



Hornsea 4 Project Team  
Planning Inspectorate  
[HornseaProjectFour@planninginspectorate.gov.uk](mailto:HornseaProjectFour@planninginspectorate.gov.uk)  
(By email only)

Planning Inspectorate Reference:  
EN010098  
MMO Reference: DCO/2018/00014  
Identification Number: 20029896

21 April 2022

Dear Jo Dowling,

**Planning Act 2008 - Application by Ørsted Hornsea Project Four (UK) Limited (“Ltd”) for an Order Granting Development Consent for Hornsea Project Four Offshore Wind Farm**

**Deadline 3 Submission**

On 4 November 2021, the Marine Management Organisation (the “MMO”) received notice under Section 56 of the Planning Act 2008 (the “PA 2008”) that the Planning Inspectorate (“PINS”) had accepted an application made by Orsted Hornsea Project Four (UK) Ltd (the “Applicant”) for a development consent order (the “Application”).

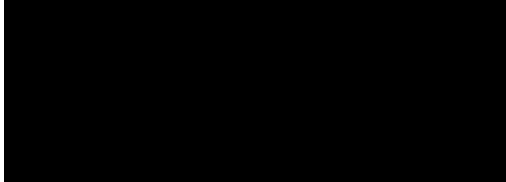
The Application seeks authorisation to construct, operate and maintain Hornsea Project Four offshore wind farm, comprising of up to 180 offshore wind turbines together with associated offshore and onshore infrastructure and all associated development (the “Project”).

The MMO submits the following as part of our Deadline 3 submission:

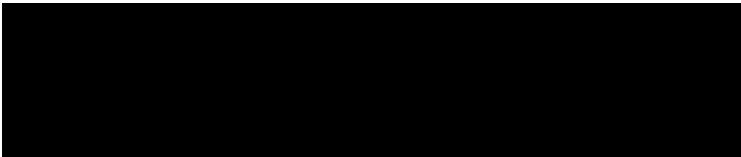
1. **Post-hearing submissions including written summaries of oral case put at any of the hearings held during w/c 11 April 2022**
2. **Comments on submissions received at Deadline 2**
3. **Progressed versions of any SoCG and an updated Statement of Commonality of SoCG**
4. **Any further information requested by the ExA under Rule 17 of the Examination Procedure Rules**



This written representation is submitted without prejudice to any future representation the MMO may make about the Application throughout the examination process. This representation is also submitted without prejudice to any decision the MMO may make on any associated application for consent, permission, approval or any other type of authorisation submitted to the MMO either for the works in the marine area or for any other authorisation relevant to the proposed development.



Marine Licencing Case Officer



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## 1. Post-hearing submissions including written summaries of oral case put at any of the hearings held during w/c 11 April 2022

1.1 The MMO submitted an “in lieu of attendance” on 11 April 2022 [AS-031]. We have since reviewed the action points from Issue Specific Hearing 1 held during the week commencing 11 April 2022 and wish to make the following comments.

1.2 **Action point 2** - Review the Applicant’s response to ExQ1 DCO.1.24 [REP2-038] in regard to Schedule 1 Part 1 and confirm if now satisfied.

1.2.1 The MMO has reviewed the applicant’s response within G1.9: Applicant's Comments on Relevant Representations (REP1-038) and notes that the Applicant has stated that this is a common occurrence and that systems are, or can be put in place between the MMO and the Local Planning Authority (LPA) to govern enforceability in such circumstances in line with their statutory duties, and that this is not a situation unique to this project.

1.2.2 Without knowing yet what systems are proposed to be put in place, the MMO is unable to advise on this, and shall respond at such a time that an agreement is in place.

1.3 **Action point 33** - Review Applicant’s Deadline 2 response to ExQ1 DCO.1.10 [REP2-038] regarding Article 8 and confirm if now satisfied.

1.3.1 The MMO notes that ExQ1 DCO.1.10 regarding Article 8 does not relate to the MMO’s remit and defers to the relevant LPA.

1.4 **Action point 34** - Review Applicant’s Deadline 2 response to ExQ1 DCO.1.24 [REP2-038] regarding Article 10(7) and confirm if it is now satisfied.

1.4.1 The MMO notes that Article 10(7) does not relate to the MMO’s remit, and it is applicable to a street authority, and as such defers to the relevant LPA. The MMO notes that this Action point could also relate to DCO.1.12, regarding Articles 10(7), 12(2), 15(9) and 17(6). We confirm that we are not the consenting authority for any of these Articles. The MMO has discussed its own timescales for DML conditions under sections 1.1.1, 2.1.2-2.1.14 of RR-020.

1.5 **Action point 35** - Review the recording of ISH1 and respond to any relevant points made by the Applicant or any other IPs. In particular:

- In regard to Article 5 transfer of benefit (approx. 01:30:00);
- In regard to proposed timescales (approx. 02:45:00);
- In regard to the Commitments Register being a signposting tool (approx. 03:10:00).

1.5.1 The MMO has reviewed the recording of ISH1 in particular the areas highlighted.

1.5.2 The MMO has noted the comments relating to the transfer of benefit and is discussing this further internally and will provide a response at Deadline 4.

1.5.3 **Condition 14**



- 1.5.3.1 The MMO reiterates the following comments regarding condition 14. It sets out the requirements for the Applicant to submit all pre-construction documentation at least four months prior to the commencement of the construction works. The MMO does not agree that a four month timescale provides sufficient time for the post consent documentation to be considered prior to the start of commencement of works. The MMO believes that a four month pre-construction submission date is unrealistic and even counterproductive, as the pre-construction sign-off process is not always straight forward.
- 1.5.3.2 The four month timescale was deemed appropriate for Round 1 developments, which were smaller, closer to shore and with fewer complex environmental concerns. The documents in question require in-depth analysis by both MMO staff and statutory consultees and as such, there needs to be as much time as practically possible to allow this process to take place.
- 1.5.3.3 It is very common that documents submitted under these type of conditions require multiple rounds of consultation to address stakeholder concerns. This process alone can be very time consuming and the proposed four-month submission time would not account for any additional time that the Applicant may require to update documents throughout the process. The MMO further notes that some documents require additional assessment processes, for example a Southern North Sea (SNS) Special Area of Conservation (SAC) Site Integrity Plan (SIP) may require post consent Habitats Regulations Assessment (HRA) considerations to be made. The MMO appreciates that the Applicant could be working within tight time schedules post consent, and as such, we advise that a more suitable timescale is provided to reduce risks that could lead to project delays.
- 1.5.3.4 The MMO considers it is important to address the practicalities of these types of signoff as well as the specific wording held within the consent. If the works are submitted four months prior to the construction start date, then there is risk that the Applicant will have already begun preparing for construction. If sign off cannot be achieved within the four month window then there is a risk that the Applicant will face cost implications of this, for instance the costs from vessels sitting idle and the potential need to resource storage areas for wind farm infrastructure components that should have been installed. By amending the submission timescale to 6 months there is more time to undertake the required process with less risk of needing an extension or the Applicant facing delays.
- 1.5.3.5 The MMO will continue to engage with the Applicant on this matter.
- 1.5.4 The Applicant has clarified the purpose of the commitments register, the MMO confirms that it has no issues with the purpose of the document but re-iterates that each mitigation measure within the register must be clearly stipulated under a condition on the DCO/DML or within an outline plan as part of a certified document for it to be enforceable.



## 2. Comments on submissions received at Deadline 2

2.1 The MMO has reviewed a number of documents submitted at Deadline 2, any comments on these have been set out below. The MMO notes that the Applicant and other Interested Parties have outstanding concerns and ongoing discussions on a number of offshore issues that may be resolved when the Applicant updates the relevant documents at Deadline 3. The MMO has noted these concerns but has not provided comments at this stage. The MMO will continue to review the updated documents and relevant Interested Parties responses and provide comments at subsequent deadlines where appropriate.

### 2.2 Clarification Note on Marine Sediment Contaminants Revision: 1 [REP1-066]

2.2.1 The MMO has reviewed the information within this document and consulted our scientific advisors at the Centre for Environment, Fisheries and Aquaculture Science (CEFAS). The MMO wishes to make the following comments regarding this evidence:

2.2.2 The MMO previously raised the potential issue of obtaining contaminant samples from a Hamon Grab as this gear mixes the sediment. We note that the Applicant has justified this within Table 1, next to our RR-020 section 3.4.25 comments. The MMO now agrees that a Mini-Hamon Grab, whilst not ideal, will be sufficient for these sandy samples.

2.2.3 The MMO has however, regarding the same comments, identified that the depth of the samples are unclear from the results template. Our review of this analysis has been carried out under the assumption that the depth provided was water depth and not sediment depth, and that all samples were taken from the seabed surface. However, this will need to be confirmed by the Applicant as a Mini-Hamon Grab is not appropriate for depth samples.

2.2.4 The MMO agrees with comments made from Natural England outlined within Table 1 of this Clarification Note, that all potential impacts should be carried forward to the Cumulative Effect Assessment unless the Applicant can provide sufficient justification for not doing so.

2.2.5 Regarding Section 3 of the Clarification Note, the MMO has major concerns, and cannot accept the results provided at present. The analysis laboratories are noted as “Gardline Limited” for the array samples and “Bibby HydroMap Limited/Benthic Solutions Limited” for the Export Cable Corridor. Neither of these are validated laboratories by the MMO for analysing marine sediments. Confirmation of the analysing laboratories is required to allow the interpretation of the results. The MMO did request this information from the Applicant on 7 April 2022, however, has been advised it may be a number of weeks before this information can be provided by the Applicant. The MMO cannot undertake a robust review of the analysis results with the outstanding matters mentioned within 2.2.5 and 2.2.6 of this response. As such the MMO will provide a further response on the contaminants at a later Deadline when the information is provided.



2.2.6 For further guidance on sample analysis and validated laboratories, please see the guidance on the government webpage<sup>1</sup>. If the Examiner requires this guidance to be submitted in an alternative format, please can this be requested.

### **2.3 Comments Outline Fisheries Coexistence and Liaison Plan [REP1-033]**

2.3.1 The MMO requests it is made clear within the document that *“the MMO will not act as arbitrator and will not be involved in discussions on the need for, or amount of, compensation being issued”*. The MMO believes this should be made clear **at this stage** to ensure all parties are aware that the MMO will not be part of this process.

2.3.2 The MMO supports the outline of what will be included within the final Commercial Fisheries Coexistence Plan but will defer to the National Federation of Fishermen’s Organisation for additional comments.

### **2.4 Comments on Applicant’s revised documents- G1.8 Hornsea Four Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction Revision: 2 [REP2-032]**

2.4.1 The MMO is currently reviewing the document with our scientific advisors at CEFAS and defers comments on this until Deadline 4.

### **2.5 Written representation from The Corporation of Trinity House of Deptford Strond [REP2-094]**

2.5.1 The MMO supports Trinity House’s request to change “working days” to “days” in Schedule 11 Part II (Conditions) Section 7(13) and in Schedule 12 Part II (Conditions) Section 7 (13).

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<sup>1</sup> <https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans>



**2.6 Responses to Examiners Questions 1 deferred from Deadline 2 [REP2-077]**

2.6.1 The MMO provides the following responses from Examiner’s Questions 1 which were deferred from the MMO’s Deadline 2 submission [REP2-077].

Heading	Question Number	Question	MMO Response for DL3
CF Commercial Fishing and Fisheries	1.2	<p><b>Cumulative effect of potential Marine Conservation Zone (MCZ) potting restrictions</b></p> <p>Please comment in detail on the representation [AS-026] from the NFFO that it cannot agree with the assessed likely ‘minor’ magnitude of impact on UK potting fleets of the inclusion of MCZs in the ES Chapter 6 consideration of cumulative effects, [APP-018, section 6.12.2.18] because the prohibition of bottom-contacting fishing in MCZs has potential to affect potting activity that should be taken account of in the assessment of cumulative impact for this Proposed Development. If it were to be included what implications would this have for the conclusions drawn in the ES? (If not fully addressed in the Applicant’s Deadline 1 responses to Relevant Representations. Cross-reference may also be made to relevant responses to</p>	<p>The MMO notes that the Applicant intends on continuing to engage with the National Federation of Fishermen's Organisations (NFFO). The MMO encourages this engagement.</p> <p>The MMO has reviewed the Applicant’s response to this question within [REP2-038] and has no comments to make at this stage. We will continue to review this matter and monitor subsequent submissions from the NFFO on this.</p>



		ExQ1 Marine Ecology.)	
DCO Draft Development Consent Order (draft DCO)	1.18	<p><b>Plans required before commencement of marine licensed activities</b></p> <p>The following plans are required to be produced before commencement of marine licensed activities (draft DCO [APP-203]):</p> <ul style="list-style-type: none"> <li>• a construction project environmental management and monitoring plan (including a marine pollution contingency plan, a marine biosecurity plan, and a vessel management plan);</li> <li>• a scour protection management plan;</li> <li>• a piling marine mammal mitigation protocol;</li> <li>• a cable specification and installation plan;</li> <li>• an aid to navigation management plan;</li> <li>• a site integrity plan (assumed to relate to the Southern North Sea Special Area of Conservation (SAC)); and</li> </ul>	<p>The MMO notes the Applicant has clarified the “outline cable specification and installation plan” and provided it’s definition means “the document certified as the outline cable specification and installation plan by the Secretary of State for the purposes of this Order under article 38;”.</p> <p>We also note the Applicant has now updated condition 14 with “(5) The plans, protocols, statements, schemes and details submitted under condition 13 must ensure that any residual effects fall within the scope of those predicted in the environmental statement”.</p> <p>The MMO supports these amendments in principle, but will confirm it’s final position on them at a later Deadline.</p> <p>The MMO reiterates that each document listed within Schedule 15 should have a corresponding condition that states “in accordance with the outline plan XX”.</p>

		<ul style="list-style-type: none"> <li>• an ornithological monitoring plan.</li> </ul> <p>Condition 13 mentions only the Site Integrity Plan and Piling Marine Mammal Mitigation Protocol in relation to a need to accord with an outline plan listed in Schedule 15 and secured through Article 38 of the draft DCO [APP-203]. On what basis would the other plans be produced to ensure that the remaining effects fall within the scope of those predicted in the ES? What is the purpose of the submitted Outline Offshore Cable Installation Plan [APP-250]?</p>	
	1.25	<p><b>Environmental assessment of compensation measure sites</b></p> <p>Given the lack of refinement of possible sites for the proposed compensation measures, how reliable is the assessment of likely environmental effects set out in the ES [APP-057] for them? Please explain your reasoning.</p>	The MMO has reviewed the Applicant's answer to this question and will continue to monitor the progression of this topic through Examination, making comments where applicable.
ES Environmental Impact Assessment (EIA) and Environmental Statement	1.16	<p><b>Controlling in-combination impacts on the integrity of the Southern North Sea SAC</b></p> <p>Given the doubts expressed by some parties in Relevant Representations, what level of confidence does the MMO have that the proposed Southern North Sea SAC site integrity plan for this project</p>	<p>The MMO recognises concerns raised by NE and continues to engage with Statutory Nature Conservation Body's (SNCB) on the management of noise in the Southern North Sea (SNS) SAC.</p> <p>The site integrity plan (SIP) process was set out following the Review of Consents (RoC), which concluded that in order to manage noise impacts to the SNS SAC several projects were required to submit a Site</p>

(based on [APP-246]), when considered alongside similar controls that would be available through Marine Licence conditions attached to other projects that might affect the harbour porpoise interest feature in-combination, would provide it with sufficient control over the timing and nature of noisy activities across the various projects to ensure that the relevant in-combination disturbance impact thresholds would not be breached? In the event that a number of noisy activities from various concurrent projects became likely, would it be the MMO's intention to use these controls to ensure that no threshold was breached, and, if so, how?

Integrity Plan (SIP) to the MMO. The impacted projects had conditions imposed on the Deemed Marine Licenses (DMLs) by the MMO.

For this Project the Applicant has included a condition similar to the original SIP condition required by the RoC. As stipulated by the condition 13 (1)(j) of both Schedule 11 and 12 (please see comments on the wording of this condition below), no noisy activities permitted under the DML can take place prior to the SIP being approved by the MMO.

The MMO assesses the impacts set out within the SIP in line with the Joint Nature Conservation Committee (JNCC) guidance once submitted alongside other projects emitting noise. We utilise the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) SNS SAC Tracker (Annex 1 is a snapshot of the current tracker) which contains noise threshold data for all projects proposed to be undertaken within the SNS SAC for each season every year. This ensures all projects are taken into account when discharging the SIP condition. This is a key part of our determination process and helps us manage affects to the harbour porpoise. This tracker is updated by regulators regularly and will include any updated noise impact information or any mitigation that is used by other projects.

For marine licences we have a number of conditions that can be included to provide further clarity or enable collaboration between developers. This includes a "Coordination" condition, which stipulates that

developers must work together to manage their activities to avoid undertaking certain types of activities at the same time, and a programme of works condition can also be required prior to the works beginning to have full review of activities taking place. In addition to the above the MMO can include conditions that stop activity at certain periods or stop work when other works are being undertaken or include any required mitigation for all or some of the activities. A notification of completion of works condition can also be included which will inform regulators when activities have completed which can potentially allow other activities to take place for the remainder of the season.

For SIP documents the MMO requires these to include an "In-Combination Management section" within the SIP and the MMO can request to include any or all of the above conditions or any additional conditions that may be required at the time. Although not set out formally within the DML this section is still enforceable as if forms part of a discharged document that the Applicant must adhere to, to be compliant. If this section is not included then the MMO may not be able to discharge the SIP document until satisfied all information is provided.

The MMO is confident in the current SIP process, however we note that our request within RR-020 has still not been actioned. This is repeated as follows:

The MMO has updated the standard condition in relation to designated sites for harbour porpoise. This is due to the outcome of the Review of Consents undertaken by the Secretary of State, the MMO advises that, like any

new application, it will need to be in line with the Review of Consents condition. The MMO would like condition 13 (1)(j) to be removed and replaced with the new standalone condition outlined below.

When the standalone condition is added, the Interpretations section will need to be updated to include:

*““JNCC Guidance” means the statutory nature conservation body ‘Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs’ Joint Nature Conservation Committee Report No.654, May 2020 published in June 2020 as amended, updated or superseded from time to time”.*

The MMO propose the following wording for the new SIP condition:

***“Southern North Sea Special Area of Conservation Site Integrity Plan***

*25- (1) No piling activities can take place until a Site Integrity Plan (SIP), which accords with the principles set out in the in principle XX Project Southern North Sea SAC Site Integrity Plan, has been submitted to, and approved in writing, by the MMO in consultation with the relevant statutory nature conservation body.*

*(2) The SIP submitted for approval must contain a description of the conservation objectives for the Southern North Sea Special Area of Conservation (SNS SAC) as well as any relevant management measures and it must set out the key statutory nature conservation body advice on activities within the SNS SAC relating to piling as set out within the JNCC Guidance and how this has been considered in the context of the authorised*

		<p>scheme.</p> <p><i>(3) The SIP must be submitted to the MMO no later than six months prior to the commencement of the piling activities.</i></p> <p><i>(4) In approving the SIP the MMO must be satisfied that the authorised scheme at the pre-construction stage, in-combination with other plans and projects, is in line with the JNCC Guidance.</i></p> <p><i>(5) The approved SIP may be amended with the prior written approval of the MMO, in consultation with the relevant statutory nature conservation body, where the MMO remains satisfied that the Project, in-combination with other plans or projects at the pre-construction stage, is in line with the JNCC Guidance.”</i></p>
1.22	<p><b>Applicant Mitigation for effects on marine mammal qualifying features and monitoring</b> Could Natural England and MMO explain if any of their proposed post-consent monitoring for effects on the marine mammal qualifying features would: inform the Site Integrity Plan process; serve a purpose of verification of assumptions made in the assessment; or would it simply be useful data collection? What monitoring is required to deliver control over in combination effects and is it necessary to secure this in the draft DCO process? Could the Applicant explain what, if any, options for mitigation measures in relation to underwater noise</p>	<p>The MMO has reviewed Natural England’s response to this question and concurs with their comments on the following:</p> <ul style="list-style-type: none"> <li>• Operational WTG noise monitoring</li> <li>• Monitoring bottlenose dolphin</li> </ul> <p>The MMO is supportive of the Applicant’s consideration of monitoring in relation to the Southern North Sea SAC and the SIP.</p> <p>At this stage the MMO does not propose additional monitoring. The MMO confirms that we secure conditions on Marine Licences to further manage in-combination noise impacts from activities in the Southern North Sea SAC and as above these can be included</p>

		<p>effects on marine mammals could be committed to at the consenting stage to address uncertainties with control in the post-consent stage? Explain how any mitigation measures could be secured through any DCO.</p>	<p>within the SIP.</p> <p>Developers can only commence works with written approval from the MMO and any mitigation will be captured within the SIP document or the Marine Mammal Mitigation Plan.</p> <p>The DML also contains Marine Noise Registry (MNR) conditions which requires the Applicant to provide information to JNCC.</p>
	1.2	<p><b>Further geophysical surveys</b> Chapter 4 of the ES [APP-010] notes that pre-construction, high-resolution geophysical surveys were yet to be undertaken at the time of writing, but that they were planned for 2021 and that interpretation will be available Q4 2021. Could the Applicant provide an update and all invited parties comment on any implications?</p>	<p>The MMO notes the Applicant's answer to this question and has no comment to make at this time.</p>
HRA Habitats Regulations Assessment (HRA)	1.4	<p><b>Sign-off of any further geophysical surveys</b> Natural England [RR-029] suggests that further commitments and regulator sign-off would be necessary in relation to any pre-construction geophysical surveys. What is the Applicant's and MMO's reaction to this</p>	<p>The MMO clarifies the following, with regards to geophysical survey sign offs.</p> <p>It is the responsibility of developers to determine whether a Marine Licence is required for their proposed works, including geophysical, or seismic surveys.</p> <p>However, geophysical surveys may be considered exempt from requiring a marine licence. In this case a</p>

suggestion?

marine licence exemption notification must be completed via the MMO Marine Case Management System (MCMS). This notification of the intention to carry out an activity provides the MMO with information on planned surveys. This should be submitted to the MMO at least 28 days before a survey begins. To be exempt from a marine licence, it must be demonstrated that the activity will not have a likely significant effect on a marine protected area (MPA).

There is clear guidance on this online, specifically, advice on what considerations are required, and that the relevant SNCB should be contacted for advice if the developer is unsure.

In the exemption notification, details on how relevant conditions are met and detail on any steps undertaken to engage with relevant bodies must be included.

Enforcement action might be taken if it is later determined that the activity, or the circumstances in which it was carried out, have significant effects on an MPA.

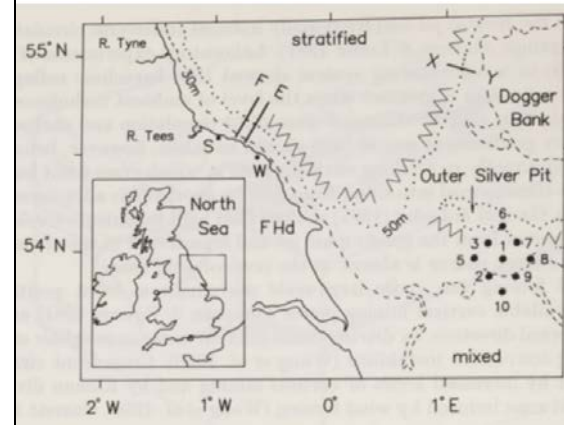
The MMO confirms that any Geophysical surveys that qualify as an “exempt” activity, do not require regulatory sign off prior to works, only the notification.



	1.5	<p><b>Marine modelling and climate change scenarios</b></p> <p>Natural England [RR-029] suggests that the marine process modelling, and assessment set out in the ES should be re-run to account for various climate change scenarios. Is further modelling required to rectify this? If not, why not? (If not fully addressed in the Applicant's Deadline 1 response to Relevant Representations.)</p>	<p>The MMO is monitoring Natural England's and the Applicant's response to this topic. The MMO will await the submissions at Deadline 3 before commenting where applicable.</p>
<p>Marine and Coastal Geology, Oceanography and physical processes.</p>	1.14	<p><b>Location of the Flamborough Front</b></p> <p>The information provided to the Examination suggests different views are held about the location of the Flamborough Front. The ES [APP-013, paras 1.7.9.2 and 1.7.9.3] suggests it is south of the proposed array area. Natural England's Relevant Representation [RR-029, Appendix E, entries 8, 74 and 97] argues that Figure 37 of the Marine Processes Technical Report [APP-067] shows the array area to be located within a zone of 90-100% occurrence of the Front. If the location of the Front is not fixed, to what extent does it vary and over what time frame? What implications does this have for turbulent wakes and their effects? What are the implications of the inclusion of the non-cylindrical, gravity</p>	<p>The MMO has broken the response to this question into 3 parts:</p> <p><b>1. If the location of the Front is not fixed, to what extent does it vary and over what time frame?</b></p> <p>Flamborough Front is a highly dynamic feature that is not fixed, it moves/changes in a variety of manners. These include:</p> <p>a. Changes in the intensity of the stratification due either to colder than normal deep water to the North or additional heating to the south. This can be caused by the increase of cloudless and windless days that allow stratification to build from the surface. The magnitude, size and frequency of the meanders of the Front can change due to changes in wind strength/direction and those factors described above.</p> <p>b(i). The dynamics of the Flamborough Front have been acknowledged for nearly 30 years. In Hill et al. (1993), it</p>

base structure foundations in the array, and what level of certainty can be applied to the consequent wakes, their interactions, and potential direct impacts on the Flamborough Front and indirect impacts on seabirds and marine mammals through changes to its productivity?

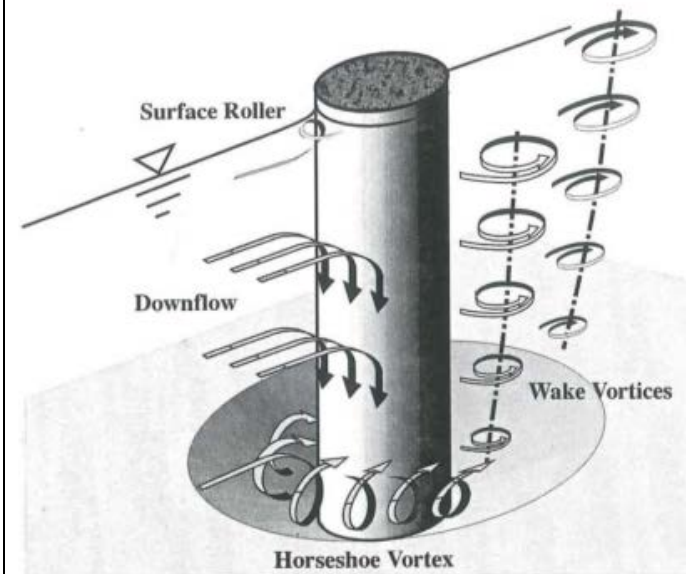
shows the Front as “zig-zag” lines (see figure 1). Along with northern and southern trajectories North and South of Dogger Bank. More modern numerical models are starting to capture the variability but not on an instantaneous level i.e. direct comparison between the observations and model predictions.



**Figure 1-** 1993 map of Flamborough front expressed as "zig-zag lines" (Hill, A.E. et al, 1993)

b(ii). Huthnance et al. (2016) reviewed the changes within the North Sea over the last 30 years. In terms of temperature the strongest increases are in the South, which is mirrored by similar increases in salinity, probably caused by flows between in the Faroe-Shetland channel from more oceanic sources mitigating wider temperature increases. Therefore, there are both inter-annual variability in the position of the front and long-term (30 years+) changes.

		<p><b>2. What implications does this have for turbulent wakes and their effects?</b></p> <p>It should be acknowledged that the creation of the Flamborough Front only occurs in summer when the stratified waters of the Southern North Sea interact with those well mixed in the north. Therefore, any effects and hence impacts will also be seasonal. It should be noted that the period of stratification is predicted to be one week earlier by 2100 and last 5-10 days longer. No changes in intensity are predicted.</p> <p>The introduction of any structures into these waters with thermal stratification will then act as “mixing rods” and mix surface water downward on the front face of the monopile and resuspend material from the seabed on the downstream side (see figure 2).</p>
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**Figure 2-** Flow dynamics around a simple cylinder (Melville and Colman, 2000)

This is the mechanism that creates surface suspended sediment plumes behind monopiles at certain locations e.g. Thanet Offshore Wind Farm in the southern North Sea. Here, a benthic boundary layer of high suspended sediment concentrations is advected to the surface and slowly the material falls out of suspension depositing back on the seabed. These can be seen from both aerial images as well as satellite based remote sensing. At present, the impact on the benthic community of this additional suspended sediment depositing in a “hallow area” around each monopile/wind farm has not yet been investigated.

In a similar mode to suspended sediment, it is hypothesised that temperature effects will be similar. For instance, that the cold water will be brought to the surface on the down stream side of the monopile. The scale, intensity and duration of these “cold water surface plumes” is currently unknown. However, simple modelling results seem to suggest that these cold water plumes will be on a scale smaller than the inter-monopole distance. It should be noted that whilst there is a potential for cumulative impacts if the current is along an axis of monopiles, this should not be the case, as the front meanders back and forward.

Any changes to the dynamics of the front could be significant in a number of ways. Firstly, the Front itself creates a “strong jet” heading offshore in the case of Flamborough that transport particles and contaminates East and eventually to the Dogger Bank. Secondly, the Front itself creates pelagic biodiversity as deep nutrients are brought to the surface and create chlorophyll plumes on the surface that can be observed from satellite imagery. Furthermore, a sub-surface chlorophyll maxima (or sub-surface front) can also be seen in sections across the area. The primary productivity in this Deep Chlorophyll Maxima (DCM) has been shown to be 66% of the total productivity of the North Sea (Fernand et al, 2013).

**3. What are the implications of the inclusion of the non-cylindrical, gravity base structure (GBS) foundations in the array, and what level of certainty can be applied to the consequent wakes, their**

**interactions, and potential direct impacts on the Flamborough Front and indirect impacts on seabirds and marine mammals through changes to its productivity?**

The introduction of large non-cylindrical gravity based structures will have the same effects as discussed at the beginning of subsection 2 of this answer. However, with these structure the impacts will be more severe.

Firstly, the scale of the device is significantly larger and the height /width ratio wider (monopiles are normally considered as slim).

Secondly, they are not simple cylinders and may have additional secondary currents at certain tidal elevations/wave heights (for instance around the “shoulders” of the GBS).

Whilst there is a theoretical impact pathway from changes in turbulence and thus changes in mixing resulting in a change in primary productivity reductions and hence finally impacts on seabirds/mammals. However, at present the sign of the impact is unknown as is the magnitude or scale or duration of impact (for instance, it could be argued that the additional turbulence will enhance mixing and thus increase productivity or on the other hand, the blockage of the structures will reduce mixing and thus reduce primary productivity).

The MMO suggests that monitoring conditions are developed that identify:

- i) the changes in the mixing in stratified areas from GBS based structures – satellite monitoring of “cold water surface plumes” and;
- ii) link any observed cold water plumes with changes in primary productivity (both surface and deep water maxima).

The degree of impact of GBS on the structure and function of Flamborough Front has been an issue discussed throughout the EIA process. Whilst the developer has identified some variability in the location of the Front, the potential impact pathways (and their significance) have not been explored. We note that the ExA’s have also identified this omission.

The MMO reiterates that the Marine Processes Supplementary Report(s) are due to be submitted by the Applicant at Deadline 3, which is only a week before the ExA’s planned Issue Specific Hearings and 2 weeks before Deadline 4 and advises that this does not provide adequate time for Interested Parties to review the documents robustly.

In the interests of efficient team resource management, the MMO will not be attending the ISH hearings planned for the week commencing 25 April 2022. This is due to capacity issues faced by the MMO at present. However, the MMO is committed to the Examination’s written process and will continue to provide comments on both

		the contents of the ISHs and any action points that are applicable.
1.15	<p><b>Sensitivity of the Flamborough Front</b>  Natural England [RR-029, Appendix E, entry 56] suggests that the Flamborough Front feature should have a high sensitivity rather than medium (as allocated in the ES [APP-013]), given that the novelty of the situation and information gaps should lead to a precautionary approach that cannot, on current understanding, rule out more significant impacts and Adverse Effects on Integrity in relation to three European sites. Can the Applicant provide anything further to close such gaps and provide corroborative evidence for the medium sensitivity, or should this be changed to high? If so, a reassessment and further consideration of mitigation would be required. This would be required in the Examination as soon as possible. When would any results be available? (If not fully addressed in the Applicant's Deadline 1 response to Relevant Representations.)</p>	<p>The MMO is monitoring Natural England's and the Applicant's response to this topic. The MMO will await the submissions at Deadline 3 before commenting where applicable.</p>



	1.16	<p><b>Transboundary noise effects on fish</b>          Could the MMO clarify its position in relation to potential transboundary effects from underwater construction noise. On one hand, the Relevant Representation [RR-020] seems to suggest that the Proposed Development has the potential to affect fish in Netherlands waters (though in the absence of behavioural response impact range noise contours it is said not to be possible to determine the extent). On the other hand, the Relevant Representation states that, given the distances involved, “the MMO agree that the risk of significant impact of potential transboundary effects is likely to be low.” Does the Applicant intend to provide any further analysis to test for any such transboundary underwater noise impacts, and, if not, why not?</p>	<p>The MMO advises that in order to provide clarity regarding previous comments on potential transboundary impacts from underwater noise, it should be recognised that the two sections of comments that the Examining Authority (ExA) is referring to relate to two different receptor groups, and thus the potential effects upon these receptors may be different. Section 3.7.18 of Relevant Representation [RR-020] “the MMO agrees that the risk of significant impact of potential transboundary effects is likely to be low” is directly related to potential transboundary effects from underwater noise upon marine mammals.</p> <p>The first part of the ExA question is related to fish receptors. In our previous advice, it was recognised that it was appropriate that potential direct underwater noise transboundary effects on fish receptors resulting from piling operations had been scoped in.</p> <p>The Environmental Statement (ES) acknowledged that behavioural responses in certain fish species are predicted to extend to several 10s of kilometres beyond Hornsea Four and therefore have the potential to affect fish (and shellfish) habitats of the Netherlands during the construction period. However, as range contours for behavioural responses to noise impact for fish have not been presented in the ES it was not possible to determine the extent of this transboundary impact or determine whether there will be any spatial overlap of noise with spawning and nursery grounds of fish in the Netherlands or any other neighbouring countries.</p> <p>Further comments regarding the requirement for</p>
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behavioural response impact range noise contours to be mapped are provided in Sections 3.6.15-3.6.17 of the Relevant Representation (RR-020).

Potential transboundary effects related to increases in suspended sediment concentrations are predicted to occur up to 14 km from Hornsea Four and are therefore not predicted to extend into the waters of other EEA states. Therefore, the MMO advises that transboundary impacts arising from this effect will not be significant for fish receptors.

**3. Progressed versions of any SoCG and an updated Statement of Commonality of SoCG**

3.1 The MMO continues to hold regular discussions with the applicant regarding the Statement of Common Ground (SoCG). The MMO has reviewed an updated version of the SOCG and understands the Applicant is submitting these into the Examination at Deadline 3.

**4. Any further information requested by the ExA under Rule 17 of the Examination Procedure Rules**

4.1 The MMO notes that The Examining Authority (ExA) writes to the Applicant and BP Exploration Operating Company Limited (BP) within the Rule 17 letter, and as such has no comments to make on it.

Yours Sincerely

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Marine Licencing Case Officer

A black rectangular redaction box covering contact information.

## References

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## Annex 1

Snapshot of current OPRED SNS SAC Tracker, which contains noise threshold data for all projects proposed to be undertaken within the SNS SAC for each season every year<sup>2</sup>

SNS ACTIVITY TRACKER															
REFERENCE	APPLICATION STATUS	APPROVAL DATE	REGULATOR	NAME OF PROJECT/ACTIVITY	OPERATOR/DEVELOPER	LOCATION QUAD/BLOCK	LOCATION CO-ORDINATES	APPLICATION EARLIEST START DATE	ACTUAL ACTIVITIES END DATE	DATE OPERATIONS COMPLETED	DURATION OF ACTIVITY IN	DURATION OF ACTIVITY IMPACTING SAC IN DAYS	ACTIVITY TYPE	ACTIVITY SIZE Daily KM2	MAGNITUDE
	Proposed is included to highlight the potential activities but should not be used to in AA							Initial start date within the Application - remains the same for Audit	Refined end date of activities - updated once the final program	Update from notification of completion	The number of days the activity will take place	The number of days the activity will impact the SAC	Be clear on the impact to the SAC and any information that could assist in completing AA	Still in discussion on if it is within the SAC or average WCS	SEL, dB, cc, kg - depending on activity - put as much informati
MLA/2018/00503/2	Submitted		MMD	Hornsea 2 offshore wind farm UXD Clearance	Orsted	N/A	<a href="https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3">https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3</a>	01/01/2022			40	40	Ongoing UXD clearance campaign continued from 2021. This will be ad hoc works and only required if anything is identified in the remaining construction phase. 40 remaining detonations with the ability to detonate 5 in one 24 hour period within 5km radius. In addition they have a greed not to do works within the SAC/28km of SAC when Sofia does high order detonations	2,303.00	
GS/1332	Submitted		OPRED	Greater NEP 3D Towed-streamer (Endurance & BC3) Seismic Survey	BP Exploration Operating Company Limited	42/19-20, 42/23-25, 42/29-30, 43/17-19, 43/21-30, 44/21-22, 44/26-27, 48/5, 49/1	Various - see application	01/04/2022			64	64	3D Seismic	2190	SEL 220.6 dB
MLA/2020/00489	Approved		MMD	Sofia OWF UXD Clearance - Low order	RWE LTD	N/A	<a href="https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3">https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3</a>	01/04/2022			50	25	UXD Clearance campaign - I have put both the high order and low order information in for reference.	157.08	
MLA/2020/00489	Approved		MMD	Sofia OWF UXD Clearance - Low order	RWE LTD	N/A	<a href="https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3">https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3</a>	01/04/2022			50	25		3781.7	
DCO/2016/00024	Approved		MMD	Dogger Bank A Piling	DOGGERBANK OFFSHORE WIND FARM PROJECT 1 PROJCO LIMITED	N/A	<a href="https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3">https://marinelicensing.marine.nema.gov.uk/mmofoxc/foxiiv/g/IMO_PUBLIC_REGISTER/search?area=3</a>	01/06/2022			110	110	Piling	2227.68	
ML/766	Approved	2022	OPRED	Leman 27 C P & A	Perenco UK Limited	49/27c	various - see application	06/01/2022					Downhole explosives		Below PTS and
MLA/2021/00552	Submitted		MMD	Doggerbank Array Area A and B UXD - Low Order	DOGGERBANK OFFSHORE WIND FARM PROJECT 1 PROJCO LIMITED	N/A		01/05/2022			6	6	UXD Clearance campaign - I have put both the high order and low order information in for reference.	79	

<sup>2</sup> Located at <https://www.gov.uk/guidance/oil-and-gas-offshore-environmental-legislation> under "SNCB Noise Guidance".