From:	Opel, Laura (MMO)
To:	Hornsea Project Three
Cc:	West, Richard (MMO); Stephenson, Paul (MMO)
Subject:	EN010080 - Hornsea Project 3 Deadline 3 submission
Date:	14 December 2018 12:22:06
Attachments:	EN010080 - Annex A - MMO guidance on MCZ assessments.pdf EN010080 - Annex B - MMO comments on In Principle Monitoring Plan.pdf EN010080 - Annex C -MMO comments on Herring Noise Contours.pdf EN010080 - Example MMO MCZ screening document.pdf EN010080 - Example MMO MCZ Stage 1 Assessment.pdf EN010080 - Hornsea Project Three - Deadline 3 - MMO Post Hearing Submission.pdf

---

Good afternoon,

Identification Number: 20010662

Please find attached the MMOs Deadline 3 submission for Hornsea Project 3. The following documents have been attached:

- Post hearing submission including written submission of oral cases and comments on the revised draft DCO
- Annex A – MMO guidance on MCZ assessment
- Annex B – MMO comments on In Principle Monitoring Plan
- Annex c – MMO comments on Herring Noise Contours
- Example MCZ screening document
- Example MCZ Stage 1 assessment

Please let me know if you have any questions.

Kind regards,
Laura

Laura Opel BSc. (Hons), MSc., PIEMA **I** Marine Licensing Case Officer **I** Her Majesty's Government – Marine Management Organisation.
Direct Line: 020822 57690**I** laura.opel@marinemanagement.org.uk **I** Lancaster House, Newcastle Business Park, Newcastle upon Tyne, NE4 7YH

Website | Twitter | Facebook | Linkedin | Blog |Instagram | Flickr | YouTube | Google+ | Pinterest

Marine Management Organisation

Lancaster House
Newcastle Business Park
Newcastle Upon Tyne
NE4 7YH

T +44 (0)191 376 2791
www.gov.uk/mmo

MMO Reference: DCO/2016/00001
Planning Inspectorate Reference: EN010080

14 December 2018

Annex C

Planning Act 2008, Orsted Hornsea Project Three Limited, Proposed Hornsea Project Three Offshore Windfarm Order – Concurrent Piling

The Marine Management Organisation (MMO) is an interested party for the examination of Development Consent Order (DCO) applications for Nationally Significant Infrastructure Projects in the marine area. The MMO has received notice of such an application for Hornsea Project Three Offshore Windfarm (Ref: EN010080).

Please find below the MMO's comments on the updated underwater noise modelling outputs and how these relate to the assessment of effects on herring spawning at the Flamborough Head spawning ground, including concurrent piling. Please note these are initial comments only and the MMO reserves the right to make further comment on this application throughout the examination process. Please see below the MMO's comments for your consideration:

1. The MMO appreciate that Ørsted have provided updated modelling in relation to concurrent piling. Updated modelling is for a single pile and concurrent piling, showing the SPLpeak noise contours based on a 5,000 kJ hammer energy. Using noise exposure criteria from Popper et al. (2014), the risk of mortality, potential mortal injury and recoverable injury at the onset of piling are likely only at close ranges to the source (relevant threshold for fish with swim bladder involved in hearing is > 207dB peak).

2. The MMO note that the applicant has provided the SPLpeak contours based on concurrent piling in their response. As requested, they have included a Figure (under point A) showing the indicative noise contours, with a second noise contour within the array. The response states that:
   "At a great distance from piling activities the pulses (the SPLpeak contours are for a single pulse) from two sources are highly unlikely to occur at the same time at any one location – consecutive pulses travelling through the water will be 3 km apart or more. In the worst case scenario, whereby two piles are installed adjacent to one another and

these pulses combine, this will cause a maximum 3 dB increase in the noise level, leading to 142 dB SPLpeak at the edge of Flamborough Head spawning ground, rather than 139dB as shown in Figure 3.4 of the Fish and Shellfish ES chapter and attached). This is assuming the absolute maximum hammer energy at the location closest to the spawning ground (i.e. the most conservative assumptions".

The MMO would also expect to see the modelled results (for injury and Temporary Threshold Shift, TTS) based on the cumulative Sound Exposure Level (SELcum) for a stationary fish receptor.

3. The MMO note that the Applicant maintains their position that there is evidence to support the assumption that fish are likely to move away from sound that is loud enough to cause harm and therefore it is reasonable to assume in general that fish will flee from elevated noise levels.

   The MMO are yet to see evidence to support fleeing responses to noise in fish. The MMO recognise that fish will likely respond to a loud noise source, and reactions have been observed such as schooling more closely or moving to the bottom of the water column, burying in substrate. Hawkins et al. (2014) for example, reported changes in density of fish within a school, or a depth change in pelagic species in response to noise (percussive pile driving playback). However, this is not evidence to support fleeing (which, under current assumptions in assessments, assumes a receptor would flee directly and consistently from the source over the effect distances predicted).

4. Nevertheless, the Applicant has provided an additional run of noise modelling assuming a non-fleeing fish at the eastern edge of Flamborough Head spawning ground (i.e. closest to the Hornsea Three array area). The scenario assumes concurrent piling in the western corner of the array area and 5,000 kJ hammer energy. The modelling concluded that the received levels would be approximately 171 dB SELcum; this is approximately 15 dB lower than the TTS criteria stated in Popper et al. (2014). In order to provide more clarity on the above, the MMO would like to see the modelled received levels for SELcum, as has been done for the peak SPL (showing the spawning habitats).

5. Additionally, the MMO recommend that the hammer energy profiles for the SELcum scenarios should also be provided (including the number of piles installed in 24 hours, number of strikes, source level etc.). Volume 4 – 3.1 Subsea Noise Technical Report includes Figures 5.3 to 5.10 showing the unweighted single strike SEL (SELss) noise levels. The MMO consider that it would be appropriate to show similar figures for concurrent piling based on a 5,000 kJ hammer energy.

   In Summary:

6. As outlined in the MMO's comments above the Applicant is requested to provide further information in order to assess whether any concurrent piling noise would attenuate to

the known herring spawning grounds located off Flamborough Head. In addition to the information already provided, the MMO recommends that the additional information is provided by the Applicant:

i. The hammer energy profiles for the SELcum scenarios (including the number of piles installed in 24 hours, number of strikes, source level).
ii. The unweighted single strike SEL (SELss) received levels based on concurrent piling and a 5,000 kJ hammer energy (showing the contours and spawning habitats).
iii. The modelled received levels for SELcum based on concurrent piling, as has been done for the peak SPL (showing the contours and spawning habitats).

A: Additional Herring Noise contours as submitted by the Applicant on the 3rd December 2018 via email.

Dear Laura,

Thanks for your email and apologies in the delay in getting back to you. As discussed in the last meeting on the SoCG, we have looked again at the underwater noise modelling outputs and how these relate to the assessment of effects on herring spawning at the Flamborough Head spawning ground, including concurrent piling. We hope the clarifications below can give you the re-assurance you need that piling at the Hornsea Three array area will not represent a significant risk to herring spawning at this spawning ground.

<u>Noise Contours</u>

We discussed at that time, showing the updated indicative noise contours associated with piling in the Hornsea Three array area relative to the Flamborough Head spawning ground (as shown in Figure 3.4 of the Fish and Shellfish ES chapter), but assuming concurrent piling. We explained that due to the metric used (i.e. SPLpeak), addition of a second piling location would extend these contours to the east (i.e. any further piling locations would be east of the most westerly corner of the array area), and would not increase the risk of behavioural effects on spawning adult herring, i.e. by extending the contours west into the spawning ground. As promised, we have produced a map showing a second noise contour within the array area (attached) and while it shows that the overall area of the combined contours is greater, these do not extend further east into the spawning ground. However, while we have presented these contours to you, you will see our Deadline 2 response on this point is a little different. The reason for this is that presentation of these contours is somewhat of a simplification of the situation.

At a great distance from piling activities the pulses (the SPLpeak contours are for a single pulse) from two sources are highly unlikely to occur at the same time at any one location – consecutive pulses travelling through the water will be 3 km apart or more. In the worst

case scenario, whereby two piles are installed adjacent to one another and these pulses combine, this will cause a maximum 3 dB increase in the noise level, leading to 142 dB SPLpeak at the edge of Flamborough Head spawning ground, rather than 139dB as shown in Figure 3.4 of the Fish and Shellfish ES chapter and attached). This is assuming the absolute maximum hammer energy at the location closest to the spawning ground (i.e. the most conservative assumptions).

While there are no agreed numerical behavioural avoidance criteria for fish, a noise level of under 140 dB SPLpeak (<130 dB SELss) is of the order of background noise, and highly unlikely to produce any aversive reaction, especially due to the spreading of sound over large distances, reducing the potential for any startle reaction. This is in line with the results from Doksæter et al. (2012) – these levels are considerably below any level that produced an aversive reaction in that study.

Fleeing Fish

In relation to the assumption of a fleeing fish in some of the modelling of fish injury ranges, we maintain our position that there is evidence to support the assumption that fish are likely to move away from sound that is loud enough to cause harm and therefore it is reasonable to assume in general that fish will flee from elevated noise levels (i.e. those high enough to potentially cause injury).

We would note, however that the impact assessment was not based solely on the SELcum metrics (assuming a fleeing fish) and that SPLpeak metrics (not assuming fleeing fish) were also used to inform the impact assessment for injury and behavioural effects.

Noting the concerns raised by the MMO, an additional run of the noise modelling has been undertaken assuming a non-fleeing fish (i.e. stationary receptor) at the eastern edge Flamborough Head spawning ground (i.e. closest to the Hornsea Three array area). This highly conservative scenario assumes:

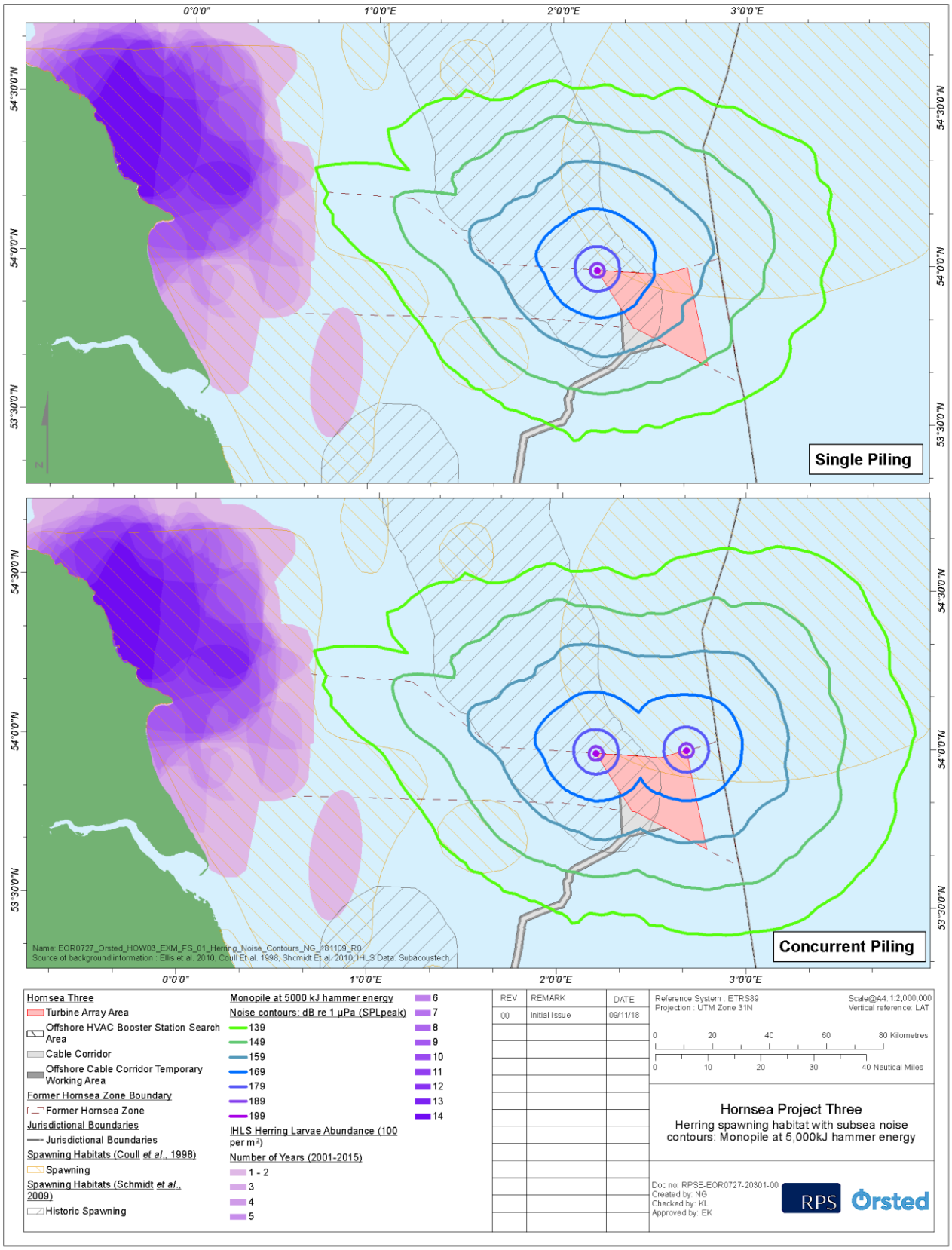
- The absolute maximum hammer energy of 5,000 kJ;
- Concurrent piling in the western corner of the array area; and
- A stationary (non-fleeing) receptor at the edge of the Flamborough Head spawning ground.

This modelling run concluded that the noise levels associated with the entire duration of two concurrent pile installations would result in received levels of approximately 171 dB SELcum. This is approximately 15 dB lower than the TTS criteria stated in Popper et al. (2014) even in this highly conservative, entirely hypothetical scenario.

Both of these clarifications, using different metrics and highly conservative assumptions, demonstrate that the risk to herring spawning as a result of piling at the Hornsea Three array area is very low and will not lead to a significant effect in EIA terms, in line with the conclusions of the Fish and Shellfish ES chapter.

I hope this provides the information required to resolve your concerns, but we would be

happy to discuss during the week if necessary.



Reference:

Hawkins, A. D., Roberts, L., & Cheesman, S. (2014). Responses of free-living coastal

pelagic fish to impulsive sounds. The Journal of the Acoustical Society of America, 135(5).

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J., … Tavolga, W. N. (2014). ASA S3/SC1.4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards committee S3/SC1 and registered with ANSI. American National Standards Institute.