moderated as they will occur within an environment which already contains light and introduces more immediate views of existing light sources.

Phase 1 Strategy Results Overview

7.12 High power floodlighting mounted to tall masts will enable light to reach further from more restricted mounting locations which provides light from a reduced number of light points. This can be harder to control with respect to tight boundaries.

7.13 As designed without mitigation, there is likely to be light reaching the Rosper Road Pools in excess of 5 lux and up to 25 lux at the Site boundary. Although this is above the recommended threshold of 1 lux for ecologically sensitive areas for the Pools, it is not expected that new light would extend far into the fields to the north of Rosper Road or to sensitive areas beyond. Mitigation in the form of cowls and refining orientation will reduce the amount of light reaching outside of the Site boundary.

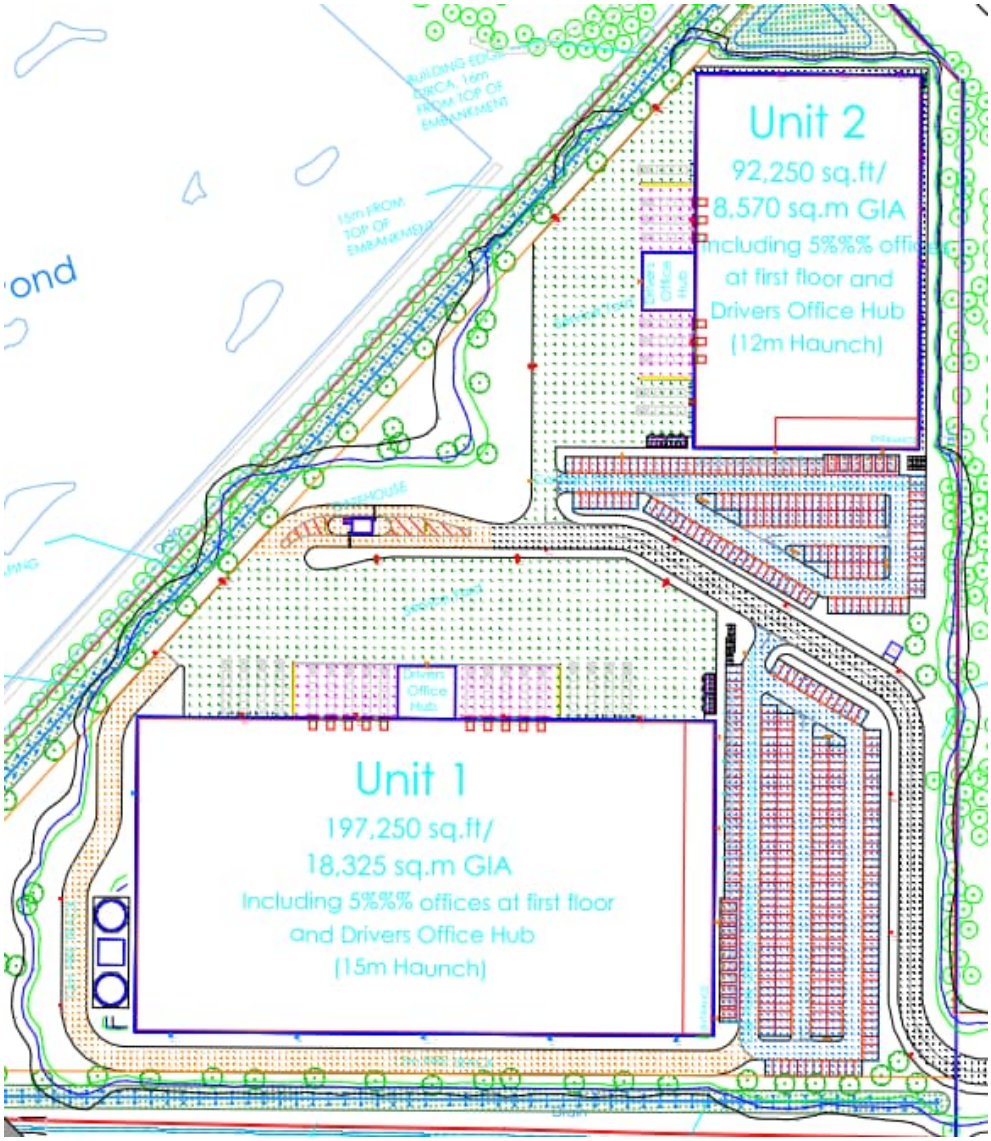
7.14 Direct sky glow is not likely to occur, although there may be some areas where indirect light could reflect off of surfaces create some additional brightening directly above the Site. There is also potential for glare from visible light sources from some viewing locations, however these are overall limited due to the design strategy and higher setting of floodlights being above a standard field of view.

Phase 2 Lighting Performance

7.15 The effect of units is included within the assessment, however, no trees fencing, bins, containers, lorries or other low height structures or objects are considered within the assessment. The addition of these structures, particularly lorries, during operation will introduce some obstruction that will block light in loading bays and service yards.

7.16 Figure 11 provides an overview of the lighting calculation and shows light distribution in plan using point readings for design areas and iso-contour lines at the perimeter using a range of 1 – 3 lux.

Figure 11 Proposed Site lighting performance – Phase 2 light distribution



Source: extract of Kingfisher drawing D46334/JB/B

Simulation Results

7.17 All areas identified were found to meet the design criteria assumed for light levels and uniformity either outright as part of the design consideration with adjacent illuminated spaces or be sufficiently close in terms of uniformity that the performance is acceptable. Table 15 provides a summary of the simulation results.

Table 15 Lighting design results

Site area	Light level (lux) target	Uniformity target	Light level (lux) result	Uniformity result	Comments
Main Access Road	20	0.4	22.8	0.26	Meets lux level criteira, slightly low uniformity but will be infilled by existing lighting from the existing access arrangements
Unit 1 Bin Store	10	0.4	12.7	0.71	Meets design criteria
Unit 1 Car Park	10	0.25	18.8	0.48	Meets design criteria
Unit 1 Cycle Store	5	-	19.5	0.72	Meets design criteria
Unit 1 Fire Track	10	0.25	16.5	0.30	Meets design criteria

Site area	Light level (lux) target	Uniformity target	Light level (lux) result	Uniformity result	Comments
Unit 1 Gatehouse	50	0.4	51.6	0.41	Meets design criteria
Unit 1 Loading Bays	50	0.4	54.4	0.40	Meets design criteria
Unit 1 Service yard	20	0.4	31.9	0.44	Meets design criteria
Unit 2 Bin Store	10	0.4	35.8	0.89	Meets design criteria
Unit 2 Car Park	10	0.25	22.5	0.40	Meets design criteria
Unit 2 Cycle Store	5	-	13.0	0.77	Meets design criteria
Unit 2 Loading Bays	50	0.4	64.3	0.51	Meets design criteria
Unit 2 Perimeter	5	0.25	7..8	0.51	Meets design criteria
Unit 2 Service yard	30	0.4	35.0	0.43	Meets design criteria

7.18 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.

Light Spill

7.19 There are no existing windows which are affected by an increase in light spill created by the proposed lighting design and so good practice light spill criteria are met.

7.20 A small amount of spill may occur where columns are close to the Site boundary near the existing pool, however this is in the bare earth scenario and doesn't take into account the effect of ground form and trees that will be retained/ introduced as part of the Proposed Development arrangements. This is under the pre-and post-curfew requirements for a zone E3. Lighting will also be turned off or dimmed when the Site is experiencing little to no activity, which will result in some reduction to the indicative effects reported with all lighting in use.

7.21 Otherwise, light is distributed within the Site and would not reach the Rosper Road Pools LWS, the fields to the north of Rosper Road or to other connected nature sites and effects are minimised.

Sky Glow

7.22 There is minimal potential for light to shine directly into the sky from the proposed installation, and a maximum of 0% has been calculated. This is well within the recommended threshold for zone E3 and the stricter criteria of zone E2 and so good practice sky glow criteria are met.

7.23 The lighting design incorporates design measures which inherently limit upward light. This includes:

- selection of full cut-off lighting which does not shine light directly above the horizontal;
- directing light down through installing new lighting with minimal to no tilt; and
- selection of lighting equipment which does not contribute to over lighting.

Glare

7.24 There are no existing windows which are affected by new glare from the proposed lighting design and so good practice glare criteria are met.

7.25 Assessment points were taken at the boundary to review the potential for glare to occur from lighting within the Site and found to have a maximum of 118 cd/m2. This is well below the threshold criteria for an environmental zone E3 for pre and post-curfew periods, as well as below both of these criteria for zone E2.

Phase 2 Strategy Results Overview

7.26 Light is contained within the Site through a combination of equipment selection and design which utilises the proposed units to provide some degree of visual screening of illuminated service yards and loading

bays from Humber Road. Screening provided by existing and retained trees along the Site boundary will also be beneficial in minimising direct views from outside the Site boundary.

7.27 The above assessment considers the illustrative layout outlined on the indicative proposed masterplan and based on the strategy set out together with additional consideration of proposed perimeter arrangements, the indicative Phase 2 lighting design is unlikely to contribute to light spill, sky glow or glare effects that are in excess of guidance or recommendations for limiting effects to ecologically sensitive areas.

7.28 Final lighting details will be submitted as part of any future reserved matters application for Phase 2 of the development.

8. Summary

8.1 Two lighting strategies that reflect the requirements for the two phases of development have been considered.

Construction

8.2 Most activities associated with construction would be primarily kept to daylight hours and as a result would have limited use of high-power floodlighting to allow for an extension of the working period during winter months or when there is insufficient daylight available due to inclement weather. It is expected that a Light Management Plan will be incorporated into the Construction Environmental Management Plan (CEMP) used during this phase of works that addresses use and monitoring of lighting, particularly around sensitive areas. Therefore, effects from construction lighting are able to be adequately managed.

Operation

Phase 1 Operation

8.3 An external lighting strategy has been developed for Phase 1 that utilises a high mast design for access and storage areas in an open storage arrangement.

8.4 This has resulted in a design which overall meets the design criteria set out for an empty Site, and one which has large and moderately continuous obstructions in the form of containers, in terms of light levels and uniformity.

8.5 An unmitigated design is likely to result in light levels that exceed recommendations beyond the Site boundary. The increased mounting height using high masts over a conventional column solution is unlikely to result in a lighting condition where effects are reduced to 1 lux or below at or beyond the Site boundary, but the levels calculated within the design will be reduced with the introduction of cowls and other control strategies, such as dimming. There is also potential for light source glare to occur from some viewing locations, however this is offset by the current lit condition of the local area and location of floodlights being above the standard field of view.

8.6 Direct light will not shine into the sky, therefore sky glow would meet good practice benchmarks.

Phase 2 Operation

8.7 An external lighting strategy has been developed for Phase 2 to include traffic routes, car parking and cycle facility, building perimeter spaces, loading bays and service yards. Please note that while light is provided to the building perimeter, this is a side effect of its location and does not constitute façade illumination.

8.8 The proposals for Phase 2 are shown indicatively at this stage. Final details and further assessment will be submitted at the reserved matters stage.

8.9 This has resulted in a design which overall meets the design criteria set out for each area defined in terms of light levels and uniformity.

8.10 There are no windows near enough to the Site which are likely to be affected by the change in lighting condition and properties are unlikely to be affected by new lighting. The potential for sky glow and glare is controlled through a combination of equipment selection and design strategy and good practice criteria are met.

8.11 The effects of the design are largely contained within the Site boundary and effects to sensitive ecological areas are not anticipated.