



AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement – Volume 3 – Appendix 6.1 Physical Processes Consultation Responses

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations
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The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

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TABLE 1 – SCOPING RESPONSES

Consultee	Scoping Opinion ID/Page	Summary of Comment Received	How this has been addressed by the Applicant
<p>Planning Inspectorate ('PINS')</p>	<p>4.1.1</p>	<p>The Scoping Report contains very limited information with regards to air quality in the marine area and the likely numbers and types of vessels to be used. No information has been provided with regards to receptors that are likely to be sensitive to air quality effects, including distance from the Proposed Development. The Inspectorate anticipates that exhaust emissions from vessels used in the construction of the Proposed Development within the marine environment would be the main source of potential impacts on air quality and that the pollutants emitted are likely to be nitrogen oxides (NO_x), sulphur dioxide (SO₂), and particulate matter.</p> <p>Due to the nature of the Proposed Development and receiving environment, and on the basis that the main source of atmospheric emissions would be exhaust emissions from vessels and is unlikely to result in significant increase in emissions across all phases of the</p> <p>Proposed Development, the Inspectorate considers that the agrees that this matter can be scoped out of the ES.</p>	<p>In accordance with PINS comments, air quality has been scoped out of this assessment and is not considered within Chapter 6 (Physical Processes) of the Environmental Statement ('ES') Volume 1 (document reference 6.1.6).</p>

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PINS	4.1.2	The Scoping Report does not refer to or define the study area for this aspect. The ES should clearly define the study area and explain why it has been selected.	Section 6.1 of this chapter defines the study area and explains the reasoning behind its selection. Plate 6.1 shows the study area.
PINS	4.1.3	Sandbanks and seabed features, particularly where they are in the vicinity of protected areas, should be considered as receptors in the ES.	The seabed and associated sediments have been considered as a receptor within the ES chapter. This receptor incorporates sandbanks and other sedimentary features/structures. These features have been assessed as receptors within the chapter.
PINS	4.1.4	Reference is made to marine surveys used to inform the baseline for this aspect; however, very limited information has been provided as to what these surveys comprised/will comprise, including their extent. The ES should include a description of the surveys that have underpinned the impact assessment.	Section 6.5 of this chapter details the marine surveys commissioned and undertaken to date. These are also covered in Chapter 3 (Description of the Proposed Development) of the ES Volume 1 (document reference 6.1.3).
PINS	4.1.5	The importance of currents for sediment transport is acknowledged in the Scoping Report. Modelling of current should also be validated against measured data. The desk study should identify the most suitable data.	The hydrodynamic model has been extensively validated (in terms of water levels, current speed and direction and wave height) and this process is described briefly in Section 6.5.

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			Further detail on the hydrodynamic model and validation is also provided in Appendix 6.2 (Modelling Technical Report) of the ES Volume 3 (document reference 6.3.6.2).
PINS	4.1.6	The ES should clearly describe the mitigation measures identified and proposed as a result of the EIA process. The ES should also clearly identify any embedded mitigation measures within the design that have been chosen as a result of potential impacts to physical processes.	The embedded mitigation is described/discussed in Section 6.6, and Table 6.13 of this chapter. No additional mitigation was required for physical processes.
PINS	4.1.7	This aspect chapter of the Scoping Report does not describe in any detail the specific approach to assessing the significance of the identified potential impacts with regards to the physical environment. It is unclear if the physical processes chapter will present an assessment of receptors separate to those presented in related aspect chapters, such as Marine Water and Sediment Quality, and Intertidal and Benthic Ecology. This aspect chapter also does not indicate that the physical processes assessment will be cross-referenced with other aspect chapters.	Section 6.4 of this chapter describes the assessment methodology adopted. The specific receptors associated with the physical processes' aspect chapter are identified in Section 6.4 of this chapter. The approach to assessment described is consistent with both Chapter 4 (EIA Methodology) of the ES Volume 1 (document reference 6.1.4) of the ES (EIA Methodology) and with guidance provided by Cefas (2004). Where impacts upon physical processes are apparent, and they have the potential

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		<p>The ES should clearly set out the approach to the impact assessment for the physical processes aspect chapter, particularly where this differs from the overarching approach described in Chapter 4 to the Scoping Report. Where the intention is to present the impact assessment on receptors arising from changes to physical processes in other aspect chapters, this should be clearly explained in the ES. The Inspectorate considers that cross-referencing enables a thorough assessment and should be followed where appropriate.</p>	<p>to impact upon receptors in other aspect chapters (e.g. benthic ecology, marine archaeology) these have been clearly identified and cross referenced within the chapter.</p>
<p>MMO</p>	<p>Pg 2 of 7 (response letter) Para. 1.1</p>	<p>Wave and current data collection is not proposed, and numerical modelling will be used instead to provide details on site hydrodynamics, which is a proportionate approach to adopt. It is proposed that modelling will be undertaken using a MIKE21 particle tracking module, and the MIKE21 hydrodynamic model. In addition, a bespoke SWAN wave model will be developed, with a high resolution regional nest, to produce wave data along the length of the marine cable corridor. It is stated that the SWAN wave model will be validated against existing datasets. As it is stated that sediment transport is tidally driven, and therefore currents are also of importance, modelling of currents should therefore also be validated against</p>	<p>Please see response to comment ID: 4.1.5 above.</p>

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		measured data. The desk study should identify the most suitable data.	
MMO	Para 1.2	The MMO recommends that sandbanks and seabed features should be considered as receptors, particularly where they are in the vicinity of protected areas.	Please see response to comment ID: 4.1.3 above.
MMO	Para 1.3	The high-level approach to the environmental assessment process is described and is in line with standard practice. However, the specific approach to assessing the significance of the identified potential impacts in relation to the physical environment is not well described in the sections of the document reviewed; this may be because modelling outputs will instead feed into other chapters (e.g. benthic ecology or water quality). These linkages should be clearly laid out in the final Environmental Statement (ES) report.	Please see response to comment ID: 4.1.7 above. In addition, as requested the significance of potential impacts on physical processes and the potential 'downstream' impacts on different aspects presented in other chapters will be clearly identified and detailed.
MMO	Para 1.4	The Physical Environment is scoped in to the ES in Table 4.1 and addresses the subject in a dedicated chapter. Table 6.1 identifies potential impacts as: Physical disturbance to seabed geology and morphology (during installation works)	Noted.

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		<p>Impacts to local sediment regimes (within the vicinity of the development)</p> <p>Impacts to coastal processes (within the vicinity of the development).</p> <p>This scope is adequate from a marine processes perspective.</p>	
MMO	Para 1.6	The report has sufficiently addressed the individual comments relating to physical processes from the previous consultation with the MMO (see MMO EIA Scoping Opinion dated 22 June 2018, reference EIA/2018/00011)	Noted.
MMO	Para 1.8	Monitoring - The monitoring methods proposed are adequate and the envelope of potential timing appears sufficient. The MMO recommends surveys at six-monthly intervals for a period immediately after construction completion, as this will enable seasonal variations to be identified. These surveys should assess larger scale seabed condition, including the sandwave recovery, in addition to their stated focus of establishing cable burial depths and the status of cable protection.	<p>Noted.</p> <p>The requirement for additional monitoring and mitigation was considered further as part of the Environmental Impact Assessment ('EIA'). No additional mitigation or monitoring was considered necessary as a result of the EIA process.</p>

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MMO	Para 1.9	Mitigation - Table 6.1 of the scoping report states that any mitigation required will be identified through the EIA process, and specific measures are not explicitly described, as it to be expected at this stage. However, it is noted that there is evidence that the project design encompasses embedded mitigation, for example, the cable is being routed to avoid sandwaves and large ripples where feasible and it is stated that the route will be further refined once pre-construction surveys have been assessed.	The embedded mitigation is described/discussed in Section 6.6.2, and Table 6.13 of this chapter.
MMO	Para 1.10	The project is adequately described, as are the multiple designs and construction methodologies options still under consideration. Further detail regarding what method of (non-burial) cable protection will be deployed and how it was chosen will be necessary prior to installation.	Noted. Details of non-burial protection is presented within Figure 3.5 of the ES Volume 2 (document reference 6.2.3.5) and Chapter 3 (Description of the Proposed Development). Further details regarding cable burial protection is presented in Section 6.6.3 (Table 6.15) and the resultant effects from such measures is assessed within this chapter.

TABLE 2 – PEIR CONSULTATION RESPONSES

Consultee	Summary of Comment Received	How this has been addressed by the Applicant
<p>Joint Nature Conservation Committee ('JNCC')</p>	<p>It would be beneficial to include a summary of the total seabed footprint impact area as part of Table 6.17 to provide a complete overview of the actual total impact of the operation. It would also be useful to include the impact area of thermal effects on the surrounding seabed.</p>	<p>Table 6.15 provides the worst-case parameters for the Proposed Development, which has been updated based upon new information and the finalised project description (see Appendix 3.2 (Marine Worst-Case Design Parameters) of the ES Volume 3 (document reference 6.3.3.2) and Chapter 3 (Description of the Proposed Development) for more information). In this chapter, the total area of seabed disturbance is not considered as an impact itself but has been considered in terms of subsurface geology and surficial sedimentology and its resultant impacts e.g. effects of increased SSC etc.</p> <p>While we do not consider that thermal effects from cables will result in significant environmental effects, for completeness the impact of thermal emissions will be considered within Chapter 8 (Intertidal and Benthic Habitats) of the ES Volume 1 (document reference 6.1.8) and the Habitat Regulations Assessment ('HRA') Report (document reference 6.8.1).</p>

Consultee	Summary of Comment Received	How this has been addressed by the Applicant
JNCC	There is currently a lack of detail on the impact of the deposition of dredged material. While plume modelling is being carried out and will be reported in the ES, the potential impact from the initial dredging, deposition, re-dredging and final deposition as infill for the worst case, which could be up to 1.7 million cubic metres, needs to be addressed in the ES.	The assessment of the deposition of dredge material and potential impacts associated with all dredging activities is provided in Section 6.6.4 of this chapter.
MMO	Section 6.6.5 sets out the approach to cumulative effects assessment, identifying the IFA2 interconnector as well as the French component of the Aquind project as potentially interacting projects and the interaction will be further assessed in the ES.	The cumulative effects associated with the identified projects and the Proposed Development has been assessed in Section 6.7 of this chapter.
MMO	Greater detail and justification would be welcomed regarding the recoverability of bedforms after seabed clearance. Section 6.6.3.3 of the PEIR states that the trench will infill in a matter of weeks, leading to the reformation of bedform features. However, this statement is based on a reference for a report regarding tidal model set up for the NEMO interconnector, which does not discuss this. It is possible that this has been incorrectly referenced. I would advise that the applicant updates the reference, as well providing further discussion regarding bedform recoverability in the ES. The assessment should be more explicitly linked to the	Greater detail is provided in paragraphs 6.6.4.30 – 6.6.4.33 regarding the impact upon and likely recoverability of bedform features. The reference has been corrected.

Consultee	Summary of Comment Received	How this has been addressed by the Applicant
	baseline information at the site, rather than only relying on an assessment from another project.	
MMO	Impacts to coastal processes (and by extension coastal geomorphology) were scoped in during the scoping process. This has not been included in the overview of the impact assessment undertaken so far (section 6.6), except that it is stated the HDD drilling will not influence coastal processes. Coastal processes should be considered as a potential receptor for other activities as well as HDD drilling and this should be assessed explicitly for each activity.	Impacts from all relevant activities upon coastal processes has been assessed in paragraphs 6.6.4.27, 6.6.4.33, 6.6.4.42, 6.6.4.43 and 6.6.5.4.
MMO	The approach described by the applicant to be sufficient to identify and assess impacts. However, in Table 6.22, the applicant has presented conclusions on impact significance in the PEIR, despite stating that several strands of work (e.g. sediment plume modelling, floatation pit analysis, sediment core data processing) are still ongoing at the time of writing. It seems that this has been done quite early in the process, and it is likely that such conclusions may change. The applicant should ensure that all assessments of impact significance affected by ongoing work are fully reviewed prior to the completion of the ES.	<p>All assessments of impact significance has been updated to reflect the completion of the EIA. Please note the sediment plume modelling is presented in paragraphs 6.6.4.19 – 6.6.4.22 and further detailed in Appendix 6.2 (Modelling Technical Report).</p> <p>Flotation pits are no longer proposed as part of the Proposed Development and have therefore not been included in the EIA. Sediment core data (particle size analyses) is presented in Appendix 6.3 (Grain Size Statistics) of the ES Volume 3 (document reference 6.3.6.3).</p>

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MMO	<p>Table 6.1 in the PEIR provides an overview of each comment from the scoping opinion, summarising how it has been addressed and clearly identifying the relevant section of the PEIR where this is done. Key comments in the scoping included:</p> <ul style="list-style-type: none"> · A request to include tidal data for model validation, which has been undertaken (described in section 6.5). · A request to consider seabed features as receptors, which has been acknowledged in the PEIR and the applicant states that this will be accounted for in the ES. · A request for further detail on specific EIA approach and cross-referencing to other ES chapters to identify indirect linkages to other chapters has been (section 6.4 and chapter 4) · Details of embedded mitigation measures which were incorporated into project design have been described in section 6.7 and table 6.20. · More detail of non-burial cable protection was requested, and further detail has been provided in chapter 3 and figure 3.5 	No additional comment.
MMO	Section 6.4.5.2 states that several aspects of the proposed development have not yet been finalised and therefore there are several gaps which are openly acknowledged. The applicant has stated that	No additional comment. These data gaps have been reviewed and where applicable assessed within this chapter.

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	these will be addressed during the assessments which feed into the final ES.	
MMO	The applicant has presented a comprehensive overview of the baseline data which has been gathered to date, and there are no significant data gaps. Several aspects of the EIA are in progress (e.g. sediment plume modelling, assessments of floatation pits, and analysis of sediment core survey data) and some aspects of the project design are yet to be confirmed, which is to be expected at this stage. I am content that the applicant has stated that outstanding issues will be addressed during the EIA process and results included in the Environmental Statement. The applicant states that new material not included in the PEIR will be provided in technical appendices in the ES; these appendices should be readily identifiable as new material, to ensure that these aspects are fully reviewed by the consultees during the final ES review.	No additional comment.
MMO	Section 6.7 outline embedded mitigation measures which formed part of the project design process. No mitigation is proposed of residual effects (table 6.22) that could not be mitigated during the design process. However, some assessments have not yet been fully completed. Once ongoing aspects of EIA have been completed (as detailed in section 6.10), any further mitigation required to reduce potential	All embedded mitigation measures are presented in Table 6.13. All aspects of the EIA have been completed and no further mitigation was required (see Section 6.9).

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	impacts from these should be reassessed and included in the ES: the applicant states that they intend to do so in paragraph 6.4.5.5.	
MMO	It should be considered whether there will be in combination effects from project activities on seabed features, for example the deposition of dredged material, and whether this will affect the recoverability of bedforms which have been levelled nearby.	Greater detail is provided in paragraphs 6.6.4.30 – 6.6.4.33 regarding the impacts of activities upon and likely recoverability of bedform features.
MMO	Section 6.6.6 addressed transboundary effects, stating that they are unlikely to be significant in terms of physical process impacts, with the potential exception of sediment plumes, for which modelling is ongoing. This will be further addressed in the final ES, which is acceptable.	No additional comment. Transboundary effects are assessed in Section 6.7.
Natural England	We note that the rationale and conclusions of the worst-case design envelope (section 6.6.2) and subsequent impact assessment (section 6.6.3) are descriptive, relying on studies and evidence from other projects. These sections would benefit from the use of more specific analysis relevant to this project and study area. Where other studies are referred to, a description of how and why they are analogous in terms of features such as sediment type, water depth and current speeds would be useful.	The use of data from other studies is discussed in paragraph 6.6.4.14. Though other data is considered (and reported in Table 6.16) for the purposes of the assessment, only data from previous assessments conducted in the Eastern Channel are utilised. As the data from previous assessments is drawn from numerical modelling studies it is considered that the boundary conditions utilised within these studies are likely to be analogous to the boundary conditions employed within the AQUIND Interconnector Modelling Suite

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		<p>(‘AIMS’). As such these studies, in terms of their hydrodynamic regime can be considered analogous to the present study and thus highly relevant to the assessment of the Proposed Development.</p> <p>Furthermore, within these modelling studies as a pre-requisite of numerical modelling, the sediment characteristics are parameterised within the model from a grain size class and presented as ‘fine’ (assumed to comprise clay and silts) and ‘coarse’ (assumed to comprise sands and gravels) sediment. The hydraulic characteristics (i.e. size, settling velocity etc) of these sediments is typically captured from a median grain size within this grain size class. The bed conditions are not considered within these simulations and thus, the similarity between seabed conditions does not need to be considered in this assessment. The information, as presented, provides relevant information regarding the likely distances sediment grain size classes will be transported once liberated during construction activities.</p>
Natural England	Table 6.17 (page 6-100) – Worst Case Design Parameters: Natural England requests an understanding of how the figures have been derived for the dredged material. In addition to this, the area of seabed that will be impacted by dredging and	<p>The worst-case design parameters (now detailed in Table 6.15) includes the total area of dredging footprint. How dredge volumes were determined is provided in paragraph 4.2.2.4 of Appendix 6.2.</p> <p>Appendix 6.5 (Disposal Site Characterisation Report) of the ES Volume 3 (document reference</p>

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	disposal should be defined in terms of seabed footprint and not just the volume.	6.3.6.5) presents further information relating to characterisation of the proposed disposal site. Within this chapter, the area of disturbance resulting from the construction activities such as dredging has been quantified. However, seabed disturbance has not been considered as an impact itself but, has been considered with regards to its potential resultant impacts e.g. increased SSC.
Natural England	Table 6.17 (page 6-100) – Worst Case Design Parameters: Natural England recommends that for clarity, it would be of benefit to list the Worst-Case Scenario (WCS) by impact rather than the activity. For example, several potential impacts are listed as causing increases to nearbed Suspended Sediment Concentration (SSC) but it remains unclear as to which is the worst case for nearbed SSC. Some of the potential impacts may result in higher concentrations of SSC over a small area and others a lower SSC concentration over larger areas.	The worst-case scenarios for the Proposed Development for different impacts is provided in Table 6.15) of this chapter and includes identification of which activities are considered the worst case scenario for different receptors.
Natural England	Clarity is required on why potential SSC impacts are not included under dredging and disposal in Table 6.17 (page 6-100). In addition, Natural England notes that the use of Mass Flow Excavation (MFE) for sandwave clearance is not mentioned in Table 6.17, and requests clarification if this represents the WCS.	The worst-case design parameters table (Table 6.15 of this chapter) has been updated. Further clarity on the use of MFE and how this relates to the WCS is discussed in this chapter including within paragraph 6.6.3.14.

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Natural England	Paragraph 6.6.3.3: clarification is required on how the NEMO Link Interconnector study translates to this area in terms of water depth, sediment type and other relevant features. This study has yet to be validated by monitoring. Monitoring data from the Race Bank Offshore Wind Farm has indicated that whilst some recovery from sandwave clearance can be seen in a timescale of a few months, full recovery is likely to take years.	The assessment on the impacts on bedforms and bedform recoverability has been updated and is provided in paragraph 6.6.4.30 to 6.6.4.33.
Natural England	Paragraph 6.6.3.5: Natural England welcomes further information on potential disposal plumes and areas likely to be affected by deposition.	Plume dispersion modelling to assess the temporal and spatial extent of sediment plumes generated during dredge disposal operations, associated suspended sediment concentrations and thickness of deposits on the seabed has been undertaken. This is provided in paragraph 6.6.4.19 to 6.6.4.22 and Appendix 6.2 (Modelling Technical Report). Appendix 6.5 (Disposal Site Characterisation Report) presents further information relating to characterisation of the proposed disposal site.
Natural England	Paragraph 6.6.3.6: flotation pits have a greater impact on near-field flow and this should be considered and assessed if this approach is intended to be used.	The use of flotation pits is no longer proposed and has now been removed from the Proposed Development and is not assessed as part of the EIA.

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Natural England	Paragraph 6.6.3.14: we note that the effects of MFE are assessed as the WCS for cable installation operations.	Jetting is assessed as the worst case for cable installation operations. Justification is provided in paragraph 6.6.4.11.
Natural England	Paragraphs 6.6.3.15 – 6.6.3.19: whilst reference to other studies are useful, they should be put into context by stating where similarities in seabed are between the studies. In this case, consideration should be given to what the WCS increase would be for SSC (over a given area and for how long). This should be presented in the context of background SSC in the relevant area, which may or may not be analogous to other projects. Consideration should also be given to SSC increases and subsequent deposition from sandwave clearance.	See response to the first Natural England comment in this table. Plume dispersion modelling to assess the temporal and spatial extent of sediment plumes generated during dredge disposal operations, associated suspended sediment concentrations and thickness of deposits on the seabed has been undertaken. This is provided in paragraph 6.6.4.19 to 6.6.4.22 and Appendix 6.2.
Natural England	Paragraph 6.6.3.24: further detail is required on any change in seabed height due to cable protection and this should be documented in the WCS. Evidence should be provided on the potential impact upon sediment transport processes, rather than defining the impacts as negligible within the scale of natural variability of the local seabed topography.	Worst case design parameters have been updated and are detailed in Table 6.15. The potential impacts associated with cable protection are assessed in paragraph 6.6.4.35 to 6.6.4.38 and paragraph 6.6.5.1 in this chapter.

Consultee	Summary of Comment Received	How this has been addressed by the Applicant
Natural England	Paragraph 6.6.4.4: Natural England requests further information with respect to whether cable protection will be removed upon decommissioning.	<p>The potential effects of decommissioning are considered in the ES, and in broad terms, the worst case is predicted to be equivalent to the effects associated with construction and are assessed on this basis. They may potentially be less than those associated with construction depending on the decommissioning activities undertaken, for instance where the marine cable and associated protection is left <i>in situ</i>.</p> <p>It is not possible to advise what and how decommissioning will be undertaken so far in advance of likely decommissioning. This will be determined closer to the time, and relevant permissions will be sought prior to the works.</p>
Natural England	Paragraphs 6.10.1.1 and 6.10.1.2: Natural England welcomes further, more detailed assessment.	A more detailed assessment of the potential impacts associated with the Proposed Development are presented in Sections 6.6 to 6.7 of this chapter.