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Seagreen Alpha and Seagreen Bravo Offshore Wind Farms Benthic Monitoring Plan

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1. Introduction

Seagreen Wind Energy Ltd (Seagreen) is progressing the development of the Seagreen Alpha and Seagreen Bravo offshore wind farms (OWFs) off the east coast of Scotland in the outer Firth of Forth and Firth of Tay area (Figure 1.1). The projects received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers in 2014 (the Section 36 Consents) (subsequently varied to remove wind farm capacity limits, Aug 2018) and were granted three Marine Licences from the Scottish Ministers in 2014, one for the Seagreen Alpha Generating Station, one for the Seagreen Bravo Generating Station, and one for the Offshore Transmission Works (OfTW). The project consents were confirmed in November 2017 following a legal challenge. The Onshore Transmission Asset (the onshore export cable and onshore substation) was granted Planning Permission in principle by Angus Council in 2013 (subsequently extended in 2016).

The Seagreen Alpha and Seagreen Bravo OWFs will together comprise up to 150 wind turbine generators (WTGs) with associated foundations, inter-array cables, Offshore Substation Platforms (OSPs) and meteorological masts. The OfTW cable corridor makes landfall at Carnoustie, in Angus (Figure 1.1).

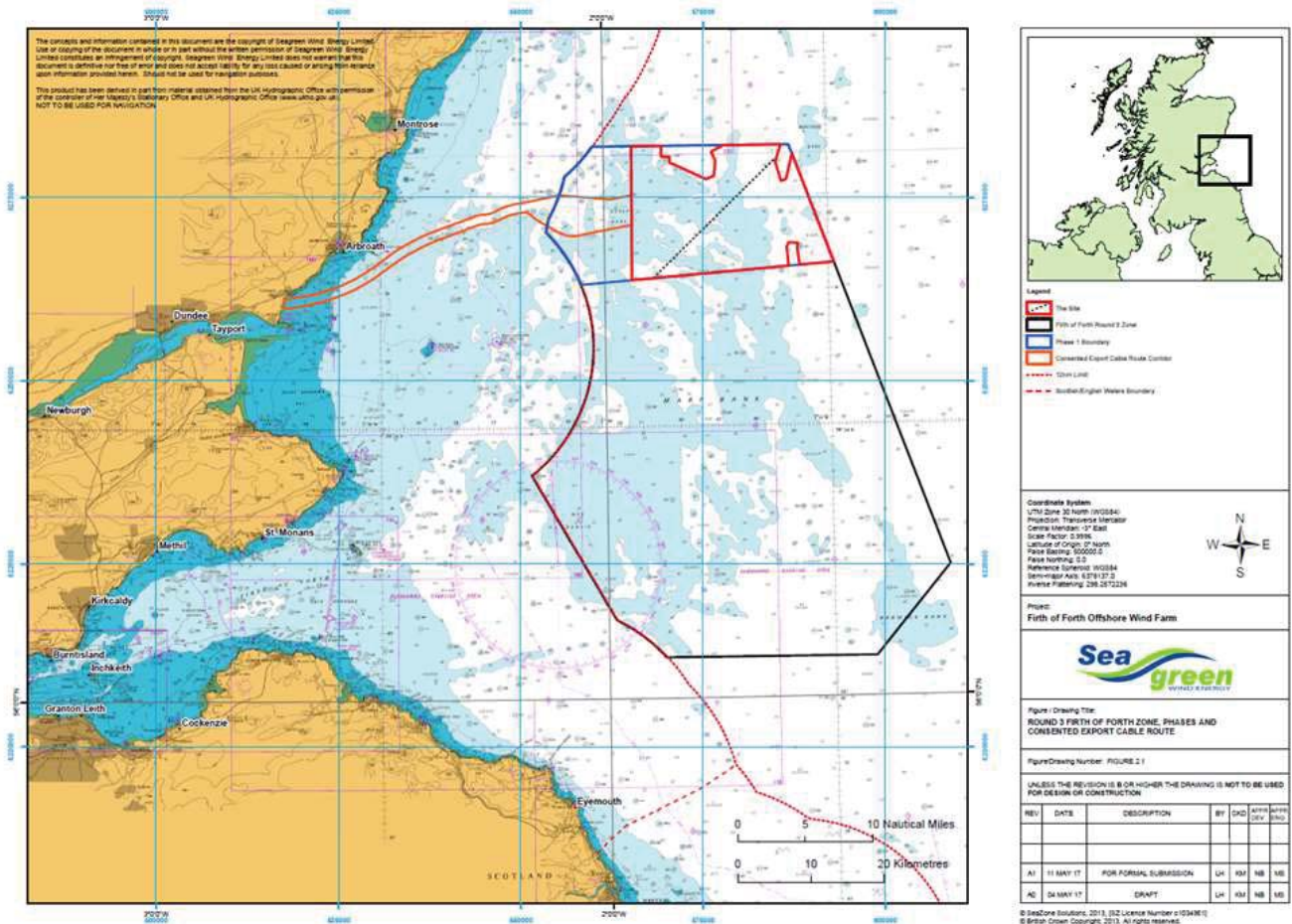


Figure 1.1: Firth of Forth Zone, Seagreen Alpha and Seagreen Bravo OWFs and the OfTW.

1.1 Document Purpose

This document has been prepared by RPS Energy on behalf of Seagreen. It outlines the rationale and specification for the planned benthic monitoring for the Seagreen Alpha and Seagreen Bravo OWFs in the Firth of Forth Zone and the associated transmission works. The programme of monitoring has been designed in accordance with the Conditions of the Seagreen Alpha and Seagreen Bravo OWFs Section 36 consents and the Marine Licence for the OfTW (Condition 3.2.1.1) as described in section 3.1 of this note.

The benthic monitoring strategy has been informed by a comprehensive review of monitoring requirements across the Seagreen Alpha and Seagreen Bravo OWF sites which was undertaken by RPS Energy, on behalf of Seagreen. This review was undertaken to evaluate and provide justification for the need for benthic surveys at the Seagreen OWFs sites and OfTW to discharge the Marine Licence and Section 36 consent Conditions. The review has considered the following aspects:

- The benthic ecology baseline conditions of the Seagreen Alpha and Seagreen Bravo OWFs sites (i.e. the results of the Environmental Impact Assessment (EIA) baseline characterisation);
- The predictions of the impact assessment for benthic ecology, and degree of certainty in these predictions, made within the Seagreen Alpha and Seagreen Bravo Environmental Statement (ES; Seagreen, 2012);
- The conclusions of the Marine Protected Area (MPA) assessment undertaken by Marine Scotland Licensing Operations Team (MS-LOT) (Marine Scotland, 2014) on behalf of the Scottish Ministers for the Firth of Forth Banks Complex MPA;
- The mitigation and monitoring commitments outlined in the Environmental Statement (ES; Seagreen, 2012) and MPA assessment (Marine Scotland, 2014) with respect to benthic ecology;
- The outcomes/recommendations of published reports on benthic ecology monitoring at other OWF sites in the UK (and overseas) and existing data on the sensitivity and recoverability of benthic ecological receptors; and
- The outcomes of the independent review of post-consent environmental monitoring data undertaken by Fugro EMU Ltd. on behalf of the Marine Management Organisation (MMO; MMO, 2014a) and the MMO's subsequent recommendations (MMO, 2014b).

1.2 Consultation

The report Seagreen Benthic Monitoring Strategy (LF000009-CST-OF-0017 (Seagreen (2019))), outlining Seagreen's initial proposals for the benthic monitoring strategy, was prepared in advance of a technical consultation meeting between Seagreen, Marine Scotland and Scottish Natural Heritage (SNH) on 5th March 2019. This document was circulated to attendees and formed the basis of the discussions held at that meeting.

Marine Scotland Science provided comments on the benthic monitoring strategy in a letter dated 17th April 2019, to which Seagreen provided a written response on 6th May 2019. This was followed by confirmation from Marine Scotland Science that they were content with the benthic monitoring strategy on the basis of the response provided by Seagreen and that the locations of drop down video ground truthing locations and the final pre-construction survey report are provided to Marine Scotland.

The proposed monitoring strategy was then discussed and agreed at the Forth and Tay Regional Advisory Group meeting on 24th June 2019. This report therefore has been completed following feedback received from the consultees and confirms the agreed plan for benthic monitoring.

2. Benthic Ecology Baseline Summary

The following sections provide a brief overview of the benthic ecology baseline conditions at Seagreen Alpha and Seagreen Bravo OWFs and along the OfTW, as outlined in the ES (Seagreen, 2012). The EIA benthic characterisation was based on the results of site-specific surveys undertaken by Seagreen in 2011 which comprised infaunal grab sampling, beam trawl sampling and drop down video sampling across the Immediate Study Area (defined as the Phase 1 area (which encompasses Seagreen Alpha and Seagreen Bravo; see Figure 1.1) and the offshore cable corridor).

2.1 Seagreen Alpha and Seagreen Bravo OWFs

The sediments present across the Seagreen Alpha OWF site ranged from cobbles with sand and gravelly sand in the west to sandy gravel in the east. There was a greater predominance of fine sediments recorded across Seagreen Bravo OWF compared with Seagreen Alpha OWF with sediments ranging from slightly gravelly sand in the west, sandy gravel in the central section and gravelly sand in the east of the Seagreen Bravo OWF.

The habitats recorded across both sites were identified as being typical of the wider study area (defined in the ES as the northern North Sea regional area) and areas of the North Sea that have been subject to fishing with ground contacting gears. The habitats mapped for the EIA characterisation are shown in Figure 2.1 and can be divided into the following benthic community classes for each site:

- Seagreen Alpha OWF:
 - Western area: 'Sabellaria', 'sparse polychaetes and bivalves' and 'faunal turf'; and
 - Central and eastern areas: dominated by the sabellid polychaete classes 'dense *Chone*' and 'sparse *Chone*'.
- Seagreen Bravo OWF:
 - Western half: 'Sabellaria', 'rich polychaetes and bivalves' and 'epifauna with polychaetes'; and
 - Eastern half: 'dense *Chone*' and 'rich polychaetes'.

Abundance and species richness were found to be generally low within areas of sandy sediment and the greatest number of individuals were recorded from samples within the 'dense *Chone*' habitat in association with areas of sandy gravel. Abundances and species richness were generally lower across the Seagreen Bravo OWF site than within the Seagreen Alpha OWF site, which was attributed to the higher proportion of fines in the sediment across this site.

High species richness recorded was in association with areas of the *Sabellaria* habitat although it should be noted that there was no evidence from the drop down video surveys of extensive or well developed aggregations of *Sabellaria* at the Seagreen Alpha OWF site which would potentially qualify as reefs under the Habitats Directive using criteria developed by Gubbay (2007).

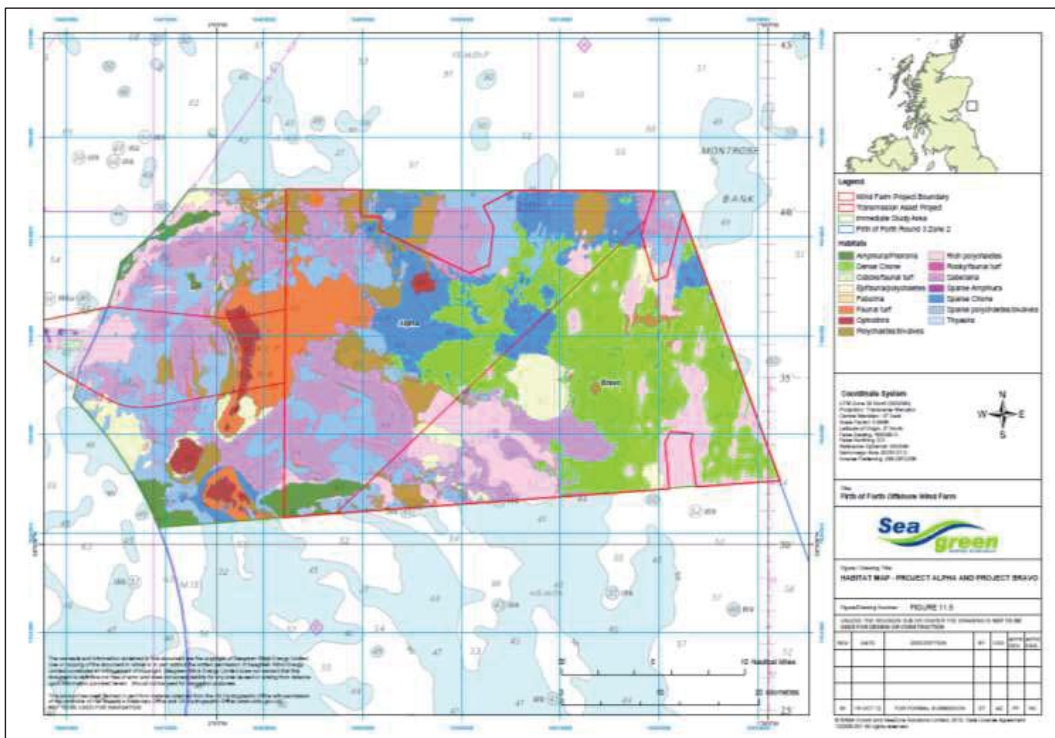


Figure 2.1: Seagreen Alpha and Seagreen Bravo habitat map (taken from Figure 11.5 of the original ES; Seagreen, 2012).

2.1.1 Firth of Forth Banks Complex MPA

As shown in Figure 2.2, the Firth of Forth Banks Complex MPA, which was designated in 2014 after the submission of the ES (Seagreen, 2012), partially overlaps with the western section of Seagreen Alpha OWF site and the eastern part of Seagreen Bravo OWF site.

Within the Seagreen Alpha OWF site, the habitats recorded in the area coinciding with the MPA were the 'Sabellaria' and 'sparse polychaetes and bivalves' habitats. Dense 'Amphiura/Phoronis' habitat was recorded in the south western corner of the Seagreen Alpha OWF site, within the boundary of the MPA, and is associated with the UK Biodiversity Action Plan (UK BAP) habitat, 'mud habitats in deep water'. The ES (Seagreen, 2012) identified the 'Amphiura/Phoronis' habitat as a habitat listed under the Habitats Directive, however, it is understood that this habitat does not currently qualify as an Annex I habitat. Within the part of the Seagreen Bravo OWF site that coincides with the MPA, the habitats recorded were 'dense Chone' and 'rich polychaetes'.

The habitats recorded coinciding with the MPA qualify as the 'Offshore subtidal sands and gravels' feature of the MPA which is also a Scottish Priority Marine Feature (PMF). In addition, ocean quahog (*Arctica islandica*) aggregations are a protected feature of The Firth of Forth Banks Complex MPA. It should be noted however, that only juveniles of this species were recorded during the EIA characterisation surveys (Seagreen, 2012) suggesting that an on-going source of disturbance (i.e. commercial fisheries) may have prevented the species from maturing more widely across the area.

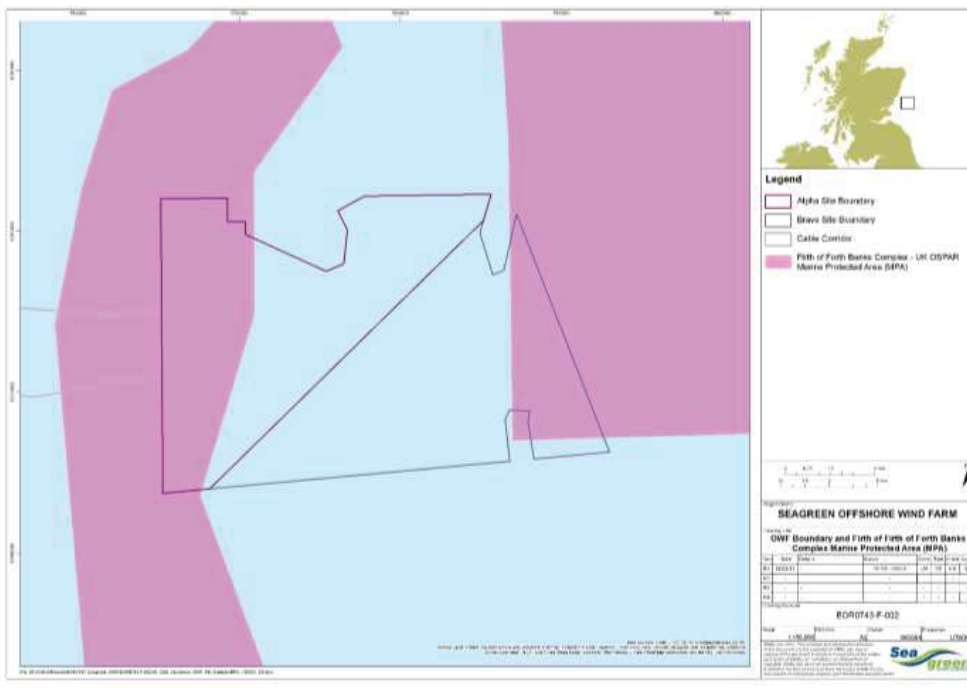


Figure 2.2: Overlap of Seagreen Alpha and Seagreen Bravo with the Firth of Forth Banks Complex MPA.

2.2 OfTW

The habitats recorded across the OfTW during the EIA characterisation surveys were divided into four sections. In the area adjacent to the Seagreen Alpha OWF site boundary, the OfTW passes through 'Ophiothrix' and 'faunal turf' habitat and then 'sparse polychaetes/bivalves' and 'Sabellaria' habitats moving further west. The central sections of the OfTW passes through 'rich polychaetes' and 'sparse Amphiuira' habitats and further inshore the corridor is dominated by a large stretch of the 'Amphiura/Phoronis' habitat which gives way to 'cobble turf' habitat close to the landfall (see Figure 2.3).

The ES (Seagreen, 2012) identified that, on the basis of Joint Nature Conservation Committee (JNCC) Annex I reef mapping data, a small area of potential Annex I rocky reef may exist at the landfall end of the OfTW. It should be noted, however that no evidence of rocky reef was identified during the geophysical surveys undertaken to inform the EIA. The JNCC Annex I reef layer has since been updated and this revised layer demonstrates that the distribution of potential Annex I rocky reef (bedrock and/or stony) lies to the north of the OfTW and out with the boundary of the project. On this basis, it is considered unlikely that potential Annex I rocky reef is present at the landfall or within the OfTW boundary.

2.2.1 Firth of Forth Banks Complex MPA

As shown in Figure 2.2, the westernmost section of the OfTW, adjacent to the Seagreen Alpha OWF site boundary, overlaps with the Firth of Forth Banks Complex MPA. Figure 2.3 demonstrates that the habitats mapped within this area of overlap include: 'faunal turf', 'Ophiothrix', 'Sabellaria', 'polychaetes/bivalves' and 'sparse polychaetes/bivalves'. As discussed in section 2.1.1 above, these habitats qualify as the 'Offshore subtidal sands and gravels' feature of the MPA and as a Scottish PMF.

2.3 Landfall

The EIA characterisation surveys of the intertidal area described habitats that were not particularly diverse and that the benthic communities in the intertidal are also not species rich. The mobile sediments associated with the sandy beach were devoid of benthic fauna and the greatest species richness was found on the artificial substrata of the rock revetment extending from the mid shore to the upper shore which was characterised by lichens, winkles and limpets and interspersed with mussels.

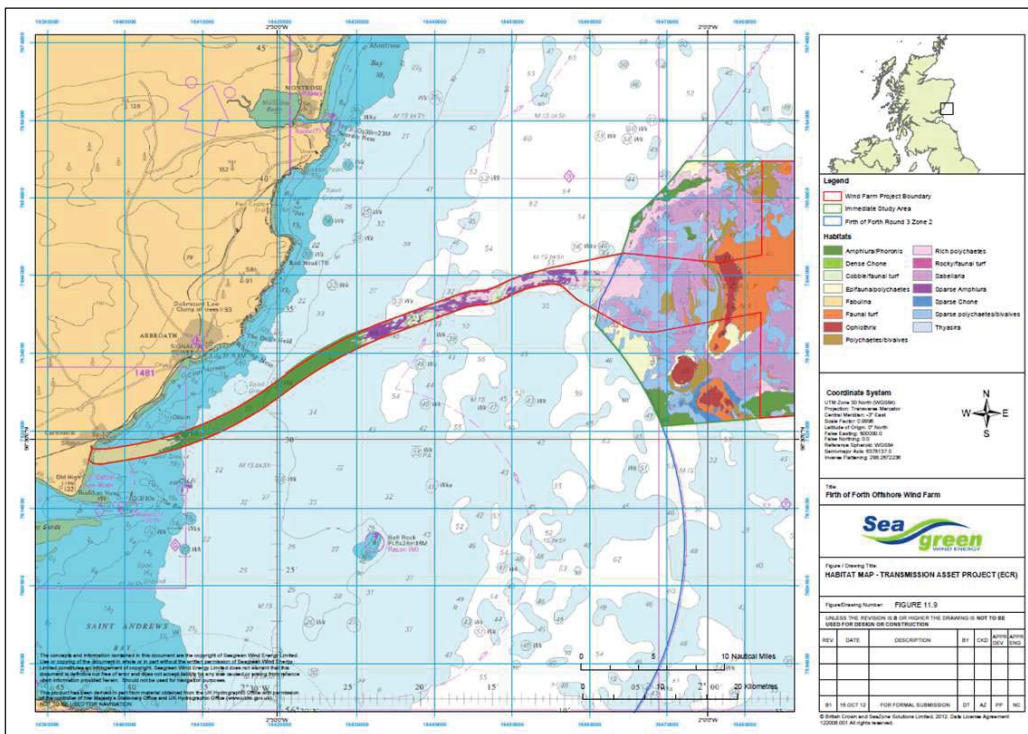


Figure 2.3: Seagreen OfTW habitat map (taken from Figure 11.9 of the original ES; Seagreen, 2012).

3. Monitoring Rationale

3.1 Relevant Conditions

Condition 26 of both the Seagreen Alpha and Seagreen Bravo OWF Section 36 consents state that the Project Environmental Monitoring Programme (PEMP) must cover, but not be limited to:

Pre-construction, construction (if considered appropriate by the Scottish Ministers) and post-construction monitoring surveys for...[bullet 5] benthic communities.

Part 3, Condition 3.2.1.1 of the Marine Licence for the OfTW also has the same condition, worded slightly differently, which requires that the PEMP must cover, but not be limited to:

Pre-construction, construction (if considered appropriate by the Scottish Ministers) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for...[bullet 2] benthic communities.

Condition 18 of both the Seagreen Alpha OWF and Seagreen Bravo OWF Section 36 consents and Part 3, Condition 3.2.2.10 (b) of the Marine Licence for the OfTW also requires that Seagreen submit a Cable Plan (CaP) which must include the following:

b) The results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing.

3.2 Monitoring Commitments in ES

The Seagreen ES (Seagreen, 2012) outlined the following monitoring commitments with respect to benthic ecology which have been considered as part of the process of defining the monitoring strategy for Seagreen Alpha and Seagreen Bravo OWFs:

As part of the pre-construction survey (which will be agreed with Marine Scotland) data will be analysed to ascertain the presences of any rare or important habitats, such as Sabellaria or Modiolus reef; and

If pre-construction surveys were to identify any areas that are considered to constitute biogenic reef, micrositing of WTGs, ancillary infrastructure and cables, and subsequent consultation with Marine Scotland to ensure that planned installation would not have a significant adverse effect on these features.

3.3 Benthic Monitoring Plan

Generic pre- and post-construction monitoring for benthic ecology were not proposed for the Seagreen Alpha and Seagreen Bravo OWFs; a full justification for this is provided in section 3.4 below.

The approach to benthic monitoring within the Seagreen Alpha and Seagreen Bravo OWF sites and along the OfTW has, instead, been designed to specifically target and minimise impacts to key benthic habitats

which were identified in the ES as having the highest sensitivity to construction impacts and which have the potential to be present within the sites prior to construction, i.e. Annex I biogenic and geogenic reef habitats. This is consistent with the commitments outlined in the ES (Seagreen, 2012) and summarised in section 3.2 of this note. A full justification for this rationale and for no further benthic monitoring surveys is provided in section 3.4 below.

3.3.1 Pre-construction monitoring

Seagreen will undertake a data review to determine whether a pre-construction Annex 1 reef survey will be required. The purpose of such a survey, if required, would be to identify and, if present, delineate any Annex I reefs (biogenic and/or geogenic) which may have developed at the Seagreen Alpha and Seagreen Bravo OWF sites and along the OfTW since the EIA characterisation surveys were undertaken. It is noted that reefs were not recorded during the EIA characterisation surveys.

A pre-construction geophysical survey was undertaken by Seagreen in 2018, which comprised a combination of multibeam echosounder and high resolution side scan sonar. The coverage of the 2018 pre-construction geophysical survey comprised all areas within which construction activity (including pre-construction ground preparation works) is proposed for both the Seagreen Alpha and Seagreen Bravo OWF sites. Geophysical data is also available from the 2011 geophysical survey of the OfTW. In the first instance, the geophysical survey outputs for both the Seagreen Alpha and Seagreen Bravo OWF sites and the OfTW will be reviewed and interpreted by a suitably qualified and experienced marine ecologist / geophysicist, to identify any areas of potential reef features.

In the event that acoustic signatures synonymous with potential reef presence are identified from the geophysical data, these will be subject to further ground-truthing via a pre-construction Annex I reef survey. The pre-construction Annex I reef survey, if required, would utilise remote sampling techniques (e.g. drop down video) to establish the presence or absence of any reef features, and where present to determine their extent. This approach is consistent with the relevant guidance documents (e.g. Limpenny *et al.*, 2010).

If a pre-construction Annex I reef survey utilising seabed imagery is required (i.e. in the event that acoustic signatures synonymous with reef presence are identified from the geophysical survey data), this will be undertaken within two years of the commencement of offshore construction activities. The results of these surveys will therefore be available to inform micro-siting of cables and turbines etc. to ensure that direct impacts to reef habitats, if present, are avoided wherever possible within the Seagreen Alpha and Seagreen Bravo OWF sites and along the OfTW corridor.

3.3.2 Post-construction monitoring

A single post-construction Annex I reef survey would be undertaken, if required, to determine any change in the location, extent and/or composition of reef habitats if both of the following two criteria are met:

- Annex I reef habitats are recorded within the Seagreen Alpha and Seagreen Bravo OWF sites and/or along the OfTW corridor during the pre-construction survey described in section 3.3.1 above; AND
- Construction activity may occur within any of the areas confirmed as reef habitat.

The methodology for undertaking this monitoring survey would be as described above in 3.3.1 for the pre-construction survey i.e. that the monitoring would in the first instance be informed by the outputs of the post-construction geophysical survey. Any acoustic signatures synonymous with reef presence would then be subject to further ground-truthing through remote sampling techniques (e.g. drop down video) to establish whether the location, nature and/or extent of reef features has changed following construction.

3.4 Justification for Benthic Monitoring

The following sections outline, in the first instance (section 3.4.1), Seagreen's justification for the adopted approach of pre- and post- construction Annex I reef surveys. A justification is then provided (section 3.4.2) for not proposing generic pre- or post-construction monitoring for benthic ecology at the Seagreen Alpha and Seagreen Bravo OWFs or OfTW.

3.4.1 Monitoring plan

1. The benthic monitoring plan fulfils the requirements of Condition 26 of the Section 36 consents for both the Seagreen Alpha and Seagreen Bravo OWFs and Part 3, Condition 3.2.1.1 of the Marine Licence for the OfTW with respect to what the PEMP must include for benthic ecology. The monitoring strategy is also consistent with Condition 18 of both the Seagreen Alpha OWF and Seagreen Bravo OWF Section 36 consents and Part 3, Condition 3.2.2.10 (b) of the Marine Licence for the OfTW which requires that the results of benthic surveys are used to inform cable routing. These conditions have been met through the completion of the geophysical surveys of the OWF and OfTW, with a subsequent ground-truthing survey using drop down video, should potential Annex I reefs be identified from a review of these geophysical survey outputs.
2. The benthic monitoring plan fulfils the commitments made within the ES (Seagreen, 2012) and the MPA assessment (Marine Scotland, 2014), as outlined in section 3.2, with respect to identifying rare or important habitats such as reef so that WTG, ancillary infrastructure and cables can be microsituated away from these areas to avoid direct impacts.
3. The MMO's recommendations for post-consent environmental monitoring (MMO, 2014b) states, under Recommendation 11, that:
"Where baseline surveys do not reveal the presence of species/habitat of conservation interest (e.g. Annex I habitat such as Sabellaria reef, Priority Marine Features (PMFs), Marine Protected Areas (MPAs), Biodiversity Action Plan (BAP) and OSPAR habitats; see JNCC 2014), and where modifications to the seabed through scour is not predicted then further PCM [post-consent monitoring] should not typically be required."

The monitoring plan for the Seagreen Alpha and Seagreen Bravo OWFs has been designed to target the potential occurrence of Annex I reef habitat (biogenic and/or geogenic) as *Sabellaria* dominated communities were the most sensitive habitat that was identified within the site during the EIA characterisation (although noting that *Sabellaria* reef was not recorded) and also this habitat occurs within a large proportion of the overlap of the Firth of Forth Banks Complex MPA with the Seagreen

Alpha and Beta OWF sites. Although not a Scottish PMF in its own right, the distribution of *Sabellaria* habitat overlaps with the distribution of the 'offshore subtidal sands and gravels' feature of the MPA which is a PMF. The monitoring strategy is therefore consistent with Recommendation 11 of MMO (2014b).

4. The MMO's recommendations for post-consent environmental monitoring (MMO, 2014b) also states, under Recommendation 10, that:

"Where benthic ecological monitoring is required, scientifically robust strategies using cost-effective monitoring methods should be adopted (e.g. depending on issues to be investigated, drop-down video, or particle size analysis may be appropriate as a surrogate for macrofaunal taxonomic analyses)."

Seagreen considers that the approach to benthic monitoring offers both a scientifically robust strategy, as it is based on relevant guidance documents for identifying and evaluating reef habitats (e.g. Limpenny *et al.*, 2010), and an effective method of utilising geophysical survey data in the first instance, followed up with visual ground truthing if required.

3.4.2 No generic monitoring

The following section outlines a number of reasons for not undertaking generic benthic monitoring based on, for example, recommendations in relevant guidance documents. A separate bullet then outlines how and why the approach is consistent with this.

1. A full review of the Seagreen Alpha and Seagreen Bravo ES (Seagreen, 2012) has been undertaken which has confirmed that no significant effects from either the construction, operation and maintenance or decommissioning of the project are predicted on benthic ecology receptors. This is on the basis that the magnitude of all impacts is predicted to be negligible or low and the significance of all associated effects (in the absence of any mitigation measures) of minor adverse significance or less. With the implementation of the mitigation measures proposed in the ES, which includes the measures outlined in section 3.2, all effects were further reduced to negligible significance. The MPA assessment (Marine Scotland, 2014) for the project, undertaken by Marine Scotland, also concludes that impacts on the ocean quahog aggregations and offshore subtidal sands and gravels protected features of the Firth of Forth Banks Complex MPA, are not considered to be significant on the basis of the small area of habitats which will experience physical disturbance and the mitigation measures to be implemented for the project.
 - o One of the recommendations of the independent review of post-consent environmental monitoring data undertaken by Fugro EMU Ltd on behalf of the MMO (MMO, 2014a) is that monitoring requirements are driven to ensure compliance with measures identified in assessments to mitigate significant impacts and/or to protect the environment. As no significant impacts were predicted in the ES, benthic monitoring to address this is not deemed necessary.

2. The Seagreen Alpha and Seagreen Bravo ES (Seagreen, 2012) concludes that, as site-specific benthic survey data was collected using a range of techniques to characterise the baseline and inform the assessment of impacts, the confidence in the conclusions of the ES is therefore high.
 - The MMO (2014a) review states that monitoring should be used where there is uncertainty in the significance of an impact which could lead to a potentially significant impact on a sensitive receptor. Surveys should be designed so that data collected can reduce uncertainty in impact significance statements. It also states that monitoring should not be required for impacts where there is already high certainty. As the conclusions of the ES were made with a high degree of certainty, benthic monitoring is not considered necessary to address areas of uncertainty.
3. The worst case scenario assessed in the ES (Seagreen, 2012) for each impact (with the exception of effects associated with the resuspension of contaminated sediments) assumed that impacts would occur entirely within the most sensitive habitat which was identified as *Sabellaria*. Therefore, Seagreen is confident that the effects that will arise as a result of the construction, operation and decommissioning of the project will be less than those predicted within the ES.
 - On this basis benthic monitoring is not deemed necessary to address areas of uncertainty with respect to the recovery of benthic communities from the impacts predicted to occur.
4. As outlined in the ES (Seagreen, 2012) and discussed in section 2 above, much of the Seagreen Alpha and Seagreen Bravo OWF sites and the wider area have been historically, and continue to be, regularly heavily fished by bottom contacting gears, particularly by scallop dredges. These are activities which are known to physically disturb sediments and associated benthic habitats as well as elevate concentrations of suspended sediments. On this basis, and as concluded in the ES (Seagreen, 2012), the benthic habitats present are not considered to be particularly sensitive to physical impacts.
 - On the basis that the worst case scenario assessed in the ES (Seagreen, 2012) assumed that the Seagreen Alpha and Seagreen Bravo OWFs would coexist with existing fisheries activities, it can be assumed that there will be a level of ongoing physical disturbance to the benthic habitats within the site for over the lifetime of the project, which are independent of any activities associated with any phase of the project. Therefore, it is considered that any generic monitoring programme of benthic habitats would be ineffective at detecting any variations in communities present that were attributable to the OWFs rather than the ongoing disturbance from commercial fishing activity. On this basis it would be extremely difficult for any monitoring to validate the monitoring hypotheses.
5. Impacts associated with the construction and operation of OWFs are, on the whole, well understood. For example, effects associated with cable installation are well understood and effects from temporary seabed disturbance resulting from OWF construction activities are analogous to (although generally of lower magnitude than) the effects of substratum loss/disturbance resulting from aggregate extraction. The subsequent recovery of communities from such physical disturbance impacts is well understood, particularly as a result of extensive research work undertaken for the aggregates industry including studies funded by the Marine Aggregate Levy Sustainability Fund (MALSF; e.g. Marine Ecological Surveys Ltd., 2007; Tillin, *et al.*, 2011 and Newell *et al.*, 2002), but also from published literature and studies

undertaken for the OWF industry (e.g. NWP Offshore Ltd., 2002). Similarly, the effects associated with sedimentation on benthic ecology are generally well understood from the detailed knowledge of the ecology of the component species and specific experimental field studies relating to the effects of sediment deposition on benthic habitats and communities (studies funded by the MALSF, e.g. Newell *et al.*, 2002; Robinson *et al.*, 2005).

- On this basis benthic monitoring is not deemed necessary to address areas of uncertainty with respect to the recovery of benthic communities from the impacts predicted to occur as these impacts are well understood and documents in the scientific literature.

6. The MMO (2014a) review concluded that, to date, OWFs have not had significant impacts on benthic habitats and associated faunal communities as any observed differences have also been observed in reference areas and, as such, could be attributed to natural variability. The design of many monitoring strategies in the UK have largely focused on broad scale monitoring to allow for major changes in the infaunal communities present to be identified. These studies have been successful in demonstrating the lack of significant impact, which has contributed to the high certainty confidence in the assessment of impacts such as seabed disturbance and increased suspended sediment for example (i.e. impacts which extend over a spatially large area).

- On this basis benthic monitoring is not deemed necessary to address areas of uncertainty with respect to the recovery of benthic communities from the impacts predicted to occur.

7. As outlined above, the MPA assessment concluded that impacts on protected features of the Firth of Forth Banks Complex MPA will not be significant because of the small area of habitats which will experience physical disturbance and the mitigation measures to be implemented for the project. The mitigation measures referred to in the MPA assessment include the survey commitments outlined in section 3.2 of this note (i.e. a pre-construction survey for reef habitats to facilitate micro-siting of infrastructure) and a recommendation to avoid the siting of infrastructure in areas of habitat identified as 'dense *Amphiura/Phoronis*' habitat, where ever practicable.

- Seagreen considers that the benthic monitoring plan outlined in section 3.3 above is consistent with the mitigation requirements of the MPA assessment. Furthermore, because of the small percentage area of the MPA that may be directly impacted by the project (0.21% of the MPA area will receive physical disturbance and there will be habitat loss amounting to 0.05% of the MPA area during construction and operational phases) any monitoring of the broadscale Scottish PMFs present, or of areas identified in the ES as 'dense *Amphiura/Phoronis*' habitat, within the site was not proposed and not deemed necessary. This is on the basis that the monitoring proposals are targeting at the most sensitive habitat identified within the Seagreen Alpha and Seagreen Bravo OWFs and within the MPA (i.e. *Sabellaria* habitat), albeit that this is not itself a Scottish PMF although the offshore subtidal sands and gravels habitat which it coincides with is a PMF.

4. Conclusions

Benthic ecology monitoring surveys form part of the conditions attached to the Seagreen Alpha and Seagreen Bravo OWFs Section 36 consents and the Marine Licence for the OfTW. A review has been undertaken of the requirement for benthic monitoring surveys based on consideration of the predictions made within the ES (Seagreen, 2012) and the level of certainty in these assessments. These findings have been considered in the context of published reports on benthic ecology monitoring at other OWF sites in the UK (and overseas) and existing data on the sensitivity and recoverability of benthic ecological receptors, to determine if significant impacts or areas of uncertainty exist, against which benthic monitoring could be targeted.

The conclusions of this review are that there is a high level of certainty in the impact assessments presented within the Seagreen ES and that no significant impacts were predicted. This is due to the typically well understood nature of many of the impacts and the certainty of the predicted extents of the impacts. Furthermore, there is a high degree of certainty in the sensitivity and recoverability of the habitats present to many of the impacts, which is drawn from evidence from other OWFs as well as analogous activities such as aggregate extraction. On this basis, Seagreen did not propose a programme of generic pre- and post-construction monitoring surveys for benthic ecology. Instead, the agreed plan was to specifically target and limit impacts to the more sensitive benthic habitats, which may be present within the sites prior to construction (i.e. biogenic and geogenic reef habitats). This monitoring comprises a review of the 2018 geophysical survey data for the OWFs and the 2011 geophysical survey data for the OfTW corridor to identify any potential areas of reef and to identify survey targets. A single pre-construction Annex I drop down video survey of these targets (potential reefs) will be undertaken, if required. If reefs are identified during this pre-construction survey, a single post-construction Annex I reef survey would be undertaken to determine any change in the location, extent and/or composition of reef if construction activity occurs within any of the areas confirmed as reef habitat.

Seagreen considers that this approach is consistent with the requirements of the Section 36 consents and the Marine Licence conditions and is also consistent with the commitments for monitoring/mitigation outlined in the ES (Seagreen, 2012).

5. References

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