



Able Marine Energy Park

Material Change 2

Responses to Questions

9.0.1 – 9.0.6

ABLE MARINE ENERGY PARK (MATERIAL CHANGE 2)

Aviation Responses to Examining Body ExQ1

Section 9: Quayside Cranes

Able Marine Energy Park, Killingholme, North Lincolnshire



SLR Ref: 416.01148.00005
Version No: -v0.1
December 2021



BASIS OF REPORT

This report has been prepared by SLR Consulting Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Rydon Constructions Ltd. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

CONTENTS

1.0	INTRODUCTION	4
2.0	RESPONSE TO EXQ1: 9.0.1.....	5
3.0	RESPONSE TO EXQ1: 9.0.2.....	6
4.0	RESPONSE TO EXQ1: 9.0.3.....	8
5.0	RESPONSE TO EXQ1: 9.0.4.....	10
6.0	RESPONSE TO EXQ1: 9.0.5.....	13
7.0	RESPONSE TO EXQ1: 9.0.6.....	15

DOCUMENT REFERENCES

TABLES

Table 1	ExQ1 – Section 9 Quayside Cranes.....	4
---------	---------------------------------------	---

FIGURES

Figure 1	Potential Obstacle Lighting Arrangement.....	7
Figure 2	Medium-Intensity Flashing-Red Obstacle Lighting System, Type B	9
Figure 3	Humberside Airport ATC Surveillance Minimum Altitude Chart – ICAO (2018 Update).....	11
Figure 4	Examples of Obstacle Marking.....	12
Figure 5	Typical Examples of Crane Aviation Warning Lighting	14
Figure 6	Comparison of White LED Lighting with Red-Blue-Green Led Lighting	14
Figure 7	Humberside Airport Instrument Approach Chart – ICAO (2018 Update).....	16

1.0 Introduction

Able Humber Ports Ltd has submitted their application for Material Change 2 to the Able Marine Energy Park DCO. The Examining Body’s written questions and requests for information (ExQ1) were issued on 19 November 2021.

This document responds to several issues raised in relation to the **Quayside Crane** component of the Application, found within ExQ1 Section 9.

- The specific questions addressed are set out in **Table 1**; and
- They relate primarily to the issue of crane lighting for **Aviation Safety**.

Table 1 ExQ1 – Section 9 Quayside Cranes

ExQ1	Question to:	Question	Refer Section ...
9	Quayside Cranes¹		
9.0.1	Applicant	UES 22.4.9, How is the Civil Aviation Publications (CAP) 1096 requirement for lighting en-route objects 150m or more above ground level (agl) co-ordinated with the requirements arising from the Humberside Airport Obstacle Limiting Surface (OLS)/Outer Horizontal Surface (OHS)?	2
9.0.2	Applicant	The photomontages in the original ES show turbines set upright on the site. Should consideration be given to lighting the turbines under construction which, at 165m, are more than 150m agl?	3
9.0.3	Applicant	UES 22.5.6, third bullet, notes that for a crane of height 200m, four levels of lighting are recommended: medium intensity at the top and various intensities at intermediate levels. Would these recommendations be followed? Would there be a different regime for cranes above 200m in height?	4
9.0.4	Applicant	Has progress been made in consultations regarding the recommended white flashing day-time lighting to the cranes, in addition to the necessary continuous red night-time lighting?	5
9.0.5	Applicant	Please fully assess the impacts of the various forms of lighting, and the contrasting, coloured patterned banding (a possible alternative to white flashing lighting) in relation to residential, avian, landscape, and heritage receptors.	6
9.0.6	Applicant	Has responsibility for incorporating the tall features into air mapping been resolved?	7

*Note 1 Only **ONE** crane will be deployed for the Project moving along the front of the quayside.*

2.0 Response to ExQ1: 9.0.1

ExQ1: 9.0.1 UES 22.4.9, How is the Civil Aviation Publications (CAP) 1096 requirement for lighting en-route objects 150m or more above ground level (agl) co-ordinated with the requirements arising from the Humberside Airport Obstacle Limiting Surface (OLS)/Outer Horizontal Surface (OHS)?

Response

The key guidance documents involved in the coordination of CAP 1096 and OLS/OHS-related airport requirements are as follows:

Civil Aviation Authority (CAA) CAP 168 Licensing of Aerodromes (Ed.11, January 2019).

- CAP 168 summarises requirements for the marking and lighting of obstacles, and is aligned with the 2016 update of ICAO Annex 14 and EASA (European Union Safety Agency) Easy Access Rules for Aerodromes Regulation (EU) No 139, May 2019.
- CAP 168 also contains the definitions needed for an airport OLS/OHS.

Civil Aviation Authority (CAA) CAP 738 Safeguarding of Aerodromes (Ed.3, October 2020).

- CAP 738 provides expanded guidance regarding the identification of so-called “obstacles” in relation to aerodrome operations and associated safeguarding requirements, through marking and/or lighting. CAP 738 contains a new Appendix B devoted to cranes that is aligned with CAP 1096.
- CAP 738 also contains the definitions needed for an airport OLS/OHS, same as CAP 168.

Civil Aviation Authority (CAA) CAP 1096 Guidance to Crane Users (Ed.2.1, September 2020)

- CAP 1096 specifically addresses potential impacts of cranes on aviation. The lighting recommendations contained in CAP 1096 are aligned with ICAO Annex 14.

International Civil Aviation Organisation (ICAO) Annex 14 Aerodromes – Volume 1 Aerodrome Design and Operations (Ed.7, July 2016)

- ICAO Annex 14, Vol.1, Chapter 6 contains updated guidance in relation to objects that need to be marked and/or lighted. In relation to marking and lighting, the recommendations contained in the July 2016 version of ICAO Annex 14 are mostly similar to those of previous versions, with additional guidance in relation to LED lighting, wind turbines and additional details covering intensity and beam spread of standard lighting types.
- Again, ICAO Annex 14 contains the definitions needed for an airport OLS/OHS, same as CAP 168 and CAP 738.

From the above, it can be seen that the guidance elements contained in **ALL** of the above standards/guidelines are aligned with each other, with respect to the definition of “obstacles” and their associated needs in relation to lighting and marking. Humberside Airports safeguarding surfaces and approach to responding to obstacles is therefore directed by the CAA and ICAO guidance outlined above and there is no requirement to ‘co-ordinate’ requirements identified therein.

3.0 Response to ExQ1: 9.0.2

ExQ1: 9.0.2 The photomontages in the original ES show turbines set upright on the site. Should consideration be given to lighting the turbines under construction which, at 165m, are more than 150m agl?

Response

Schedule 11 paragraph 35 of the DCO provides that no structures exceeding 45m in height above finished ground level should be erected until written details of a lighting scheme for that structure have been approved by the Civil Aviation Authority. This requirement will apply to the wind turbines and their component parts.

The erection of turbines on the AMEP site is not a change in the application. The presentation of upright turbines within the original ES is a 'worst case scenario' in terms of obstacles. Current practice for offshore windfarms is to transport the turbines in segments before construction takes place out at sea/at place of installation

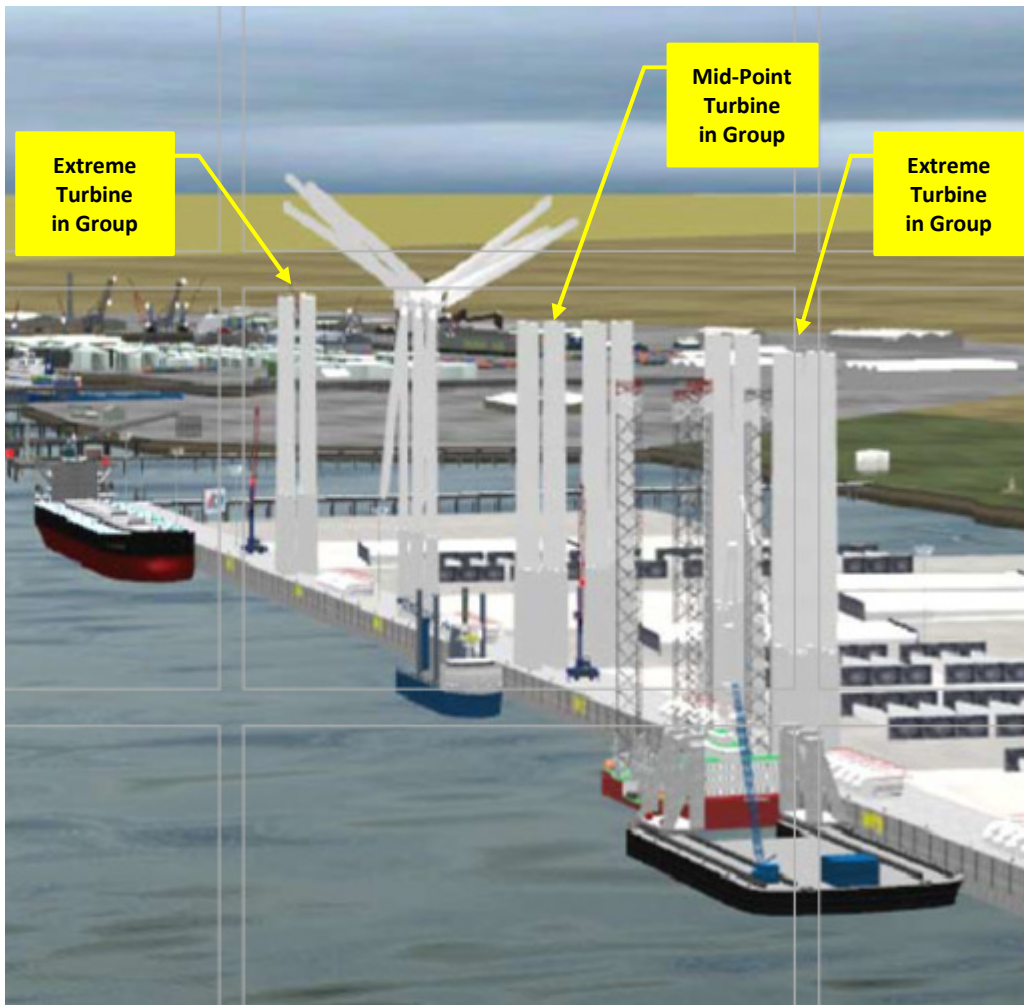
Nevertheless, all of the recommendations made in the UES in relation to lighting and/or marking of the proposed AMEP Quayside Crane apply equally to any other "obstacles" of significant height at the site, subject to the following considerations:

- Obstacle lighting should be such that any single structure can be perceived from every angle in azimuth.
- Where the lighting of an individual structure is shielded in any direction by another adjacent structure, additional lights should be provided on the neighbouring structure, or the part of the structure that is shielding the light, in such a way as to retain the general definition of the structure to be lighted.
- In the case of a group of closely spaced structures that penetrate an airport OLS, the top lights should be so arranged as to indicate the points of the HIGHEST structure, as well as the general definition and the extent of ALL the structures.
- Where it is deemed necessary to light a group of structures that are relatively close to each other, it is standard practice to use medium-intensity night-time red lights on the "outer" structures and low-intensity night-time red lights on structures that are bounded by neighbouring structures.

On the basis of the above:

- Given that the Quayside Crane is always present at the site, all UES obstacle lighting and marking recommendations apply automatically to the crane.
- Were full height turbines present on site, **Figure 1** shows a concept visual of the site in operation with several turbine components at the site which also exceed the key 150 m agl level.
- All such full height turbines exceeding the 150m agl level should be lit in accordance with the general rules outlined above.
- It would not be necessary to provide night-time obstacle lighting for all turbine components to comply with best practice guidance.
- However, at a minimum, the extreme turbine components (refer **Figure 1**) should be lit as per the Quayside Crane.
- If the extent of turbine components is sufficiently spread out, the "mid-point" turbine component should also be provided by night-time lighting at its top (medium-intensity red lighting, Type B).

Figure 1 Potential Obstacle Lighting Arrangement



4.0 Response to ExQ1: 9.0.3

ExQ1: 9.0.3 UES 22.5.6, third bullet, notes that for a crane of height 200m, four levels of lighting are recommended: medium intensity at the top and various intensities at intermediate levels. Would these recommendations be followed? Would there be a different regime for cranes above 200m in height?

Response(s)

Would these recommendations be followed?

The relevant UES 22.5.6 recommendation was that, for a crane of height 200 m, four levels of lighting should be installed in relation to aviation safety considerations:

- medium intensity (Type B) at the top;
- low or medium intensity (Type B) at the first intermediate level;
- medium intensity (Type B) at the second intermediate level; and
- low or medium (Type B) intensity again at the lowest intermediate level.

The Applicant has committed to installing the above lighting system, in the medium/low/medium/low arrangement. Whilst this lighting practice would be required under separate legislation/guidance due to the crane representing an 'obstacle', it is also secured by Schedule 11 paragraph 35 of the DCO.

Further, the Applicant is aware that:

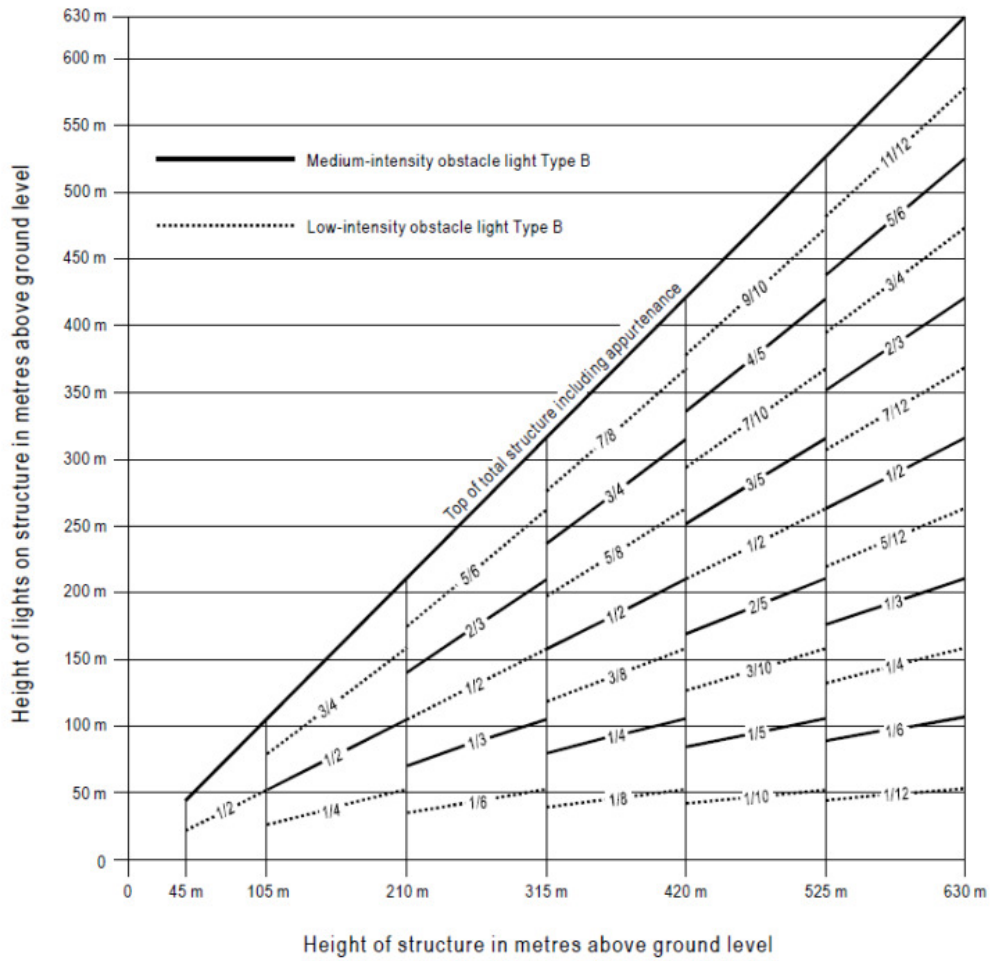
- The above obstacle lights at each level should be such that the Quayside Crane is indicated from every angle in azimuth.
- Where a light is shielded in any direction by a part of the crane, additional lights should be provided on the part of the crane that is shielding the light, in such a way as to retain the general definition of the crane.
- The extremities of the Quayside Crane must be lit as well as lighting distributed along the height of the crane.
- Xenon-based lamps are typically used, although LED lighting is increasingly being adopted because of its associated reduced power consumption and longer operating life.

Would there be a different regime for cranes above 200m in height ?

Figure 2 illustrates the progression of lighting regimes for structures (including cranes) with height.

- It can be seen that the recommended lighting system for the AMEP Quayside Crane would be suitable for a crane height up to 210 m.
- Above 210 m and up to 315 m, six levels of lighting would be recommended. Additional lighting for even taller structures is shown in **Figure 2**.

Figure 2 Medium-Intensity Flashing-Red Obstacle Lighting System, Type B



5.0 Response to ExQ1: 9.0.4

ExQ1: 9.0.4 Has progress been made in consultations regarding the recommended white flashing day-time lighting to the cranes, in addition to the necessary continuous red night-time lighting?

Response

UES 22.5.6 provided recommendations regarding the need or otherwise for daytime lighting for the Quayside Crane. It was noted that daytime lighting can have unintended third-party impacts, e.g. nuisance glare impact on surrounding residences, potential consequences on local avian populations, etc.

The key factors influencing the addition of daytime aviation warning lights (flashing white lights) are:

- the proximity of the relevant obstacle to the runway centreline extension of concern;
- the height of the obstacle in absolute terms and relative to any other surrounding tall obstacles; and
- any distinctive markings that can be substituted for lighting in terms of a warning system.

The following is noted:

- The displacement of the proposed AMEP Quayside Crane from Humberside Airport's Runway 03 centreline extension is shown in **Figure 3**.
- The surrounds are partly rural in nature and there is potential for daytime nuisance glare on surrounding receivers, including avian disruption.

Accordingly, UES 22.5.6 recommended that consideration should be given to avoiding daytime lighting of the Quayside Crane. Instead, it was proposed that the proposed Quayside Crane could be made conspicuous by its colouring, e.g. employing a colouring pattern with alternating contrasting bands.

- The typical protocol for such "markings" is for the bands to be perpendicular to the longest dimension of the obstacle and have at least 5 m in width.
- Examples can be found in **Figure 4**.
- CAA CAP 1096 Guidance to Crane Users (Ed.2.1, September 2020) mentions a review by the CAA which determined that the use of a yellow and black (or dark blue) pattern (especially in urban areas) provides the best contrast with the background from the air.

On the basis of the above, the Applicant is consulting with key stakeholders, CAA and Humberside Airport, regarding a "marking" mitigation solution rather than the alternative daytime (flashing white) lighting option. As with all projects involving the introduction of an obstacle, this matter can be satisfactorily dealt with/agreed with Humberside Airport subsequent to the determination of the Material Change 2 application.

Figure 3 Humberside Airport ATC Surveillance Minimum Altitude Chart – ICAO (2018 Update)

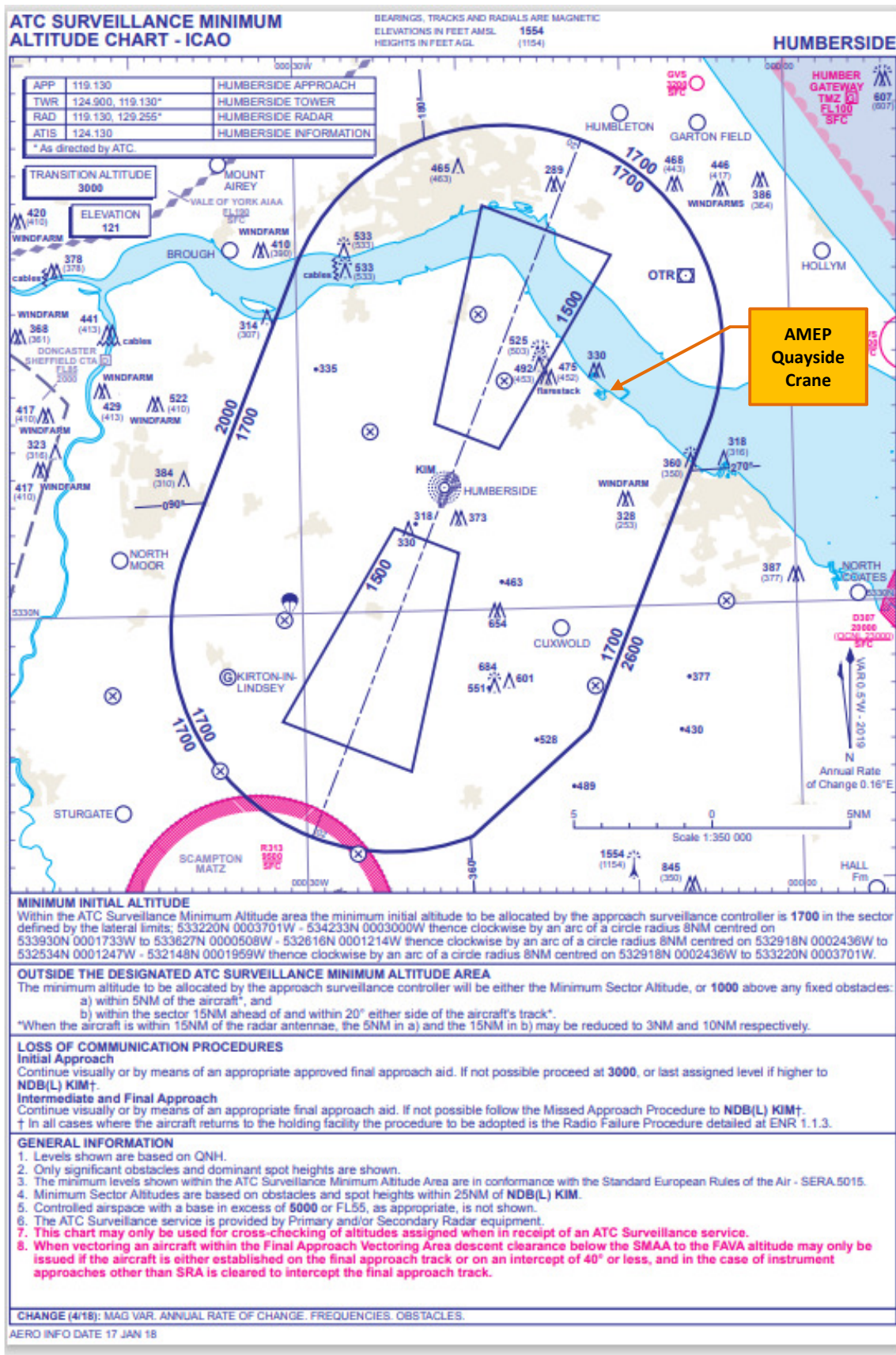
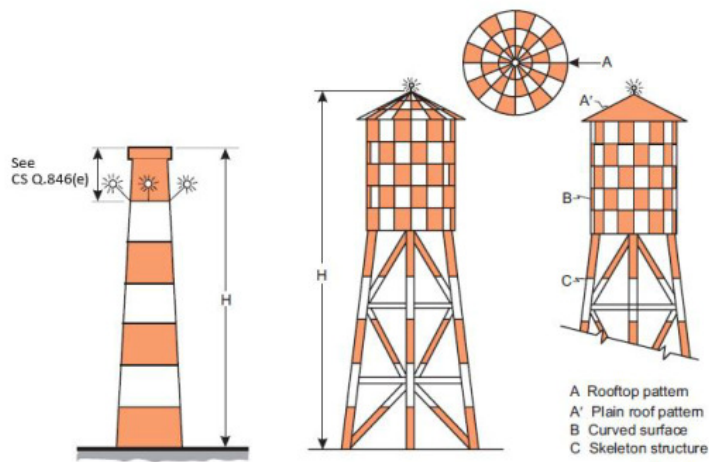
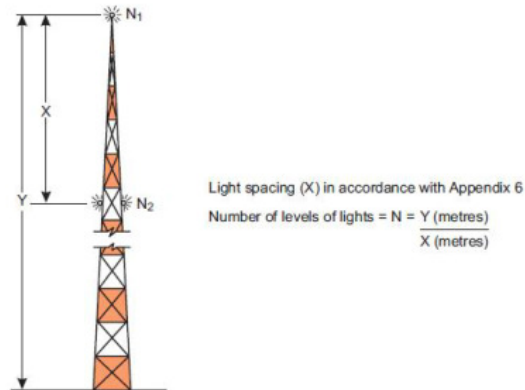


Figure 4 Examples of Obstacle Marking



Note.— *H* is less than 45 m for the examples shown above.
For greater heights intermediate lights must be added as shown below.



6.0 Response to ExQ1: 9.0.5

ExQ1: 9.0.5 Please fully assess the impacts of the various forms of lighting, and the contrasting, coloured patterned banding (a possible alternative to white flashing lighting) in relation to residential, avian, landscape, and heritage receptor?

Response

The potential impacts of the proposed aviation-related obstacle lighting and “banded marking” for the proposed Quayside Crane can be separated into the following categories.

Lighting - Daytime

- A recommendation has been made to avoid the installation of daytime lighting for the crane – refer comments in **Section 5** of this document. This would eliminate any potential impacts for all class of receptor.

Lighting – Night-time

- In terms of night-time impacts on residential, landscape and heritage receptors, it is noted that night-time lighting is a commonplace occurrence in most urban environments – refer for example **Figure 5**. Indeed, reference should be made to the Landscape Photomontages and response provided to the Examining Body’s questions Q9.0.7 to Q9.0.9 regarding the context of the site and its surroundings.
- In terms of night-time impacts on avian receptors, it is known that lights can disorientate flying birds, especially during migration, and cause them to divert from efficient migratory routes, or even collide with significant infrastructures (e.g. large buildings). This has been effectively considered within the ecological assessments previously undertaken in support of the original ES and will not alter as a result of an increase in height of the proposed crane.
- Significant impacts in relation to avian risk can be avoided through best-practice lighting design. For example, it is known that birds are more sensitive to the blue wavelengths within light. Accordingly, if choosing LED lighting options (as has become common), a selection of RGB Wavelength Lighting is preferred – refer **Figure 6**. Research on cell towers (reported by the University of Manitoba) shows that red lights have less impact on birds than white lights.
- Fortunately, the medium-intensity and low-intensity red lighting recommended for the Quayside Crane falls into this category.

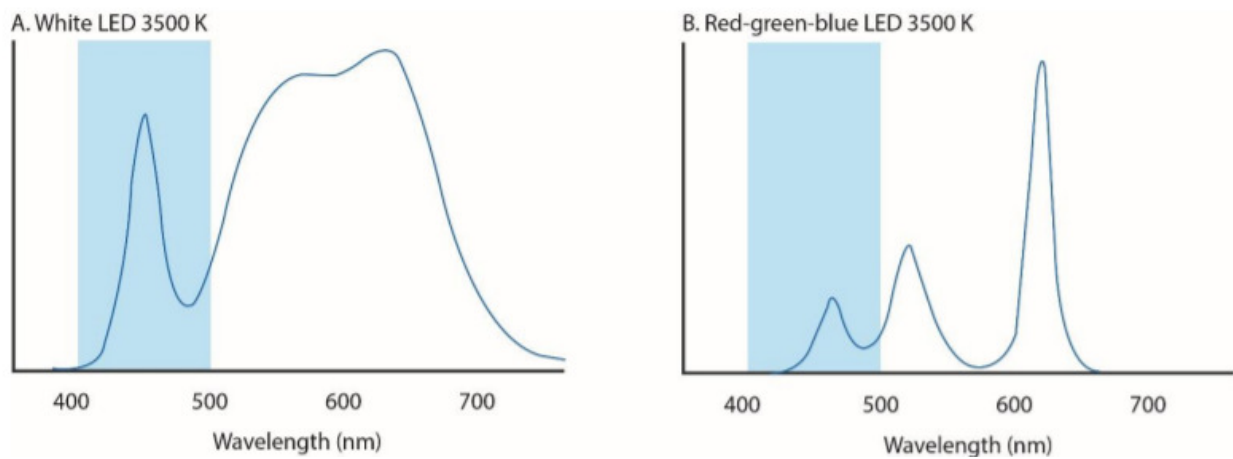
Marking - Daytime

There are no potential impacts associated with the proposed use of aviation-related marking of the crane given the distance at which it would be viewed and its surrounding landscape setting.

Figure 5 Typical Examples of Crane Aviation Warning Lighting



Figure 6 Comparison of White LED Lighting with Red-Blue-Green Led Lighting



Note:

Please note: in the above figure, the two LED lights, which have the same 3,500K output, would appear to the human eye as the same colour. Birds however would be more sensitive to the White LED light compared to the RGB LED light.

7.0 Response to ExQ1: 9.0.6

ExQ1: 9.0.6 Has responsibility for incorporating the tall features into air mapping been resolved?

Response

Incorporation of the proposed AMEP Quayside Crane into air mapping includes the following:

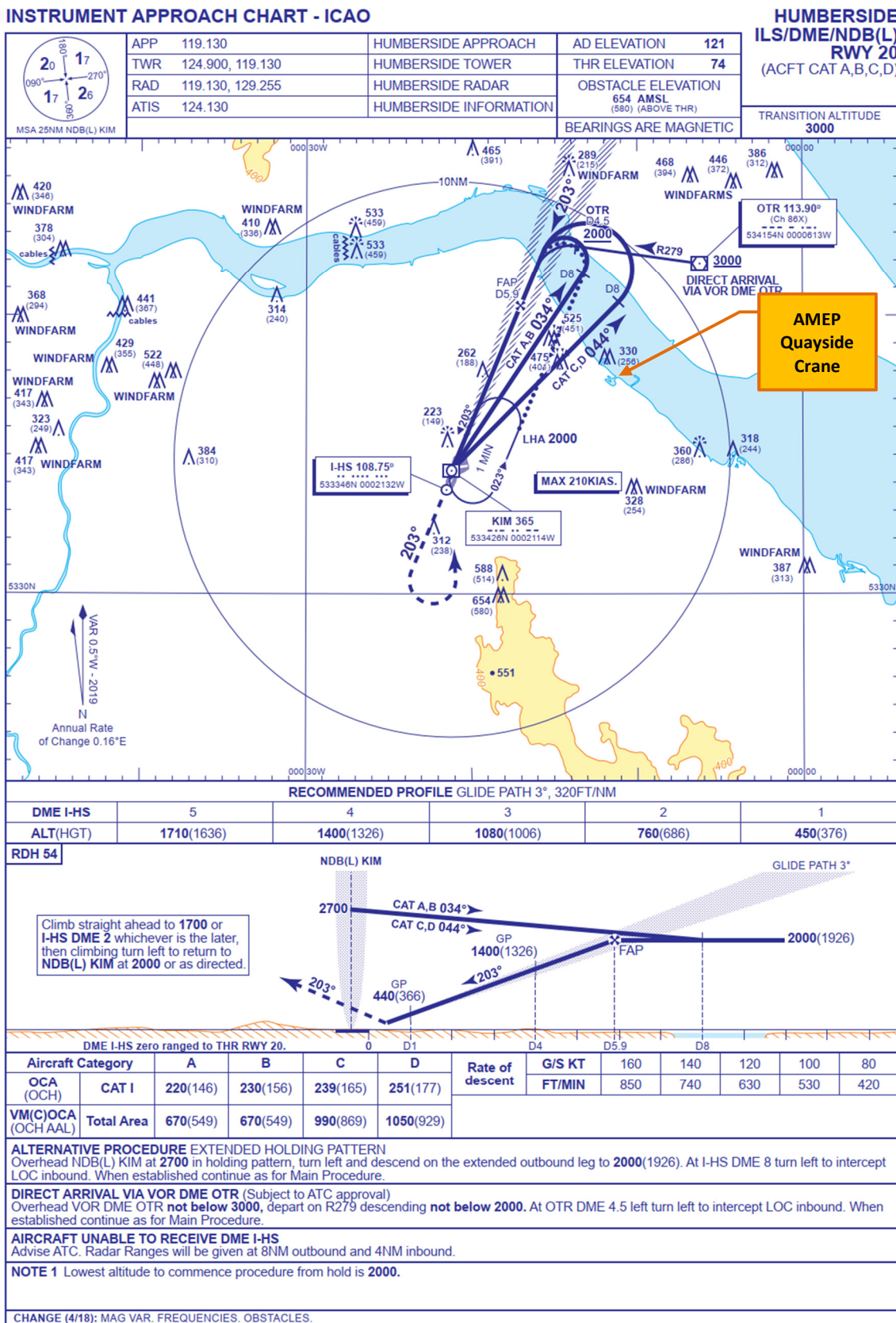
- Addition of the proposed AMEP Quayside Crane to the relevant Humberside Airport (ICAO-compliant) ATC Surveillance Minimum Altitude Chart - refer example in **Figure 3**.
- Addition of the proposed AMEP Quayside Crane to the relevant Humberside Airport (ICAO-compliant) Instrument Approach Chart - refer example in **Figure 7**.
- Addition of the proposed AMEP Quayside Crane to Humberside Airport EGNJ AD 2.10 “Aerodrome Obstacles”, 8 November 2018.

The Applicant has committed to providing Humberside Airport with the following:

- CAD drawings of the proposed Quayside Crane;
- Lat/Long coordinates of the median Quayside Crane position (noting that the crane is designed to move along the quayside);
- Precise maximum height AGL (above ground level) of the crane; and
- Lighting and Marking details of the crane.

Nevertheless, as with all projects involving the introduction of an obstacle, this matter can be satisfactorily dealt with/agreed with Humberside Airport subsequent to the determination of the Material Change 2 application.

Figure 7 Humberside Airport Instrument Approach Chart – ICAO (2018 Update)



EUROPEAN OFFICES

United Kingdom

AYLESBURY

T: +44 (0)1844 337380

BELFAST

belfast@slrconsulting.com

BRADFORD-ON-AVON

T: +44 (0)1225 309400

BRISTOL

T: +44 (0)117 906 4280

CARDIFF

T: +44 (0)29 2049 1010

CHELMSFORD

T: +44 (0)1245 392170

EDINBURGH

T: +44 (0)131 335 6830

EXETER

T: + 44 (0)1392 490152

GLASGOW

T: +44 (0)141 353 5037

GUILDFORD

T: +44 (0)1483 889800

LONDON

T: +44 (0)203 805 6418

MAIDSTONE

T: +44 (0)1622 609242

MANCHESTER

T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE

T: +44 (0)191 261 1966

NOTTINGHAM

T: +44 (0)115 964 7280

SHEFFIELD

T: +44 (0)114 245 5153

SHREWSBURY

T: +44 (0)1743 23 9250

STIRLING

T: +44 (0)1786 239900

WORCESTER

T: +44 (0)1905 751310

Ireland

DUBLIN

T: + 353 (0)1 296 4667

France

GRENOBLE

T: +33 (0)6 23 37 14 14