Beatrice Offshore Wind Farm Consent Plan

July 2017

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Project Title/ Location	Beatrice Offshore Wind Farm
Project Reference Number	LF000005
Date:	July 2017

Beatrice Offshore Wind Farm

Project Environmental Monitoring Programme

Pursuant to Section 36 Consent Condition 27 and Marine Licence (OfTW) Condition 3.2.1.1

For the approval of the Scottish Ministers

This is a 'living' document. It will be regularly reviewed and updated to reflect the status of the Beatrice Offshore Wind Farm Project Environmental Monitoring Programme. All revisions to this document are tracked in the table immediately below.

Rev	Prepared By	Sign Off	Checked By	Sign Off	ECoW Review By	Sign-Off	Approved By	Sign Off	Date of Issue
2.0	Steve Bellew GoBe Consultants	[redacted]	Lis Royle BOWL	[redacted]	Naomi Campbell Foreshore Consultants	[redacted]	Steven Wilson BOWL	[redacted]	17/07/2017

Consent Plan Overview

Purpose of the Programme

This Project Environmental Monitoring Programme (PEMP) has been prepared to address the specific requirements of the relevant conditions attached to Section 36 (S36) Consent and Offshore Transmission Works (OfTW) Marine Licence issued to Beatrice Offshore Windfarm Limited (BOWL).

The overall aim of the PEMP is to outline and define the approach BOWL, its survey contractors and advisors will take with respect to the environmental monitoring of the project required under the S36 Consent and Marine Licence conditions. The plan sets out the approach to monitoring for each environmental topic listed in the S36 Consent and OfTW Marine Licence conditions issued to BOWL.

The PEMP is also designed to provide guidance to those involved in the Development, on the monitoring of potential environmental impacts associated with the construction, operation and post-construction phases of the Wind Farm and OfTW.

Scope of the Programme

The PEMP provides the overarching framework for the offshore environmental monitoring required by Condition 27 of the S36 Consent and Condition 3.2.1.1 of the OfTW Marine Licence. The PEMP includes:

- Details on the environmental monitoring proposed for the pre-construction, during construction (if considered appropriate by Scottish Ministers) and, where relevant, post construction phases of the Development on;
  - Birds;
  - Cod;
  - Herring;
  - Sandeels;
  - Diadromous fish;
  - Benthic communities;
  - Seabed scour and local sediment deposition; and,
  - Marine mammals
- The objectives and methodologies for the monitoring surveys;
- Evidence of consultation on and approval of monitoring approach and survey methodology;
- Reference to monitoring survey reports, where available; and
- The programme for proposed monitoring surveys and reporting.

Structure of the Programme

The PEMP is structured as follows:

Sections 1 to 4 set out the scope and objectives of the PEMP, provide an overview of the Project, set out statements of compliance and detail the process for making updates and amendments to this document.

Section 5 provides detail on the parties responsible for the implementation and delivery of the PEMP.

Section 6 outlines the structure of the subsequent PEMP sections to demonstrate they have been ordered in such a way as to meet the requirements of the S36 and OfTW Marine Licence PEMP conditions.

Sections 7 to 14 summarise the approach to monitoring for each topic identified in the S36 Consent and OfTW Marine Licence PEMP conditions. These sections also detail the aims and objectives of the monitoring approach, the approved survey methodology, survey reports and provide a programme of the survey works for each topic.

Section 15 summarises the programme of survey works for each topic identified in the S36 Consent and OfTW Marine Licence PEMP conditions.

Section 16 details the licensing and legal requirements associated with the PEMP surveys which BOWL will adhere to.

Section 17 demonstrates BOWL's compliance with the monitoring measures proposed in the Application, ES and SEIS.

Appendix A details the commitments made by BOWL in the ES and SEIS and cross references to where this has been or is to be implemented.

Programme Audience

This PEMP is intended to summarise BOWL's environmental monitoring programme for stakeholders and regulators.

Compliance with this PEMP will be monitored by the BOWL Consents and Licensing Team (CLT) and the BOWL Ecological Clerk of Works (ECoW), and reported to the Licensing Authority.

Programme Locations

Copies of this PEMP are to be held in the following locations:

- BOWL Head Office;
- With the ECoW(s);
- At the Marine Coordination Centre; and
- At the premises of Key Contractors and Subcontractors.

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List of Abbreviations and Definitions

Term	Definition / Description
ADD	Acoustic Deterrent Device
Application	Application letters and Environmental Statement submitted to the Scottish Ministers by BOWL on 23 April 2012 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by BOWL on 29 May 2013
ASFB	Association of Salmon Fishery Boards
BOWL	Beatrice Offshore Windfarm Limited (Company Number SC350248) and having its registered office at Inveralmond House, 200 Dunkeld Road, Perth, PH1 3AQ
CaP	Cable Plan, as required under Condition 19 of the S36 Consent and Condition 3.2.2.10 of the OfTW Marine Licence
CMS	Construction Method Statement
Commencement of the Development	The date on which construction begins on the site of the development in accordance with the relevant consent
Company	BOWL
Consent Conditions	The terms that are imposed on BOWL under the S36 Consent or Marine Licence that must be fulfilled throughout the period that the consent is valid
CoP	Construction Programme, as required for approval under Condition 10 of the S36 Consent and Condition 3.2.2.3 of the OfTW Marine Licence
dBht	Decibel metric taking into account species hearing sensitivity
DDV	Drop Down Video
Decommissioning Programme	The programme for decommissioning the Development, to be submitted by the Company to the Secretary of State under section 105(2) of the Energy Act 2004 (as amended) and as required under Condition 3 of the S36 Consent and Condition 3.2.2.2 of the OfTW Marine Licence
Development	The Wind Farm and the associated OfTW in the outer Moray Firth
DSLP	Design Specification and Layout Plan

Term	Definition / Description
ECoW	Ecological Clark of Works
ECC	East Caithness Cliffs [SPA]
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan, as required for approval under Condition 15 of the S36 Consent and Condition 3.2.1.2 of the OfTW Marine Licence
EPS	European Protected Species
ES	Environmental Statement submitted to the Scottish Ministers by the Company on 23 April 2012 as part of the Application as defined above
Final Commissioning of the Development	The date on which all wind turbine generators forming the Development have supplied electricity on a commercial basis to the National Grid, or such earlier date as the Scottish Ministers deem the Development to be complete
GPS	Global Positioning System
HRA	Habitats Regulations Assessment
Key Contractors	The Contractors appointed for the individual work streams of Marine Installation; Transmission; and WTGs. The Key Contractors appointed are; Seaway Heavy Lifting Ltd, Siemens Wind Power Ltd and Siemens Transmission and Distribution Ltd
km	Kilometre
Landfall Site	The point above MHWS near Portgordon, where the OfTW Cable connects to the OnTW
Marine Licences	The consents issued by the Scottish Ministers under section 20(1) of the Marine (Scotland) Act 2010 and section 65 of the Marine and Coastal Access Act 2009, for the Development dated 2 September 2014
MFRAG	Moray Firth Regional Advisory Group. A group responsible for overseeing monitoring and mitigation on a regional scale, set up by the Scottish Ministers
MHWS	Mean High Water Springs
MMMP	Marine Mammal Monitoring Programme
MMO	Marine Management Organisation

Term	Definition / Description
MORL	Moray Offshore Renewables Limited, and having its registered office at 1st floor, 14/18 City Road, Cardiff, CF24 3DL. Registration Number: 07101438
MS-LOT	Marine Scotland Licensing Operations Team
MSS	Marine Scotland Science
MW	Megawatt
O&M	Operation and Maintenance
OMP	Operation and Maintenance Plan, as required under Condition 17 of the S36 Consent and Condition 3.2.3.2 of the OfTW Marine Licence
OfTW	The Offshore Transmission Works. The OfTW includes the transmissions cable required to connect the Wind Farm to the OnTW. This covers the offshore transformer modules (OTMSs) and the cable route from the OSPs to the Mean High Water Springs (MHWS) at the landfall west of Portgordon on the Moray coast
OfTW Cable	The cable connecting the OTMs to the landfall site
OfTW Corridor	The area within which the OfTW Cable is to be located as presented in the ES and SEIS
OnTW	Onshore Transmission Works, i.e. all components and operations for the onshore elements. The EIA of these elements is reported in a separate ES and is subject to a separate consent application
OSP	Offshore Substation Platform
OTM	Offshore Transformer Module
OWF	Offshore Wind Farm
PEMP	Project Environmental Monitoring Programme
PS	Piling Strategy, as required under Condition 12 of the S36 Consent and Condition 3.2.2.5 of the OfTW Marine Licence
ROV	Remotely Operated Vehicle
RSPB Scotland	Royal Society for the Protection of Birds Scotland
S36 Consent	The written consent granted by the Scottish Ministers under Section 36 of the Electricity Act 1989, on 19 March 2014

Term	Definition / Description
SAC	Special Area of Conservation, protected sites classified in accordance with Article 3 of the EC Habitats Directive
SEIS	Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 29 May 2013 as part of the Application as defined above
Site	The area outlined in red in Figure 1 attached to the S36 Consent Annex 1 and the area outlined in red and the area outlined in black in the figure contained in Part 4 of the OfTW Marine Licence
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
Soft Start	The gradual increase of piling power, incrementally over a set time period, until full operational power is achieved
SPA	Special Protection Area, protected sites classified in accordance with Article 4 of the EC Birds Directive
SSMEG	Scottish Strategic Marine Environment Group. A group yet to be formed, responsible for overseeing monitoring and mitigation on a national scale, set up by the Scottish Ministers
Subcontractors	Subcontractors to the Key Contractors
VMP	Vessel Management Plan, as required under Condition 16 of the S36 Consent and Condition 3.2.2.8 of the OfTW Marine Licence
WDC	Whale and Dolphin Conservation
Wind Farm	Offshore Development as assessed in the ES including wind turbines, their foundations, inter-array cabling and meteorological masts
WP	Work Package
WTG	Wind Turbine Generator

1 Introduction

1.1 Background

1.1.1 BOWL received consent for the Wind Farm under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 19 March 2014 (the Section 36 Consent) and was granted two Marine Licences from the Scottish Ministers, for the Wind Farm and associated Offshore Transmission Works (OfTW), on 2nd September 2014 (reference: [04461/16/0]/[04462/16/0]) and subsequently superseded on 27 April 2016. Objectives of this Document

1.1.2 The S36 Consent and Marine Licences contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of offshore construction. One such requirement is the approval of a Project Environmental Monitoring Programme (PEMP) the purpose of which is to provide the over-arching framework by which Beatrice Offshore Windfarm Limited (BOWL) will monitor the environmental effects of the Development throughout its lifetime.

1.1.3 The relevant conditions setting out the requirement for a PEMP for approval, and which are discharged by issue and approval of this PEMP, are set out in full in Table 1.1. Revision 1.0 of the PEMP was approved by Scottish Ministers on 02nd August 2016. This approval confirmed that the implementation of the PEMP Rev 1.0 satisfied the requirements of Section 36 Consent Condition 27 and the Marine Licence (Offshore Transmission Works) Condition 3.2.1.1, and therefore the above Section 36 and Marine Licence condition were discharged in respect of the pre-construction elements relating to a number of receptors. Revision 2.0 of the PEMP, this document, provides an update following completion of the pre-construction monitoring programme in support of the discharge of all pre-construction requirements of relevant consent conditions and effectively supersedes Revision 1.0 of the PEMP.

1.1.4 This document satisfies the requirements of the relevant S36 Consent and OfTW Marine Licence conditions by setting out BOWL's approach to environmental monitoring.

1.1.5 This PEMP summarises the programme of environmental monitoring that BOWL intends to undertake or has already undertaken and provides cross-references, where relevant, to detailed method statements and any monitoring reports completed to date. Note that these method statements have been subject to prior, separate consultation and approval by relevant statutory bodies and stakeholders, including discussion and agreement at the Moray Firth Regional Advisory Group (MFRAG), and the MFRAG marine mammal and ornithology subgroups where appropriate.

Table 1.1: Consent conditions to be discharged by this PEMP.

Con ent Document	Condition Reference	Condition Text	Reference to relevant Section of this PEMP
S36 Consent	Condition 27	The Company must, no later than 6 months prior to the Commencement of the Development, submit a Project Environmental Monitoring Programme ("PEMP"), in writing, to the Scottish Ministers for their written approval.	This document sets out the PEMP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Scottish Ministers with the JNCC, SNH, RSPB Scotland, WDC, ASFB and any other ecological advisor as required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers
		The PEMP must be in accordance with the ES as it relates to environmental monitoring.	Appendix A
		The PEMP must set out measures by which the Company must monitor the environmental impacts of the Development. Monitoring is required throughout the lifespan of the Development where this is deemed necessary by the Scottish Ministers. Lifespan in this context includes pre-construction, construction, operational and decommissioning phases.	Sections 7 to 14
		Monitoring should be done in such a way as to ensure that the data which is collected allows useful and valid comparisons between different phases of the Development.	Section 6 to 14
		Monitoring may also serve the purpose of verifying key predictions in the ES.	Section 6 to 14
		Additional monitoring may be required in the event that further potential adverse environmental effects are identified for which no predictions were made in the ES. The Scottish Ministers may agree that monitoring may cease before the end of the lifespan of the Development.	Section 6 to 14

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this PEMP
		The PEMP must cover, but not be limited to the following matters: a. Pre-construction, construction (if considered appropriate by the Scottish Ministers) and post-construction monitoring surveys as relevant in terms of the ES and any subsequent surveys for 1. Birds; 2. Cod; 3. Herring; 4. Sandeels; 5. Diadromous fish; 6. Benthic communities; and 7. Seabed scour and local sediment deposition b. The participation by the Company in surveys to be carried out in relation to marine mammals as set out in the MMMP; and c. The participation by the Company in surveys to be carried out in relation to regional and strategic bird monitoring;	Section 6 to 14
		All the initial methodologies for the above monitoring must be approved, in writing, by the Scottish Ministers and, where appropriate, in consultation with the MFRAG referred to in condition 28 of this consent.	Section 6 to 14
		Any pre-consent surveys carried out by the Company to address any of the above species may be used in part to discharge this condition.	Section 6 to 14
		The PEMP is a live document and must be regularly reviewed by the Scottish Ministers, at timescales to be determined by the Scottish Ministers, in consultation with the MFRAG to identify the appropriateness of on-going monitoring. Following such reviews, the Scottish Ministers may, in consultation with the MFRAG, require the Company to amend the PEMP and submit such an amended PEMP, in writing, to the Scottish Ministers, for their written approval. Such approval may only be granted following consultation with MFRAG and any other ecological, or such other advisors as may be required at the discretion of the Scottish Ministers. The PEMP, as amended from time to time, must be fully implemented by the Company at all times.	Section 3

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this PEMP
		The Company must submit written reports of such monitoring surveys to the Scottish Ministers at timescales to be determined by the Scottish Ministers in consultation with the MFRAG. Subject to any legal restrictions regarding the treatment of the information, the results are to be made publicly available by the Scottish Ministers, or by such other party appointed at their discretion.	Sections 7 to 14
		Reason: To ensure that appropriate and effective monitoring of the impacts of the Development is undertaken.	N/A
OfTW Marine Licence	3.2.1.1	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a PEMP, in writing, to the Licensing Authority for their written approval.	This document sets out the PEMP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Licensing Authority with the Joint Nature Conservation Committee ("JNCC"), Scottish Natural Heritage ("SNH"), Whale and Dolphin Conservation ("WDC"), the Association of Salmon Fishery Boards ("ASFB") and any other ecological advisors as required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers
		The PEMP must be in accordance with the Application as it relates to environmental monitoring.	Appendix A
		The PEMP must set out measures by which the Licensee must monitor the environmental impacts of the Works. Monitoring is required throughout the lifespan of the Works where this is deemed necessary by the Licensing Authority and specifically, monitoring for cable exposure as specified in condition 3.2.2.10 parts e and f. Lifespan in this context includes pre-construction, construction, operational and decommissioning phases.	Sections 7 to 14
		Monitoring should be done in such a way as to ensure that the data which is collected allows useful and valid comparisons as between different phases of the Works.	Section 6 to 14
		Monitoring may also serve the purpose of verifying key predictions in the Application.	Section 6 to 14

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this PEMP
		Additional monitoring may be required in the event that further potential adverse environmental effects are identified for which no predictions were made in the Application. The Licensing Authority may agree that monitoring may cease before the end of the lifespan of the Works.	Section 6 to 14
		The PEMP must cover, but not be limited to the following matters: a) Pre-construction, construction (if considered appropriate by the Licensing Authority) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for: 1. Diadromous fish; 2. Benthic communities; and 3. Seabed scour and local sediment deposition. b) The participation by the Licensee in surveys to be carried out in relation to marine mammals as set out in the Marine Mammal Monitoring Programme.	Section 11 to 14
		All the initial methodologies for the above monitoring must be approved, in writing, by the Licensing Authority and, where appropriate, in consultation with the Moray Firth Regional Advisory Group ("MFRAG"), referred to in conditions 3.2.2.18 and 3.2.3.10 of this licence.	Section 11 to 14
		Any pre-consent surveys carried out by Licensee to address any of the above species may be used in part to discharge this condition.	Section 6 to 14
		The PEMP is a live document and must be regularly reviewed by the Licensing Authority, at timescales to be determined by the Licensing Authority, in consultation with the MFRAG to identify the appropriateness of on-going monitoring. Following such reviews, the Licensing Authority may, in consultation with the MFRAG, require the Licensee to amend the PEMP and submit such an amended PEMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation with MFRAG and any other ecological, or such other advisors as may be required at the discretion of the Licensing Authority. The PEMP, as amended from time to time, must be fully implemented by the Licensee at all times.	Section 3

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this PEMP
		The Licensee must submit written reports of such monitoring surveys to the Licensing Authority at timescales to be determined by the Licensing Authority in consultation with the MFRAG. Subject to any legal restrictions regarding the treatment of the information, the results are to be made publicly available by the Licensing Authority, or by such other party appointed at their discretion.	Sections 7 to 14

1.1.6 In addition to the specific consent requirements for a PEMP and the requirements thereof (as set out in Table 1.1), this PEMP also includes information in respect of a number of other conditions within the Project consents which are linked to the matter of environmental monitoring; these are set out in Table 1.2 and references to where matters are addressed in this PEMP are given.

Table 1.2. Other consent conditions relevant to this PEMP.

Ref.	Summary of Condition	Where Addressed
S36 Condition 12 / OfTW Marine Licence 3.2.2.5	**The Piling Strategy (PS) must include the following:** c) Details of mitigation and monitoring to be employed during pile-driving, as agreed by the Scottish Ministers.	Section 8,9, 11 and 14
S36 Condition 19 / OfTW Marine Licence 3.2.2.10	**The Cable Plan (CaP) must include the following:** b) The results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing;	Section 12
S36 Consent Condition 28 / OfTW Marine Licence Conditions 3.2.2.18 and 3.2.3.10	**Participation in Moray Firth Regional Advisory Group** The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") established by the Scottish Ministers for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for, but not limited to, ornithology, diadromous fish, marine mammals and commercial fish. Should a SSMEG be established (refer to condition 29), the responsibilities and obligations being delivered by the MFRAG will be subsumed by the SSMEG at a timescale to be determined by the Scottish Ministers.	Sections 7 to 14
S36 Consent Condition 29 / OfTW Marine Licence Conditions 3.2.2.19 and 3.2.3.11	**Participation in Scottish Strategic Marine Environment Group** The Company must participate in any Scottish Marine Environmental Group ("SSMEG") established by the Scottish Ministers for the purposes of advising the Scottish Ministers on research, monitoring and mitigation programmes for, but not limited to, ornithology, diadromous fish, marine mammals and commercial fish.	Section 2

Ref.	Summary of Condition	Where Addressed
S36 Con ent Condition 31 / OfTW Marine Licence Condition 3.2.1.3	**Participation in Scottish Atlantic Salmon, Sea Trout and European Eel Monitoring Strategy** The Company must, to the satisfaction of the Scottish Ministers, participate in the monitoring requirements as laid out in the 'Scottish Atlantic Salmon, Sea Trout and European Eel Monitoring Strategy' so far as they apply at a local level (the Moray Firth). The extent and nature of the Company's participation is to be agreed by the Scottish Ministers in consultation with the MFRAG.	Section 11
S36 Consent Condition 34	**Herring Surveys** In the event that pile foundations are to be used, the Company must undertake herring surveys every year during the months of August and September commencing the first August and September following the date of this consent, up until, and including, the last August and September prior to Commencement of the Development, unless otherwise agreed in writing by the Scottish Ministers. The methodology of the herring surveys must be agreed, in writing, by the Scottish Ministers, following consultation with Marine Scotland Science, prior to the surveys commencing. The results of the herring surveys will be used to better inform the knowledge of spawning behaviour / characteristics of the Orkney / Shetland herring stock, thus allowing the Company to devise mitigation options to minimise noise impacts from piling activity on all life stages of herring and to inform the Company's PS (if a PS is required).	Section 9
	Following the results of the herring surveys undertaken in the last August and September prior to the Commencement of the Development, the Company must submit, in writing, its mitigation strategy to minimise the noise impacts on herring from piling activity, to the Scottish Ministers for their written approval.	Section 9
S36 Consent Condition 35	**Cod Surveys** Any baseline cod survey undertaken between February and March in any given year prior to Commencement of the Development will remain valid as a pre-construction baseline cod survey provided the Commencement of the Development occurs no later than 5 years from completion of said baseline cod survey. A full survey report and data set must be submitted, in writing, to the Scottish Ministers within 3 months following completion of the baseline cod survey for approval, in writing, by the Scottish Ministers.	Section 8

Ref.	Summary of Condition	Where Addressed
	If Commencement of the Development occur later than 5 years after the initial baseline cod survey was carried out, the Company must undertake a further baseline cod survey between the months of February and March prior to the Commencement of the Development, in a survey area to be agreed with the Scottish Ministers. A full survey report and data set must be submitted, in writing, to the Scottish Ministers within 3 months following completion of any further baseline cod survey for approval, in writing, by the Scottish Ministers. Surveys must be carried out, as agreed by the Scottish Ministers, unless prior written approval is sought and obtained from the Scottish Ministers.	Section 8
	The Company must undertake a post-construction cod survey in the first February and March, occurring no earlier than 12 months, following the Final Commissioning of the Development. This cod survey must be undertaken in an area, to be agreed with the Scottish Ministers, unless prior written approval is sought and obtained from the Scottish Ministers. A full survey report and data set must be submitted, in writing, to the Scottish Ministers within 3 months following completion of any post-construction cod survey for approval, in writing, by the Scottish Ministers.	Section 8
S36 Consent Condition 36	**Sandeel Surveys** Any baseline sandeel survey undertaken between February and March in any given year prior to Commencement of the Development will remain valid as a pre-construction baseline sandeel survey provided the Commencement of the Development occurs no later than 5 years from completion of said baseline sandeel survey. A full survey report and data set must be submitted, in writing, to the Scottish Ministers within 3 months following completion of the baseline sandeel survey for approval, in writing, by the Scottish Ministers.	Section 10
	If Commencement of the Development occurs later than 5 years after the initial baseline sandeel survey was carried out, the Company must undertake a further baseline sandeel survey between the months of February and March prior to the Commencement of the Development, in a survey area to be agreed with the Scottish Ministers. A full survey report and data set must be submitted, in writing, to the Scottish Ministers within 3 months following completion of any further baseline sandeel survey for approval, in writing, by the Scottish Ministers. Surveys must be carried out, as agreed by the Scottish Ministers, unless prior written approval is sought and obtained from the Scottish Ministers.	Section 10

Ref.	Summary of Condition	Where Addressed
	The Company mu t undertake a po t con truction andeel survey in the first February and March, occurring no earlier than 12 months, following the Final Commissioning of the Development. This sandeel survey must be undertaken in an area, to be agreed with the Scottish Ministers, unless prior written approval is sought and obtained from the Scottish Ministers. A full survey report and data set must be submitted, in writing, to the Scottish Ministers within 3 months following completion of any post-construction sandeel survey for approval, in writing, by the Scottish Ministers.	Section 10

1.2 Linkages with Other Consent Plans

1.2.1 This PEMP document sets out the proposed framework for the monitoring of each topic identified in the S36 Consent and OfTW Marine Licence PEMP Conditions. However, ultimately it forms part of a suite of approved documents that may shape and/or be informed by the BOWL environmental monitoring programme – namely the other consent plans required under the S36 Consent and Marine Licences.

1.2.2 Conditions of the S36 Consent and OfTW Marine Licence require several Consent Plans to be, so far as is reasonably practicable, informed by and/or consistent with the PEMP.

1.2.3 Consent Plans that are informed by the PEMP are as follows:

- The Environmental Management Plan (EMP) (LF000005-PLN-144) (required under Condition 15 of the S36 Consent and Condition 3.2.1.2 of the OfTW Marine Licence); and
- The Wind Farm Cable Plan (CaP) (LF000005-PLN-183) (required under Condition 19 of the S36 Consent and Condition 3.2.2.10 of the OfTW Marine Licence).

1.2.4 Consent Plans that are required to be consistent with the PEMP are as follows:

- The Vessel Management Plan (VMP) (LF000005-PLN-168) (required under Condition 16 of the S36 Consent and Condition 3.2.2.8 of the OfTW Marine Licence);
- The Piling Strategy (PS) (LF000005-PLN-142) (required under Condition 12 of the S36 Consent and Condition 3.2.2.5 of the OfTW Marine Licence); and
- The Operation and Maintenance Programme (OMP) (required under Condition 17 of the S36 Consent and Condition 3.2.3.2 of the OfTW Marine Licence).

1.2.5 The linkages between the PEMP and those Consent Plans listed above are summarised in Table 1.3.

1.2.6 Note that other relevant Consent Plans are cross-referenced as appropriate in this PEMP but the detail from those other plans is not repeated here.

Table 1.3. Linkages between the PEMP and other Consent Plans.

Other named Consent Plan	Consistency with and linkage to PEMP
EMP	The approved EMP sets out the environmental management framework for the construction and operation of the Development. The EMP must be informed by the baseline surveys undertaken as part of the PEMP.
VMP	The purpose of the approved VMP is to mitigate disturbance or impact to marine mammals and birds throughout the construction period of the Development. The VMP also considers operational management and coordination of vessels. The VMP details how vessel movements will be managed during construction of the Development. The VMP is consistent with the PEMP.
PS	The approved PS contains information on how the piling methods and programme have been developed to reduce effects on noise sensitive species. It provides a detailed description of the piling procedures and associated mitigation and monitoring. The environmental monitoring for marine mammals, cod and herring summarised in the PS is captured within the PEMP (see Section 8, 9 and 14). This PEMP is, as far as reasonably practicable, consistent with the PS.
Wind Farm CaP and OfTW CaP	The approved Wind Farm CaP and OfTW CaP provides the more detailed specification of the cables, their installation, burial and/or protection, their interactions with the environment and safety considerations for the inter-array cables and export cables respectively. The CaP includes the results of survey work, including benthic survey, which will help inform cable routing. The benthic survey work used to inform the CaP is captured within this PEMP (see Section 12).
OMP	The OMP will set out an intended programme of operation and maintenance activities associated with the Development. When the OMP is prepared, it must, so far as reasonably practicable, be consistent with the PEMP.
Decommissioning Programme (DP) (LF000005-PLN-146)	The approved DP sets out BOWL's intended approach to the decommissioning of the Development. BOWL will need to undertake site restoration in accordance with the DP and the PEMP.

1.2.7 A number of other Consent Plans also include commitments to provide particular information in the PEMP. Table 1.4 below details these commitments.

Table 1.4. Commitments made in other approved Consent Plans relevant to this PEMP.

Consent Plan	Section	Detail of Commitment
Navigational Safety Plan (NSP) (LF000005-PLN-128)	12 and 13	Surveys of the seabed required by the S36 Consent and Marine Licence conditions following construction will be set out in the PEMP.

Consent Plan	Section	Detail of Commitment
Piling Strategy	14.3	Monitoring of underwater noise resulting from piling activities is being undertaken to address the question of whether received noise levels correspond to those predicted in the acoustic model that underpin the ES a e ment and the Piling Mitigation Protocol.
Piling Strategy	14 3	Detail regarding mitigation and monitoring of harbour porpoi e response to Acoustic Deterrent Devices (ADDs) and soft-start pile driving have been agreed in the MFRAG-Marine Mammal (MM) subgroup and approved by MS-LOT.
Piling Strategy	11.3	Details regarding monitoring of diadromous fish are provided for approval in this PEMP.
Piling Strategy	9.3	Details in relation to pre-construction herring larval surveys are provided in this PEMP.
Piling Strategy	8.3	Details in relation to post-construction cod surveys are provided in this PEMP.

1.3 PEMP Document Structure

1.3.1 In response to the specific requirements of the S36 Consent and the OfTW Marine Licence, this PEMP has been structured so as to be clear that each part of the specific requirements have been met and that the relevant information to allow the Scottish Ministers to approve the PEMP has been provided. The document structure is set out in Table 1.5.

Table 1.5. PEMP document structure.

Section	Title	Overview
1	Introduction	Background to consent requirements and overview of the PEMP scope and structure; and Identifies those other Consent Plans relevant to the environmental monitoring process and details the relationship between the PEMP and those plans.
2	BOWL Statements of Compliance	Sets out the BOWL statements of compliance in relation to the PEMP Consent Conditions.
3	Updates and amendments to this PEMP	Sets out the procedures for any required updating to or amending of the approved PEMP and subsequent further approval by the Scottish Ministers.
4	Development Overview	Provides an overview of the Development and key programme milestones.
5	PEMP Roles and Responsibilities	Provides information on the roles and responsibilities of BOWL and other parties in the implementation and delivery of the PEMP.
6	BOWL Environmental	Sets out BOWLs approach to developing monitoring strategies for each of the topics identified in the S36

Section	Title	Overview
	Monitoring Programme	Consent and OfTW Marine Licence.
7	Birds	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of birds.
8	Cod	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of cod.
9	Herring	Summarises the monitoring strategy and results in respect of herring.
10	Sandeels	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of sandeel.
11	Diadromous Fish	Summarises the monitoring strategy and results in respect of migratory fish species.
12	Benthic Communities	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of benthic communities.
13	Seabed Scour and Local Sediment Deposition	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of seabed scour and local sediment deposition.
14	Marine Mammals	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of marine mammals.
15	Programme of Survey Works	Summarises the monitoring programme for all environmental topics.
16	Licences and Legal Requirements	Sets out the licences that must be sought and legal requirements associated with delivering the PEMP.
17	Compliance with the Application, ES and SEIS	Demonstrates that the programme of monitoring set out in this PEMP is consistent with that proposed in the ES and SEIS.

2 BOWL Statements of Compliance

2.1 Introduction

2.1.1 This section is intended to re-affirm the BOWL commitment to ensuring that the Development is monitored in such a manner as to meet the relevant requirements set out by the project consents but also broader legislative requirements.

2.2 Statements of Compliance

2.2.1 BOWL in instructing environmental monitoring will require compliance with this PEMP as approved by the Scottish Ministers (and as updated or amended from time to time following the procedure set out in Section 3 of this PEMP).

2.2.2 Where updates or amendments are required to this PEMP, BOWL will require the Scottish Ministers are informed as soon as reasonably practicable and where necessary the PEMP will be updated or amended (see Section 3 below).

2.2.3 BOWL in undertaking the environmental monitoring of the project will require compliance with other, relevant Consent Plans as approved by the Scottish Ministers including, as set out in Section 1.3 above.

2.2.4 BOWL in undertaking environmental monitoring will require compliance with the environmental monitoring commitments set out in the original Application and the Environmental Statement (ES) and Supplementary Environmental Information Statement (SEIS) and referred to in Annex 1 of the S36 Consent except in so far as amended by the terms of the S36 Consents (unless otherwise approved by the Scottish Ministers) (see Section 17 and Appendix A).

2.2.5 BOWL will require compliance with the overarching BOWL Company Safety, Health and Environment (SHE) systems and standards, the SHE legislation and such other relevant legislation and guidance designed to ensure the safety of all personnel and other third parties.

2.2.6 BOWL will, in instructing monitoring, require compliance with all other relevant legislation and require that all necessary licences and permissions are obtained by BOWL or, where relevant, by contractors through condition of contract

2.2.7 BOWL have committed to participating in MFRAG, including any relevant subgroups, and SSMEG. A SSMEG has not currently been established.

3 Updates and Amendments to this PEMP

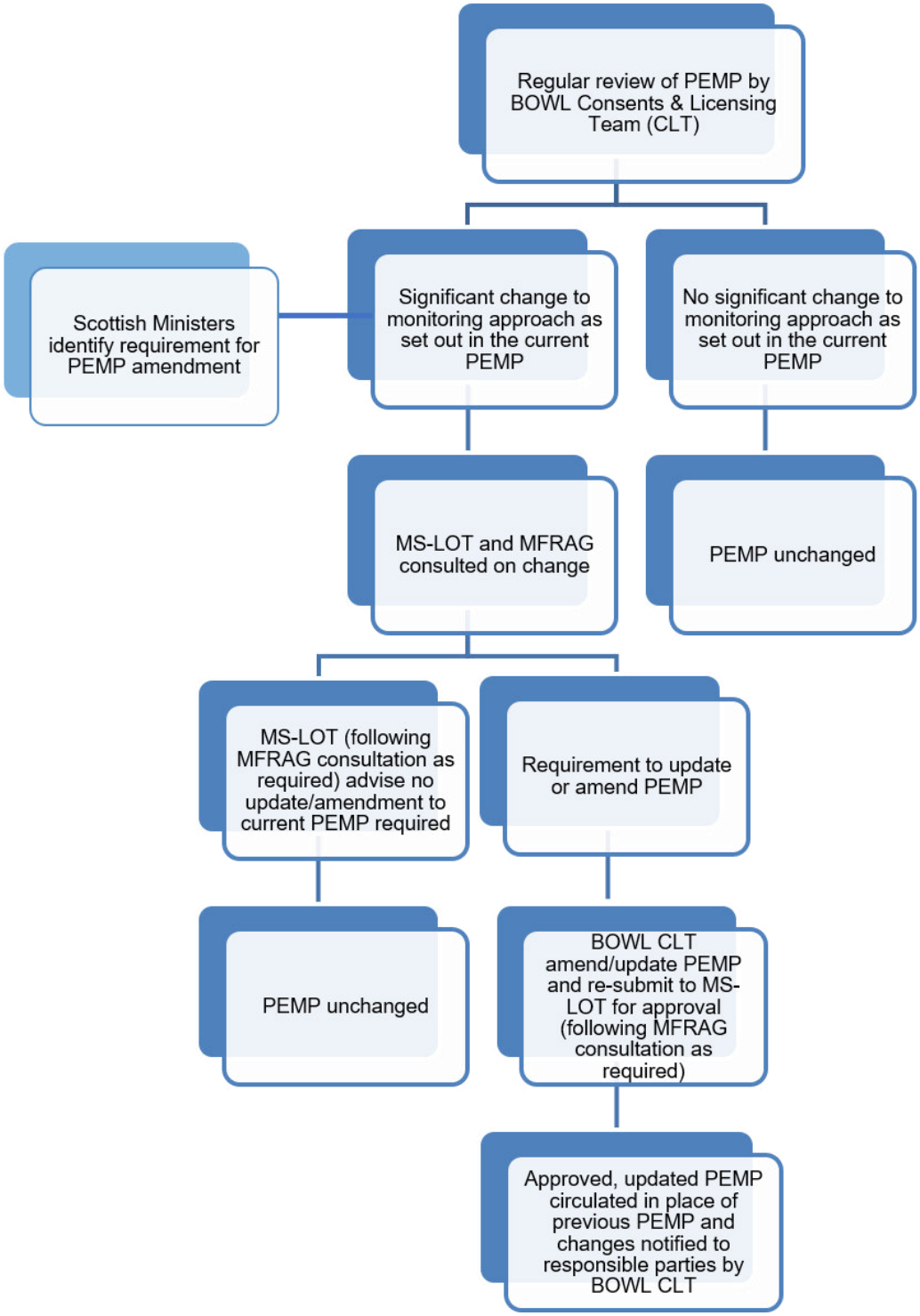
3.1.1 This PEMP sets out the environmental monitoring of the Development planned by BOWL.

3.1.2 S36 Consent condition 27 recognises that updates or amendments to this PEMP may be required, stating that:

> *The PEMP is a live document and must be regularly reviewed by the Scottish Ministers, at timescales to be determined by the Scottish Ministers, in consultation with the MFRAG to identify the appropriateness of on-going monitoring. Following such reviews, the Scottish Ministers may, in consultation with the MFRAG, require the Company to amend the PEMP and submit such an amended PEMP, in writing, to the Scottish Ministers, for their written approval. Such approval may only be granted following consultation with MFRAG and any other ecological, or such other advisors as may be required at the discretion of the Scottish Ministers. The PEMP, as amended from time to time, must be fully implemented by the Company at all times.*

3.1.3 Where it is necessary to update this PEMP in light of significant new information, or upon notification by the Scottish Ministers, BOWL propose to use the change management process set out in Figure 3.1 to identify such information, communicate changes to the Scottish Ministers, update the PEMP, seek further approval of amendments or updates (in consultation with MFRAG or such other advisors as may be required by the Scottish Ministers), and disseminate the updated version of the PEMP.

Figure 3.1. PEMP change management procedure.



4 Development Overview

4.1 Introduction

4.1.1 This section of this PEMP provides a brief summary overview of the Development and the key construction milestone dates.

4.2 Development Overview

4.2.1 Figure 4.1 shows the location of the Development in the Moray Firth. The Development will consist of the following main components:

- A total generating capacity of not less than 588MW;
- Up to 84 wind turbines of 7MW rated generating capacity;
- Jacket substructures each installed on four pile foundations driven into the seabed;
- Two AC 220 / 22kV substation platforms, referred to as Offshore Transformer Modules (OTMs) to collect the generated electricity and transform the electricity from 33kV to 220kV for transmission to shore;
- A network of circa 140km of inter-array, buried or (if burying is not possible) mechanically protected, subsea cables to connect strings of turbines together and to connect the turbines to the OTMs;
- Two buried or mechanically protected, subsea Export Cables, totalling circa 140km in length, to transmit the electricity from the two OTMs to the landfall at Portgordon and connect to the two onshore buried Export Cables for transmission at the transition joint pit. The onshore Export Cables further transmit the electricity to the BOWL onshore substation at Blackhillock. After which further 400 kV cabling connect the BOWL substation to the National Grid network via the neighbouring Scottish Hydro Electric Blackhillock substation.
- One OTM Interconnector Cable of circa 1.2km in length that links the OTMs to one another; and
- Minor ancillary works such as the deployment of met buoys and permanent navigational marks as defined in the Lighting and Marking Plan (LMP) (LF000005-PLN-136).

4.2.2 Further information on the layout of the OWF and OfTW will be provided in the respective DSLPs.

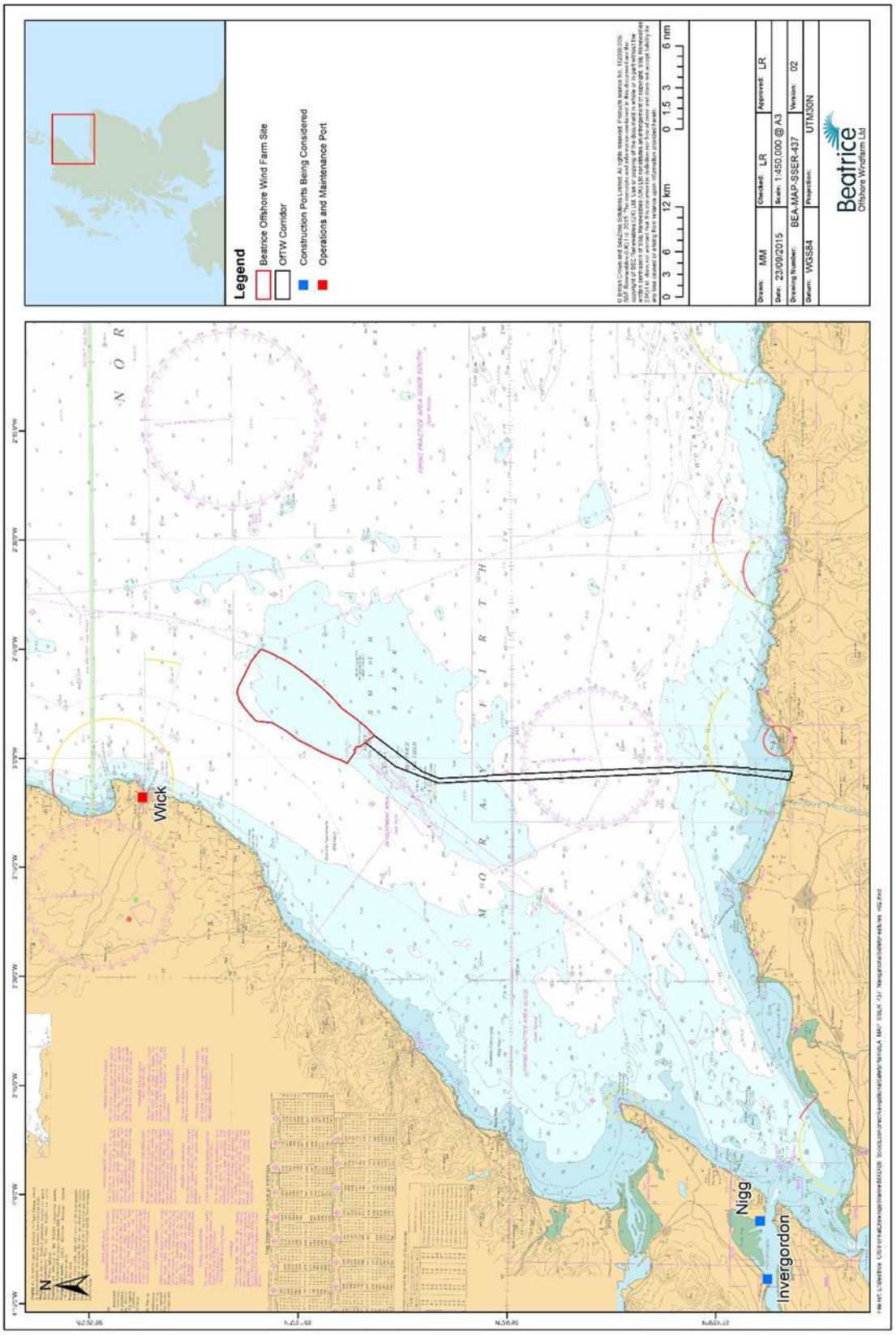


Figure 4.1. Beatrice Wind Farm and OfTW general location map

4.3 Development Programme Milestones

4.3.1 Details of the construction programme are provided in the approved Construction Programme (CoP) (required under Condition 10 of the S36 Consent and Condition 3.2.2.3 of the OfTW Marine Licence) (LF000005-PLN-138). It is currently anticipated that the offshore construction works will be carried out around the clock (i.e. 24 hour working 7 days a week unless noted otherwise).

5 PEMP Roles and Responsibilities

5.1 BOWL Consents and Licensing Team

5.1.1 The BOWL Consents and Licensing Team (CLT) will have overall responsibility for the following:

- Maintaining and updating the PEMP document, in consultation with and as required by the relevant authorities;
- Requiring that all environmental monitoring or specialist studies required under the PEMP are undertaken at the appropriate time;
- Reviewing the monitoring reports and submitting the reports to either MFRAG or the appropriate subgroup for consultation before submission to the Scottish Minsters; and
- Liaising with the relevant consultees, including the MFRAG, on matters related to this PEMP.

5.2 BOWL Ecological Clerk of Works

5.2.1 The Ecological Clerk of Works (ECoW) is responsible for monitoring compliance of the project with the consents and Consent Plans, and for reporting on compliance and environmental issues to BOWL and to MS-LOT. The ECoW provides advice to BOWL on compliance with consents conditions in liaison with MS-LOT, MFRAG, statutory bodies and stakeholders as required.

5.2.2 Reporting on the PEMP will be led by BOWL CLT rather than the ECoW, however ECoW Monthly Compliance reporting will contain a summary of PEMP related activities.

5.3 Ecological Survey Contractors

5.3.1 BOWL CLT have engaged specialist survey contractors to input to the design of the monitoring programme and undertake monitoring surveys, as required. Table 5.1 details the subcontractors currently involved in the delivery of the proposed monitoring for each receptor group.

Table 5.1. Specialist contractors who have been or are currently involved in the delivery of monitoring surveys.

Receptor	Specialist Contractor
Birds	MacArthur Green / HiDef Aerial Surveying.
Cod	Brown and May Marine Ltd.
Herring	Brown and May Marine Ltd.
Sandeels	Brown and May Marine Ltd.
Diadromous Fish	Glasgow University Scottish Centre for Ecology & the Natural Environment (SCENE).

Receptor	Specialist Contractor
Benthic Communities	RPS / APEM Ltd.
Seabed Scour and Local Sediment Deposition	RPS Strategy based on existing engineering surveys. No ecological surveys undertaken.
Marine Mammals	Aberdeen University, Lighthouse Research Station / RPS

5.4 Key Contractors and Subcontractors

5.4.1 Environmental monitoring will be undertaken throughout all phases of the Development. Whilst Key Contractors and Subcontractors undertaking construction of the Development, and contractors with Operation and Maintenance (O&M) responsibilities, will not be involved in undertaking environmental monitoring, conditions of their contracts will require that they facilitate BOWL's compliance with the PEMP.

6 BOWL Project Environmental Monitoring Programme

6.1 Introduction

6.1.1 This section of the PEMP summarises the approach to monitoring for each topic identified in the relevant S36 Consent and Marine Licence conditions.

6.1.2 This PEMP document is not intended to present the detail of the monitoring proposals, but rather to summarise the agreed approach to environmental monitoring. Where separate detailed monitoring strategy documents or technical survey reports are available, reference to these is made and a brief summary is provided. References to key documents are highlighted within this PEMP in blue text. BOWL documents are typically referenced by their BOWL document number (prefixed by 'LF000005-').

6.1.3 In line with the rationale for post-consent monitoring presented in the Marine Management Organisation's (MMO's) strategic review of offshore wind farm environmental monitoring (MMO, 2014), the monitoring proposals set out in this document aim to:

- Validate, or reduce uncertainty in predictions on environmental impacts recorded in supporting Environmental Impact Assessments (EIAs) and Habitats Regulations Assessments (HRAs);
- Provide evidence on the effectiveness of mitigation measures; and
- Allow identification of any unforeseen impacts.

6.1.4 The Development consents variously require BOWL to undertake and/or participate in strategic, regional and project-specific monitoring. Whilst the focus of the PEMP is on project-specific monitoring, under each topic heading in Sections 7 to 14, commitments to participate in regional and strategic monitoring are also captured where relevant.

6.1.5 Under each monitoring topic heading, the following structure is followed:

- Consent Conditions;
- Approach to Monitoring;
- Aims and Objectives;
- Methodology;
- Reporting; and
- Programme.

7 Birds

7.1 Introduction

7.1.1 This section of the PEMP summarises BOWL's approach to monitoring of seabirds in relation to the Development. BOWL has committed to undertake pre- and post-construction bird surveys to better understand seabird activity in the vicinity of the wind turbines and to validate assumptions made within the ES and SEIS.

7.2 Consent Conditions

7.2.1 Consent conditions relevant to bird monitoring are summarised in Table 7.1 below.

Table 7.1. BOWL Consent conditions requiring bird monitoring.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.1	The PEMP must cover, but not be limited to the following matters: a. Pre-construction, construction (if considered appropriate by the Scottish Ministers) and post-construction monitoring surveys as relevant in terms of the ES and any subsequent surveys for; 1. Birds;	**Pre-construction:** Discharge of pre-construction element of Condition 27.a.1 has been confirmed by MS-LOT (02/08/2016). LF000005-LET-630
		Construction: Agreed by MFRAG ornithology subgroup that construction monitoring is not required. MS-LOT have confirmed that the construction element of Condition 27.a.1 does not apply.
		Post-construction: The outline scope of post construction monitoring has been agreed with MFRAG (see LF000005-REP-800). The amount, duration and frequency of monitoring is still under discussion with MFRAG. BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.a.1 at the appropriate time.
Condition 27.c	c. The participation by the Company in surveys to be carried out in relation to regional and strategic bird monitoring;	Monitoring strategy developed in collaboration with the MFRAG ornithology subgroup to take into account regional considerations. Part discharge of Condition 27.c, in relation to regional monitoring, has been confirmed by MS-LOT (02/08/2016) LF000005-LET-630

Reference	Condition Summary	Discharge Status
Condition 28 Regional Monitoring	The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for ornithology.	Monitoring strategy developed in collaboration with the MFRAG ornithology subgroup to take into account regional considerations. BOWL will seek confirmation from MS-LOT on discharge of Condition 28 at the appropriate time.

7.3 Approach to Bird Monitoring

7.3.1 An ornithology subgroup has been set up as part of MFRAG, to discuss and agree appropriate bird monitoring for the BOWL and Moray Offshore Renewables Limited (MORL) wind farms. The following organisations are represented on the subgroup: BOWL, Moray Offshore Renewables Limited (MORL), Marine Scotland Science (MSS), Scottish Natural Heritage (SNH), Joint Nature Conservation Committee (JNCC) and Royal Society for the Protection of Birds (RSPB).

7.3.2 BOWL has appointed MacArthur Green (MG) to provide advice on bird monitoring options, engage in discussions with the MFRAG ornithology subgroup, develop monitoring scopes to obtain discharge of conditions and undertake analysis and reporting as necessary.

7.3.3 A summary of the MFRAG ornithology subgroup discussions is provided in Table 7.2. Meeting agendas and minutes referred to in Table 7.2 can be obtained on the Scottish Government website (once finalised) at: http://www.gov.scot/Topics/marine/Licensing/marine/scoping/mfrag/Ornithology

Table 7.2. MFRAG ornithology subgroup discussions and agreements on monitoring.

Date	Summary of key discussions and agreements	Reference
14/11/2014	Initial discussion to identify key seabird issues for BOWL (and MORL) and potential monitoring options.	Meeting agenda and minutes available on the Scottish Government website. These are listed by meeting date (as per column 1).
16/12/2014	Refinement of monitoring focus and determination of appropriate survey methods. Agreement that great black-backed gull, herring gull and puffin are the primary focus.	
02/03/2015	Further discussion on suitable monitoring methods for focal species, including, but not limited to, survey timing in relation to wind farm phases.	

Date	Summary of key discussions and agreements	Reference
30/03/2015	Discussion of proposed BOWL pre-construction breeding season aerial survey (design for and power analysis) and of planned SNH survey of the East Caithne Cliff SPA colonie	
03/07/2015	Sign-off of agreement on BOWL pre-construction aerial urvey de ign Note that agreement wa obtained via email from group members prior to this meeting (see Table 7.1), with that decision minuted at this meeting. Discussion on timing for post-construction monitoring. Agreement that the completion of the aerial surveys could be extended from 31st July to 7th August if necessary due to weather delays experienced during the survey period.	Meeting agenda and minute available on the Scottish Government website.
12/11/2015	Review and discussion of results from BOWL 2015 pre-construction breeding season aerial survey.	Meeting agenda and minutes available on the Scottish Government website.

7.3.4 Through discussions with the MFRAG ornithology subgroup it was agreed that the primary focus for monitoring should be the East Caithness Cliffs (ECC) Special Protection Area (SPA) breeding populations of:

- Great black-backed gull;
- Herring gull; and,
- Puffin.

7.3.5 These species were selected due to their status as the main focus of the Environmental Impact Assessment (EIA), Supplementary Environmental Impact Assessment and the Habitats Regulations Assessment (HRA) assessments. Secondary species, which were also considered during the assessment but for which impacts were determined to be of a lower significance were guillemot, razorbill, kittiwake and gannet and therefore no targeted monitoring of these species is proposed. However, opportunistic data on the abundance and distribution of the secondary species will be collected during monitoring targeted at the key species.

7.3.6 The scope of ornithology monitoring, including the principles and timing of the monitoring activities, has been discussed at each MFRAG ornithology subgroup meeting. At the MFRAG ornithology subgroup meeting on 12/11/2015 it was agreed that fully defined monitoring plans will no longer be discussed within a joint BOWL/MORL document (referring to the document Moray Firth Ornithology Monitoring Strategy: Outline Programme (LF000005-REP-800). This document will instead form the basis of projects PEMPs, to be developed separately by BOWL and MORL, which will be based on the principles set out in the document. A summary of

the monitoring scope presented in the Outline Programme is provided in Table 7.3.

7.3.7 Two monitoring survey programmes pertinent to this PEMP have been devised through discussion with the MFRAG ornithology subgroup:

- Digital aerial surveys of the Offshore Wind Farm (OWF) and the waters extending to the Caithness coast, conducted during the core seabird breeding season months (May to July). The scope of the aerial surveys is provided in the document Aerial Survey method for Pre-construction Surveys (LF000005-SOW-051); and,
- Deployment of GPS tags on adult great black-backed gulls and herring gulls breeding in the ECC SPA. The principles and timing of this monitoring are set out in the document Moray Firth Ornithology Monitoring Strategy: Outline Programme (LF000005-REP-800). The detailed scope of this tagging study will be discussed and agreed within the MFRAG ornithology subgroup.

7.3.8 An additional requirement to monitor the breeding populations and obtain demographic estimates (e.g. productivity rates) of the three named species at the ECC SPA has been discussed by the MFRAG ornithology subgroup. It should be noted that EU member states are obliged to monitor SPA populations. Therefore, while wind farm developers should be prepared to contribute to colony monitoring, SNH has an existing obligation to monitor the ECC SPA populations.

7.3.9 The proposed timescales for the above monitoring are presented in the document Moray Firth Ornithology Monitoring Strategy: Outline Programme (LF000005-REP-800), and summarised in Table 7.3.

7.4 Aims and Objectives of Monitoring

7.4.1 The objectives of seabird monitoring of the OWF are to improve understanding of seabird interactions with offshore wind turbines and validate assumptions made in the ES and SEIS. The key seabird concerns identified in the assessment for the OWF were collision risk for large gulls (great black-backed gull and herring gull) and displacement risk for auks (puffin, guillemot and razorbill).

7.4.2 Monitoring surveys aim to address three key questions:

- Is there connectivity between the ECC SPA and the OWF?
- If there is connectivity, are there detectable effects (i.e. collisions and displacement) occurring at the OWF?
- Are the impacts sufficiently large to have an effect on the populations of concern?

Digital Aerial Surveys

7.4.3 The primary aims of the digital aerial surveys are:

- To collect seabird distribution data during the breeding season to permit spatial modelling of seabird distributions and estimation of abundance both before and after construction and estimate the magnitude (if any) of displacement resulting from avoidance of the OWF (with a particular emphasis on puffin);
- Estimate the extent of connectivity between the OWF and the ECC SPA through analysis of flight directions; and
- Investigate the robustness of flight heights calculated from digital aerial data.

GPS Tagging Surveys

7.4.4 The primary aims of the GPS tagging surveys are to:

- Use foraging distribution data obtained through tag deployment to investigate the extent of connectivity between the OWF and the ECC SPA populations and potentially finer scale movements in relation to turbines;
- Obtain data on flight characteristics (e.g. height and speed if possible) and to permit discrimination of behaviour (e.g. flying, sat on sea surface, etc.). These data will be used to inform collision risk modelling methods with a view to improving methods for estimating collision risk; and
- Build on the previous tagging work conducted.

7.4.5 This study will be planned for a single breeding season, with the requirement for any necessary subsequent work to be discussed and agreed with MFRAG ornithology subgroup following review by BOWL and MFRAG of the results from year one.

7.5 Monitoring Survey Methodology

Digital Aerial Surveys

7.5.1 The scope of the aerial surveys is provided in the document Aerial Survey Method for Pre-construction Surveys (LF000005-SOW-051). The pre-construction baseline data, for subsequent comparison with data to be collected using the same methodology following construction of the OWF. The survey data, analysis methods and results are presented in the pre-construction Aerial Survey Report (LF000005-REP-690). This report has been accepted by the MFRAG ornithology subgroup, and the subgroup have confirmed that BOWL are not required to complete any further pre-construction aerial surveys (confirmation emails received from the subgroup members were provided to MS-LOT on 25th March 2016).

Gull GPS Tagging Study

7.5.2 A pilot tagging study of East Caithness Cliffs SPA great black-backed gulls and

herring gulls was conducted during the 2014 breeding season with the aim of investigating connectivity to the Wind Farm and habitat preferences (Bogdanova et al. 2015). This study found no evidence for connectivity to the Wind Farm, although this may have been a reflection of the tagging locations which were not adjacent to the Development due to concerns over safe working.

7.6 Reporting

7.6.1 BOWL will aim to submit survey reports to the MFRAG ornithology subgroup for consultation within 3 months of receipt of data from the survey contractors. Once the reports have been consulted on with the MFRAG ornithology subgroup, BOWL will issue the reports to MS-LOT on behalf of the Scottish Ministers in support of the discharge of conditions where appropriate.

7.6.2 To date the following key reports have been produced to inform the ornithology monitoring requirements:

- Moray Firth Ornithology Monitoring Strategy: Outline Programme (LF000005-REP-800) (also available in Table 7.3).
- Pre-construction Aerial Survey Report (LF000005-REP-690). The report and its conclusion have been approved by the MFRAG ornithology subgroup (see Section 7.5.1).
- Foraging behaviour of large gulls and implications for offshore wind site selection Work Package 2: Analysis of gull foraging behaviour and implications for offshore wind farm site selection (Bogdanova et al, 2015). This report details the results of the 2014 pilot tagging study of the ECC SPA great black-backed gulls and herring gull.

7.7 Programme

7.7.1 The programme for pre-construction monitoring has been discussed and agreed with the MFRAG ornithology subgroup (see Table 7.3). A programme of post-construction monitoring has been proposed (Table 7.3) and will be agreed following consultation with MFRAG.

Table 7.3. Seabird monitoring programme as agreed with the MFRAG ornithology subgroup.

Project Phase	Proposed Survey	Timings and Duration	Data acquired	Reason
Pre-construction	Aerial surveys	Breeding season (e.g. May - July) BOWL: confirmed as 1 year following the results from 2015 survey work MORL 1 year of pre construction survey with optional re-analysis of 1 year of existing APEM survey data (re-analysis to add in availability bias correction).	Sea bird distributions Flight heights and direction	Baseline bird data (distributions and flight heights) for comparison with later phases. Connectivity (inferred) and flight heights for comparison with baseline and post-construction.
Construction	Not required	Construction will commence on Beatrice in 2017 and may overlap with commencement of construction at MORL.	N/A	It has been agreed via MFRAG-O that surveys during construction are not a requirement. However, differences in construction timetables between wind farms mean that post-construction surveys for one area may overlap with construction activity in another.
Post-construction	Aerial Surveys	Both projects: Breeding season (e.g. May - July). The first post-construction survey will be conducted across the BOWL site following completion of the first phase of turbine installation, i.e. in 2019 Monitoring will follow an iterative programme which is still to be discussed and agreed via MFRAG-O, with a review of key questions and the ability to address them following the third year of surveys post-construction.	Post-construction seabird distributions. Flight heights, flight directions. Possibly flight speed if technology is available.	Displacement during operation (range of scales considered: exclusion from site and from vicinity of turbines). Connectivity (inferred) and flight heights for comparison inside and outside the wind farm. Small scale displacement due to construction disturbance if applicable.

Project Phase	Proposed Survey	Timings and Duration	Data acquired	Reason
	Gull tagging	Both project Breeding ea on BOWL: Selection of years (to be determined, but unlikely to be consecutive). First year expected to be following full BOWL installation (in 2020). Timing and requirement of later years to be agreed following review of year 1 tagging results and supplementary data (e.g. from aerial surveys). Requirement for later years dependent on results of preliminary survey. If results indicate that connectivity with BOWL is minimal or absent, there will be little value in continuing to tag from the sampled colonies. MORL: Dependent on the results of Year 1 tagging study in 2020 described above. If there is minimal or no connectivity with MORL there would be little value in continuing tag from the sampled colonies. MFRAG-O will review the requirement for follow-on gull tagging (after year 1) in light of the evidence obtained from previous surveys. The emphasis should be on the likelihood of connectivity to the SPA population and hence collision risk.	Gull location and movements Flight data; i.e. flight height and speed	Connectivity Collision parameters.

Project Phase	Proposed Survey	Timings and Duration	Data acquired	Reason
	ECC large gull and puffin colony monitoring: counts (inc. plot sampling), productivity estimation, ringing	Both project Breeding ea on MFRAG-O to review the requirements for colony monitoring for ECC large gulls based on the results from tagging work and aerial survey. If this indicates a very low likelihood of connectivity between the wind farms and the SPA then the requirement for colony monitoring can be removed. MFRAG-O to review the requirements for colony monitoring for ECC puffin based on results from the 2014 colony survey to indicate whether or not there are any suitable locations for such monitoring.	Population counts Demographic rates	Monitor and understand trends

8 Cod

8.1 Introduction

8.1.1 BOWL have committed to undertake pre- and post-construction cod surveys to better understand cod spawning activity in the vicinity of the Development.

8.2 Consent Conditions

8.2.1 Consent conditions relevant to cod monitoring are summarised in Table 8.1 below.

Table 8.1: BOWL Consent Conditions requiring the monitoring of cod.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.2 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for cod	**Pre-construction:** Discharge of pre-construction element of Condition 27.a.2 confirmed by MS-LOT (02/08/2016). LF000005-LET-630
		Construction: Confirmed (via approved Piling Strategy) that construction monitoring is not required should piling operations be avoided during February and March (02/11/2015). LF000005-LET-280
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.a.2 at the appropriate time.
Condition 35 Cod Monitoring	BOWL must conduct baseline cod surveys prior to Commencement of the Development and also undertake post-construction cod surveys in the first February and March occurring no earlier than 12 months following the Final Commissioning of the Development.	**Pre-construction:** Discharge of pre-construction element of Condition 35 confirmed by MS-LOT (19/02/2016). LF000005-LET-352
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 35 at the appropriate time.

8.3 Approach to Cod Monitoring

8.3.1 BOWL appointed Brown and May Marine Limited (BMM) to advise on the scope of,

and to undertake, the pre-construction cod monitoring survey.

8.3.2 The approach to the pre-construction cod monitoring was presented to MSS and MS-LOT and agreed with MSS, as summarised in Table 8.2. The pre-construction survey was completed in March 2014 (LF000005-REP-094).

Table 8.2. Summary of key consultation meetings and agreements for cod monitoring.

Date	Summary of discussion and agreements	Reference
06/02/2014	Proposal for the Undertaking of a Cod Spawning and Sandeel Survey for the Beatrice Offshore Windfarm Ltd developed.	Report LF000005-REP-060
15/02/2014	Confirmation by MS-LOT that survey methodology as proposed will meet pre-construction survey requirement.	Email from MS-LOT to BOWL
24/07/2014	2014 pre-construction cod survey report submitted to MS-LOT.	Email from BOWL to MS-LOT Report LF000005-REP-094
09/09/2014	MS-LOT comments on cod survey report seeking provision of further information on survey results analysis and on other fish species caught.	Email from MS-LOT to BOWL LF000005-LET-078
25/09/2014	BOWL response to MS-LOT confirming methodology and seeking meeting to discuss finalisation of report.	Email from BOWL to MS-LOT LF000005-LET-079
11/03/2015	BOWL issue of revised pre-construction cod survey report following MSS confirmation of the corrected method for calculating cod spawning intensity from the survey results.	Letter LF000005-LET-126 Report LF000005-REP-094
24/04/2015	MS-LOT acceptance of pre-construction survey report as meeting condition requirements.	Letter LF000005-LET-156
19/02/2016	MS-LOT confirm discharge of the pre-construction element of Condition 35.	Letter LF000005-LET-352
02/08/2016	MS-LOT confirm S36 condition 27.a.2. (cod) is discharged where it relates to pre-construction surveys.	Letter LF000005-LET-630

8.3.3 As required by S36 condition 35 BOWL will complete a post-construction cod survey in the first February and March, occurring no earlier than 12 months, following the Final Commissioning of the Development. Final Commissioning of the Development is expected to take place in September 2019 as set out in the Construction Programme (LF000005-PLN-010). As such it is anticipated that this survey will be

completed in the February or March of 2021. The post-construction surveys will be agreed with MS-LOT and MSS prior to undertaking any survey work.

8.4 Aims and Objectives of Monitoring

8.4.1 The aims and objectives of pre-construction, and post-construction surveys are to:

- Characterise cod spawning occurring within the zone of potential underwater noise impact; and
- Provide a pre-construction baseline against which post-construction monitoring can be compared.

8.5 Monitoring Survey Methodology

8.5.1 Methods employed for cod spawning surveys have been developed in consultation with MSS, following relevant published guidelines and MSS advice (Table 8.2).

8.5.2 A total of 40 stations across the Wind Farm were sampled using a commercial rock-hopper otter trawl. Full details of the survey methods employed during the pre-construction cod spawning surveys are outlined in BMM's Proposal for the Undertaking of a Cod Spawning and Sandeel Survey for the Beatrice Offshore Windfarm Ltd. (LF000005-REP-060).

8.5.3 The survey methodology to be employed for the post-construction survey will be the same as that utilised in the pre-construction survey to ensure that the data collected are consistent and comparable.

8.5.4 In the event that piling operations take place during the cod spawning period, any mitigation requirements will be determined under the remit of the PS. Currently the piling programme does not overlap with the cod spawning season (February/March) in the Moray Firth. However, the PS states that 'should piling during the cod spawning period be required due to unforeseen circumstance, BOWL will discuss with MSS the viability of potential mitigation options in seeking to reduce potential effects on spawning cod'. There may be an option for BOWL to carry out cod spawning surveys, the objective being to provide data on whether piling activity has any noise induced effects on cod spawning behaviour. This will be subject to further discussions with MS-LOT/ the Licensing Authority and in consultation with MSS.'

8.6 Reporting

8.6.1 BOWL will aim to issue all survey reports to MS-LOT within 3 months of survey completion.

8.6.2 A pre-construction survey was completed by BMM in 2014 and a report was submitted to MS-LOT. Following discussion of the analysis of the survey data with Marine Scotland Science an updated report was submitted to MS-LOT (see Table 8.2) (Cod Survey Results Technical Report – LF000005-REP-094). This report has been accepted by MSS and the pre-construction element of cod monitoring consent

condition 35 has been formally discharged by MS-LOT on behalf of the Scottish Ministers.

8.7 Programme

8.7.1 The intended programme of monitoring for cod is set out in Table 8.3.

Table 8.3. Summary of cod monitoring programme.

Development Phase		
Pre-Construction	**Construction**	**Post-Construction**
2014 spawning survey completed. Survey report accepted. Pre-construction monitoring complete.	None required if piling operations are avoided in February and March.	Post construction spawning survey currently anticipated to be undertaken in February and March 2021.

9 Herring

9.1 Introduction

9.1.1 BOWL have committed to undertake pre-and post-construction herring larval surveys to better understand herring spawning activity in the vicinity of the Development and validate assumptions made within the ES and SEIS.

9.2 Consent Conditions

9.2.1 Consent conditions relevant to herring monitoring are summarised in Table 9.1 below

Table 9.1. BOWL Consent Conditions requiring the monitoring of herring.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.3 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for; 3. herring	**Pre-construction:** Pre-construction surveys completed. Discharge of pre-construction element of Condition 27.a.3 confirmed by MS-LOT (02/08/2016). LF000005-LET-630
		Construction: MS-LOT have confirmed that no surveys are required during construction, based on the results of the pre-construction surveys (02/08/2016). LF000005-LET-630
		Post-construction: MS-LOT have confirmed that no post-construction surveys would be required following review of the pre-construction surveys and therefore the post-construction element of Condition 27.a.3 does not apply. LF000005-LET-630
		S36 Condition 27.a.3 has been fully discharged and therefore no further actions are required

Reference	Condition Summary	Discharge Status
Condition 34 Herring Monitoring	In the event that pile foundations are to be used, the Company must undertake herring surveys during the months of August and September. The survey methodology to be agreed, in writing, by the Scottish Ministers, following consultation with MSS. Survey results will be used devise mitigation options for piling noise impacts on herring.	**Pre- and post-construction:** Full discharge of Condition 34 confirmed by MS-LOT (24/03/2016). LF000005-LET-379

9.3 Approach to Herring Monitoring

9.3.1 BOWL have appointed BMM to advise on the scope of, and undertake, herring monitoring surveys.

9.3.2 The approach to herring monitoring was presented to and agreed by MSS as summarised in Table 9.2.

Table 9.2. Summary of key consultation meetings and agreements for herring monitoring.

Date	Summary of discussions and agreements	Reference
21/11/2013	Meeting (BOWL, MORL, MSS, MS-LOT) to discuss requirements for herring surveys.	Minutes of meeting LF000005-MOM-013
26/06/2014	Issue of draft herring larval survey methodology to MSS and MS-LOT.	Email from BOWL to MS-LOT LF000005-EMA-033
08/07/2014	Meeting to confirm proposed herring larval survey methodology, analysis and number of surveys.	Minutes of meeting LF000005-MOM-106
15/07/2014	BOWL Issue final herring larval survey methodology report to MS-LOT.	Report LF00005-REP-147
18/07/2014	MS-LOT confirmed the approval of survey design and methodology of herring larvae survey for August/September 2014.	Letter LF000005-LET-064
12/11/2014	Herring larval survey technical report (2014) completed and submitted to MSS.	Report LF000005-REP-345

Date	Summary of discussions and agreements	Reference
07/01/2015	Herring larval survey technical report (2014) accepted by MSS.	Letter LF000005-LET-113
19/01/2015	Meeting to present pre-construction herring survey results. Attended by MS-LOT, MSS, SNH, JNCC. MSS confirmed they approve with the survey methodology.	Minutes of meeting LF000005-MOM-230
02/11/2015	Approach to requirement for mitigation measures for herring set out in approved Piling Strategy	Consent Plan LF000005-PLN-142
25/02/2016	Herring larval survey technical report (2015) issued to MSS for acceptance	Report LF000005-REP-786
25/02/2016	Summary report of the 2014 and 2015 larval survey results issued to MSS for acceptance with justification for no piling noise mitigation requirement.	Report LF000005-REP-813
26/02/2016	MSS confirm acceptance of survey reports and agree that piling installation activities will not adversely affect spawning of the Orkney-Shetland herring stock.	Letter LF000005-LET-357
02/03/2016	Email from BOWL to MS-LOT requesting discharge of S36 condition 34.	Email LF000005-EMA-264
24/03/2016	MS-LOT confirm no requirement for piling mitigation or piling restriction, MS-LOT confirm S36 condition 34 is fully discharged.	Letter LF000005-LET-379
02/08/2016	MS-LOT confirm S36 condition 27.a.3. (herring) is fully discharged.	Letter LF000005-LET-630

9.4 Aims and Objectives of Monitoring

9.4.1 The aims and objectives of the pre-construction surveys are to:

- Characterise herring spawning occurring within the zone of potential underwater noise impact;
- To better inform the knowledge of spawning behaviour of the Orkney/ Shetland herring stock, to enable mitigation options to minimise noise impacts from piling activity on herring to be devised
- To inform the PS; and
- Provide a pre-construction baseline against which any post-construction monitoring can be compared, if required, in order to validate the predictions

made within the ES and SEIS.

9.4.2 Based on the results from the 2014 and 2015 herring spawning surveys BOWL does not propose to undertake during construction or post construction surveys.

9.5 Monitoring Survey Methodology

9.5.1 Methods employed for herring spawning surveys were developed in consultation with MSS, following relevant published guidelines and MSS advice (see table 9.2).

9.5.2 Pre-construction herring spawning surveys have been undertaken in August and September 2014, and 2015. Surveys were undertaken using a Gulf VII high speed plankton sampler tows at 25 locations in the outer Moray Firth, within the predicted 90dBht noise contour range. The survey duration was 8 weeks with tows undertaken at each station once each week, (weather permitting). Full details of the survey methods employed during the pre-construction herring spawning surveys are outlined in BOWLs Herring Larval Survey Methodology report (LF000005-REP-147).

9.5.3 The pre-construction survey methodology and a larval age back-calculation methodology was agreed with MSS (LF000005-REP-147).

9.6 Reporting

9.6.1 Two pre-construction surveys were completed in 2014 and 2015. Results of the 2014 pre-construction larval surveys are provided in the Herring Larval Survey Results – Technical Report (LF000005-REP-345). This report has been accepted by MSS. Results of the 2015 pre-construction larval surveys are provided in the Herring Larval Survey Results – Technical Report (LF000005-REP-786). This report has also been accepted by MSS (Table 9.2).

9.6.2 A summary of the results of both the 2015 and 2014 pre-construction herring larval surveys was been provided in the Pre-construction Baseline Herring Larval Survey Report (LF000005-REP-813). This report states that there is good agreement between the results of the 2014 and 2015 surveys, indicating that no significant herring spawning takes place within the survey area and, therefore, there is no requirement for piling noise mitigation for herring, as stated in the approved Piling Strategy (LF000005-PLN-142). This report has been accepted by MSS and approved by MS-LOT (Table 9.2).

9.7 Programme

9.7.1 The intended programme of monitoring for herring is set out in Table 9.3.

Table 9.3. Summary of herring monitoring programme.

Development Phase		
Pre-Construction	**Construction**	**Post-Construction**
2014 and 2015 larval urvey completed and reports submitted. Survey reports accepted by MSS and S36 condition 34 fully discharged by MS-LOT. Pre-construction monitoring complete.	Not required	Not required

10 Sandeels

10.1 Introduction

10.1.1 BOWL have committed to undertake pre- and post-construction sandeel surveys to better understand the distribution and abundance of sandeels in the vicinity of the Development and validate assumptions made within the ES and SEIS.

10.2 Consent Conditions

10.2.1 Consent conditions relevant to sandeels monitoring are summarised in Table 10.1 below.

Table 10.1. BOWL Consent Conditions requiring the monitoring of sandeels.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.4 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for sandeels.	**Pre-construction:** Discharge of pre-construction element of Condition 27.a.4 confirmed by MS-LOT (02/08/2016). LF000005-LET-630
		Construction: MS-LOT have confirmed that the construction element of Condition 27.a.4 does not apply (02/08/2017). LF000005-LET-630
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.a.4 at the appropriate time.
Condition 36 Sandeel Monitoring	BOWL must conduct baseline sandeel surveys prior to Commencement of the Development and also undertake post-construction sandeel surveys in the first February and March occurring no earlier than 12 months following the Final Commissioning of the Development	**Pre-construction:** Discharge of pre-construction element of Condition 36 confirmed by MS-LOT (19/02/2016). LF000005-LET-352
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.a.4 at the appropriate time.

10.3 Approach to Sandeel Monitoring

10.3.1 BOWL have appointed BMM to advise on the scope of, and undertake, sandeel

monitoring surveys.

10.3.2 The approach to sandeel monitoring was presented to MSS and MS-LOT and agreed with MSS, as summarised in Table 10.2.

Table 10.2. Summary of key consultation meetings and agreements for sandeel monitoring.

Date	Summary of key discussions and agreements	Reference
06/02/2014	Proposal for the Undertaking of a Cod Spawning and Sandeel Survey for the Beatrice Offshore Windfarm Ltd developed.	Report LF000005-REP-060
15/02/2014	Confirmation by MS-LOT that survey methodology as proposed will meet pre-construction survey requirement.	Email from M-LOT to BOWL LF000005-EMA-013
26/06/2014	Sandeel survey results technical report completed by BOWL and issued to MSS.	Report LF000005-REP-095
02/09/2014	Written acceptance of 2014 pre-construction sandeel survey reports by MSS and MS-LOT.	Letter LF000005-LET-078
25/09/2014	Written response to MS-LOT concerning points raised by MSS in response to report LF000005-LET-078.	Letter LF000005-LET-079
19/02/2016	MS-LOT confirm discharge of the pre-construction element of Condition 36.	Letter LF000005-LET-352
02/08/2016	MS-LOT confirm S36 condition 27.a.4. (sandeels) is discharged where it relates to pre-construction surveys.	Letter LF000005-LET-630

10.3.3 Post-construction, a single monitoring survey for sandeels will be undertaken in the first February and March occurring no earlier than 12 months following the final commissioning of the Development to characterise the abundance and distribution of sandeels within the defined survey area. Final Commissioning of the Development is expected to take place in September 2019 as set out in the Construction Programme (LF000005-PLN-010). As such it is anticipated that this survey will be completed in the February or March of 2021. The data will be used to validate the conclusions of the impact assessment as presented in the ES and be compared against the results of the pre-construction surveys.

10.3.4 No sandeel monitoring is planned during the construction phase.

10.3.5 The key focus of the post-construction monitoring programme will be on the recovery of sandeel habitats which have been affected by construction of the Wind Farm. Comparison with pre-construction monitoring data will give an indication on whether or not sandeels have recolonised areas directly or indirectly affected by construction operations and provide details on the rate of recovery.

10.4 Aims and Objectives of Monitoring

10.4.1 The aims and objectives of the pre-construction surveys are to:

- Establish the abundance and distribution of sandeels within the BOWL OWF site boundary; and
- Provide a pre-construction baseline against which post-construction monitoring can be compared in order to validate the predictions made within the ES and SEIS.

10.5 Monitoring Survey Methodology

10.5.1 Methods employed for sandeel surveys were developed in consultation with MSS, following relevant published guidelines and MSS advice (see Table 10.2).

10.5.2 A total of 103 stations were sampled over a 2.1 km square grid across the Wind Farm area using a towed dredge. Full details of the survey methods employed during the pre-construction sandeel surveys are outlined in BMM's Proposal for the Undertaking of a Cod Spawning and Sandeel Survey for the Beatrice Offshore Windfarm Ltd. report (LF000005-REP-060).

10.5.3 The survey methodology to be employed for post-construction surveys will be the same to that utilised in the pre-construction surveys to ensure that the data collected are consistent and comparable. A single post-construction sandeel monitoring survey will be undertaken between February and March, no earlier than 12 months following final commissioning of the Development.

10.6 Reporting

10.6.1 BOWL will aim to issue all survey reports to MS-LOT within 3 months of survey completion.

10.6.2 A pre-construction survey and monitoring report has been completed (LF000005-REP-095) and submitted to MS-LOT. This report has been accepted by MSS and the pre-construction element of the sandeel monitoring consent condition 36 has been formally discharged by MS-LOT (LF000005-LET-352) on behalf of the Scottish Ministers.

10.7 Programme

10.7.1 The intended programme of monitoring for sandeels is set out in Table 10.3.

Table 10.3. Summary of sandeel monitoring programme

Development Phase		
Pre-Construction	**Construction**	**Post-Construction**
2014 andeel urvey completed. Survey report accepted. Pre-construction monitoring complete.	Not required	Po t con truction andeel survey currently anticipated to be undertaken in February and March 2021.

11 Diadromous Fish

11.1 Introduction

11.1.1 BOWL committed to participate in the National Research and Monitoring Strategy for Diadromous Fish (NRMSD) through undertaking a pre-construction Atlantic salmon smolt tracking study. The completed study has provided information to support better understanding of natural migration pathways and behaviour of smolts in the Moray Firth..

11.2 Consent Conditions

11.2.1 Consent conditions relevant to diadromous monitoring are summarised in Table 11.1 below.

Table 11.1. BOWL Consent Conditions requiring monitoring of diadromous fish.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.5 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for diadromous fish.	**Pre-construction:** Pre-construction element of condition discharged by MS-LOT (29/01/2016). LF000005-LET-333
		Construction: MS-LOT have confirmed that the construction element of Condition 27.a.5 does not apply (02/08/2017). LF000005-LET-630
		Post-construction: MS-LOT have confirmed that the post-construction element of Condition 27.a.5 does not apply (02/08/2017). LF000005-LET-630.
Condition 28 Regional Monitoring	The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for diadromous fish.	MFRAG approval of pre-construction survey methodology confirmed (18/01/2016). LF000005-EMA-272

Reference	Condition Summary	Discharge Status
Condition 31 Regional Monitoring	The Company must, to the satisfaction of the Scottish Ministers, participate in the monitoring requirements as laid out in the 'Scottish Atlantic Salmon, Sea Trout and European Eel Monitoring Strategy' so far as they apply at a local level (the Moray Firth).	Condition fully discharged by MS-LOT (29/01/2016). LF000005-LET-333
OfTW Marine Licence		
Condition 3.2.1.1 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for diadromous fish	**Pre-construction:** Proposed pre-construction survey methodology approved. Pre-construction element of conditions discharged by MS-LOT (29/01/2016). LF000005-LET-333
		Construction: MS-LOT have confirmed that the construction element of Condition 3.2.1.1 does not apply (02/08/2017). LF000005-LET-630
		Post-construction: MS-LOT have confirmed that the post-construction element of Condition 3.2.1.1 does not apply (02/08/2017). LF000005-LET-630
Condition 3.2.1.3 Regional Monitoring	The Company must, to the satisfaction of the Scottish Ministers, participate in the monitoring requirements as laid out in the 'Scottish Atlantic Salmon, Sea Trout and European Eel Monitoring Strategy' so far as they apply at a local level (the Moray Firth).	Smolt tracking survey methodology approved. Condition discharged by MS-LOT (29/01/2016). LF000005-LET-333

Reference	Condition Summary	Discharge Status
Condition 3.2.2.18 Regional Monitoring	The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for, diadromous fish.	MFRAG acceptance of pre-construction survey methodology confirmed (18/01/2016). LF000005-EMA-272

11.3 Approach to Diadromous Fish Monitoring

11.3.1 BOWL appointed The University of Glasgow, Scottish Centre for Ecology and the Natural Environment (SCENE) to advise on the scope of and undertake an Atlantic salmon smolt tracking study.

11.3.2 The approach to the pre-construction study was developed in discussion with MFRAG and MSS as summarised in Table 11.2 below.

11.3.3 BOWL do not propose to undertake any post construction monitoring for diadromous fish.

Table 11.2. Summary of key consultation meetings and agreements for diadromous fish monitoring.

Date	Summary of key discussions and agreements	Reference
12/09/2014	Meeting with MSS, MS-LOT to discuss BOWL participation in Pentland Salmon Initiative to achieve required monitoring. This study was not taken forward.	Minutes of meeting LF000005-MOM-132
26/06/2015	BOWL issued a briefing note including proposed methodology for smolt tracking in the Cromarty Firth for discussion with MSS.	Briefing note LF00005-BRN-076
03/07/2014	Meeting with MSS at Battleby. MSS requested that BOWL enhance marine tracking element of proposed study.	Minutes of meeting LF000005-MOM-314
26/08/2015	BOWL issued a revised scope including a greater tracking element to MSS.	Report LF000005-REP-598
28/08/2015	Meeting with local District Salmon Fishery Boards (DSFBs) who provided support for the study proposal.	Minutes of meeting LF000005-MOM-343

Date	Summary of key discussions and agreements	Reference
23/09/2015	Letter issued to MSS requesting acceptance of proposed Cromarty Firth smolt tracking study methodology.	Letter LF000005-LET-235
07/10/2015	MSS letter confirming acceptance of Cromarty Firth smolt tracking study.	Letter LF000005-LET-250
02/11/2015	Cromarty Firth smolt tracking study methodology issued for acceptance by MFRAG.	Report LF000005-REP-671
18/01/2016	MFRAG accept the proposed methodology for smolt tracking survey.	Email LF000005-EMA-272
29/01/2016	MS-LOT letter confirming discharge of S36 condition 31 and OfTW Marine Licence condition 3.2.1.3 as set out in Table 11.1.	Letter LF000005-LET-333
23/02/2017	Meeting with local District Salmon Fishery Boards (DSFBs) to present the results of the Cromarty Firth smolt tracking study.	Minutes of Meeting LF000005-MIN-686
04/04/2017	BOWL issued the Cromarty smolt tracking final report to MS-LOT.	Report LF000005-REP-1854 Letter LF000005-LET-622

11.3.4 The study was designed to track the seawards migration of Atlantic salmon smolts through the Cromarty Firth and into the Moray Firth. The study was designed to align with the research requirements of National Research and Monitoring Strategy for Diadromous Fish (NRMSD).

11.3.5 The data collected during this monitoring programme has increased the understanding of the speed and pathway of migrating salmon smolts and their mortality during the early stages of migration. The study has provided information on the direction preferences displayed by smolts as they leave the Cromarty Firth and their behavioural responses to the tidal and residual flows during migration. These data, together with other studies on smolt migration, build upon the understanding of Atlantic salmon smolt behaviour in Scottish waters.

11.4 Aims and Objectives of Monitoring

11.4.1 The overall aim of the proposed monitoring programme was to increase the knowledge base of the behaviour of Atlantic salmon in the Moray Firth and to contribute to the National Strategy for Monitoring of Diadromous Fish.

11.5 Monitoring Survey Methodology

11.5.1 The smolt tracking study involved the capture and tagging of smolts as they

commenced their seawards migration from a tributary of the River Conon. The smolts' passage past acoustic receiver arrays in the Cromarty Firth was recorded. Marine Scotland Science deployed an additional array of acoustic receivers in the Moray Firth, which further added to the outcome of the study. Attempts were made to actively track a small number of smolts from a small boat, however the combination of background noise levels, tidal and wind conditions and fish behaviour prevented any meaningful data collection. Details of the survey methods employed during the pre-construction smolt tracking surveys were provided in the document Cromarty Firth Smolt Tracking Study (LF000005-REP-671) and approved by MFRAG on 18th Jan 2016.

11.6 Reporting

11.6.1 The final survey report entitled Atlantic Salmon, *Salmo salar,* smolt movements in the Cromarty and Moray Firths (LF000005-REP-1854) was completed in 2017. This study is the first to identify the migration direction and swimming depths of downstream migrating salmon in both estuarine and marine environments in Scotland. The results of the study suggest that salmon smolts initially migrate in an eastwards direction from the Cromarty Firth rather than in a more northerly direction close to the coast as hypothesised.

11.6.2 The report was accepted by MSS and was issued to MS-LOT on 4th April 2017 (LF000005-LET-622). The report demonstrated the full implementation of the agreed study methodology as required by MS-LOT in respect of the full discharge of S36 consent condition 31 and discharge of S36 condition 27a5, as relating to diadromous fish (LF000005-LET-333 and LF000005-LET-630).

11.7 Programme

11.7.1 The programme of monitoring for diadromous fish is set out in Table 11.3.

Table 11.3. Summary Programme of survey works for diadromous fish.

Development Stage		
Pre-construction	**Construction**	**Post-construction**
Pre-construction survey completed in spring 2016.	Not required	Not required.

12 Benthic Communities

12.1 Introduction

12.1.1 BOWL have committed to undertake pre- and post-construction benthic surveys to better understand the recovery rates of benthic communities in the vicinity of the Development to validate assumptions made within the ES and SEIS.

12.2 Consent Conditions

12.2.1 Consent conditions relevant to benthic monitoring are summarised in Table 12.1 below.

Table 12.1. BOWL Consent Conditions requiring monitoring of benthic communities.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.6 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for benthic communities	**Pre-construction:** Pre-construction element of condition discharged by MS-LOT (02/08/2016). LF000005-LET-630
		Construction: MS-LOT have confirmed that the construction element of Condition 27.a.6 does not apply (02/08/2017). LF000005-LET-630
		Post-construction: MS-LOT have confirmed that completion of the post-construction surveys as set out in the benthic post construction survey strategy report (LF000005-REP-341) will discharge the post-construction element of Condition 27.a.6 (02/08/2016). LF000005-LET-630 BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.a.6 at the appropriate time.

Reference	Condition Summary	Discharge Status
Condition 19 CaP	The Company must submit a Cable Plan that includes the results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing.	Pre-construction surveys of the Wind Farm were completed in 2016. Survey results were used to inform the OWF CaP which was approved by MS-LOT on the (18/11/2016). LF000005-EMA-344
OfTW Marine Licence		
Condition 3.2.1.1.a.2 PEMP	The PEMP must cover pre-construction, construction (if appropriate) and post-construction monitoring surveys for benthic communities	**Pre-construction:** Pre-construction element of condition discharged by MS-LOT (02/08/2016). LF000005-LET-630
		Construction: MS-LOT have confirmed that the construction element of Condition 3.2.1.1.a.2 does not apply (02/08/2016). LF000005-LET-630
		Post-construction: MS-LOT have confirmed that completion of the post-construction surveys as set out in the benthic post construction survey strategy report (LF000005-REP-341) will discharge the post-construction element of Condition 3.2.1.1.a.2 (02/08/2017). BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 3.2.1.1.a.2.at the appropriate time.
Condition 3.2.2.10.b CaP	The Licensee must submit a Cable Plan that includes the results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing.	Pre-construction surveys of OfTW were completed in 2015. Survey results were used to inform the OfTW CaP which was approved by MS-LOT on the 23/01/2017. LF000005-LET-601

12.3 Approach to Benthic Monitoring

12.3.1 BOWL appointed RPS to advise on the scope and methodology for benthic monitoring surveys. APEM were appointed to undertake the pre-construction monitoring surveys for the wind farm and OfTW.

12.3.2 BOWL completed pre-construction benthic surveys within the Wind Farm during June 2015 to establish baseline conditions for comparison against the results of post-construction surveys to validate predictions made regarding potential impacts on benthic habitats and their subsequent recovery.

12.3.3 A pre-construction survey of portions of the OfTW cable corridor was undertaken in June 2015 to confirm the presence and extent of potential Annex I habitats and to inform cable routing. No further benthic monitoring in the OfTW cable corridor is proposed due to the predicted limited impact and rapid rate of recovery as set out in report LF00005-REP-584, Pre-construction Annex 1 habitat survey of the OfTW.

12.3.4 The approach to benthic monitoring was presented to and discussed with MS-LOT, MSS, SNH and JNCC and confirmed in subsequent meetings and correspondence (Table 12.2).

12.2. Summary of key consultation meeting and agreements for benthic monitoring.

Date	Summary of key discussions and agreements	Reference
19/01/2015	Meeting to present and discuss the scope of pre-construction benthic surveys. Attended by MS-LOT, MSS, SNH and JNCC.	Minutes of meeting LF000005-MOM-230
09/04/2015	BOWL response to MSS post-meeting comments regarding benthic survey strategy following.	Letter LF000005-LET-128
11/05/2015	MFRAG meeting to discuss benthic post-construction monitoring and scope of monitoring.	Minutes of meeting LF000005-MOM-310
18/06/2015	BOWL confirmation to MSS and MS-LOT of OWF pre-construction benthic grab sample locations and OfTW DDV survey plan.	Email from BOWL to MSS and MS-LOT
11/12/2015	BOWL Pre-construction Annex 1 habitat survey report for the OfTW corridor completed.	Report LF000005-REP-584
14/12/2015	BOWL Pre-construction Benthic Report Wind Farm completed.	Report LF000005-REP-585
17/12/2015	BOWL issue pre-construction survey reports and benthic post-construction survey strategy report to MSS for acceptance.	Letter LF000005-LET-290 Report LF000005-REP-341
25/01/2016	MSS accept both Wind Farm and OfTW benthic survey reports. Query raised regarding the implications of the reported change in the dominant biotope across the OWF site for the post-construction monitoring strategy.	Email from MSS to BOWL LF000005-EMA-276

Date	Summary of key discussions and agreements	Reference
19/02/2016	BOWL response addressing MSS query concerning proposed post-construction monitoring strategy.	Letter LF000005-LET-338
21/03/2016	MSS confirm acceptance of the Wind Farm and OfTW survey reports and the proposed post-construction monitoring strategy	Email LF000005-EMA-273
02/08/2016	MS-LOT confirm acceptance of the PEMP and confirm discharge of the pre-construction elements of the S36 Condition 27 and OfTW Marine Licence condition 3.2.1.1.	Letter LF00005-LET-630
18/11/2016	MS-LOT confirm acceptance and approval of the Wind Farm CaP (LF000005-PLN-183).	Email LF000005-LET-601
18/11/2016	MS-LOT confirm acceptance and approval of the OfTW CaP (LF000005-PLN-214).	Email LF00005-EMA-344

12.4 Aims and Objectives of Monitoring

12.4.1 The aims and objectives of the proposed benthic monitoring surveys within the Development site are to:

- Characterise the benthic communities within the Wind Farm site and establish the pre-construction baseline against which post-construction monitoring can be compared in order to validate the predictions made within the ES and SEIS.
- Identify any Annex 1 cobble reefs present along the OfTW corridor and delineate their extent in order to inform the export cable routing options and to confirm if Annex 1 submarine structures made by leaking gases are present in association with the pock marks identified in the OfTW corridor.

12.5 Monitoring Survey Methodology

12.5.1 Methods employed for the pre-construction Wind Farm benthic surveys involve grab samples for infaunal analysis and particle size analysis (PSA).

12.5.2 Full details of the survey methods employed in the pre-construction benthic surveys of the wind farm site are outlined in report OWF Pre-construction Benthic Survey Report (LF000005-REP-585).

12.5.3 Methods employed for the pre-construction OfTW benthic surveys involved Drop Down Video (underwater camera) photography to assess the location and extent of potential Annex 1 habitats. Full details of the methodology used for the pre-construction OfTW benthic surveys are outlined in report OfTW Pre-construction Annex 1 Habitat survey (LF000005-REP-584).

12.5.4 Post-construction benthic monitoring within the Wind Farm is proposed to be

undertaken one, two and five years following the completion of construction activities within the Wind Farm site (expected to be in 2020, 2021 and 2024). The number of years of repeat surveys will depend on the degree of habitat disturbance and the rate of recovery.

12.5.5 The survey methodology to be employed for the post-construction survey within the Wind Farm will be the same to that utilised in the pre-construction survey to ensure that the data collected are consistent and comparable.

12.5.6 Post-construction surveys will also include monitoring of any drill spoil or pile soil plug arisings due to construction activities. Monitoring of the colonisation of hard substrates, such as jacket foundation structures, will also be undertaken. The post-construction benthic monitoring strategy is described in the report Benthic Monitoring Strategy (LF000005-REP-341).

12.5.7 Post-construction surveys for benthic habitats within the OfTW corridor, as required by Condition 3.2.1.1 of the Marine License for the OfTW, are not deemed necessary due to the limited impact and the expected rapid recovery of disturbed habitats.

12.6 Reporting

12.6.1 BOWL will aim to issue all survey reports to MS-LOT within 3 months of survey completion.

12.6.2 The following pre-construction survey reports have been issued and accepted by MSS (Table 12.2):

- Wind Farm Pre-construction Benthic Survey Report (LF000005-REP-585)
- Pre-construction Annex 1 Habitat Survey of the OfTW (LF000005-REP-584)

12.6.3 The BOWL benthic post-construction survey strategy report (LF000005-REP-341) has been issued to and accepted by MSS.

12.7 Programme

12.7.1 Post construction benthic monitoring surveys of the Wind Farm site one, two and five years, as required, following the completion of construction activities within the Wind Farm site.

12.7.2 Details of the benthic monitoring survey programme are summarised at Table 12.3 and provided in report Benthic Monitoring Strategy Report (LF000005-REP-341).

Table 12.3. Summary of survey programme for benthic community monitoring surveys.

Development stage		
Pre-Construction	**Construction**	**Post-Construction**
2015 Wind Farm and OfTW surveys completed. Pre-construction monitoring complete.	No urvey required	Wind Farm benthic grab 12 locations as per pre-construction survey (2020, 2021 and 2024) Wind Farm – PSA samples, 4 locations drill/spoil mounds (2020, 2021 and 2024) Wind Farm - DDV hard substrates 2 locations (2020, 2021 and 2024). OfTW – Not required.

13 Seabed Scour and Local Sediment Deposition

13.1 Introduction

13.1.1 BOWL considers that seabed scour and local sediment deposition is an engineering issue and is not specifically linked to a sensitive environmental receptor. The Marine Management Organisation (MMO) have undertaken a review of post-consent offshore wind farm monitoring (MMO, 2014). This report noted that monitoring of scour should only be required in relation to the structural integrity of foundations or other associated infrastructure over the lifetime of the project. This section of the PEMP document is therefore informed by proposed seabed surveys required for engineering purposes for the pre-construction, post installation and post construction phases.

13.2 Consent Conditions

13.2.1 Consent conditions relevant to seabed scour and local sediment deposition monitoring are summarised in Table 13.1

Table 13.1. Seabed scour and local sediment deposition monitoring conditions.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.a.7 PEMP	The PEMP must cover pre-construction, construction (where appropriate) and post-construction monitoring surveys for seabed scour and local sediment deposition.	**Pre-construction:** MS-LOT have confirmed that the pre-construction element of Condition 27.a.7 is discharged by approval of the Scour and Local Sediment Deposition Monitoring Strategy Report (LF000005-STR-043) (30/08/2016)[1]. LF000005-EMA-408
		Construction: MS-LOT has confirmed that the Scour and Local Sediment Deposition Monitoring Strategy Report (LF000005-STR-043) has been approved in relation to the construction element of Condition 27.a.7.
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.a.7 at the appropriate time.

[1] The Scour and Local Sediment Deposition Strategy provided a summary of the pre-construction surveys conducted to date and conisderations of post-construction monitoring. The pre-construction elements of the monitoring strategy remain relevant. However, engineering-led post-construction monitoring strategies are being developed for specfic project elements (WTG foundations, inter-array cables, OTM foundations and export cables). The Scour and Local Sediment Deposition Strategy will therefore be superseded by focused methodologies addressing scour at specfic project infrastructure.

Reference	Condition Summary	Discharge Status
Condition 19 CaP	The Company must submit a Cable Plan (CaP) that includes measures to address exposure of any cables.	Pre-construction geophysical and geotechnical surveys of the Wind Farm were completed in 2015 and 2016. Survey results were used to inform the Wind Farm CaP which was approved by MS-LOT on the (18/11/2016). LF000005-EMA-344
OfTW Marine Licence		
Condition 3.2.1.1.a.3 PEMP	The PEMP must cover pre-construction, construction (where appropriate) and post-construction monitoring surveys for seabed scour and local sediment deposition. Monitoring is required throughout the lifespan of the Works where this is deemed necessary by the Licensing Authority and specifically, monitoring for cable exposure as specified in condition 3.2.2.10 parts e and f.	**Pre-construction:** MS-LOT has confirmed that that the Scour and Local Sediment Deposition Monitoring Strategy Report (LF000005-STR-043) is approved (30/08/2016)[2]. LF000005-EMA-408
		Construction: MS-LOT has confirmed that the construction element of condition 3.2.1.1.a.3 is discharged by approval of the Scour and Local Sediment Deposition Monitoring Strategy Report (LF000005-STR-043).
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 3.2.1.1.a.3 at the appropriate time.
Condition 3.2.2.10 CaP	The Licensee must submit a Cable Plan (CaP) that includes measures to address exposure of any cables.	Pre-construction geophysical and geotechnical surveys of OfTW were completed in 2015 and 2016. Surveys results and a Near Shore Risk Assessment (Appendix C of the OfTW CaP) were used to inform the OfTW CaP which was approved by MS-LOT on the 23/01/2017. LF000005-LET-601

13.3 Approach to Seabed Scour and Local Sediment Deposition Monitoring

13.3.1 BOWL intends to use the results of pre-construction geophysical and geotechnical surveys and post-construction engineering-led surveys to monitor the extent of any scour, local sediment deposition or beach morphological change that might result from the installation of the Wind Farm and OfTW. This approach has been presented

[2] See footnote 1.

to and discussed with MS-LOT, MSS, SNH and JNCC (BOWL and MS-LOT/MSS/SNH/JNCC meeting LF000005-MOM-230). Prior to construction start, but before the finalisation of the wind farm detailed design, a strategy document LF000005-STR-043 was prepared that detailed BOWL's proposals for scour and local sediment deposition monitoring. MS-LOT confirmed acceptance of the monitoring strategy document in respect of the relevant Project consent conditions (Table 13.1)

Table 13.2. Summary of key consultation meetings and agreements for seabed scour and local sediment deposition monitoring.

Date	Summary of discussion and agreements	Reference
19/01/2015	Meeting to present BOWL's outline scour monitoring strategy. Attended by MS-LOT, MSS, SNH and JNCC.	Minutes of meeting LF000005-MOM-230
19/05/2016	BOWL issued the Scour and Local Sediment Deposition Monitoring Strategy Report to MS-LOT.	Report LF000005-REP-043
30/08/2016	MSS confirm acceptance of the Scour and Local Sediment Deposition Monitoring Strategy Report	Email LF000005-EMA-408

13.3.2 A review was undertaken by the Marine Management Organisation (MMO) of post-consent offshore wind farm monitoring (MMO, 2014). The review states that scour is not specifically linked to a sensitive environmental receptor and therefore does not inform the environmental receptor impacts. The review describes scour as essentially an engineering issue, and states that scour monitoring should only be conducted by developers and their engineers in order to monitor the structural stability of any foundations and other associated infrastructure over the lifetime of the project.

13.3.3 The strategy document reiterated the conclusions of the MMO report and set out a number of distinct strategies for monitoring scour and sediment deposition around all Project infrastructure. Monitoring requirements will vary across the Development Area depending on the Project asset to be monitored, the predicted risk of local scour and the local seabed and hydrodynamic conditions.

13.3.4 The strategy document has now been superseded. It is BOWL's intention that the monitoring required by the consent conditions will be delivered through the surveys and inspections required for engineering purposes. The detail of these will be determined post construction through design and construction verification requirements and by operational requirements for specific project elements.

13.4 Aims and Objectives of Monitoring

13.4.1 The aims and objectives of any monitoring undertaken for seabed scour and local sediment deposition are:

- To monitor development, if any, of scour at WTG foundations
- To monitor any exposure of array cables within the OWF site
- To monitor development, if any, of scour at OTM foundations and along the export cable route.
- To monitor beach morphological change closest to the export cable landfall point, if necessary.

13.5 Monitoring Survey Methodology

13.5.1 The primary method for monitoring scour and local sediment deposition will be through visual inspections using Remotely Operated Vehicles (ROV) and analysis of geophysical survey results if required. Geophysical surveys may include use of multi-beam echo sounder and side scan sonar equipment to provide high resolution bathymetry and data on seabed features.

13.5.2 Pre-construction survey data was reviewed to develop an understanding of seabed conditions and identify any areas that may be susceptible to scour. This work is intended to facilitate an initial estimation of the potential for scour around Project infrastructure. Any locations considered susceptible to significant scour will be identified for potential future monitoring. The actual scour extent will be monitored at a suitable frequency and remediation will be undertaken if necessary following the installation of the structure.

13.5.3 Post installation surveys will be undertaken by Key Contractors (or their subcontractors) to verify the installation completion of the required infrastructure works. This will include surveys of WTG and OTM foundations. Post installation monitoring of drill spoil mounds and soil plug deposits will also inform the benthic monitoring (See Section 12). Post installation surveys will also be undertaken to confirm export and array cable burial depth and protection.

13.5.4 During wind farm operation visual and bathymetric surveys will be undertaken to assess scour around WTG and OTM structures and to monitor burial and exposure of both the inter-array and export cables, if required. Beach morphological change and retreat at the export cable landfall location may be conducted by visual and topographic surveys.

Table 13.3. Summary of post-construction scour and local sediment deposition monitoring.

Project Installation	Monitoring Strategy	BOWL Document
WTG foundations	Visual inspections of WTG foundation substructures at five locations (one in each cluster) using ROV. If significant scour is identified further geophysical survey work will be undertaken and/or the number of monitoring locations will be increased.	LF000005-PLN-662

	Inspection is planned to be undertaken at five year intervals commencing in 2020.	
Inter-array cabling	Following installation, an assessment will be completed identifying areas of cable at potential risk of exposure in the future. Monitoring of these 'at-risk' areas will be conducted annually initially. Subject to the findings of the surveys, the frequency of these will be adapted to the appropriate level of risk exposure.	LF000005-PLN-184
OTM foundations	Engineering design recommendations that scour extent around OTM foundations is monitored at a suitable frequency and that remediation will be undertaken if necessary following the installation of the structure.	LF000005-REP-734
Offshore Export Cable and Interconnector Cable	A survey will be undertaken 1 year post-installation to confirm that the cables remain as installed. The frequency and scope of further monitoring will be proportional to the risk of future cable exposure and determined based on the outcome of the year 1 survey.	LF000005-PLN-214

13.5.5 The precise post-construction monitoring strategy for scour is to be confirmed following development of the detailed engineering operation and maintenance strategy for the operational phase. This will be based on all design information and as built outputs and may incorporate engineering survey results during the first year of operations.

13.5.6 The OfTW assets will be sold to an OFTO and thereafter the responsibility for the implementation of this PEMP in so far as it applies to the OfTW assets will transfer to the OFTO. It is expected that part of the transfer of the asset will involve a cable burial validation survey. This will inform any future requirement for monitoring of cable burial and any actions in response to cable exposure, if identified. The intensity of cable monitoring may be increased closer to shore (<10km approx.) due to increased exposure to wave action and tidal currents. It is expected that the OFTO will be responsible for the implementation of this PEMP in relation to the operation of the OfTW unless a different agreement is reached.

13.6 Reporting

13.6.1 BOWL will aim to issue all survey reports to MS-LOT within 3 months of survey completion.

13.6.2 The pre-construction geophysical survey datasets for the Wind Farm site and OfTW corridor are summarised in Tables 13.4 and 13.5. below. These surveys form the pre-construction baseline. The spatial coverage of the Wind Farm surveys includes one full site survey, with subsequent surveys focusing on selected areas around the proposed foundation locations and inter-array cable routes. The OfTW surveys cover

the length and width of the cable route.

Table 13.4. Pre-construction baseline geophysical data - Wind Farm site.

Date	Reference	Type	Spatial Coverage	Reference
2010	Osiris	Multi-beam echo sounder, AGDS, side scan sonar, sub-bottom profiler	100% of Wind Farm site	BEA-REP-GEP-OSI-051
2013	Fugro EMU	UXO survey (Multi-beam echo sounder, side scan sonar, magnetometer)	150 m boxes at 45 turbine locations	BEA-REP-SAS-BOWL-407
2014	Fugro Survey	UXO survey (Multi-beam echo sounder, side scan sonar, magnetometer)	50 m boxes at all turbine locations	LF000005-REP-378
2015	MMT	Multi-beam echo sounder, side scan sonar, sub-bottom profiler, magnetometer, ROV imagery	200m corridor along all planned inter-array cable routes	LF000005-REP-603

Table 13.5. Pre-construction baseline geophysical data – OfTW

Date	Reference	Type	Spatial Coverage	Reference
2011	Gardline	Single and multi-beam echo sounder, side scan sonar, sub-bottom profiler, magnetometer	OfTW route from Wind Farm site tie-in to two landfall options (approx. 64 km)	BEA-REP-SAS-GARD-115
2015	Fugro EMU	Multi-beam echo sounder, side-scan sonar, sub-bottom profiler, magnetometer	Nearshore (350 m to 1650 m from MHWS)	LF000005-REP-388
2015	MMT	Multi-beam echo sounder, side scan sonar, sub-bottom profiler, magnetometer, ROV imagery	Full survey of OfTW corridor (6m depth contour to Wind Farm site boundary)	LF000005-REP-605
2016	Nexans	Export cable landfall topographical survey and seismic refraction survey.	Cable duct pipe installation route at landfall between littoral and shallow subtidal	LF00005-REP-1229

13.6.3 Pre-construction data has been analysed to identify the most appropriate Project design and scour protection strategy for each work package. This work has informed the construction methodology reported in various Project consent plans including the Wind Farm and OfTW CMSs, DSLPs and CaPs.

13.7 Programme

13.7.1 The programme for post-construction monitoring as set out in Table 13.3 will be confirmed based on the level of risk associated with scour around installed assets, following initial monitoring results, based on the extent of scour around Project infrastructure and exposure of inter-array and export cables.

13.7.2 The programme for shoreline inspections is subject to development of a detailed engineering monitoring strategy at the landfall location.

Table 13.6. Summary of seabed scour and local sediment deposition monitoring programme.

Development Stage		
Pre-Construction	**Construction**	**Post-Construction**
Pre-construction surveys completed	No surveys required. Pre-construction data analysis completed to inform Project method statements and consent plans.	Wind Farm scour monitoring at selected foundations (proposed every 5 years commencing in 2020) *If Required* Scour monitoring at inter-array cables and export cables. Wind Farm 2 drill mounds & 2 spoil mounds (see benthic monitoring). OfTW maintain record of beach condition and morphology at landfall, including photograph (annual inspection).

14 Marine Mammals

14.1 Introduction

14.1.1 BOWL has committed to undertake pre-, during and post-construction marine mammal monitoring surveys to better understand the effect of construction activities associated with the Development on marine mammal populations in the vicinity of the Development, and validate assumptions made within the ES and SEIS.

14.2 Consent Conditions

14.2.1 Consent conditions relevant to marine mammal monitoring are summarised in Table 14.1 below.

Table 14.1. Consent conditions requiring marine mammal monitoring.

Reference	Condition Summary	Discharge Status
S36 Consent		
Condition 27.b PEMP	The PEMP must cover, but not be limited to the following matters: b. The participation by the Company in surveys to be carried out in relation to marine mammals as set out in the Marine Mammal Monitoring Programme (MMMP);	**Pre-construction:** Pre-construction surveys completed. The Pre-construction MMMP Year 3 Annual Report (LF000005-REP-1903) was accepted at the MFRAG Marine Mammals subgroup meeting on 20th June 2017(Minutes in preparation) BOWL are seeking confirmation from MS-LOT on discharge of the pre-construction element of Condition 27.b monitoring requirements.
		Construction: Construction monitoring is underway. BOWL will seek confirmation from MS-LOT on discharge of the construction element of Condition 27.b monitoring requirements at the appropriate time. Final detailed monitoring design for the Construction MMMP, as described in LF000005-REP-1367 was approved by the MFRAG Marine Mammals subgroup (as noted in Table 17.2).
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 27.b monitoring requirements at the appropriate time

Reference	Condition Summary	Discharge Status
Condition 28 Regional Monitoring	The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") established by the Scottish Ministers for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for, marine mammals	A pre-construction MMMP and CMMMP have been developed in collaboration with the MFRAG Marine Mammal Subgroup, which takes into account strategic considerations.
OfTW Marine Licence		
Condition 3.2.1.1.b PEMP	The PEMP must cover, but not be limited to the following matters: b) The participation by the Company in surveys to be carried out in relation to marine mammals as set out in the MMMP	BOWL are seeking confirmation from MS-LOT on discharge of the pre-construction element of Condition 3.2.1.1.b.
Condition 3.2.2.18 Regional Monitoring	The Licensee must participate in any MFRAG established by the Licensing Authority for the purpose of advising the Licensing Authority on research, monitoring and mitigation programmes for marine mammals	A pre-construction MMMP and CMMMP have been developed in collaboration with the MFRAG-MM, which takes into account strategic considerations.

14.3 Approach to Monitoring of Marine Mammals

14.3.1 Based on recommendations made by MSS, BOWL and Moray Offshore Renewables Limited (MORL) agreed in consultation with MS-LOT to contribute to a regional Marine Mammal Monitoring Programme (MMMP) that is being managed by Professor Paul Thompson from the University of Aberdeen (UoA).

14.3.2 A marine mammal subgroup has been set up as part of MFRAG (referred to as

MFRAG-MM[3]), to discuss and agree the regional MMMP. The scope and objectives of both the pre-construction MMMP and the construction MMMP (CMMMP) were developed by Professor Paul Thompson and agreed in consultation with the MFRAG-MM and additional stakeholders. The following organisations are represented on the MFRAG-MM: BOWL, MORL, MS-LOT, MSS, Scottish Natural Heritage (SNH), Joint Nature Conservation Committee (JNCC) and Whale and Dolphin Conservation (WDC).

14.3.3 Following formal approval of the pre-construction MMMP by MS-LOT pre-construction monitoring commenced in 2014 and has now been completed. The Pre-construction MMMP Year 3 Annual Report (LF000005-REP-1903) was submitted to MFRAG-MM for approval at the meeting of 20th June 2017.

14.3.4 The scope of the CMMMP has been agreed with the MFRAG-MM and was approved by MFRAG-MM on 17th November 2016.

14.3.5 A summary of the process by which the pre-construction MMMP has been agreed and approved, and the CMMMP agreed, is presented in Table 14.2 below. Agreement has been reached primarily via discussions within the MFRAG-MM. Meeting agendas and minutes referred to in Table 14.2 can be obtained on the Scottish Government website (once finalised) at: http://www.gov.scot/Topics/marine/Licensing/marine/scoping/mfrag/marine-mammals

Table 14.2. Summary of key consultation meetings and agreements for marine mammal monitoring.

Date	Summary of discussion and agreements	Reference
02/04/2014	Final draft of the pre-construction MMMP issued to MS-LOT and stakeholders for consultation.	Letter LF000005-LET-037
April /May 2014	Stakeholders respond to the pre-construction MMMP. MMMP updated and issued to MFRAG.	Letter LF000005-LET-359
10/10/2014	Pre-construction monitoring scope and methodology approved by MS-LOT.	Email from MS-LOT to BOWL LF000005-EMA-051
27/11/2014	MMMP Interim Report relating to monitoring surveys undertaken between May and September of 2014 completed and circulated to the MFRAG-MM.	Report LF000005-REP-355

[3] MFRAG-MM subgroup was known as the Moray Firth Marine Mammal Monitoring Steering Group prior to 1st April 2015. For ease of reference the Steering Group is referred to as the MFRAG MM Subgroup in the PEMP.

Date	Summary of discussion and agreements	Reference
16/12/2014	MFRAG-MM meeting to discuss data collected since commencement of the pre-construction MMMP. The next steps for monitoring since the i uing of the MMMP in April 2014 were identified Discussed the approach to construction monitoring.	Minutes of meeting LF000005-MOM-410
26/03/2015	Draft CMMMP circulated to MFRAG MM for review and comment.	Report LF000005-REP-550
30/03/2015	MFRAG-MM meeting to discuss draft CMMMP and potential scope of a post-construction MMMP. Results from the continuing pre-construction MMMP surveys also discussed. Noted that certain studies under the remit of the pre-construction CMMMP will be continued in the CMMMP. As a result of BOWL's intended use of Acoustic Deterrent Devices (ADDs) during piling operations, the CMMMP includes monitoring of responses of harbour seals and harbour porpoises to ADD. MSS agree the outline construction monitoring programme suitably covers the Moray Firth.	Minutes of meeting LF000005-MOM-313
24/04/2015	Comments on the draft CMMMP received from SNH and JNCC. CMMMP updated and issued to MFRAG-MM.	
06/05/2015	Pre-construction MMMP annual report relating to surveys completed in 2014/2015 was completed and circulated to the MFRAG-MM.	Report LF000005-REP-538
19/06/2015	MFRAG-MM meeting to allow further discussion of suitable construction monitoring methods for focal species and survey timing in relation to wind farm phases.	Minutes of meeting LF000005-MOM-360
25/11/2015	Pre-construction MMMP Interim Report relating to monitoring surveys undertaken between May and September of 2015 completed and circulated to MFRAG-MM.	Report LF000005-REP-816
15/12/2015	MFRAG-MM meeting. Prof. Paul Thompson presented the final CMMMP proposal in detail. Seal usage of the BOWL and MORL wind farm sites was discussed. Due to their low usage of the site, it was agreed that there was limited opportunities for investigating harbour seal responses to ADDs and piling soft starts (WP 3.1).	Minutes of Meeting LF000005-MOM-389

Date	Summary of discussion and agreements	Reference
05/02/2016	CMMMP issued to MFRAG-MM for consultation The CMMMP was updated following receipt of comments from attendees at the MFRAG-MM meeting on 15/12/2015 and circulated to the subgroups for approval.	Emails from BOWL to MFRAG-MM subgroup Report LF000005 REP 550
22/09/16	Meeting with MS LOT and MSS to pre ent and discuss BOWL's CMMMP.	MS LOT and MSS broadly accepted the proposed monitoring strategy and requested additional details on methodology be presented in the final CMMMP. Minutes of Meeting LF000005-MOM-708
17/11/16	Paul Thompson presented the final CMMMP approach to MFRAG-MM members for approval.	MFRAG-MM confirmed acceptance of the BOWL CMMMP LF000005-REP-1367. Minutes of Meeting LF000005-MOM-652
20/06/2017	The Year 3 Pre-Construction MMMP Annual Report was accepted by MFRAG-MM (Meeting minutes in preparation).	Report LF000005-REP-1903

14.3.6 Through discussion with MFRAG-MM it was agreed that the primary focus for monitoring during the pre-construction and construction phases should be harbour seal and bottlenose dolphin. The final CMMMP approved through the MFRAG-MM also incorporated additional shorter-term studies of harbour seal and harbour porpoise responses to ADDs and piling soft start, and noise measurement modelling from piling operations and ADD deployment.

14.4 Aims and Objectives of Monitoring

Pre-construction MMMP

14.4.1 The primary aim of the pre-construction MMMP was to collect baseline data on the distribution, abundance and vital rates for the two priority species during the pre-construction period (2014-2017) and validate assumptions made in the ES and SEIS.

14.4.2 The pre-construction MMMP consisted of a number of discrete work packages (WPs) for both priority species; the WPs and their objectives are as follows:

WP 1 - Harbour seal monitoring:

WP 1.1: Assess the variability in individual based reproduction and survival.

WP 1.2: Assess the variability of harbour seal trends in abundance in summer and winter.

WP 1.3: Characterise the at-sea distribution and foraging patterns of harbour seals breeding at haul outs in the Moray Firth.

14.4.3 Work packages 1.1 and 1.2 ran continuously over the duration of the pre-construction MMMP, with data acquisition and analysis taking place in each year from 2014 to 2016. Work package 1.3 involved data acquisition and analysis during 2014 and 2015.

WP 2 - Bottlenose dolphin monitoring:

WP 2.1: Assess the variability in individual based reproduction and survival rates..

WP 2.2: Assess the long-term variability in the trends in abundance of bottlenose dolphins in the Moray Firth SAC.

14.4.4 Work packages 2.1 and 2.2 ran continuously over the duration of the pre-construction MMMP with data acquisition and analysis taking place in each year.

Construction MMMP

14.4.5 The aims of the CMMMP are to use the baseline data obtained from the pre-construction MMMP studies to support studies of harbour seal and bottlenose dolphin behavioural responses to pile driving noise and any broader scale changes in their distribution during the construction period. The CMMMP consists of the continuation of WP1 and 2 as outlined above, and also includes two additional work packages, WP3 and WP4.

14.4.6 Additionally, under WP2 (bottlenose dolphin monitoring) a further element, WP2.3, has been developed that aims to assess the effects of construction on bottlenose dolphins.

14.4.7 WP3 and WP4 specifically aim to monitor the broad-scale and fine-scale responses of both harbour seal and harbour porpoise to the deployment of an Acoustic Deterrent Device (ADD) and piling soft start procedures, which will be deployed as part of BOWL's mitigation strategy during piling operations. However, it was discussed at the MFRAG-MM meeting on 15/12/2015, that there is limited opportunity to conduct this monitoring for harbour seal within the wind farm site due to the low numbers of individuals using these offshore foraging areas as indicated by the results from the pre-construction MMMP. Instead, broader scale tracking work under WP 1.3 (at-sea distribution and foraging patterns of harbour seals) may provide opportunistic evidence of responses to ADD and soft start should harbour seal be in nearfield areas prior to start of piling activities.

14.4.8 The objectives of the WPs included in the CMMMP, in addition to those carried over

from the pre-construction MMMP (described above) are:

WP 2 – Bottlenose dolphin monitoring:

WP 2.3: Assess the variability in the baseline occurrence of bottlenose dolphins in favoured areas (key sites) within the Moray Firth SAC and southern Moray Firth coast during construction of the wind farm.

WP 3 - Monitoring deployment of acoustic deterrent devices

WP 3.2: Assess the broad-scale and fine-scale responses of harbour porpoises to ADD and piling soft starts.

WP 4 – Noise measurement and modelling

WP 4.1: Quantify the temporal variation in source levels of piling noise in relation to differences in hammer energy and ground conditions across the wind farm site; and

WP 4.2: Quantify the spatial variation in received levels of piling noise and ADD noise exposure.

14.4.9 The scope of any post-construction MMMP will be informed by the outcomes of pre-construction and construction monitoring, developed in consultation with the MFRAG-MM and subject to approval by MS-LOT on behalf of Scottish Ministers.

14.5 Monitoring Survey Methodology

14.5.1 Agreed pre-construction survey methods were detailed in the pre-construction MMMP (referred to in full as the Strategic Regional Marine Mammal Monitoring Programme for Assessing the Population Consequences of Constructing the BOWL and MORL Wind Farm Developments) (LF000005-REP-355).

14.5.2 The pre-construction surveys have been designed to complement existing datasets within the Moray Firth and wider region for the two priority species; bottlenose dolphin and harbour seal.

14.5.3 Agreed methods for during construction surveys are provided in the CMMMP report (LF000005-REP-1367). The final CMMMP was approved by the MFRAG-MM subgroup members on the 17th November 2016. Work under the CMMMP commenced in February/March 2017, prior to the start of piling operations in April 2017, with the capture and tagging of harbour seals at Loch Fleet and the deployment of an array of acoustic devices.

14.6 Reporting

14.6.1 All pre-construction fieldwork from 2014 to 2016 was successfully completed, the data have been archived and analyses used to address key project objectives. These data sets now provide a robust baseline on the vital rates, population status and distributions of these harbour seal and bottlenose dolphin populations. This information will underpin ongoing construction monitoring for the BOWL wind farm

and monitoring of future construction in the MORL development areas.

14.6.2 Results and data analysis for the pre-construction surveys during 2014 to 2016 have been detailed in Annual Reports, culminating in the final pre-construction monitoring report entitled Strategic Regional Pre-Construction Marine Mammal Monitoring Programme Annual Report 2017 (LF000005-PLN-1903). This presents the results and analysis of data collected between 2014 and 2016 and confirms the successful completion of the planned pre-construction data collection to provide a robust baseline for comparison against construction and post construction monitoring results.

14.6.3 Reports detailing the results of construction monitoring are expected to be available in Quarter 1 or 2 2018.

14.7 Programme

14.7.1 The programme for all marine mammal monitoring surveys is detailed in the CMMMP (LF000005-REP-550)

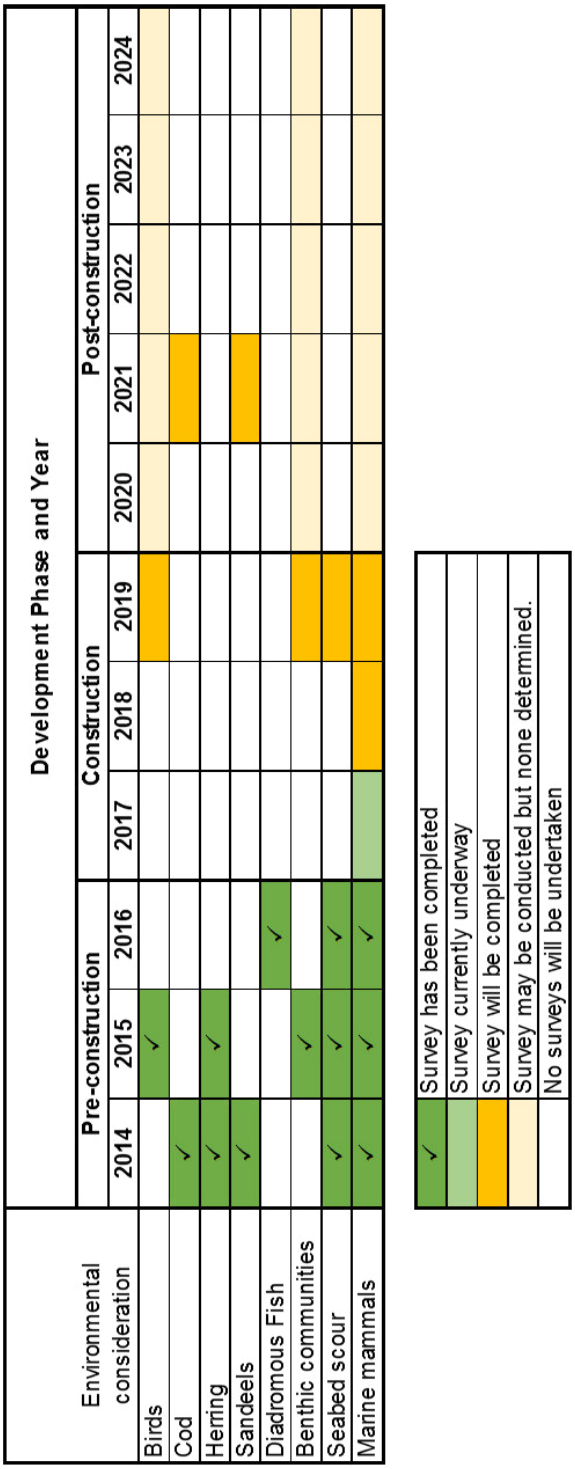
Table 14.3: Summary of marine mammal monitoring programme

Development stage		
Pre-construction	**Construction**	**Post-construction**
WP 1 (harbour seal monitoring) and WP 2 (bottlenose dolphin monitoring) monitoring surveys undertaken during 2014-2016. Pre-construction monitoring complete.	WP 1 (harbour seal monitoring) and WP 2 (bottlenose dolphin monitoring) monitoring is underway and will continue throughout the construction phase (2017 to 2019). WP 3 (monitoring responses to ADDs) will be conducted for a period of time during piling operations, and are expected to be completed in Quarter 4 2017. WP 4 (noise measurement and modelling) commenced in advance of piling operations and is expected to be completed in Quarter 4 2017.	To be determined Monitoring scope and survey design will be informed by the results of pre and during construction monitoring, and discussed in MFRAG-MM.

15 Programme of Survey Works

15.1.1 Table 15.1 provides an overview of when the monitoring activities set out in this PEMP for each receptor group have or will be conducted.

Table 15.1: Summary of monitoring programme for each topic



Environmental consideration	Development Phase and Year										
	Pre-construction			Construction			Post-construction				
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Birds		✓									
Cod	✓										
Herring	✓	✓									
Sandeels	✓										
Diadromous Fish			✓								
Benthic communities		✓									
Seabed scour	✓	✓	✓								
Marine mammals	✓	✓	✓								

✓	Survey has been completed
	Survey currently underway
	Survey will be completed
	Survey may be conducted but none determined.
	No surveys will be undertaken

16 Licenses and Legal Requirements

16.1.1 In order to allow survey activity to proceed, licences and dispensations may need to be sought by BOWL in advance of planned surveys. Table 15.1 below identifies the licensing requirements associated with PEMP surveys, which BOWL will adhere to.

Table16.1. Notices, licenses and approvals of PEMP survey activity.

PEMP A pect	**Licence / Other Requirement**
All offshore surveys	Issue of a Notice to Mariners stating the location, nature and duration of the survey.
	Issue of a notice in the Kingfisher Fortnightly Bulletin stating the location, nature and duration of the survey.
Benthic surveys	Submission of a Notice of Exempted Activity form to MS-LOT prior to commencing any benthic survey activities. Application for Small Works Licence from The Crown Estate
Sandeel surveys	Request for a dispensation from Marine Scotland Science, in accordance with the terms of Section 9 of the Sea Fish Conservation Act 1967 and Article 43 of Council Regulation No. 850/98 related to days at sea. Specific reference to catching and landing of sandeels using a fixed tooth bar dredge.
Cod surveys	Request for a dispensation from Marine Scotland Science, in accordance with the terms of Section 9 of the Sea Fish Conservation Act 1967 and Article 43 of Council Regulation No. 850/98 related to days at sea. Specific reference to catching and landing undersized and out of quota cod, using undersized mesh.
Herring surveys	Request for a dispensation from Marine Scotland Science, in accordance with the terms of Section 9 of the Sea Fish Conservation Act 1967 and Article 43 of Council Regulation No. 850/98 related to days at sea.
Atlantic salmon survey	Application for a licence for carrying out procedures on animals according to the Animals (Scientific Procedures) Act 1986 (ASPA). This will be a personal licence held by one of the surveyors. Application for Small Works Licence from The Crown Estate Home office licence for smolt tagging
	Issue of a Notice to Mariners describing the survey and the duration of deployment of the Acoustic Receiver arrays.
	Issue of a notice in the Kingfisher Fortnightly Bulletin describing the survey and the duration of deployment of the Acoustic Receiver arrays.
Marine Mammals	Application for a Marine Licence to cover the deployment of moored acoustic devices.
	Application for a licence to disturb EPS under the Conservation (Natural Habitats, &c.) Regulations 1994 and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007.

PEMP A pect	**Licence / Other Requirement**
Birds	Application for a Home Office licence in accordance with the Animals (Scientific Procedures) Act 1986 (due to the animal capturing and handling involved).

17 Compliance with the Application, ES and SEIS

17.1.1 Part of Condition 27 of the S36 Consent states:

17.1.2 The PEMP must be in accordance with the ES as it relates to environmental monitoring.

17.1.3 Within the ES and SEIS, BOWL made a number of commitments to the environmental monitoring of the Development. Commitments made are presented in full in Appendix A, which also identifies how each commitment has been addressed within this PEMP.

17.1.4 Condition 8 of the S36 Consent states:

> *"The Development must be constructed and operated in accordance with the terms of the Application and related documents, including the accompanying ES, the Supplementary Environmental Information Statement ("SEIS") and Annex 1 of this letter**, except in so far as amended by the terms of this section 36 consent.**" (emphasis added).*

17.1.5 Since the Application for consents was made, BOWL's approach to environmental monitoring has been refined and commitments made in the ES and SEIS are in some cases superseded by the monitoring approach presented in this PEMP. This is envisaged by the emphasised text above, which allows departure from the Application terms in order to ensure compliance with the terms of the PEMP under Condition 27 of the S36 Consent.

18 References

Table 18.1: References of reports

Reports	Document no.
Birds	
Bogdanova, M.I., Butler, A., Gunn, C., Kafas, A., Rei, C., Low, P. and Daunt, F. (2015) Foraging behaviour of large gulls and implications for offshore wind site selection. Work Package 2: Analysis of gull foraging behaviour and implications for offshore Wind Farm site selection. Report produced in support of the project "Foraging Behaviour of large gulls and implications for offshore wind site selection" funded by Innovate UK, Moray Offshore Renewables Ltd. and Beatrice Offshore Windfarm Ltd.	LF000005-REP-879
BOWL (2016) Pre-construction Aerial Survey Report	LF000005-REP-690
Cod	
BMM (2014) Proposal for the Undertaking of a Cod Pawning and Sandeel Survey for the Beatrice Offshore Windfarm Ltd.	LF000005-REP-060
BOWL (2015) Cod Survey Results Technical Report	LF000005-REP-094
Herring	
BOWL (2014) Proposal for the Undertaking of a Herring Larval Survey	LF000005-REP-147
BOWL (2014) Herring Larval Survey Results – Technical Report	LF000005-REP-345
BOWL (2016) Herring Larval Survey Results – Technical Report	LF000005-REP-786
BOWL (2016) Pre-construction Baseline Herring Larval Survey Report	LF000005 -REP-813
Sandeels	
BMM (2014) Proposal for the Undertaking of a Cod Pawning and Sandeel Survey for the Beatrice Offshore Windfarm Ltd.	LF000005-REP-060
BOWL (2014) Sandeel Survey Results – Technical Report	LF000005-REP-095
Diadromous Fish	
BOWL (2015) Active tracking study	LF000005-REP-598
BOWL(2015 Smolt Tracking Methodology Report	LF000005-REP-671
Newton, M., Main, R., and Adams, C., (2017) Atlantic Salmon *Salmo Salar* smolt movements in the Cromarty and Moray Firths, Scotland.	LF000005-REP-1854
Benthic Communities	
BOWL (2015) Pre-construction Annex 1 habitat survey report of the OfTW	LF000005-REP-584

Reports	Document no.
BOWL (2015) Pre-construction Benthic Report Wind Farm	LF000005-REP-585
Seabed Scour	
BOWL (2015) BOWL Scour and Local Sediment Deposition Monitoring: Proposed Strategy	LF000005-STR-043
MMO (2014). Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms.	N/A
BOWL (2017) Marine growth and scour monitoring strategy.	LF000005-PLN-662
Siemens (2017) Detailed Design – OTM - Scour Assessment Report	LF000005-REP-734
Marine Mammals	
Thompson, P.M (2015) Marine Mammal Monitoring Programme Annual Report	LF000005-REP-538
BOWL (2015) Construction Marine Mammal Monitoring Programme	LF000005-REP-550
BOWL (2016) Addendum to the BOWL Construction MMMP – studies during piling	LF000005-REP-1367
Graham, I.M, Cheney,B., Hewitt,R.C., Cordes, L. S., Hastie,G.D and Thompson, P.M (2017) Strategic Regional Pre-Construction Marine Mammal Monitoring Programme Annual Report 2017.	LF000005-REP-1903

Table 18.2: References of correspondence

Letters	Document no.
Cod	
MS-LOT (2014) comments on cod survey report	LF000005-LET-078
BOWL (2014) letter to MS-LOT confirming methodology	LF000005-LET-079
BOWL (2015) revised pre-construction cod survey report following MSS confirmation of required analysis	LF000005-LET-126
MS-LOT (2015) confirmation of discharge	LF000005-LET-156
Herring	
MS-LOT (2014) confirmation of agreement with the survey methodologies	LF000005-LET-064
MSS (2015) confirmation of acceptance of 2014 technical report	LF000005-LET-113
MS-LOT (2016) confirm discharge of pre-construction element of condition 35	LF000005-LET-352
Sandeels	
BOWL (2014) Written response to MS-LOT concerning points raised	LF000005-LET-079

by MSS	
MSS and MS-LOT (2014) Written acceptance of 2014 pre-construction sandeel survey reports by MSS	LF000005-LET-078
Diadromous fish	
BOWL (2015) issue briefing note including proposed methodology for smolt tracking in the Cromarty Firth for discussion with MSS	LF00005-BRN-076
BOWL (2015) Letter to MSS requesting acceptance of proposed Cromarty Firth smolt tracking study methodology	LF000005-LET-235
MSS (2015) letter confirming acceptance of Cromarty Firth smolt tracking study	LF000005-LET-250
Benthic Communities	
BOWL (2015) response to MSS regarding comments on benthic survey strategy	LF000005-LET-128
BOWL (2015) issue pre-construction survey reports and benthic post-construction survey strategy report to MSS for acceptance	LF000005-LET-290
BOWL response to MSS points concerning proposed post-construction monitoring strategy	LF000005-LET-338
Marine Mammals	
BOWL (2014) Final draft of the pre-construction MMMP issued to MS-LOT and stakeholders for consultation.	LF000005-LET-037
BOWL (2014) Updated pre-construction MMMP issued to MFRAG following revisions based on stakeholder comments.	LF000005-LET-359
MS-LOT (2014) Letter confirming acceptance or pre-construction MMMP scope and methodology.	LF000005-LET-051
Seabed Scour	
MS-LOT (2016) Written approval of the Scour and Local Sediment Deposition Monitoring: Proposed Strategy.	LF000005-EMA-408
General	
MS-LOT (2016) Written acceptance of the PEMP and discharge of various pre-construction elements of the monitoring programme.	LF000005-LET-630
MS-LOT (2015) Confirmation of the discharge of the Piling Strategy and approval of fish and marine mammal monitoring and mitigation.	LF000005-LET-280
MS-LOT (2016) Confirmation of discharge of Wind Farm CaP condition and approval of monitoring and mitigation in respect of cable scour/exposure and diadromous fish.	LF000005-EMA-344
MS-LOT (2017) Confirmation of discharge of OfTW CaP condition	LF000005-LET-601

and approval of monitoring and mitigation in respect of cable scour/exposure and diadromous fish.	

Table 18.3: References of meeting minutes and consultations

Minutes of Meetings	Document no.
Herring	
(2013) BOWL, MORL,MSS, MS-LOT, to discuss requirements for herring survey	LF000005-MOM-013
(2014) to confirm proposed herring larval survey methodology, analysis and number of surveys	LF000005-MOM-106
(2015) to present pre-construction herring survey results	LF000005-MOM-230
Diadromous fish	
(2014) Meeting with MSS, MS-LOT to discuss BOWL participation in Pentland Salmon Initiative to achieve required monitoring.	LF000005-MOM-132
(2014) Meeting with MSS at Battleby. MSS request BOWL enhance marine tracking element of proposed study	LF000005-MOM-314
(2015) Meeting with local District Salmon Fishery Boards (DSFBs) who provided positive support for the study proposal	LF000005-MOM-343
(2017) Meeting with local DSFBs to present the results of the Cromarty Firth Smolt tracking study.	LF000005-MIN-686
Benthic Communities	
(2015) Meeting to present and discuss the scope of pre-construction benthic surveys	LF000005-MOM-230
(2015) MFRAG meeting to discuss benthic post-construction monitoring and scope of monitoring	LF000005-MOM-310
Seabed Scour	
(2015) Meeting to present BOWL's outline scour monitoring strategy	LF000005-MOM-230
Marine Mammals	
(2014) Meeting with MFRAG-MM to present pre-construction marine mammal collected to date.	LF000005-MOM-410
(2015) Meeting with MFRAG-MM to discuss the scope of the CMMMP and subsequent post-construction monitoring.	LF000005-MOM-313
(2015) Meeting with MFRAG-MM to discuss the focus and methodology of the CMMMP.	LF000005-MOM-360
(2015) Meeting with MFRAG-MM to present the full CMMMMP.	LF000005-MOM-389
(2016) Meeting with MFRAG-MM to present the full CMMMMP.	LF000005-MOM-701

(2016) Meeting to finalise and agree final CMMMP	LF000005-MOM-652

Table 18.4; References of Consent Plans

Consent Plans	Document no.
Construction Plan	LF000005-PLN-010
Piling Strategy	LF000005-PLN-142
Environmental Management Plan	LF000005-PLN-144
Wind Farm Cable Plan	LF000005-PLN-183
OfTW Cable Plan	LF000005-PLN-214

Appendix A - ES and SEIS Commitments

Table 1 presents the commitments made by BOWL in the ES and SEIS to monitoring of the Development. The table provides details of the commitments and a cross-reference to where each commitment is implemented.

Table 1. ES and SEIS Commitments

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
ES	10 Benthic Ecology 49, p175	A program of benthic monitoring will be agreed with the relevant authorities	Section 12
ES	11 Fish and Shellfish 43, p156	BOWL will work with Key Stakeholders and Marine Scotland to identify any future monitoring programmes considered necessary	Sections 8, 9 and 10.
ES	12 Marine Mammals 67, p205	BOWL will continue to work with Marine Scotland and key stakeholders to undertake work to fill gaps in the understanding of the effects of underwater noise on marine mammals behaviourally and at a population level. BOWL will work collaboratively with the wider Offshore Wind Industry in Scotland and the UK as well as with key experts in the field of underwater noise and marine mammals to undertake this work.	Section 14.3
ES	12 Marine Mammals 73, p236	BOWL will work with Marine Scotland, SNH/JNCC and other key stakeholders to develop the specification for an appropriate monitoring programme.	Section 14
ES	Ornithology 58, p196	It is expected that best practice monitoring of bird use within the Wind Farm Site and 4 km buffer will be undertaken. Typically this comprises periods of pre-construction, construction and post-construction monitoring in order to identify any changes in bird usage of the Wind Farm Site attributable to the development. The scope and periods (e.g. post-consent/pre-construction) of monitoring required will be determined in discussion with SNH and Marine Scotland.	Section 7

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
ES	16 Commercial Fisheries 36, p157, 176	Post construction surveys will be undertaken to assess the seabed status in the immediate vicinity of construction and installation activities	Section 13
ES	21 Physical Processes OfTW 19, p111	The development of any scour will also be monitored post construction and scour protection will be installed if required	Section 13
ES	21 Physical Processes OfTW 20, p116	Visual and/or bathymetric surveys will be undertaken pre- and post-construction along part or all of the OfTW route and these surveys compared	Section 13
ES	21 Physical Processes OfTW 20, p118	Visual and/or topographic surveys will be undertaken pre- and post-construction between the onshore jointing bay and an adjacent point on the beach around or below Mean Low Water Springs. These surveys will be compared to monitor the actual (naturally occurring) rates of beach morphological change and retreat	Section 13
ES	22 Benthic Ecology OfTW 17, p90	Monitoring of the effects from cable installation will be included as part of the overall benthic monitoring plan, to be agreed with most notably (but not limited to) Marine Scotland and SNH	Section 12
ES	23 Fish and Shellfish OfTW 33, p119	BOWL will work with key stakeholders and Marine Scotland to identify any future monitoring programmes considered necessary	Sections 8, 9, 10 and 11
ES	27 Commercial Fisheries OfTW 54, p229	BOWL will work with key stakeholders and Marine Scotland to identify any future monitoring programmes considered necessary	Sections 8, 9, 10and 11
ES	28 Shipping and Navigation OfTW 21, table 28.3	Periodic and planned surveys of cable routes to monitor burial depths and sea bed mobility	Section 13
SEIS	5 Fish and Shellfish Ecology 3, table 5.1	Consultation will be undertaken with MSS to discuss the proposal to undertake a pre-construction sandeel survey.	Section 10

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
SEIS	5 Fish and Shellfish Ecology 3, table 5.1	Sandeel survey methodology will be in line with that used by the Moray Firth Round 3 Zone development	Sections 10
SEIS	5 Fish and Shellfish Ecology 4, table 5.1	BOWL is engaging with Marine Scotland and other developers to define an adequate salmon and sea trout monitoring strategy	Section 11
SEIS	5 Fish and Shellfish Ecology 11, table 5.1	BOWL is committed, in consultation with Marine Scotland, to undertake the appropriate additional surveys as a condition of consent. These may include; Sandeel survey; and Cod survey.	Section 8 and 10
SEIS	5 Fish and Shellfish Ecology 12, table 5.2	A post installation survey is likely to be undertaken following completion of cable installation and protection works trenching and rock dumping, depending on the final construction plans	Sections 8, 9, 10 and 11
SEIS	5 Fish and Shellfish Ecology 55, p127	BOWL is committed, in consultation with Marine Scotland, to undertake the appropriate additional surveys as a condition of consent. These may include; · Sandeel survey; and Cod survey.	Sections 8 and 10
SEIS	6 Marine Mammals 3, table 6.1	A BOWL/MORL marine mammal monitoring programme (MMMP), including the collection of pre-construction baseline data, is proposed.	Sections 14
SEIS	6 Marine Mammals 47, p83	Acoustic Deterrent Devices (ADDs) are a particularly useful tool for mitigating effects upon seals as a result of the difficulties associated with identifying and observing these species, particularly at night and during periods of poor visibility.	Section 14
SEIS	6 Marine Mammals 48, p86	BOWL is working together with MORL to devise a marine mammal monitoring programme (MMMP) that tests the predictions of the assessment of potential effects.	Section 14

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
SEIS	6 Marine Mammals 49, p93	The MMMP will include acoustic surveys to monitor the existing noise levels in the Moray Firth and collation of data from other studies (either from other parts of the BOWL/MORL monitoring programme or using data already available) that can provide information on key prey populations, physical processes, by-catch etc. Further information on the PCoD will be sought from the SMRU Ltd and University of Aberdeen study which is due for publication this year.	Section 14
SEIS	6 Marine Mammals 18, table 15.2	A detailed MMMP is currently being developed in consultation with developers, Marine Scotland, Scottish Natural Heritage and the University of Aberdeen to allow the unique existing baseline information of the Moray Firth to be built on, and to provide the opportunity to better understand the interactions between marine mammals and offshore wind farms.	Section 14