



Able Marine Energy Park

Material Change 2

Original ES Appendix

19.1

(referenced in response to question 5.0.5)

19.1 INTRODUCTION

19.1.1 Although the closest communities are over 1.5 km from the proposed site, it is possible that certain human receptors will be sensitive to increases in light levels at the site due to the presence of isolated dwellings close to the site boundary. Obtrusive lighting installations can have a negative impact on the appearance of the night sky and can lead to complaints from adjacent sensitive receptors, such as residents and recreational users. It is also possible that ecological receptors in the vicinity of the AMEP site are sensitive to lighting and the findings of this assessment will be used to inform the ecology and nature conservation assessments. There are various sources of lighting which may impact on nearby sensitive receptors:

- security lighting;
- operational lighting;
- car park lighting;
- lights fixed on buildings; and
- road/junction lighting.

19.1.2 There are four potential effects associated with obtrusive light – sky glow, light presence, glare and intrusion.

19.1.3 **Sky glow** refers to sky luminance and site aura, which are large scale effects associated with direct and indirect light sources interacting with the atmosphere. They usually arise from large towns and cities and brightly lit installations.

19.1.4 **Light presence** arises when there is a leakage of light from a light source or that projected onto an area or building. The light which can be viewed causes minimal visual discomfort but fails to reach an intrusive level. This light presence may draw attention to a structure that was previously inconspicuous by day.

19.1.5 **Glare** is perhaps the most serious form of obtrusive light and can cause a general visual discomfort. The impact of glare is dependant upon the quantities and directional nature of the glare source, the physiological status and age of the person affected, the general nature of the area in which the effect occurs and the surrounding ambient lighting.

19.1.6 **Intrusion** is light trespassing into an area beyond the intended illuminated subject areas, such as into adjacent residential properties.

Light intrusion may be the result of a single source or multiple light sources acting together, none of which need necessarily be a source of glare. The same measured value of light intrusion is likely to be less of a problem in a well lit urban area than in a previously unlit rural situation.

19.2 LEGISLATION, POLICY AND GUIDANCE

Legislation

The Clean Neighbourhoods and Environment Act 2005 (CNEA 2005)

- 19.2.1 The CNEA amended section 79(1) of the EPA 1990 to include under the statutory nuisance regime, ‘artificial light emitted from premises so as to be prejudicial to health or a nuisance’ (CNEA 2005).

Land Compensation Act 1973

- 19.2.2 Light is included in the list of physical factors which may be taken into account in determining compensation for the physical effects of roads on the value of property under Part 1 of the Land Compensation Act 1973.

Planning Policy Guidance/Statements

Planning Policy Statement 23: Planning and Pollution Control

- 19.2.3 PPS23 recommended that LPA’s should take account of lighting and light issues in preparing Local Plan policies, identifying a:

‘need to limit and, where possible, reduce the adverse impact of light pollution, e.g. on local amenity, rural tranquillity and nature conservation’.

Local Plan Policy

North Lincolnshire Council Local Plan

- 19.2.4 NLC Local Plan acknowledges that external lighting can have beneficial properties and can contribute to the safety and security of areas, but also that inappropriate and unnecessary lighting, or lighting which is insensitively used, can adversely affect the amenity of an area, including harm on wildlife and to the night sky.

19.2.5 **Local Plan policy DS12 – Light Pollution** states that:

‘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.’

ERYC Holderness District Wide Local Plan

19.2.6 The ERYC Local Plan acknowledges that lighting is needed in many areas in the interests of public safety and to “highlight” some attractive buildings and structures, but also that some lighting is wasteful, unnecessary or misdirected. The Council consider that light pollution should be minimised.

19.2.7 **Local Plan policy Env35** states that:

‘development proposals requiring external lighting, especially where it is likely to affect the amenity of residents, should seek to minimise light pollution by demonstrating to the local planning authority that the lighting scheme proposed is the minimum required for safety, security and effective working practices.’

19.3 **ASSESSMENT METHODOLOGY AND CRITERIA**

Overview

19.3.1 In order to determine the existing level of lighting at the AMEP site, a baseline light assessment has been undertaken to measure the Lux levels at various locations surrounding the site. The locations coincide with sensitive receptors both human and ecological. Locations are representative and, at a number of locations, a single reading has been taken to represent several nearby receptors.

19.3.2 The location of baseline light readings has been determined based on information forthcoming from the *Scoping Opinion Report*, specialist input and following fieldwork. Light has been measured at locations within 1 km of the proposed development site boundary. However, this distance has not precluded the assessment of light impacts on sensitive receptors further afield and these limits are defined in the relevant ecological and landscape and visual chapters.

19.3.3 The light baseline study also records the existing sources of light in the study area and their characteristics. It also identifies if these existing sources are already obtrusive.

Construction Phase

- 19.3.4 Information regarding the method of illuminating the site during construction will be identified and any likely impacts on nearby sensitive receptors will be reported.

Operational Phase

- 19.3.5 Information has been provided by the applicant with regard to likely lux levels arising from the operation of the scheme. The predicted lux levels which are stationary will be calculated and reported for each sensitive receptor and will illustrate how levels decrease from their source in accordance with the Inverse Square Law. Existing light sources will be included in order to identify areas where the greatest light accumulation is predicted to occur.

Sensitive Receptors

- 19.3.6 Sensitive receptors and locations have been identified in consultation with the ecology and visual specialists. The main ecological receptors are the North Killingholme Haven Pits to the north of the site and the intertidal mud flats. Their sensitivities mainly relate to birds. Additional ecological receptors are the wooded areas west of the site ie Burkinshaw's Covert and Chase Hill Wood, which may contain nocturnal mammal activities.
- 19.3.7 In terms of human sensitivities, there are a number of residential properties in proximity to the boundaries of the Project. Other properties are at the edges of settlements at distances over 2 km. Rural areas in relative darkness are sensitive to light impacts and the landscape across the estuary which meets this criterion will be assessed.
- 19.3.8 A summary of sensitive receptors is shown in *Table 19.1*

Table 19.1 *Summary of Sensitive Receptors*

Ecology	Amenity
Bird interests in adjacent Mitigation Fields	Residential at East Halton
Burkinshaw's Covert	Residential at North Killingholme
Chase Hill Wood	Residential at South Killingholme
North Killingholme Haven Pits (SSSI)	Road users Rosper Road
Mudflats (SPA)	Residential at Station House
Feeding Areas for Birds in adjacent fields	LPG Terminal
	Residential Hazel Dene
	Residential at Immingham
	Coastal path along the North Humber bank and Paull

Significance Criteria

- 19.3.9 In terms of significance, *Chapter 11* will assess the significance of light impacts on sensitive ecological receptors based on the change of magnitude which will be reported in this chapter.
- 19.3.10 For landscape and visual, the significance of any impacts will be determined using judgement based on the magnitude of change and the type of light effect predicted.
- 19.3.11 Changes in magnitude arising from the Project can be described as follows:
- Large – where the light source under consideration is the only source and introduces glare and intrusion;
 - Medium – where the light source under consideration is one of several sources but is close to the receptor or the source is at some distance with intermittent screening; and
 - Small – where the light is at such a distance that its effect is negligible and/ or there are many other light sources or an adjacent more dominant source.

19.4 *CONSULTATION*

- 19.4.1 Following the completion and submission of the scoping report to the IPC and the comments contained within S42, *Annex 2.2* includes a summary of the responses relevant to the lighting of the development.

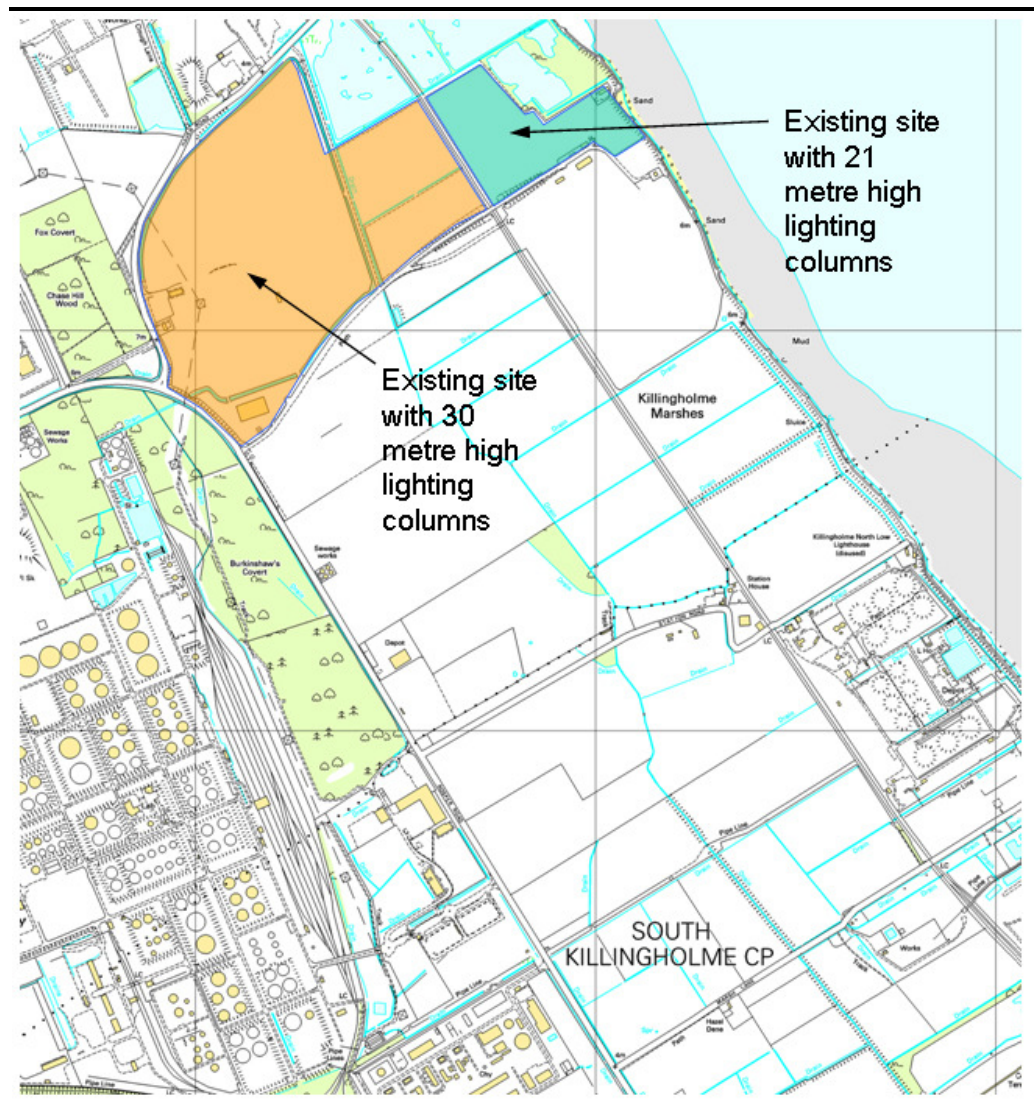
19.5 *BASELINE*

Overview

- 19.5.1 The baseline for the lighting study extends as far as the Humber bank to the north and east and the outskirts of Immingham to the south. To the west it extends as far as the villages of East Halton and North Killingholme.
- 19.5.2 Within the local context, existing light sources are varied. The north-west corner of the proposed site is currently a car storage facility with existing 30 m high columns. To the east of this and south of North Killingholme Haven Pits is a small area with existing 21 m high lighting columns. The majority of the remainder of the proposed site is in relative darkness, particularly the areas east of the railway line which

are remote from sources of existing illumination. See *Figure 19.1* for location of existing lighting columns.

Figure 19.1 *Location of Existing Lighting Columns*



19.5.3 To the west of the site the main sources of existing light are from the Lindsey Oil Refinery and adjacent power stations.

19.5.4 None of the public roads surrounding the site boundary are illuminated by street lights. However, there are a few locations where local artificial illumination is provided at entrance gates.

19.5.5 On a wider context the light baseline is dominated by the existing Lindsey Oil Refinery. This facility is brightly lit by a combination of lighting methods, both ground fixings and at higher levels on buildings, pipe bridges and access facilities. Additional sources of light are the numerous flare stacks which rise above the complex. Light also arises

from the Humber Sea Terminal to the north and the two power stations, E.ON and Centrica to the northwest of the site.

- 19.5.6 The village of East Halton lies approximately 1.5 km north-west of the site boundary. The main road (Townside) travels through the village and is illuminated by street lamps. A number of lanes running east are similarly lit along part of their length only.
- 19.5.7 The villages of North and South Killingholme lie west of the site boundary at approximately 2 km. They are similarly lit to East Halton but, of more relevance, are separated from the site by the oil refinery. The oil refinery is brightly illuminated and a dominant feature at night.
- 19.5.8 Immingham lies south of the site boundary at a distance of approximately 3.3 km. It is separated from the site by Manby Road (A1173) which is illuminated, a golf course, parkland and agricultural fields.
- 19.5.9 *Table 19.2* below includes the typical lux levels which are likely to be found outdoors in both natural and artificial conditions.

Table 19.2 *Light type - Lux levels*

Light Type	Lux level
Direct sunlight	100,000-130,000
Indirect sunlight	10,000- 20,000
Overcast day	1,000
Very dark day	100
Twilight	10
Deep twilight	1
Full moon	0.1
Quarter moon	0.01
Moonless clear night sky	0.001
Moonless overcast night sky	0.0001
Main Road lighting	30
Residential Street lighting	0.5 - 3

Fieldwork

- 19.5.10 Following consultation with the ecology and landscape/visual specialist and with reference to the consultees' responses, 17 locations were selected for night-time light level measurements. These locations were subject to consultation by virtue of being identified in the PEIR and no additional locations were identified as a consequence. Locations selected were based on either residential or ecological sensitivities. At some locations a number of readings were taken where a single reading would not be representative.

19.5.11 Locations were visited on Friday 19 November 2010 between 20.30 and 23.45. Conditions were full darkness, cloudy with a full moon not visible. Weather was dry with a light haze and visibility was good. The fog which was expected did not arise until the following morning. The locations of the field measurements are shown in *Figure 19.2*.

19.5.12 The following *Table 9.3* indicates the locations, the time of the reading, the readings in lux, and the reason for selection, and includes observation notes which are of relevance.

Table 19.3 *Lux Readings*

Light Measurement Locations	Time (24h)	Steady (lux)	Max (lux)	Selection criteria	Notes
1	23.32	0.0	0.0	Residential Amenity- East Halton	Eastern end of Kettlebridge Lane, East Halton. Street lit up to boundaries of private property. On road outside properties, steady 1.2 lux. Away from street lighting (field entrance), steady 0.0 lux.
2	23.28	0.2	0.2	Residential Amenity- East Halton	10m west of final house on Swinster Lane, East Halton. Street lit up to boundary of private property. On road outside property, steady 0.2 lux. Estimated 0.0 lux in garden.
3	23.22	0.0	0.0	Residential Amenity- East Halton	Field entrance 20 m east of final house on Scrub Lane, East Halton. No artificial lighting. Lighting from refinery visible beyond hedge screen. Steady 0.0 lux.
4	23.17	0.1	0.1	Residential Amenity- East Halton	Property entrance, halfway along Brick Lane, East Halton. No artificial lighting. Hedges screen industrial lighting to SE Steady 0.1 lux.

Light Measurement Locations	Time (24h)	Steady (lux)	Max (lux)	Selection criteria	Notes
5	23.12	0.5	0.5	Residential Amenity- North Killingholme	Field entrance approx. 45 m east of final property on Nicholson Road, North Killingholme. Illumination from street lighting in village and from oil refinery. Steady 0.5 lux.
6	22.2	1.1	1.1	Site Boundary- Rosper Road Adjacent mitigation fields with Bird Interest	Side of Rosper Road adjacent to above ground oil pipelines. Illuminated entrance to oil refinery on other side of road. Steady 1.1 lux.
7	22.01	0.6	0.7	Adjacent Burkinshaw's Covert	Rosper Road, opposite side of road to transport depot. Illumination from lights on depot building and small lighting columns in compound. Steady 0.6 lux, max 0.7 lux.
8	21.58	0.7	0.7	Adjacent Burkinshaw's Covert	At junction of Rosper Road and Haven Road, south side of road. No junction lighting, light cast by Able lighting columns to E. Some lighting from power stations visible. Steady 0.7 lux.
9	21.53	1.3	1.3	Near Chase Hill Wood	Roadside near entrance to HST at end of closed off layby. Steady 1.3 lux. Able Compound to SE illuminated by columns, no artificial lighting to NW.
10	20.55	1.1	1.3	North Killingholme Haven Pits SSSI/SPA	Corner of Able Area A, adjacent to North Killingholme Haven Pits. No direct overhead lighting (dark corner of illuminated compound) Steady 1.1 lux, max 1.3 lux.

Light Measurement Locations	Time (24h)	Steady (lux)	Max (lux)	Selection criteria	Notes
10a	21.30	2.0	2.5	North Killingholme Haven Pits SSSI/SPA	Foreshore in small bay under Centrica pumping station (by gate in wave return wall). 3 curlew feeding on illuminated mudflat. Steady 2.0 lux max 2.5, directly from pumping station lighting.
11	21.10	1.9	3.7	Mudflats SPA - Birds	South of E.ON pumping station, 4 m from the fence on Able site Area C. Steady 1.9 lux, max 3.7 lux (directional towards lighting column). In shadow cast by pumping station (estuary side) steady 0.3 lux.
11a	21.35	0.4	0.5	Mudflats SPA - Birds	Foreshore immediately adjacent to E.ON pumping station. Approx 30 medium sized waders (poss redshank) feeding on illuminated mudflat. Steady 0.4 lux, max 0.5 lux.
12	22.11	0.9	1.0	Mudflats SPA - Birds Also residential receptors at nearby lighthouse	On Station Road level with sluice gate in ditch, approx 60 m from sea wall. Illumination from lighting columns within MoD compound to South. Steady 0.2 lux, max 0.3 lux.
12a	22.16	0.2	0.3	Feeding Area- Birds (Area J see ecology figure 11.11)	On Station Road, approx. 100m E of level crossing. Illumination from lighting columns within MoD compound to South. Several curlews roosting in field immediately to North. Steady 0.9 lux, max 1.0 lux.
12b	22.21	0.7	0.7	Feeding Area- Birds/ Close to residential receptor- Station House	Station Road, adjacent to MOD entrance. Illumination around gateway. Steady 0.7 lux.

Light Measurement Locations	Time (24h)	Steady (lux)	Max (lux)	Selection criteria	Notes
13	22.08	0.2	0.2	Place of work/Close to residential receptor- Station House	Corner of Station Road adjacent to Centrica compound. Illumination cast by lights on building in compound. Refinery visible to SW beyond trees. Steady 0.2 lux.
14	22.37	0.3	0.3	Place of work	Entrance to LPG Terminal gas caverns compound on Marsh Lane. Lighting chiefly from oil refinery to W. Steady 0.3 lux.
15	Not recorded	Not recorded	Not recorded (0.3 estimated)	Residential Amenity- Hazel Dene Also close to locally designated Wildlife Site	Outside Hazel Dene. Unable to collect reading but local lighting environment similar to that at Loc. 14. Probably steady 0.3 lux.
16	22.46	3.6	3.6	Residential Amenity- Immingham	Footpath on Washdyke Lane on residential estate in Immingham. Street lighting. Steady 3.6 lux.
16a	22.48	0.6	0.6	Residential Amenity- Immingham	NE of Loc. 16 out of street lit area, behind houses. Steady 0.6 lux.
17	23.02	1.4	1.5	Residential Amenity- South Killingholme	Side of Staple Road, South Killingholme, adjacent to road sign leaving village. Street lit to end of housing, and from oil refinery. Steady 1.4 lux, max 1.5 lux.
17a	23.03	0.6	0.6	Residential Amenity- South Killingholme	10 m east of Loc. 16, out of street lit zone. Oil refinery strongly illuminated to E Steady 0.6 lux.
17b	23.03	5.4	5.4	Residential Amenity- South Killingholme	Outside final house at east end of Staple Road, near streetlight. Steady 5.4 lux.

Summary of Results

- 19.5.13 The lowest lux levels, and the only zero lux levels, are recorded at locations to the east of East Halton which is not surprising as they are the furthest from street lighting and the influence of the oil refinery. Highest levels are recorded in residential areas close to street lighting such as South Killingholme and Immingham. Lux levels along the Rosper Road boundary are generally around the 1 lux level.
- 19.5.14 It is noted that the general lux levels across the local area and close to the proposed site are 1 lux and under. The only exceptions are at locations 10A (2.5 lux) and 11 (3.7 lux) where existing lighting provides local illumination.
- 19.5.15 Comparing typical lux levels expected in the outdoor environment shown on *Table 19.2* to the field levels recorded indicate that the levels are consistent with deep twilight and full moon conditions. The levels encountered are either due to the effects of the moon showing through the clouds, or more likely the background illuminations provided by the oil refinery and other external illumination. No zero lux levels are recorded either within the site or within 500 m of the site boundary.
- 19.5.16 Field observations made during the recording of levels show that the oil refinery is a prominent night sky feature. This particularly applies to locations 5 and 17 at Killingholme and location 3 at East Halton. It is also noted at location 14 and is likely to apply to location 15 as well. It is suggested that this is an existing Sky Glow effect, previously described in the introduction, arising from the brightly lit installation.
- 19.5.17 Despite the existing floodlights in the north western part of the AMEP site (proposed Supply Chain Park), it is worth noting that the lux level on the adjacent unlit roads are only 0.7 and 1.3 lux at locations 8 and 9 respectively.

19.6 *IMPACTS*

Construction Phase

- 19.6.1 The Construction Methodology for the AMEP site, *Section 4.6*, indicates that during construction, mobile task lighting will be used to illuminate areas under construction during the hours of darkness. This lighting will generally be less than 10 m high and will be directed away from sensitive receptors.

- 19.6.2 The duration of working hours is twenty four hours a day for the Marine Work and certain periods for the AMEP site, see *Table 4.3* in *Chapter 4*.
- 19.6.3 Marine works are proposed to be undertaken twenty fours a day. Vessel lighting will be required including localised task lighting after dark. Lighting will be kept to a minimum with light spill controlled by the use of appropriate lighting units.
- 19.6.4 Depending on the location, there is the potential for this construction lighting to impact on nearby sensitive receptors. Obviously, the marine work construction lighting is unlikely to impact significantly on sensitive residential receptors except for those near to the marine works. This could occur potentially at the light measurement location 12.
- 19.6.5 Construction lighting during Marine works may impact significantly on nearby ecological receptors. This could potentially occur at locations 10a, 11, 11a and 12.

Operational Phase

- 19.6.6 There is the potential for light impacts to arise from the operational phase of AMEP. As described in detail in *Section 4.3*, the lighting proposals (the type, height, luminescence and number of light columns) varies depending on their location on the site and their function. Maximum illumination level within the site will be 99 lux.
- 19.6.7 External lighting for the quay frontage will comprise 50 m towers fitted with directional luminaires to limit spill outside the working areas. These will provide average luminance of 50 lux with a minimum of 20 lux to the area nominally within 50 m of the quay edge. Elsewhere, on the storage areas behind the quay, lighting will be designed to provide an average luminance of 20 lux with a minimum of 5 lux.
- 19.6.8 The Heavy Component Manufacturing Site will include several large buildings within plots. Lighting levels immediately outside the buildings will be provided by external downlights fixed to the buildings to provide an average luminance of 35 lux. Each building will have a car parking area with safe pedestrian access from the car park into the buildings. The car parks will be illuminated with 30 m high columns to achieve an average luminance of 20 lux and a minimum level of 5 lux.

- 19.6.9 External storage areas within each plot will need to operate twenty four hours a day. Accordingly, external lighting for these areas will comprise 50 m towers fitted with directional luminaires to limit spill outside the working areas. The external lighting will provide an average luminance of 20 lux with a minimum of 5 lux.
- 19.6.10 The proposed Supply Chain Park (SCP) is wholly located on areas of the site that currently have the benefit of planning consent for port related storage. As with the quay and the heavy component manufacturing site, the external storage areas around the SCP will need to operate twenty four hours a day. The existing external lighting for these areas comprises 30 m towers that are fitted with directional luminaires to limit spill outside the working areas. The lighting is consented for an average luminance of 25 lux with a minimum of 5 lux and will be retained.
- 19.6.11 The increase in lux levels as noted above across the site has the potential to affect sensitive receptors adjacent to the site boundaries and further afield. There is the possibility of light impact arising on the nearby residential properties at the North Low Lighthouse and the Lookout, also Station House and at Hazel Dene due to their proximities to the Heavy Component Manufacturing Site. There is also the potential for impacts to arise at East Halton in part due to the heights of the proposed lighting towers. This is unlikely to be an increase in lux levels rather an impact arising from glare.
- 19.6.12 Sensitive ecological receptors at the field identified as Area J (see Ecology figure 11.11), the Humber Estuary SPA and the Designated Wildlife Site (Rosper Road Pools) are located in proximity to the Heavy Component Manufacturing Site. There is the potential for these receptors to be impacted by the increase in lux levels at this locations and effects from light intrusion.
- 19.6.13 Three night time photomontages have been prepared to illustrate the effects of the lighting proposal on sensitive receptors and also when viewed from across the estuary. The existing night time views and the photomontages are shown on *Figures 19.4a, 19.4b and 19.4c*.
- 19.6.14 The viewpoints selected for the night time photomontages are selected from those used for the landscape and visual impact assessment and are as follows:
- Viewpoint 3 – Coastal Footpath North Humber Bank
 - Viewpoint 4 – Viewing Point and Parking area at Paull
 - Viewpoint 13 – East Halton

- 19.6.15 These photographs have been taken at different times of the year to illustrate varying atmospheric conditions and times of the evening. Photos were taken in winter in December 2010 at 7 pm (dark evening - slightly hazy) and April 2011 at 8pm (Twilight - clear conditions).
- 19.6.16 Figure 19.4a, viewpoint 3 includes an existing night photograph looking across the estuary from the North Humber Bank and it is noted that artificial illumination is visible along almost the entire opposite coastline. To the south, the lights at Immingham Docks are the dominant light source at the horizon due to their proximity to the shore and high intensity. Further north, lighting to the Lindsay Oil Refinery is discernable as a higher density of light sources. A number of flares are also noticeable at a higher level associated with stacks. Lighting along the northern coastline arises from existing floodlights on the proposed site along with village street lights and other industrial lighting.
- 19.6.17 Figure 19.4a, viewpoint 3 also includes a photomontage which illustrates how the proposals might appear at the time the viewpoint photograph was taken. It is noted that the magnitude of change of the lighting proposals is not as large as might be expected from this viewpoint. Although many of the proposed tall lighting columns are visible, a large number are screened behind the proposed buildings and structures. What is more apparent in this proposed view is the silhouette of the turbines against the night sky. Existing vertical elements are similarly silhouetted in the existing view. Comparing the proposed view with the existing view there is no discernable increase in sky glow as a consequence of the increased illumination of the site.
- 19.6.18 Figure 19.4b, viewpoint 4 includes an existing night photograph looking across the estuary from a viewing point at Paull. This was taken in darker conditions than viewpoint 3 and, with the presence of haze, the existing artificial light sources produce a glare effect. Sources of light include the Humber Sea Terminal, the Lindsey Oil Refinery and Immingham Docks in the distance. The existing columns on the site also contribute to the night time light baseline along the coast. A local phenomenon is the illumination of the night sky caused by the light reflecting off the emissions from the various power stations. Views further south are truncated by high local topography.
- 19.6.19 Figure 19.4b, viewpoint 4 also includes a photomontage which illustrates how the proposals might appear at the time the viewpoint photograph was taken. From this viewpoint, the tall lighting columns are more visible than viewpoint 3 and complete the fully lit appearance of the coastline. Although there is a change of magnitude in the

baseline from this view, due to the proliferation of existing light sources, this is a minor change and therefore of minor significance. It is worth noting that some of the proposed tall buildings actually screen a number of existing light sources. There are no emissions into the air from this project which would result in the sky glow seen in the existing view.

- 19.6.20 Figure 19.4c, viewpoint 13 includes an existing night photograph from the residential edge of East Halton. Sources of light at this location are associated with the two power plants, where a number of luminaires can be seen. There is a local light effect from the emissions arising from Killingholme power station. Generally there is a night time glow which is produced by a combination of all the existing artificial lights in the area but with little direct glare or nuisance in the viewpoint.
- 19.6.21 Figure 19.4c, viewpoint 13 also includes a photomontage which illustrates how the proposals might appear at the time the viewpoint photograph was taken. There is an almost indistinguishable difference between the before and after montage in terms of the light baseline. The temporary turbines which stand on the quayside for a period prior to shipment are just visible against the night sky, being illuminated by the proposed adjacent lighting. In addition, a proposed single light source is just visible above the existing hedgerow adjacent the EON power station. However, this will be seen in conjunction with a number of other existing single light sources associated with the power station.
- 19.6.22 The following table presents an analysis of the anticipated lux levels at each of the locations measured as part of the baseline. The anticipated lux levels have been obtained from the information shown on CU Phosco Lighting Plan dwg no LS11816-14-1 (*Figure 19.3*). The change of magnitude is described and the significance of the light impact for visual receptors determined. For ecological receptors, the significance is described in the relevant section of the ecology chapter with the summary included in this table.

Table 19.4 Anticipated Operational Lux Levels and Significance of Light Impacts

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
Residential Receptors at East Halton	1 - Eastern end of Kettlebridge Lane, East Halton	0.0	No change in lux levels due to distance (1.5 km)	High (Residential Amenity)	Small due to distance and the fact that existing columns are located between the receptor and the proposed columns.	Amenity Not significant. No change in baseline.
As Above	2- 10m west of final house on Swinster Lane, East Halton	0.2	No change in lux levels due to distance (1.5 km)	High (Residential Amenity)	Small due to distance and the fact that existing columns are located between the receptor and the proposed columns.	Amenity Not significant. No change in baseline.
As above	3 - Field entrance 20 m east of final house on Scrub Lane, East Halton	0.0	No change in lux levels due to distance (1.5 km)	High (Residential Amenity)	Small due to distance and the fact that existing columns are located between the receptor and the proposed columns. Lighting from refinery visible beyond hedge screen.	Amenity Not significant. No change in baseline.
As above	4 - Property entrance, halfway along Brick Lane, East Halton.	0.1	No change in lux levels due to distance (1.5 km)	High (Residential Amenity)	Small due to distance and the fact that existing columns are located between the receptor and the proposed columns.	Amenity Not significant. No change in baseline.

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
Residential Receptors at North Killingholme	5 - Field entrance approx. 45 m east of final property on Nicholson Road, North Killingholme.	0.5	No change in lux levels due to distance (1.5km)	High (Residential Amenity)	Small due to distance and the fact that oil refinery located between the receptor and the proposed columns.	Amenity Not significant. No change in baseline.
Bird Interests in adjacent mitigation fields.	6 - Side of Rosper Road adjacent to above ground oil pipelines.	1.1	4 to 5	Medium (Bird interests in adjacent mitigation fields.	Medium due to proximity of source. However increase in lux is very low.	Ecology – Minor effect on bird interests in adjacent mitigation fields. Minor permanent negative impact, Not significant
Road users Rosper Road	6 - Side of Rosper Road adjacent to above ground oil pipelines.	1.1	4 to 5	Low (Site Boundary-Rosper Road)	Medium due to proximity of source. However increase in lux is very low.	Amenity Minor significance. Illumination will be visible particularly due to number and height of columns.
As above	7 - Rosper Road, opposite side of road to transport depot.	0.6	7 to 8	Low (Site Boundary-Rosper Road)	Medium due to proximity of source. However increase in lux is very low. Existing illumination in area from compound and lights on building.	Amenity Minor significance. Illumination will be visible particularly due to number and height of columns.

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
As above	8 - At junction of Rosper Road and Haven Road, south side of road.	0.7	3 to 4 (light arising mainly from existing lamps- some from proposed columns)	Low (Site Boundary- Rosper Road)	Medium due to proximity of source. However increase in lux is very low. Existing illumination in area from Able site and from Power Station.	Amenity Minor significance. Illumination will be visible particularly due to number and height of columns.
Burkinshaw's Covert	7 - Rosper Road, opposite side of road to transport depot.	0.6	7 to 8	Medium (Adjacent Burkinshaw's Covert)	Medium due to proximity of source. However increase in lux is very low. Existing illumination in area from compound and lights on building.	Ecology Minor effect on bat species which may use this location to cross Rosper Road. Mitigation Planting to be undertaken. Not significant.
As above	8 - At junction of Rosper Road and Haven Road, south side of road.	0.7	3 to 4 (light arising mainly from existing lamps- some from proposed columns)	Medium (Adjacent Burkinshaw's Covert)	Medium due to proximity of source. However increase in lux is very low. Existing illumination in area from Able site and from Power Station.	Ecology Minor effect on bats. Mitigation to be employed as expanded for Location 7. Not significant
Chase Hill Wood	9 - Roadside near entrance to HST at end of closed off layby	1.3	1 (light arising from existing lamps)	Medium (Near Chase Hill Wood) Minor ecological interest in this location.	Small no change arising from proposal.	Ecology Not significant

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
North Killingholme Haven Pits	10 - Corner of Able Area A, adjacent to North Killingholme Haven Pits.	1.1	1 (light arising from existing lamps)	High (North Killingholme Haven Pits SSSI/SPA)	Small no change arising from proposal.	Ecology Ecological interest at Killingholme Pits will be unaffected as light levels will not change from those current experienced which are minimal Not significant
As above	10a - Foreshore in small bay under Centrica pumping station (by gate in wave return wall).	2.0	2 (light arising from existing lamps)	High (North Killingholme Haven Pits SSSI/SPA)	Small no change arising from proposal. Existing pumping station provides background illumination.	Ecology Ecological interest at North Killingholme Haven Pits will be unaffected as light levels will not change from those current experienced which are minimal Not significant
Mudflats SPA (North - relative to proposed Quay)	11 - South of E.ON pumping station, 4 m from the fence on Able site Area C	1.9 to 3.7	8 to 44	High (Mudflats SPA - Birds)	Medium. Reasonable increase in lux levels due to proposals. Existing levels higher only in direction of existing columns.	Ecology Interest largely displaced due to construction works. Post-construction species remaining will habituate to the higher light levels and are unlikely to be affected. Minor permanent negative impact, Not significant.

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
Mudflats SPA (North - relative to proposed Quay)	11a - Foreshore immediately adjacent to E.ON pumping station.	0.4	8 to 44	High (Mudflats SPA - Birds)	Large. Reasonable increase in lux levels due to proposals.	Ecology Ecological Interest largely displaced due to construction works. Post-construction species remaining will habituate to the higher light levels and are unlikely to be affected. Minor permanent negative impact, Not significant
Residential properties near lighthouse	12 - On Station Road level with sluice gate in ditch, approx 60 m from sea wall	0.9	9 to 7	High (Residential at nearby lighthouse)	Small. Slight increase in lux levels due to proposals. Existing illumination arising from nearby MOD compound.	Amenity No impact as properties to cease to be residential following CPO

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
Mudflats SPA (South – relative to proposed Quay)	12 - On Station Road level with sluice gate in ditch, approx 60 m from sea wall	0.9	9 to 7	High (Mudflats SPA – Birds)	Small. Slight increase in lux levels due to proposals. Existing illumination arising from nearby MOD compound.	Ecology Ecological Interest largely displaced due to construction works. Post-construction species remaining will habituate to the slightly higher light levels and are unlikely to be affected. Minor permanent negative impact, Not significant
. Area J see Ecology figure 11.11	12a – On Station Road, approx. 100m E of level crossing.	0.2	5 to 7	High (Feeding Area-Birds)	Small. Slight increase in lux levels due to proposals. Existing illumination arising from nearby MOD compound.	Ecology Minor remaining ecological interest in this location post construction. Not significant
As above	12b - Station Road, adjacent to MOD entrance.	0.7	6 to 8	High (Feeding Area-Birds)	Small. Slight increase in lux levels due to proposals. Existing illumination arising from nearby MOD compound	Ecology Minor remaining ecological interest in this location post construction. Not significant
Residential at Station House	13 - Corner of Station Road adjacent to Centrica compound.	0.2	18 to 20	High (Residential)	Medium. Reasonable increase in lux levels due to proposals. Existing illumination arising from nearby MOD compound	Amenity No impact as property to cease to be residential following CPO

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
LPG Terminal	14 - Entrance to LPG Terminal gas caverns compound on Marsh Lane	0.3	1 or less	Low (Place of work)	Small Illumination mainly arising from Oil Refinery to West.	Amenity Not significance due to small change in lux and low sensitivity of receptor
Residential Hazel Dene	15 - Outside Hazel Dene.	Estimated at 0.3	1 or less	High (Residential Amenity)	Medium Although not much increase in lux levels, proposals will make a change to the baseline. Existing illumination mainly arising from Oil Refinery to West.	Amenity Moderate significance arising from new proposals which will be a significant new night time feature looking north and in proximity to receptor. Mitigation planting to be undertaken.
Designated Wildlife Site	15 - Outside Hazel Dene.	Estimated at 0.3	1 or less	High (Close to locally designated Wildlife Site)	Small Illumination mainly arising from Oil Refinery to West.	Ecology Not significant Ecological interest will be unaffected as light levels will not change from those currently experienced which are minimal

Sensitive Receptors	Light Measurement Locations	Existing levels (lux)	Likely levels (lux)	Relevant Sensitivity	Change in Magnitude	Significance and commentary
Residential receptors at Immingham	16 - Footpath on Washdyke Lane on residential estate in Immingham.	3.6	No change in lux levels due to distance (2.6 km)	High (Residential Amenity-Immingham)	Small due to distance.	Amenity Not significant Proposals will be read as part of refinery light baseline.
As above	16a - NE of Loc. 16 out of street lit area, behind houses	0.6	No change in lux levels due to distance (2.6 km)	High (Residential Amenity-Immingham)	Small due to distance.	Amenity Not significant Proposals will be read as part of refinery light baseline.
Residential receptors at Immingham	17 - Side of Staple Road, South Killingholme	1.4	No change in lux levels due to distance (2 km)	High (Residential Amenity-South Killingholme)	Small due to distance and intervention of Oil Refinery.	Amenity Not significant Proposals will be read behind and as part of refinery light baseline.
As above	17a - 10 m east of Loc. 17, out of street lit zone.	0.6	No change in lux levels due to distance (2 km)	High (Residential Amenity-South Killingholme)	Small due to distance and intervention of Oil Refinery.	Amenity Not significant Proposals will be read behind and as part of refinery light baseline.
As above	17b - Outside final house at east end of Staple Road, South Killingholme	5.4	No change in lux levels due to distance (X m)	High (Residential Amenity-South Killingholme)	Small due to distance.	Amenity Not significant Proposals will be read behind and as part of refinery light baseline.

Summary of Results - Amenity

- 19.6.23 The above table shows that of the nine sensitive receptors only one is predicted to receive moderate impacts from lighting on landscape and visual amenity. This is at Hazel Dene, which is a residential property in proximity to the project.
- 19.6.24 One receptor is predicted to receive minor impacts from lighting on landscape and visual amenity and this relates mainly to increases in lux levels in public but not particularly sensitive locations, ie users of Rosper Road.
- 19.6.25 The night time photomontages illustrate that there are no significant impacts from the three viewpoints selected as representative of sensitive visual receptors. This is mainly due to the existence of artificial lighting in the vicinity of the site and essentially along this developed and industrial part of the Lincolnshire Coastline.
- 19.6.26 All other relevant receptors are predicted to receive no significant impacts from lighting on landscape and visual amenity.

Summary of Results - Ecology

- 19.6.27 The above table illustrates that none of the sensitive ecological receptors receive significant impacts arising from the lighting proposals.
- 19.6.28 However, three of these receptors receive minor permanent negative impacts which are still recorded as not significant in terms of lighting. These receptors are the field marked as Area J on *Figure 11.11*, the Mudflats near the E.ON pumping station and the Mudflats to the south of the proposed quay.
- 19.6.29 While these additional sources of lighting will illuminate the remaining mudflat adjacent to the Quay and the remaining fields adjacent to the site it is thought that in the context of the heavily industrialised South Humber Bank these additional light sources are unlikely to significantly disturb remaining species once they have become habituated to these new light sources. There is a degree of uncertainty in this prediction but examples of where this has been the case include the jetty at Saltend which is lit at night and no observable effect on bird use has been reported.

19.7 MITIGATION

Construction Phase

- 19.7.1 During construction, mobile task lighting will be used to illuminate areas under construction during the hours of darkness. This lighting will generally be less than 10 m high and will be directed away from sensitive receptors.
- 19.7.2 Marine works are proposed to be undertaken twenty four hours a day. Vessel lighting will be required including localised task lighting after dark. Lighting will be kept to a minimum with light spill controlled by the use of appropriate lighting units. These will be directed away from sensitive residential and ecological receptors.

Operational Phase

- 19.7.3 In the area of the quay the 50 m towers will be fitted with directional luminaires to limit spill outside the working areas to avoid adjacent sensitive ecological habitats and unnecessary overspill into the estuary area.
- 19.7.4 Downlights will be fitted to the outside of buildings to provide localised lighting for safe access to the buildings.
- 19.7.5 The 50 m high towers for the external storage areas will also be fitted with directional luminaires to limit spill outside the working area particularly away from the nearby ecological and residential receptors.
- 19.7.6 For aviation safety, Humberside Airport request that all external lighting shall be flat glass, full cut off design with horizontal mountings to avoid light spill above the horizontal in the interest of aviation safety, which is also in line with best practice with the Institute of Lighting Engineers.
- 19.7.7 Final details of the lighting proposals are to take cognisance of the requirements of BS 5489 Part 8 with regard to lighting and railways.
- 19.7.8 The landscape and ecology mitigation masterplan *Annex 4.5* illustrates areas of planting in the form of tree belts and woodland areas. This planting given time will mitigate the impacts from lighting on nearby receptors. In fact, the planting will be more effective at an earlier stage on nearby receptors than on receptors at greater distances. This is due to the fact that the screening will work on the principle of line of sight and the nearer the screen is to the receptor the sooner following implementation it will be more effective.

19.8 *RESIDUAL IMPACTS*

Landscape and Visual

- 19.8.1 Following the implementation of the mitigation measures there will remain a moderate significant light impact on the amenity of the residential receptor at Hazel Dene. This is due to the relative proximity of the property, the tall height of the lighting columns and the difficulty of providing effective screening taking ecological requirements into account. Planting that was placed in proximity to the receptor would be more effective and the possibility of this could be investigated.
- 19.8.2 There will be no residual light impacts arising from AMEP on other sensitive receptors

Ecology

- 19.8.3 There will be no residual light impacts arising from AMEP on ecological receptors.

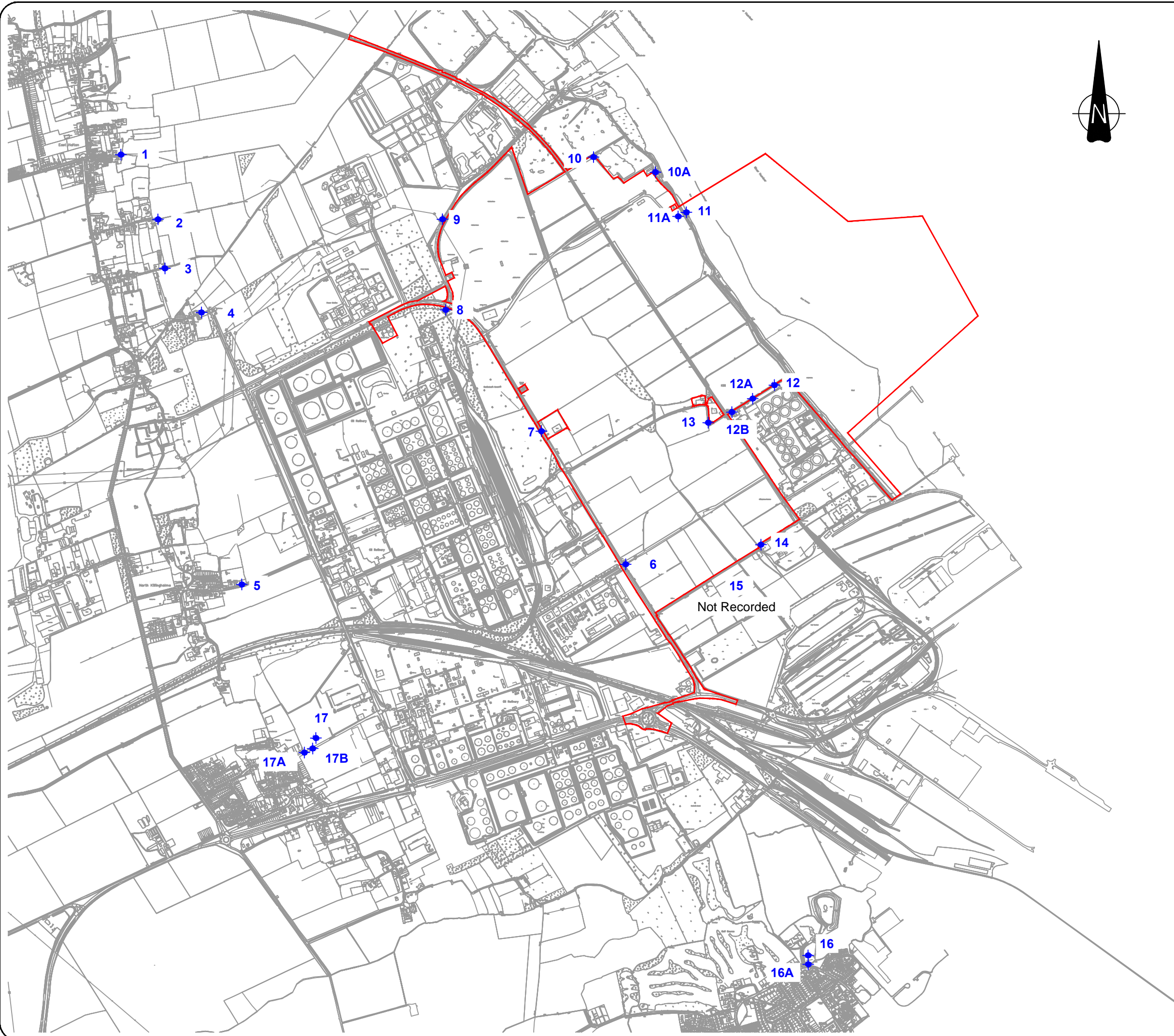
19.9 *CUMULATIVE IMPACTS*

- 19.9.1 The proposed AMEP is located in a baseline which already contains a large number of existing water and quay side developments. These developments contain lighting which is visible from many of the sensitive locations included in the light impact assessment section.
- 19.9.2 The overall lighting proposed for the AMEP is not inconsiderable and it will form a new night time feature in the area. This will be read in the context of the existing surroundings which themselves are a night time feature of the area.
- 19.9.3 Looking at the existing development in the area, the Lindsey Oil Refinery which is adjacent to the site is a major lit night time feature of the area. The E.ON power station is also lit but not quite to the same scale. The nearby Humber Sea Terminal and the Oil Terminal at Immingham both have levels of night time illumination.
- 19.9.4 Within this local context it is considered that the AMEP will add cumulatively to the night time baseline. However, due to the existing levels of illumination, it is considered that this is not a significant cumulative impact.
- 19.9.5 When viewed at night from the wider area for example across the estuary, the coastline for the most part is illuminated for much of its

length either side of the site. There are more densely lit areas and some darker lengths but on the whole the appearance is of a developed coast. One particular "hotspot" is the area around the proposed AMEP. Much of that illumination can be accorded to the Lindsey Oil Refinery. The fact that the AMEP is positioned in proximity to this existing and brightly illuminated facility reduces its potential cumulative impact.

19.9.6 Similarly the AMEP when viewed from the Lincolnshire Wolds AONB at night will be seen behind the refinery and in association with a number of nearby illuminated facilities.

19.9.7 With regard to potential projects which might cause cumulative impacts in association with AMEP, *Annex 2.3* illustrates the proposed projects under study. It is considered that AMEP will contribute significantly to a more local cumulative impact taking the scale of the project and in particular its lighting components into account. However, each of the proposed projects will include lighting which will add to the lighting baseline of the wider area. The AMEP will also contribute to the wider environment but due to the level of background lighting it is considered that its contribution will not be as significant.



KEY

- Site Boundary
- ◆ Measurement Point*

Location	Time (24h)	Steady (lux)	Max (lux)
1	23:32	0.0	0.0
2	23:28	0.2	0.2
3	23:22	0.0	0.0
4	23:17	0.1	0.1
5	23:12	0.5	0.5
6	22:20	1.1	1.1
7	22:01	0.6	0.7
8	21:58	0.7	0.7
9	21:53	1.3	1.3
10	20:55	1.1	1.3
10A	21:30	2.0	2.5
11	21:10	1.9	3.7
11A	21:35	0.4	0.5
12	22:11	0.9	1.0
12A	22:16	0.2	0.3
12B	22:21	0.7	0.7
13	22:08	0.2	0.2
14	22:37	0.3	0.3
15	NOT REC	NOT REC	NOT REC
16	22:46	3.6	3.6
16A	22:48	0.6	0.6
17	23:02	1.4	1.5
17A	23:03	0.6	0.6
17B	23:03	5.4	5.4

* Measurements made on Fri 19th Nov 2010

Rev	Date	Comments	Drw	Chk	App
C	15/12/11	Boundary Updated	JH	RC	RC
B	04/11/11	General Amendments	JH	RC	RC
A	21/01/11	Preliminary Issue	RK	JM	RC

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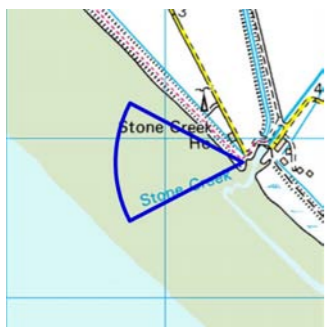
Project:	ABLE Marine Energy Park
Client:	ABLE UK Ltd
Title:	Figure 19.2 - Light Measurement Locations

PRELIMINARY

Scale:	Drawn	Checked	Approved
1:20,000@A3	R Keirl	J Monk	R Cram
Date	21/01/2011	21/01/2011	21/01/2011
Drawing No.	-		Revision: C



Existing



GR: 523488 E 418853 N
 Distance to site: 5.2Km
 Direction from site: E
 Viewpoint level: 6.0m AOD
 Photo taken: 27/4/11

Horizontal field of view: 55°

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Rev	Date	Description	By	Chk	App
0	24/11/11	Preliminary Issue	TMD	JF	SP

PRELIMINARY



Viewing Distance	Drawn	Checked	Approved
40cm @ A3	TMD	JF	SP
Date	24/11/2011	24/11/2011	24/11/2011
Drawing No.	Revision		0


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Project: **ABLE Marine Energy Park**

Client: **ABLE UK Ltd**

Title: **Figure 19.4a Photomontage - Viewpoint 3 Coastal Footpath, North Humber Bank**



Proposed



GR: 523488 E 418853 N
 Distance to site: 5.2Km
 Direction from site: E
 Viewpoint level: 6.0m AOD
 Photo taken: 27/4/11

Horizontal field of view: 55°

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Rev	Date	Description	By	Chk	App
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Viewing Distance	Drawn	Checked	Approved
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Date	24/11/2011	24/11/2011	24/11/2011
Drawing No.	Revision		0


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Project: ABLE Marine Energy Park

Client: ABLE UK Ltd

Title: Figure 19.4a Photomontage - Viewpoint 3
 Coastal Footpath, North Humber Bank



Existing



GR: 516725 E 425912 N
 Distance to site: 6.5Km
 Direction from site: N
 Viewpoint level: 3.7m AOD
 Photo taken: 18/12/10

Horizontal field of view: 55°

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Rev	Date	Description	By	Chk	App
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Viewing Distance 40cm @ A3	Drawn TMD	Checked JF	Approved SP
Date	24/11/2011	24/11/2011	24/11/2011
Drawing No.	Revision		0



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Project: **ABLE Marine Energy Park**

Client: **ABLE UK Ltd**

Title: **Figure 19.4b Photomontage - Viewpoint 4 Viewing Point and Parking Area at Paull**



Proposed



GR: 516725 E 425912 N
 Distance to site: 6.5Km
 Direction from site: N
 Viewpoint level: 3.7m AOD
 Photo taken: 18/12/10

Horizontal field of view: 55°

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Viewing Distance	Drawn	Checked	Approved
40cm @ A3	TMD	JF	SP
Date	24/11/2011	24/11/2011	24/11/2011
Drawing No.	Revision		0

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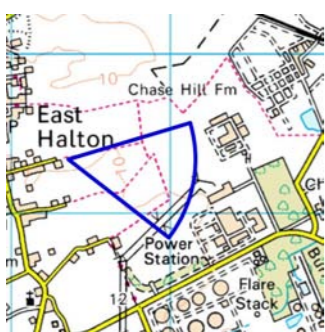
Project: **ABLE Marine Energy Park**

Client: **ABLE UK Ltd**

Title: **Figure 19.4b Photomontage - Viewpoint 4 Viewing Point and Parking Area at Paull**



Existing



GR: 514358 E 419339 N
 Distance to site: 1.5Km
 Direction from site: WNW
 Viewpoint level: 10.8m AOD
 Photo taken: 18/12/10

Horizontal field of view: 55°

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0	24/11/11	Preliminary Issue	TMD	JF	SP

PRELIMINARY



Viewing Distance 40cm @ A3	Drawn TMD	Checked JF	Approved SP
Date	24/11/2011	24/11/2011	24/11/2011
Drawing No.	Revision		0


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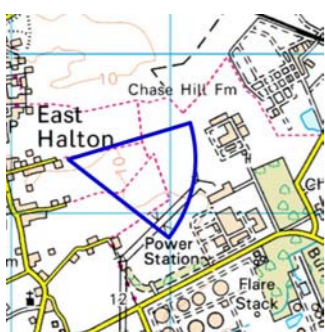
Project: **ABLE Marine Energy Park**

Client: **ABLE UK Ltd**

Title: **Figure 19.4c Photomontage Viewpoint 13
 Residents of East Halton**



Proposed



GR: 514358 E 419339 N
 Distance to site: 1.5Km
 Direction from site: WNW
 Viewpoint level: 10.8m AOD
 Photo taken: 18/12/10

Horizontal field of view: 55°

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Rev	Date	Description	By	Chk	App
0	24/11/11	Preliminary Issue	TMD	JF	SP

PRELIMINARY



Viewing Distance 40cm @ A3	Drawn TMD	Checked JF	Approved SP
Date	24/11/2011	24/11/2011	24/11/2011
Drawing No.	Revision		0



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Project: **ABLE Marine Energy Park**

Client: **ABLE UK Ltd**

Title: **Figure 19.4c Photomontage Viewpoint 13
 Residents of East Halton**