MAINSTREAM RENEWABLE POWER

Neart na Gaoithe Offshore Wind Farm

Scoping Report

May 2017

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List of Abbreviations and Definitions

Abbreviation	Term
ADR	**Air Defence Radar**
AIS	**Automatic Identification System**
ASA	**Archaeological Study Area**
ATC	**Air Traffic Control**
BEIS	**Department for Business, Energy and Industrial Strategy**
CAA	**Civil Aviation Authority**
CAP	**Civil Aviation Publication**
CIA	**Cumulative Impacts Assessment**
CfD	**Contract for Difference**
EIA	**Environmental Impact Assessment**
EMF	**Electro Magnetic Field**
EPS	**European Protected Species**
ERCoP	**Emergency Response Co-operation Plans**
ES	**Environmental Statement**
FTOWDG	**Forth and Tay Offshore Wind Developers Group**
HES	**Historic Environment Scotland**
HAT	**Highest Astronomical Tide**
HRA	**Habitats Regulations Assessment**
ICES	**Chartered Institution of Civil Engineering Surveyors**

Abbreviation	Term
JR	**Judicial Review**
LAT	**Lowest Astronomical Tide**
LSE	**Likely Significant Effect**
MCA	**Maritime and Coastguard Agency**
MGN	**Marine Guidance Note**
MHWS	**Mean High Water Springs**
MOD	**Ministry of Defence**
MPA	**Marine Protection Area**
MS-LOT	**Marine Scotland Licensing and Operations Team**
MW	**Megawatts**
NATS	**National Air Traffic Services**
NERL	**NATS En-Route plc**
NnG	**Neart na Gaoithe Offshore Wind Farm**
NnGOWL	**Neart na Gaoithe Offshore Wind Ltd.**
NRA	**Navigational Risk Assessment**
OFTO	**Offshore Transmission Operator**
OfTW	**Offshore Transmission Works**
OnTW	**Onshore Transmission Works**
OSP	**Offshore Substation Platform**
PEXA	**Military Practice and Exercise Areas**

Abbreviation	Term
RCAHMS	**Royal Commission for Ancient and Historic Monuments of Scotland**
RYA	**Royal Yachting Association**
SAC	**Special Area of Conservation**
SAR	**Search and Rescue**
SLVIA	**Seascape, Landscape and Visual Impact Assessment**
SNH	**Scottish Natural Heritage**
SPA	**Special Protection Area**
SSS	**Side Scan Sonar**
STW	**Scottish Territorial Waters**
TCE	**The Crown Estate**
UK	**United Kingdom**
UKHO	**United Kingdom Hydrographic Office**
WA	**Wessex Archaeology**
WSI	**Written Scheme of Investigation**
ZTV	**Zones of Theoretical Influence**

Glossary

Term	Definition
Application	The application for the Project, being made by NnGOWL, to which this Scoping Report relates.
Addendum	The Supplementary Environmental Information Statement (SEIS) submitted to the Scottish Ministers by NnGOWL on 7 June 2013.
the Consents	The written consents granted by the Scottish Ministers under Section 36 of the Electricity Act 1989, issued on 10th October 2014 (as varied on 21st March 2016) and under Section 20(1) of the Marine (Scotland) Act 2010 issued on 10th October 2014.
Development Area	The area comprising the Wind Farm Area and the Offshore Export Cable Corridor.
Offshore Export Cable Corridor	The area within which the Offshore Export Cables will be installed.
Offshore Export Cable	The subsea, electricity cables running from the OSPs to the landfall and transmitting the electricity generated to the onshore cables for transmission onwards to the onshore substation and the national electrical transmission system.
Offshore Substation Platform (OSP)	A standalone modular unit that transforms the alternating current (AC) from the inter-array cable to Direct Current (DC) for transport to the national grid along the Offshore Export Cable.
Offshore Transmission Works (OfTW)	The proposed transmission infrastructure comprising OSPs and their foundations and substructures and the Offshore Export Cable.
Offshore Wind Farm	The proposed generation infrastructure comprising turbines and their foundations and substructures, the OSP interconnector cables and the inter-array cables.
Original Application	The application letter, application form and Environmental Statement (ES) submitted to the Scottish Ministers by NnGOWL on 13 July 2012 for Section 36 Consent and Marine Licences together with the SEIS submitted to the Scottish Ministers by NnGOWL on 7 June 2013.
Originally Consented Project	The Neart na Gaoithe Offshore Wind Farm granted Section 36 Consent and Marine Licences by the Scottish Ministers in October 2014.
Original EIA	The Environmental Impact Assessment (EIA) that was undertaken to support the Original Application for the Originally Consented Project and was reported in the Original ES.
Original ES	The Environmental Statement (ES) submitted to the Scottish Ministers by

Term	Definition
	NnGOWL on 13 July 2012 as part of the Original Application.
Project	The proposed Neart na Gaoithe Offshore Wind Farm to which this Scoping Report relates and comprising of the Offshore Wind Farm and the Offshore Transmission Works.
Project EIA	The Environmental Impact Assessment (EIA) that will be undertaken to support the consent application for the Project and will be reported in the Project ES.
Project ES	The Environmental Statement (ES) that will be prepared to support the consent application for the Project
Scoping Opinion	The scoping opinion that will be provided by Marine Scotland Licensing Operations Team ("MS-LOT") under Regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended) and Regulation 13 and Schedule 4 of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) setting out the Scottish Ministers' opinion on the content of the Project ES including those issues that will or will not need to be addressed in the Project EIA.
Scoping Report	This scoping report setting out the proposed contents of the Project ES and provided to MS-LOT to support the request for a Scoping Opinion.
Wind Farm Area	The geographical area in which the proposed wind turbines, inter-array cables, Offshore Substation Platforms (OSPs) and other associated works will be located.

1 Introduction

1.1 Background

Neart na Gaoithe Offshore Wind Limited (NnGOWL) is promoting the development of the Neart na Gaoithe Offshore Wind Farm (NnG) (referred to throughout as 'the Project'). The Project will be located in the outer Firth of Forth, 15.5km east of Fife Ness. It will comprise an offshore array of wind turbines connected by subsea inter-array cables to 1 or 2 Offshore Substation Platforms (OSPs). Electricity generated by the turbines will be transmitted to the national grid via subsea Offshore Export Cables, running between the OSP(s) and the landfall at Thorntonloch, East Lothian.

It is anticipated that this Scoping Report will be followed by a new application for consent for the Project. It should be noted that the application is being pursued in parallel with the ongoing Judicial Review process for the Originally Consented Project (see Section 1.3 below).

The Project will comprise an offshore generating station with a capacity of greater than 1 MW and therefore requires Scottish Ministers' consent under Section 36 of the Electricity Act 1989 (S36 Consent) to allow its construction and operation. Under the Marine (Scotland) Act 2010, the Project will also require Marine Licences granted by the Scottish Ministers to allow for the construction and the deposit of substances and structures in the sea and on the seabed.

In line with the requirements of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), the application for S36 Consent and Marine Licences for the Project will be accompanied by an Environmental Statement (ES), which will detail the outcomes of Environmental Impact Assessment (EIA) for the Project.

This document comprises the Project EIA Scoping Report (referred to throughout as 'the Scoping Report') and has been prepared in support of a request for an opinion from the Scottish Ministers as to the scope of the information to be provided within the Project ES (the 'Scoping Opinion'). This document has been prepared and submitted in accordance with the aforementioned 2000 and 2007 EIA Regulations.

The scope of the Project ES, which will detail the outcome of the Project EIA, will be informed by responses made by statutory and non-statutory consultees to this Scoping Report, as may be set out in the Scoping Opinion provided by the Scottish Ministers. The Project ES will accompany the application for the S36 Consent and Marine Licences. It is currently expected to be submitted to the Marine Scotland Licensing and Operations Team (MS-LOT) (acting on behalf of the Scottish Ministers) in 2017.

1.2 The Developer

NnGOWL is the developer of Neart na Gaoithe Offshore Wind Farm (NnG). NnGOWL is a wholly owned subsidiary of International Mainstream Renewable Power Ltd (Mainstream) and was established specifically for the development of Neart na Gaoithe Offshore Wind Farm. Mainstream has a global development portfolio consisting of both onshore (wind and solar) and offshore wind projects across five continents.

NnGOWL separately applied for onshore planning permission in relation to the onshore transmission works (OnTW), which will transmit electricity from the Offshore Wind Farm to the national grid. NnGOWL was granted permission for the OnTW in June 2013. The permission was subsequently amended by a Section 42 application in November 2015 and advance construction works were undertaken in August 2016. The transmission assets will be transferred by NnGOWL to an Offshore Transmission Owner (OFTO) in due course, under the requirements of the OFTO regime established by OFGEM and the UK Government.

1.3 Development Overview

1.3.1 Original Application and Consent

NnGOWL submitted an application for consent under Section 36 (S36) of the Electricity Act 1989 and for associated Marine Licences under the Marine (Scotland) Act 2010 for the Originally Consented Project in July 2012. The application was supported by an ES and subsequently, in June 2013, by an Addendum of Supplementary Environmental Information (hereinafter referred to as the 'Addendum').

The S36 consent and the marine licences were awarded by the Scottish Ministers in October 2014, following over five years of project development, including environmental surveys, engineering design studies and wide-ranging stakeholder engagement[1].

In 2015, NnGOWL applied for a S36 Consent Variation, seeking to vary the S36 Consent in order to modify a number of parameters related to the wind turbine generators. In particular, the variation was sought to allow:

- An increase in the maximum rated turbine capacity from 6MW to 7MW (the maximum generating capacity of 450MW was to stay the same);
- A change in maximum turbine hub heights, from 107.5m to 115m above Lowest Astronomical Tide (LAT); and
- A change in maximum turbine platform height from 18m to 21m above LAT.

The S36 Consent variation was awarded by Marine Scotland in March 2016.

The decision by the Scottish Ministers to award the Original Consents for NnG (and 3 other wind farms) in 2014 was challenged by Judicial Review (JR). The JR decision has been appealed by the Scottish Ministers and NnGOWL and the outcome of that appeal is expected in the first half of 2017.

It is NnGOWL's intention to construct the Originally Consented Project or the Project, but not both.

1.4 Application for Consent for the Neart na Gaoithe Offshore Wind Farm

In parallel to the JR appeal, NnGOWL intends to pursue a new consent application for the Project. The new consent application will take advantage of new developments in offshore wind technology, allowing for example, the same generation capacity as previous designs but using fewer turbines. This will to lead to a reduction in the potential environmental impacts (when compared to the Original Application and the Originally Consented Project).

A detailed description of the infrastructure and associated construction methods is provided in Chapter 4, where direct comparison is also made between the design of the Originally Consented Project and the current Project. In summary, the Project will be an application for an offshore wind farm comprised of the following key components:

- Wind turbines;
- OSPs, used to collect the generated electricity and convert it for transmission to shore;

[1] The original application was for up to 125 wind turbines which was subsequently reduced to 90 at the stage of submitting the Addendum; the final consents granted by Scottish Ministers were for a development of up to 75 wind turbines.

- Foundations for the turbines and OSPs;
- A network of inter-array subsea cables to connect turbines and OSPs;
- Minor ancillary infrastructure such as met buoys and aids to navigation; and
- Subsea Offshore Export Cables, to transmit electricity from the OSPs to the landfall.

1.5 Purpose of the Scoping Report

This Scoping Report supports a request for a formal Scoping Opinion from Scottish Ministers. It is anticipated that the Scoping Opinion will be based on responses to this Scoping Report from key statutory and non-statutory consultees, which will help guide NnGOWL in progressing the Project EIA.

The purpose of the Scoping Report is to engage with the Scottish Ministers, statutory and non-statutory consultees in the EIA process, inviting them to provide relevant information and to comment on the proposed approach to the EIA, to ensure that a robust ES is submitted in support of the applications for consents. This Scoping Report therefore identifies:

- The main aspects of the offshore physical, biological and human environment likely to be significantly affected by the construction, operation and decommissioning of the Project; and,
- The extent of relevant environmental studies to be undertaken as part of the Project EIA and to be reported in the Project ES.

The identification and subsequent assessment of potentially significant effects will be based on an understanding of the environmental conditions likely to be encountered within the Development Area, utilising the extensive information gathered and presented within the Original ES, and other more recent, publicly available data sources.

Effects that are unlikely to be significant will be scoped out of the Project EIA (i.e. no further data collection or assessment is proposed and they will not be considered further in the EIA process) (see Chapter 2 for further detail on the approach to the scoping process).

1.6 Document Structure

The Scoping Report is structured as follows:

Chapter	Chapter Title	Overview
1	**Introduction**	Introduces the Project and developer and states the purpose of the scoping report.
2	**Approach to Scoping**	Explains the intention to draw upon the content of the Original EIA undertaken for the Originally Consented Project, to inform scoping topics in and out of the future assessment.
3	**Policy and Legislative Context**	Sets out the need for the Project and provides an overview of policy and legislation most relevant to the Project.
4	**Description of Development**	Provides a description of each of the key components of the Project and outlines approaches to construction, operation and maintenance and decommissioning.

Chapter	Chapter Title	Overview
		Compares the Project design envelope to that of the Originally Consented Project.
5	**EIA Methodology**	Describes the assessment methodology to be adhered to in undertaking the Project EIA.
6 - 19	**Topic Specific Scoping**	Presents the results of EIA scoping for topics relating to the physical, biological and human environments; each Chapter clearly proposes which potential impacts require further, detailed consideration in the Project EIA and identifies potential impacts to be scoped out of the Project EIA. Sets out the proposed methodologies for the Project EIA.
20	**Summary of EIA Scoping**	Summarises the findings presented across Chapters 6 to 19, presenting the intended scope of the Project EIA.
21	**Proposed ES Contents**	Sets out the proposed contents of the ES, which will be prepared in support of the applications for consent.

2 Approach to Scoping

2.1 Introduction

This chapter sets out the approach to scoping, in relation to the Project EIA, the cumulative impact assessment, assumptions regarding mitigation and the anticipated consultation process.

2.2 The Approach to Scoping of the Project

The Project proposed by NnGOWL is broadly analogous in terms of location and most aspects of its design to the Originally Consented Project. It should, however, be noted that the Original EIA (reported in the Original ES submitted in support of the consent applications lodged with the Scottish Ministers by NnGOWL in 2012) was undertaken on a scheme design comprising of up to 125 offshore wind turbines (and associated foundations etc.).

The Addendum submitted in June 2013 reassessed the effects on some (but not all) receptors based on a reduced Project design envelope comprising of up to 90 turbines. The Original ES and Addendum are collectively referred to as the Original Application. The conclusions set out in the Original Application documents and referred to in this Scoping Report are therefore made on that basis (although the consent was subsequently granted for a scheme comprising of up to 75 wind turbines).

Significant existing data and knowledge regarding the environmental characteristics of the Project location are already available, acquired through site specific surveys, technical studies and data gathering to inform the Original EIA and Addendum. In addition, the potential effects of the Originally Consented Project on the environment have been thoroughly assessed, and the outcomes of that assessment considered by the Scottish Ministers in their determination of the Original Application. On this basis, it is NnGOWL's intention to maximise, where appropriate, the use of the existing data and the previous impact assessments in order to:

- Characterise the baseline environment to inform the EIA, where data is sufficient and it is appropriate to do so;
- Scope out impacts where there is clear justification for doing so; and
- Where impacts are scoped in, to draw upon the existing evidence base where appropriate in preparing the Project EIA.

This approach, as summarised in Figure 2-1, is intended to focus the Project EIA on those potential impacts that are likely to give rise to significant effects (or where significant uncertainty exists in relation to the validity of the previous assessments) and thereby avoid revisiting assessments where the conclusions reached previously in the Original ES and Addendum demonstrate that significant effects would not occur.

The topic specific chapters of this Scoping Report (Chapters 6 to 19), identify where the existing evidence base (i.e. the Original ES and Addendum) has been used to confirm baseline conditions across the Project area, identify potential impacts (both alone and cumulatively) and consider their likely significance. Each topic chapter:

- Identifies and summarises the baseline data that was gathered to inform the Original EIA and Addendum, and considers the validity of the data in terms of describing current baseline conditions across the Project for the purposes of the EIA. Where more recent publicly available data sources have become available, these are also identified.
- Each topic chapter also defines a worst-case design scenario for the Project, and compares this to the equivalent for the Originally Consented Project. Where the Project design envelope is expected to be unaltered, or represent a reduction in the worst-case scenario, and where it is possible to

conclude that significant effects would not occur, then previous conclusions reached on residual effects in the Original EIA (including the Addendum) are considered to be adequate justification to scope out the topic from the Project EIA. Conversely, where the design envelope differs in a way that could give rise to previously undescribed impacts, or a level of significance that might be greater than previously described, or it is considered that the baseline might have substantively changed, it is proposed that the potential impacts are considered in the Project EIA process and reported in the Project ES.

- Finally, where relevant, topic chapter identify any more recent updates in approach or best practice that is relevant to the EIA methodology for that topic. Where new policy or guidance on assessment is relevant and available, the topic chapter describes how this will be applied in the Project EIA.

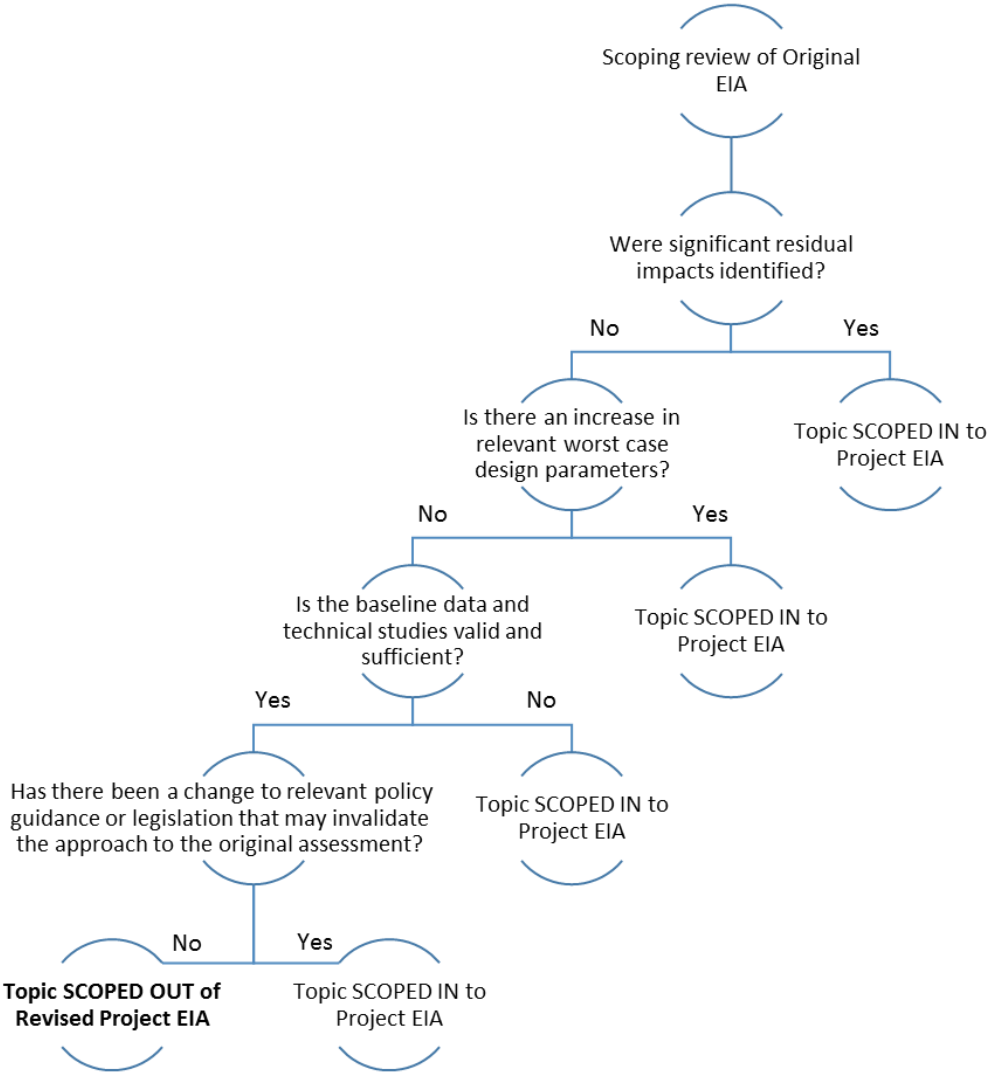


Figure 2-1. Scoping of the Project EIA based on the Original EIA.

2.3 Application of Embedded Mitigation

Embedded mitigation is the term applied to mitigation measures that are 'built in' to the scheme i.e. they are assumed to be in place as up-front commitments rather than mitigation proposed in response to the EIA process and being necessary to specifically mitigate a significant effect. In conducting this scoping exercise, NnGOWL has applied a range of 'embedded mitigation' measures in determining the residual significance, and therefore the justification for scoping issues in or out of the assessment process for the Project.

The embedded mitigation will be listed in full in the ES prepared for the Project, and NnGOWL anticipates that this mitigation will form the basis for any conditions or requirements attached to any consents subsequently granted for the Project.

The embedded mitigation presented under each of the topic specific chapters (6 to 19) is drawn from:

- Mitigation and management measures that formed 'embedded mitigation' applied during the EIA for the Originally Consented Project; and
- Additional mitigation and management measures identified as a result of the EIA for the Originally Consented Project.

2.4 Consent Condition Commitments

The relevant conditions and requirements from the consents granted for the Originally Consented Project (those that relate to mitigation or management) are reproduced in full in Appendix A. The consent conditions have taken account of relevant consultation responses and were considered in determining the acceptability of the Original Application.

NnGOWL recognises that MS-LOT may wish to apply amended conditions to any consents that may ultimately be granted for the Project but would expect the main requirements encapsulated by these conditions, where relevant and necessary to the Project, to remain a requirement in some form.

NnGOWL would envisage a condition requiring the Project to be constructed and operated in accordance with the Project ES and the requirement for the following plans to be submitted for approval, which act to limit the final design of the Project to that detailed within the design envelope:

- Construction Programme (CoP) to confirm the timing and programming of construction;
- Design Specification and Layout Plan (DSLP) detailing the final specification and layout of the wind turbine array and cable routes;
- Construction Method Statement (CMS) to confirm the installation methods and management of construction taking into account any required mitigation measures;
- Piling Strategy (PS) setting out the key pile parameters, installation method and mitigation to be applied during construction;
- Cable Plan (CaP) setting out the installation methods taking into consideration all environmental and navigational issues; and,
- Operation and Maintenance Programme (OMP) setting out the requirements and programme of ongoing operation and maintenance activities.

Where it is anticipated that similar consent conditions to those attached to the Consents may be necessary to address the environmental risk in respect of a particular receptor, these are detailed within the relevant topic chapters (Chapters 6 – 19).

2.5 Approach to Scoping of Cumulative Impacts

Assessment of cumulative effects forms part of the EIA process. This Scoping Report aims to confirm the scope of the Cumulative Impact Assessment (CIA) to be considered in the Project EIA.

Fundamental to scoping of the CIA is agreement of the list of plans, projects and activities to be considered alongside the Project. Appendix B of this document sets out the list of projects that have been considered during this scoping exercise. In advance of completing the CIA, this list may need to be updated and further agreed with the Scottish Ministers to ensure that the CIA takes account of all relevant existing and reasonably foreseeable plans, projects and activities.

It is understood that the Inch Cape and Seagreen wind farms are in the process submitting scoping reports for reduced design envelopes compared with the original applications. NnG will consider how to address new and old designs on a topic basis and based on the most recently available information. It is likely the CIA will present results for both consented and scoped designs.

2.6 Proposed Scoping Consultation

Although the Scoping Opinion will form an important step in developing the EIA of the Project, NnGOWL also recognise that the final scope of the assessments will require further development and discussion with relevant statutory and non-statutory consultees. NnGOWL expects to engage with consultees through the scoping process and throughout the pre-application period to ensure the EIA is completed appropriately and takes account of all relevant issues (see also Section 3.3 for further detail on proposed consultation).

3 Policy and Legislative Context

3.1 Need for the Development

The key drivers underpinning the need for renewable energy and therefore for the Project are as follows:

- The need to reduce greenhouse gas emissions, including increasing energy generation from low carbon sources to replace high carbon energy sources such as burning coal and oil;
- The need for energy security, including:
  - The need to secure safe, affordable, reliable and preferably local energy generation for the UK market;
  - The need to replace existing aging energy generation infrastructure;
  - The need to support expected electricity demand whilst meeting climate change commitments; and
  - The need to maximise economic opportunities from energy infrastructure.

3.2 Application and Consenting Process

The Project is located in Scottish Territorial Waters and therefore Scottish Ministers are the relevant decision maker in respect of the necessary consents and licences required for the construction and operation of the Project. To allow the Scottish Ministers to properly consider the development proposals, applicants are required to provide information which demonstrates compliance with the relevant legislation and allows adequate understanding of the material considerations.

In the following sections, the key consents required to allow the Project to proceed are identified and the consenting process is described.

3.2.1 Electricity Act 1989 (Section 36 Consent)

The Project is subject to an application to Scottish Ministers under Section 36 of the Electricity Act 1989 for consent for the construction and operation of an electricity generating station. The scope of this consent will include the installation, operation and maintenance of turbines and inter-array cables.

In addition, Scottish Ministers may make a declaration under Section 36A of the Electricity Act 1989 extinguishing the public rights of navigation for the locations of the proposed turbines and OSP structures.

3.2.2 Marine (Scotland) Act 2010 (Marine Licences)

The Marine (Scotland) Act 2010 was introduced to provide a framework to balance competing demands on Scotland's seas. It introduced a duty to protect and enhance the marine environment and included measures to help boost economic investment and growth in areas such as marine renewables. The Act included measures relating to marine planning, licensing, conservation, and enforcement.

The requirement for a Marine Licence was introduced under the 2010 Act. A Marine Licence will be required for marine licensable activities associated with the Project including the deposit on the seabed of cables and substructures seaward of the mean high water springs (MHWS) mark.

3.2.3 Consenting Process

Where an offshore energy project, such as an offshore wind farm, requires S36 Consent and a Marine Licence, the Marine Scotland Licensing and Operations Team (MS-LOT), on behalf of Scottish Ministers, can process both consent applications jointly.

The consenting process can be summarised as follows:

- Pre-application: Developer undertakes preparatory work and discusses proposal with statutory body. Developer undertakes EIA, commencing with screening and/or scoping exercises to confirm the requirement for EIA and scope of EIA respectively. Developer consults on the proposal as part of consenting and EIA process with variety of statutory consultees and stakeholders. An ES is prepared.
- Application: Developer submits consent applications, including ES and fees, to MS-LOT. Once the application is accepted by MS-LOT, the Developer circulates application information to consultees identified by MS-LOT, and also places copies of the same information in public viewing places. Developer advertises the applications in national and local press.
- Consideration of the application: Consultees make representations on the consent applications.
- Proposal evaluation: Consultee responses are considered by MS-LOT.
- Application determination and announcement: Scottish Ministers proceed to determine the applications and the decision is announced and published.
- Post-decision: Where consents are granted, the Developer must comply with any conditions attached to the consents.

3.2.4 Requirement for EIA

Certain types of developments are classed as 'EIA Development' under the requirements of the EIA Directive. The purpose of the EIA Directive is to ensure that, in considering whether to grant consents for developments that are likely to have significant environmental effects, the consenting authorities have all the necessary environmental information on which to base their decision. It is considered that, due to the nature, scale and size of the Project, there is the potential for significant environmental effects; accordingly, an EIA will be required.

The requirements of the EIA Directive are enacted through relevant UK legislation for electricity generation projects requiring consent under Section 36 of the Electricity Act 1989 by the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and in relation to marine licensing by The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended in 2011). Both sets of Regulations set out the statutory process and minimum requirements for EIA, to which NnGOWL will adhere.

The EIA Directive has been amended by Directive 2014/52/EU with the amendments due to come into force on 16th May 2017. The regulations transposing the new Directive into UK law of relevance to the Project are the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Projects which enter the planning system (i.e. submit a request for an EIA Scoping Opinion) prior to 16th May 2017 fall within the transitional provisions set out within the regulations and certain aspects of the 2000 and 2007 EIA Regulations (i.e. the scope of an ES) will continue to apply.

The main stages in the EIA process, which NnGOWL will follow, are:

- Scoping to determine the content of the ES and the matters to be addressed by the EIA (as presented in this Scoping Report);
- Data review involving compiling and reviewing available data and/or undertaking of baseline surveys to generate site-specific data;
- Assessment and design iteration whereby the likely significant effects of the Project during the construction, operation and maintenance, and decommissioning stages of its life are assessed. Feedback is provided to the design and engineering team(s) to modify the development in order to avoid, prevent, reduce or, as a last resort, offset any significant adverse effects on the environment;
- Assessment of the construction methodology and the final design of the Project;
- Identifying any residual effects and any further mitigation requirements; and
- Preparing the Environmental Statement, reporting on the EIA.

3.2.5 Requirement for Habitats Regulations Appraisal

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, known as the Habitats Directive, provides for the conservation of natural habitats and of wild flora and fauna including in offshore areas. The Council Directive 2009/147/EC on the Conservation of Wild Birds, known as the Birds Directive, applies to the conservation of all species of naturally occurring wild birds including in offshore areas. In the UK, sites designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) form part of the Natura 2000 network, delivering the requirements of the Directives.

The Directives have been transposed into Scottish Law by various regulations. The regulations of relevance to the Project are the Conservation (Natural Habitats, &c.) Regulations 1994 and the Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations).

The Habitats Regulations require that wherever a project, that is not directly connected to, or necessary to the management of a European site, is likely to have a significant effect on a European site (directly, indirectly, alone or in-combination with other plans or projects), then an 'Appropriate Assessment' (AA) of the implications of that site in view of that site's conservation objectives must be undertaken by the competent authority. The Appropriate Assessment must be carried out before consent or authorisation can be given for the project.

Habitats Regulations Appraisal (HRA) is a step by step process which determines likely significant effects (LSE) and, where appropriate, assesses adverse impact on the integrity of a European site, examines alternative solutions, and provides justification of Imperative Reasons of Overriding Public Interest (IROPI). NnGOWL will prepare and submit an HRA Screening Report for submission to MS-LOT detailing the outcome of LSE screening on the qualifying features of relevant European Sites.

3.2.6 Other Consents and Licences

3.2.6.1 The Energy Act 2004 (Safety Zones)

Under Section 95 of the Energy Act 2004 where a renewable energy installation is proposed to be constructed, and the Scottish Ministers consider it appropriate for safety reasons, designated areas may be declared as safety zones. Safety zones are intended to ensure the safety of the renewable energy installation or other installations in the vicinity during construction, operation, extension or

decommissioning. Safety zones may exclude non-Offshore Wind Farm vessels from navigating through a designated area for a designated period. NnGOWL expect to apply for standard safety zones of 500 metres (m) during construction and major maintenance activities, and of 50 m around all offshore structures (i.e. turbines and offshore substation platforms) during the operational phase of the Project.

3.2.6.2 Energy Act (2004) (Decommissioning)

Sections 105 to 114 of the Energy Act 2004 require a decommissioning scheme for an offshore renewable energy installation in Scottish Waters to be approved by Scottish Ministers.

3.2.6.3 The Crown Estate Act 1961 (Seabed Lease)

The Crown Estate Commissioners are the owner of much of the foreshore and the seabed below the territorial seas of the UK under the provisions of the Crown Estate Act 1961 and are the party entitled to exercise the right to exploit areas for the production of energy from water or winds within designated areas. The Commissioners require a lease of the seabed and foreshore to be entered into for developments on the marine estate, including cable laying and construction of offshore wind turbines.

Following the Scotland Act 2016, Crown Estate management in Scotland has now been devolved to Scottish Ministers. Crown Estate Scotland began operating on 1 April 2017 and is tasked with managing assets including agricultural and forestry land, most of the seabed, around half of the foreshore and some commercial property.

3.2.6.4 The Conservation (Natural Habitats, &c.) Regulations 1994 (European Protected Species Licensing)

The Habitats Regulations provide strict protection for certain animal and plant species referred to as European Protected Species (EPS). Under Regulation 44 of the 1994 Habitats Regulations certain activities which would normally constitute an offence against such species can be carried out legally under a licence. An example of such an activity is the piling of offshore wind turbine foundations, which may generate underwater noise at levels that could disturb cetaceans, which are EPS. The licences are granted by Scottish National Heritage (SNH) or Scottish Ministers depending on the reason for the licence application. NnGOWL will apply for licences as appropriate.

3.2.6.5 Town and Country Planning (Scotland) Act 1997

The OnTW (described briefly in Section 4.6 below) associated with the Project are not considered in detail within this Scoping Report as planning permission has been separately sought by NnGOWL for the onshore transmission infrastructure under the Town and Country Planning (Scotland) Act 1997. NnGOWL was granted planning permission for the OnTW by East Lothian Council in June 2013, the permission was subsequently amended by a Section 42 application in November 2015.

The Project EIA will consider the OnTW if there is potential for the offshore and onshore elements of the Project to interact to result in an effect on an environmental receptor (for example, on intertidal receptors at the landfall location that have the potential to be affected by Offshore Export Cable installation).

3.3 Consultation

The following legislation sets out the relevant statutory consultation requirements that will apply to the Project, such as the need for pre-application consultation and advertising of consent applications:

- Marine (Scotland) Act 2010 and the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 set out the requirements for pre-application consultation;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- The Marine Works (Environmental Impact Assessment) Regulations 2007 and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017.

NnGOWL will adhere to all statutory consultation requirements, and in doing so will build on existing relationships developed with stakeholders during the consenting of the Originally Consented Project.

As part of the EIA process, extensive consultation with those stakeholders with an interest in the Project is anticipated. Engagement with stakeholders during the EIA process is expected to be focused around the following key stages:

- Formal submission and publication of this Scoping Report and request for a Scoping Opinion;
- Follow-up to scoping, to confirm the approach to EIA (and HRA) with key stakeholders;
- Provision of key technical reports and data, used to inform the assessments, to relevant stakeholders for information and feedback;
- Completion of statutory pre-application consultations;
- Formal submission and publication of consent applications and the accompanying ES to seek views on the proposal; and
- Additional public / stakeholder-specific engagement events that will take place at intervals during the consenting process, together with the issue of newsletters and updates to the NnGOWL website.

NnGOWL will ensure that consultation is carried out in compliance with the specific requirements set out under the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013. Pre-application consultation is intended to allow local communities, environmental groups and other interested parties to comment upon proposed developments at an early stage - before a consent application is submitted. A pre-application consultation report, will be prepared and submitted to MS-LOT.

4 Description of the Project

4.1 Introduction

This section of the Scoping Report provides an outline description of the Project design and describes activities associated with the construction, operation and maintenance, and decommissioning of the Project.

The Project description is based on a 'design envelope' (which captures the full range of potential design scenarios) and is intended to provide sufficient flexibility to accommodate further expected refinement in design as the Project moves through consenting and towards construction. The sub-sections below therefore set out a series of design options and parameters, for which maximum values are typically provided. The maximum values constitute a 'realistic worst case scenario' in relation to the Project. The final design envelope will be set out within the Project ES.

Design parameters presented below are broadly consistent with those of the Originally Consented Project, as set out in the Original ES, Chapter 5 - Project Description (NnGOWL, 2012) and Addendum (NnGOWL, 2013). This is of relevance to the scoping process, since the Original EIA (including the Addendum), prepared by NnGOWL in 2012 and 2013, considered the potential effects of the Originally Consented Project and, where appropriate, the conclusions of that assessment are used to inform scoping. Comparisons are provided below, which clearly identify where the maximum values associated with the Project align with or vary from those presented for the Originally Consented Project.

Extensive studies and investigations informed the identification of the development location; key steps in site selection are summarised below. In May 2008, TCE invited expressions of interest from those companies wishing to be considered as potential developers of offshore wind farms in Scottish Territorial Waters (STW).

Prior to submitting a bid for the Development Area, Mainstream carried out a series of desk-based assessments to determine those sites in STW with the potential to be taken from Development Areas to fully consented and constructed wind farms.

In addition to these assessments, consultation was undertaken with the Scottish Government, Maritime and Coastguard Agency (MCA), Chamber of Shipping, Royal Society for the Protection of Birds (RSPB), Scottish Natural Heritage (SNH), Fisheries Research Service (FRS), Scottish Environment Protection Agency (SEPA), Scottish Fishermen's Federation (SFF), Montrose Port, Ministry of Defence (MOD), British Airports Authority (BAA), Civil Aviation Authority (CAA), Visit Scotland and Fife Council.

In 2009 TCE awarded an exclusivity agreement to NnGOWL to develop the Development Area.

The Development Area was included in Blue Seas - Green Energy: A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters: Part A - The Plan (Marine Scotland, 2011). This plan identified the Offshore Wind Farm as one of six sites, within Scottish Territorial Waters, for potential offshore wind farm development. A Strategic Environmental Assessment (SEA) of the Sectoral Marine Plan was undertaken by Marine Scotland (2010).

Since the identification of the Development Area, NnGOWL has entered into the following agreements:

- An Agreement for Lease (AfL) with TCE, which gives an exclusive right to NnGOWL to develop a wind farm and the opportunity to secure a lease giving rights to the seabed was entered into in August 2011.

- Grid connection agreements with National Grid Electricity Transmission plc. The agreements are required to transmit generated electricity, for distribution to the UK energy markets.
- A Contract for Difference ("CfD") with the UK Government's Low Carbon Contracts Company. The CfD gives the wind farm an inflation-linked strike price for electricity produced.

4.2 Development Boundary

The Development Area is shown in Figure 4-1. Location of Development Area. This area encompasses the:

- Wind Farm Area: This is where the Offshore Wind Farm will be located, which will include the turbines, OSPs, turbine and OSP foundations, inter-array cables, interconnector cables and part of the Offshore Export Cables; and
- Offshore Export Cable Corridor, within which the Offshore Export Cables will be located.

The Wind Farm Area and the Offshore Export Cable Corridor are the same as those for the previously consented Originally Consented Project.

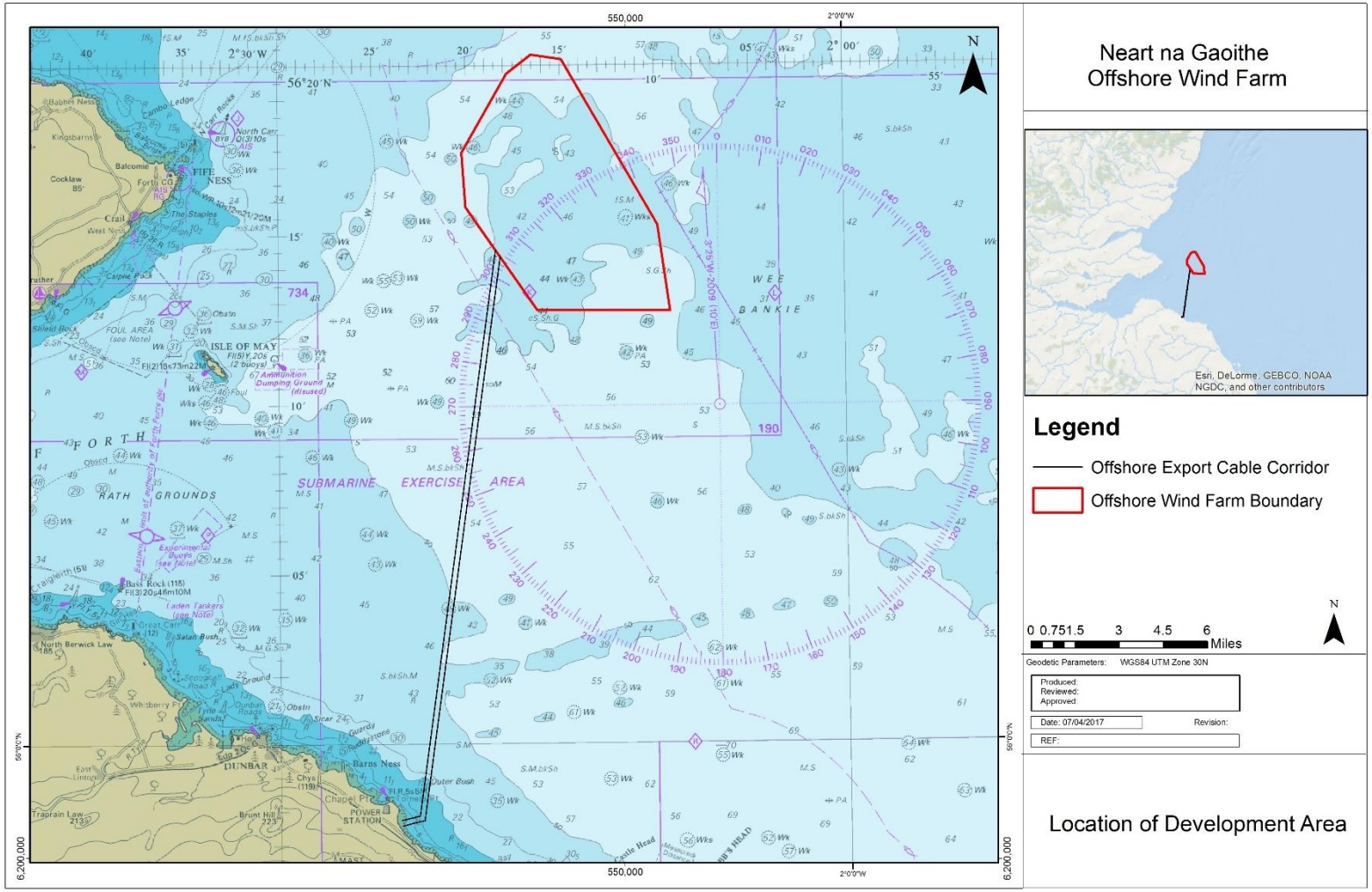


Figure 4-1. Location of Development Area.

4.3 Offshore Wind Farm infrastructure

4.3.1 Wind Turbines

The EIA will be undertaken on a range of turbine parameters to ensure the EIA and application for consents are 'future-proofed'. Anticipated turbine parameters are provided in Table 4-1 below (see Figure 4-2 for parameter definitions) and compared to those presented in the application for the Originally Consented Project.

NnGOWL proposes to install no more than 56 turbines.

Each turbine will have the same three bladed design and will incorporate the following features:

- The blades or rotor to convert wind energy to low speed rotational energy. The blades are attached to the hub of the nacelle;
- The nacelle houses the electrical generator, the control electronics, and will utilise a direct drive system for converting the incoming rotation to electricity;
- The tower supports the nacelle; and
- The turbine transformer is located within the wind turbine tower, usually at platform level above the foundation. The transformer is housed in a hermetically sealed unit and serves to step up the generator voltage to the inter-array transmission voltage

Turbine colouring, lighting, marking and foghorn requirements will be as per current relevant standards and guidance.

It is anticipated that turbine sub-assemblies (tower, nacelle and rotor blades) will be loaded onto an installation vessel or a feeder vessel and transported to the Offshore Wind Farm. A heavy lift vessel will then erect the tower first, either in single, two or three sections, followed by the nacelle and finally the rotor blades. The blades may be installed one at a time or pre-assembled and installed complete.

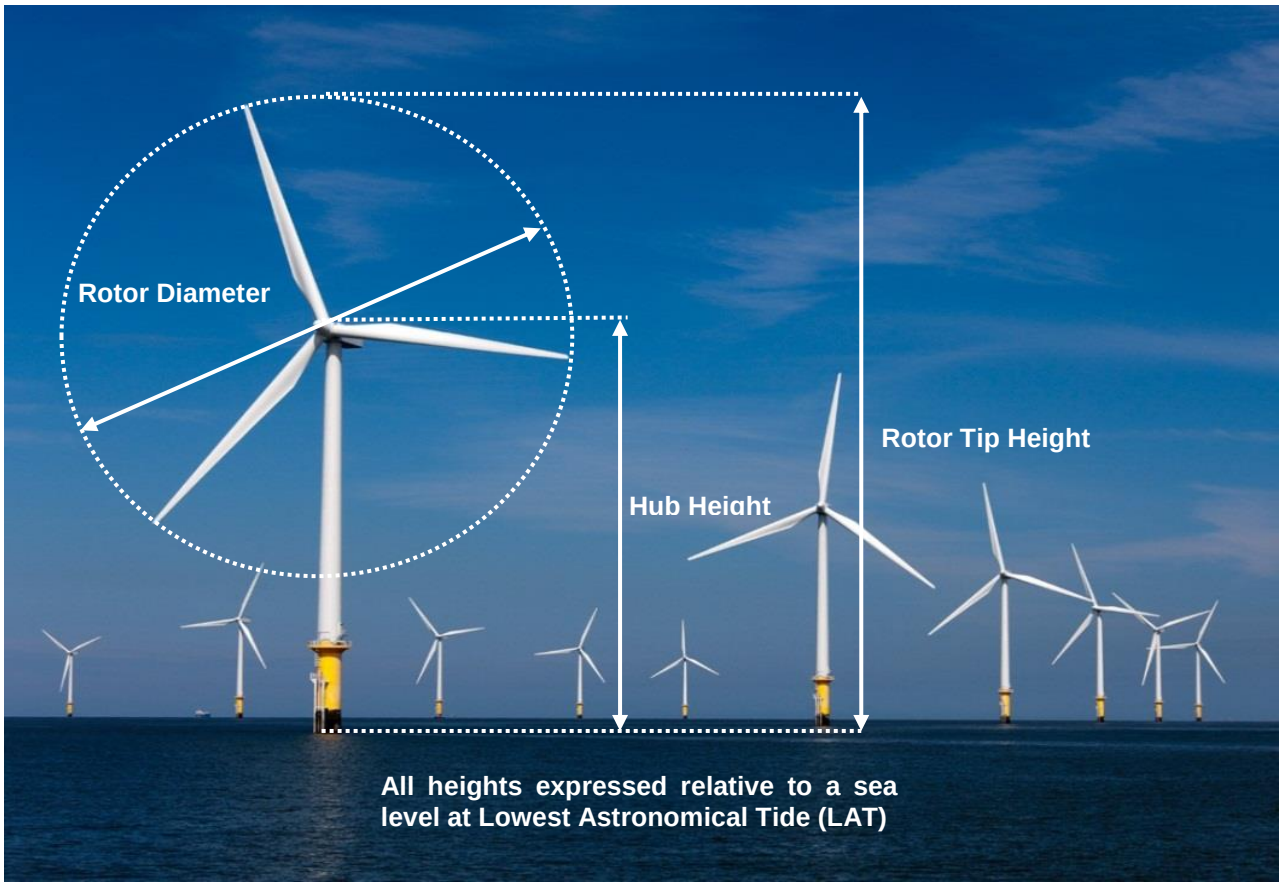
Table 4-1. Design Envelope Parameters (Wind Turbines).

Design Parameters	Design Envelope (Application)	Design Envelope (Original Application (NnGOWL, 2012; NnGOWL, 2013)
Number of turbines	Up to 56	Up to 125 in the ES, up to 90 in the Addendum[2]
Maximum rotor tip height above LAT (m)	Potentially greater than 197, currently anticipated to be	197

[2] Consents ultimately granted for up to 75 turbines.

Design Parameters	Design Envelope (Application)	Design Envelope (Original Application (NnGOWL, 2012; NnGOWL, 2013)
	approximately 230	
Rotor diameter (m)	Up to approximately 180	126 or 152
Maximum hub height above LAT (m)	Greater than 107.5, currently anticipated to be approximately 140	107.5
Min turbine spacing (m) (approximately)	Approximately 800	450
Minimum Blade clearance above LAT (m)	30.5	30.5

Figure 4-2. Wind turbine parameters (adapted from Renew (2011)).



4.3.2 Wind Turbine and OSP Foundation Substructures

Steel frame structures are the foundation and substructure option being considered for the Project. Steel jacket foundations are formed of a lattice construction comprising tubular steel members and welded

joints and are fixed to the seabed using piles below each leg of the jacket. The Project will use a steel jacket comprised of up to six legs (Figure 4-3). Typically piles are of tubular steel and are drilled or driven into the seabed sub-strata, relying on the frictional and end bearing properties of the seabed for support. Examples of steel jackets being used in the offshore wind sector include Beatrice Offshore Wind Farm in the Moray Firth, Galloper Wind Farm off the Suffolk coast and Alpha Ventus in the German sector of the North Sea

The final jacket design will require fixing to the seabed by up to six installed piles. The piles may be pre-installed using a seabed template or installed through the jacket legs or a jacket footplate. Two pile installation methods are currently being considered: driven piles where they are driven into the seabed by striking them with a hydraulic hammer; drilled piles where 'sockets' are drilled into the seabed and then the piles are inserted and grouted in place; or a combination of both.

The jackets will be pre-fabricated at an onshore base and transported to site by a transport barge or by a suitably equipped installation vessel. The jackets will then be lifted into place from either a crane on the installation vessel or using a crane barge onto pre-installed piles or a prepared seabed in the case where piles are not pre-installed.

Anticipated substructure parameters are provided in Table 4-2 below and compared to those presented in the Application for the Originally Consented Project. Gravity base foundations, previously included in the design envelope for the Originally Consented Project, are no longer being considered.

Figure 4-3. Illustrative 6-leg steel framed substructure with pile foundations.

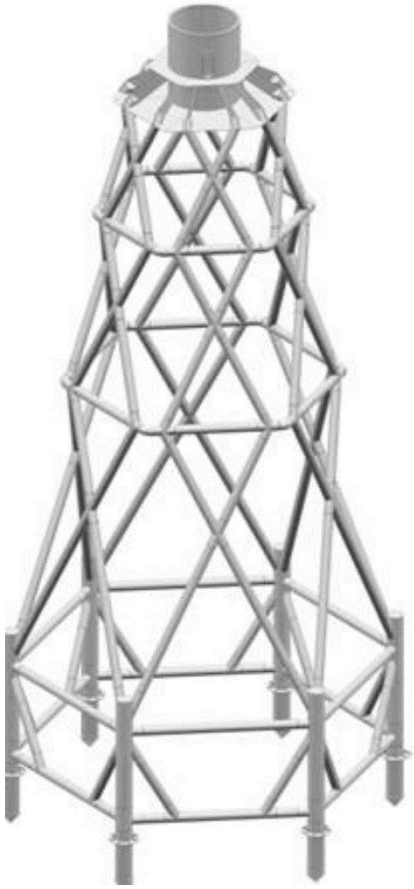


Table 4-2. Designed envelope parameters (turbine and OSP substructure and pile foundations).

Design Envelope	Design Envelope (Application)	Design Envelope (Original Application (NnGOWL, 2012; NnGOWL, 2013)	
Jacket type	Steel lattice jacket	Steel lattice jacket	Gravity base foundation
Jacket leg spacing at seabed level (m x m)	Up to approximately 30 x 30	20 x 20 – 30 x 30	Up to 45 m diameter
Details of seabed preparation	A seabed template with up to 6 legs will sit temporarily on the seabed during pile installation.	A seabed template with up to 4 legs will sit temporarily on the seabed during pile installation.	Approximately 4,000 m^3 dredged material per foundation. 530 – 1850 m^3 gravel bed laid at each foundation location extending 2-4 m beyond foundation substructure.
Foundation diameter (m) (piles)	Up to 3.5 m	2.5 – 3.5	n/a
Number of piles per foundation	Up to 6	3 or 4	n/a
Foundation bed penetration depth (m) (piling)	Up to approximately 50 m	20 – 50 m	n/a
Foundation installation method	Approximately 3% of piles will be driven only, 7% of piles will be drilled only. 90% of piles will be driven-drilled - of these an approximately 30% of the pile will be driven and 70% drilled.	Approximately 3% of piles will be driven only, 7% of piles will be drilled only. 90% of piles will be driven-drilled - of these an average of 30% of the pile will be drive and 70% drilled.	Seabed preparation will comprise dredging of seabed and deposition of gravel bed. The foundation will then be placed and filled followed by scour protection installation around perimeter of substructure.
Foundation installation duration (per foundation) (hours)	Piling (62-180 hours for 6 piles) jacket installation (12-24 hours). This includes time for setting up and changing equipment between piling locations.	Piling (62-180 hours for 4 piles) jacket installation (12-24 hours). This includes time for setting up and changing equipment between piling locations.	Dredging: 4 - 7 days, gravel bed placement: 4 - 7 days, foundation placement and filling: 4 - 7 days scour protection placement: 7 - 14 days.
Total seabed occupied by jacket (piles, legs and scour protection) (m^2)	Approximately 225 m^2	Approximately 225m^2	Approximately 1600 m^2

4.3.3 Scour Protection

A level of structure exposure due to scour erosion can be allowed for in design. However, there are instances where this is not sufficient and preventative measures against scour are required. Scour protection is generally material which cannot be moved by the momentum of increased flow around the structure e.g. specifically selected grades of gravel and rock. Concrete mattresses or similar techniques can also be used.

In detailed design the need for scour protection around jacket piles will be defined. Should scour protection be required, the area of seabed protected will be in the range of 100 to 250 m^2. The volume of material to be placed on the seabed for the purpose of scour protection will be in the range of 100 to 375 m^3 per jacket, and therefore significantly less than the area/volume needed for a gravity base, which formed part of the Originally Consented Project and was assessed in the Original EIA. The need for scour protection will be determined through detailed design and further site surveys.

4.3.4 Array Cabling

The cabling used to connect the turbines within the Offshore Wind Farm will be steel wire armoured and will have three electrical conductor cores varying in size. The cables will have cross-linked polyethylene (XLPE) insulation. Optical data cables for SCADA, control and protection will likely be included within the cable bundle.

There will be up to 14 collector circuits, connecting up to 8 turbines each, depending on the turbine model and collector voltage; these will directly link to the OSPs. In addition, there will be a number of interconnector cables connecting the OSPs. The connection between OSP's ensures that up to 50% of total power generated can be exported at all times in the event of a fault in one of the Offshore Export Cables connecting to the onshore substation. It also ensures a back-up power supply from the grid to the two OSPs.

It is anticipated that there will be up to 140 km total length of inter-array cabling depending on final turbine layout choice; this includes cabling between turbines, backlink cabling between each pair of 'strings' and cabling between the two OSPs (interconnectors) to facilitate the connection of the two OSPs to one Offshore Export Cable.

Due to the relatively small diameter, greater inherent flexibility and shorter route lengths involved in inter-array cable installation different approaches can be adopted:

- Cables can be cut to length prior to the offshore installation phase;
- Uncut cable can be loaded into a vessel cable tank or carousel (with capacity up to 80 km of cable); or
- Shorter lengths can be spooled on to an installation reel or reels, which can then be lifted onto the installation vessel.

The most typical installation method is using a single vessel to both lay and bury the cable simultaneously but they can also be performed as separate operations (refer to Section 5.10.1).

Inter-array cables will be buried where practicable and protected by other means where burial is not possible. There are several materials used to provide scour protection to cables which include one of, or a combination of:

- Durable crushed or original rock of defined size range;
- Artificial fronds or seaweed;

- Concrete mattresses; and
- Bags (high strength nylon fibre) of gravel, hardened sand-cement grout, or concrete (grout/concrete pre-filled and hardened onshore). The bag option may include a technique where the grout is introduced to the nylon fibre bag offshore through proprietary pipes (the bags being permeable to water but not to grout).

The amount of scour protection is dependent on the mobility of the seabed in the vicinity of the cables. Preliminary calculations have indicated that the scour protection grain size is expected to have a median diameter of 100 mm. The width of scour protection above the cable where necessary is expected to be about 2 m and thickness of the scour protection is expected to be of the order of 0.5 m.

Anticipated array cabling parameters are provided in Table 4-3 below and compared to those presented in the Application for the Originally Consented Project.

Table 4-3. Design envelope parameters (array cabling).

Design Parameters	Design Envelope (Application)	Design Envelope (Original Application (NnGOWL, 2012; NnGOWL, 2013)
Number of cables	Up to 14 circuits with a total of approx. 140km of cable, inclusive of interconnector cables between the OSPs.	Up to 15 circuits with a total of 75 to 140km of cable
Design array	Max 8 turbines per collector circuit	Max 6 turbines per collector circuit
Burial method/scour protection	Likely ploughing/cutting/jetting or rock cover. Exact options finalised when layout is confirmed.	Likely ploughing/cutting/jetting or rock cover. Exact options finalised when layout is confirmed.
Width of seabed affected (per cable) width of cable Corridor	Approximately 2m direct impact width up to approximately 8m width of zone of minor disturbance (approximately 10m in total).	2m direct impact width up to 8m width of zone of minor disturbance (10m in total).
Burial depth (m)	up to 3m	Up to 3m

Inter-array cables will be buried and protected as appropriate in order to:

- Prevent movement or exposure of cables over the lifetime of the Offshore Wind Farm due to seabed movement;
- Protect the cables from other activities such as fishing or anchor placement;
- Protect against the small risk of dropped objects; and
- Limit the potential effects on environmental receptors from the effects of heat and or induced magnetic fields caused by the cables.

Some seabed preparation (e.g. boulder clearance and clearance of unexploded ordnance and other seabed obstructions) may be required prior to the installation of subsea cabling.

4.4 Offshore Transmission Infrastructure

Offshore electrical transmission infrastructure is required to transfer the energy generated by the wind turbines to the electrical transmission system onshore. Electricity generated by wind turbines offshore requires the following components to transmit energy to the national grid:

- Two 43 km long Offshore Export Cables from the OSPs to the landfall point at Thorntonloch; and
- A maximum of two OSPs.

4.4.1 Offshore Substation Platforms (OSPs)

An OSP (sometimes also referred to as Offshore Transformer Modules – OTMs) is a 'box-like' structure, often referred to as a 'topside', which is set above the sea level on a substructure fixed to the seabed by a foundation. The foundation and substructure options for OSPs are the same as the options outlined for the wind turbines (detailed in Section 4.3.2) although they may be larger.

The purpose of an OSP is to transform the electricity generated offshore from a medium voltage to a higher voltage. This increased voltage allows the electricity to be transmitted from the OSPs to the onshore substation efficiently and with lower transmission losses. There will be a maximum of two high voltage alternating current (HVAC) offshore substations installed, each connecting to shore with a single cable.

The OSPs form the interface between the inter-array cabling and the offshore export cabling. They typically incorporate step-up transformers and associated equipment for the purpose of increasing the system voltage for transportation of power along the Offshore Export Cable and to shore. An example of a typical OSP configuration is shown in Figure 4-6. OSPs will contain electrical and control systems including switch gear and transformers.

Each OSP will consist of a foundation, substructure and topside facilities. The topside size and weight are determined by the equipment that is to be accommodated at the substation. Due to the offshore conditions, the substations will be built to withstand corrosion and prevent equipment damage, hence all electrical equipment is enclosed to protect it from the environment.

During construction the topside will be transported offshore on a barge or a heavy lift vessel. A heavy lift vessel will be used for lifting the topside structure onto the foundation; it is likely the heavy lift vessel will be supported by up to four vessels including tugs and fast response vessels.

OSP colouring, lighting, marking and foghorn requirements will be as per current relevant standards and guidance.

Anticipated OSP parameters are provided in

Table 4-4 below and compared to those presented in the Application for the Originally Consented Project. The OSP parameters are designed to allow flexibility when selecting the OSP.

Table 4-4. Design envelope parameters (OSPs).

Design Parameter	Design Envelope (Application)	Design Envelope (Original Application (NnGOWL, 2012; NnGOWL, 2013)
Level of Topside above LAT (m) **Height to top of crane / helicopter pad above LAT (m)**	Approximately 21 Up to approximately 60	Approximately 18 Approximately 60
Length x width of topside (m)	Approximately up to 30 x 30	Approximately 30 x 30
Total area of topside (m^2) **Total weight of topside (tonnes)**	Approximately up to 2,500 2,000 to 2,500	Approximately 2,500 2,000 to 2,500
Piles per jacket	4 to 8	4 to 8
Diameter of piles (m)	Up to 3.5	Up to 3.5
Pile penetration depth (m)	Approximately 20 to 60	20 to 60
Weight of jacket (tonnes)	Approximately up to 1,500	1,000 to 1,500
Diameter of main jacket tubulars (m)	Approximately 0.75 to 3	0.75 to 3
Jacket leg spacing at seabed level (m)	Approximately up to 60	Up to 60
Total seabed occupied by substation (piles, legs and scour protection) (m^2)	Approximately up to 450	Approximately 450

Figure 4-4. Example of a typical installed OSP.

4.4.2 Offshore Export Cable

Cable characteristics vary depending upon cable manufacturer. Currently, it is assumed that NnGOWL will use subsea cables with copper conductors and galvanized steel wire armouring to protect the cables. The total length of installed Offshore Export Cable is estimated to be approximately 86 km (two cables at up to 43 km each).

An example of a typical 3-core HVAC cable cross section is shown in Figure 4-5. The cable typically comprises three copper conductors insulated by cross linked polyethylene and an integral optical fibre cable (minimum 96 fibres).

Figure 4-5. Illustrative cable cross section.

Installation methods under consideration for the installation of the Offshore Export Cables include:

- Use of high pressure pump/jets to cut trenches where sandy conditions exist. Having laid the cable, the trenches will close naturally without backfilling;
- Use of mechanical cutters or cable ploughs as described above for the inter-array cables; and
- Laying of cable on the seabed and covering with scour protection, either with a rock mattress or by overplacement with unbound graded rock (where bedrock outcrops at seabed level or thin sediment layer is present over the bedrock).

Given the length of the Offshore Export Cable Corridor a combination of methodologies may be required to bury the cable in different sections of the route.

NnGOWL intends to bury the Offshore Export Cables in separate trenches. The extent to which the cables will be buried will be dependent on the result of a detailed seabed survey of the final cable route and associated burial risk assessment process.

The intention is to bury the cable as far as is practicable along the entire cable route. In suitable seabed conditions, cables could be buried up to 3 m. Offshore Export Cables will be separated by a minimum spacing at sea of 70 m extending to 300 m in some areas

Table 4-5. Design envelope parameters (Offshore Export Cables).

Design Parameters	Design Envelope (Application)	Design Envelope (Original Application (NnGOWL, 2012; NnGOWL, 2013))
Number of cables	2	2
Length (km)	Up to approximately 43 km per cable	33 km per cable[3]
Burial depth	Up to 3 m (dependent on risk assessment and ground conditions)	Up to 3 m (dependent on risk assessment and ground conditions)
Width of seabed affected (per cable)	Up to approximately 10 m (approximately 2 m direct impact width in the center of an up to 10 m wide zone of minor disturbance from the plough skids)	Up to 10 m (2 m direct impact width in the center of an up to 10m wide zone of minor disturbance from the plough skids)

The increased maximum Offshore Export Cable lengths compared with the Original ES allow for greater flexibility in locating the OSPs within the Offshore Wind Farm (although the final OfTW marine licence

[3] The OfTW Marine Licence issued for the Original Project provided for two export cables each of 44.5km in length.

provided for two 44.5 km length Offshore Export Cables). Due to the reduction in the scale of the Project (and the fact that GBS are no longer being considered) the overall effects on seabed habitats associated with all of the components of the development within the Offshore Wind Farm Area will be considerably less than that set out as the worst case for the Originally Consented Project, even allowing for this increase in Offshore Export Cable length.

Additional information on the effects associated with the additional lengths of Offshore Export Cable is provided within the relevant topic scoping chapters as required.

4.4.3 Landfall infrastructure

Cable landfall will be at Thorntonloch beach in East Lothian. At the landfall the two Offshore Export Cables will be brought from the offshore cable laying vessel, across the intertidal zone, to two adjacent transition (or joint) pits located above MHWS – where the onshore and offshore cables will be connected.

Two installation methods at the landfall location are currently being considered:

- Horizontal Directional Drilling (HDD) is a method of underground cable installation being considered at the land-sea interface for the Project. The principle of HDD is to drill a channel underground between two points, into which an electrical cable can be installed, without needing to excavate an open trench along the channel route. To achieve this, an onshore drill rig commences drilling at the start of the underground channel (known as the Rig Site), toward the end point of the channel (known as the Pipe Site). Using this methodology, it is estimated that the entire duration of cable installation works between the rig site and the pipe site will be approximately 4 months. Suitable geotechnical conditions are required for this method to be feasible.
- Open cut trenching may be used as an alternative to HDD to route the subsea cables through the intertidal zone. The cables will be laid in PVC ducts (a tube which facilitates the passage of the cable and offers some protection). The required burial depth will be determined in detailed design and is anticipated to be in the order of 1 m.

4.4.4 Onshore Grid Connection Infrastructure

For the purposes of describing the Project as a whole, a summary description of the OnTW covered by the onshore planning permission detailed in Section 3.2.6.5, is provided here.

Underground cables will transmit the energy generated by the wind turbines from the landfall location to an onshore substation. The onshore substation will collect the power transmitted from the onshore export cables and transform it up to a higher voltage for connection and export to the national grid.

NnGOWL's grid connection agreement arrangement is to connect to an extension to the existing 400kV substation at Crystal Rig onshore wind farm.

4.5 Construction

Offshore construction works for the Project are anticipated to occur between 2020 and 2022. An indicative programme is provided below under Section 4.5.1.

The Project design is yet to be finalised. Once decisions have been made regarding foundations, substructures, ports and vessels to be used in construction, a more detailed description of construction methods will be prepared.

For the purpose of this document, it can be assumed that the principal stages of manufacturing and transporting the various Offshore Wind Farm components to the Development Area are likely to be as follows:

- Manufacture of components (including foundations, substructures and wind turbines);
- Transport of components to the area;
- Storage and assembly of components as required at port location(s);
- Marine transportation of components to site for installation; and
- Moving construction vessels to the installation site.

It can be assumed that the key stages associated with the installation of the Offshore Wind Farm are likely to be as follows:

- Pre-construction site investigation surveys;
- Unexploded ordnance survey and clearance;
- Foundation and substructure installation and associated site preparation (and spoil disposal where necessary);
- Inter-array cabling installation and associated site preparation; and
- Installation of wind turbines.

Works associated with the OfTW are likely to include:

- Pre-construction site investigation surveys;
- Unexploded ordnance survey and clearance;
- Installation of OSPs; and
- Offshore and coastal export cable installation and associated site preparation.

4.5.1 Anticipated Programme

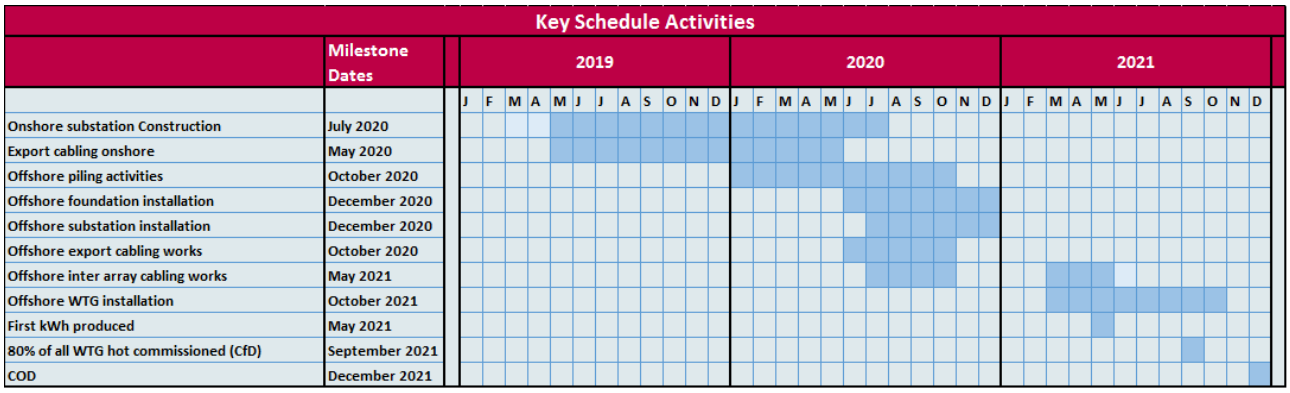
A detailed construction programme will be developed as design and procurement activities progress. The offshore construction activities are expected to start in 2020 and work will occur over approximately 2 to 3 years. Activities may not be continuous and the sequence of activities may change. Engineering and procurement activities will precede the construction phase. The main construction activities and their anticipated durations are outlined in Table 4-6 below. An illustrative activity bar chart is shown in Figure 4-6 below.

Table 4-6. Main construction activity and anticipated duration.

Main Construction Activity	Anticipated Duration
Foundation and substructure installation and associated site preparation	12 months
Inter-array cable installation	7-8 months (split over two campaigns)

Main Construction Activity	Anticipated Duration
Installation and commissioning of wind turbines	8 months
Installation and commissioning of OSPs	6 months
Offshore Export Cable installation (excluding intertidal)	5 months
Offshore Export Cable intertidal works (landfall)	3 – 7 months (dependant on final installation method)

Figure 4-6 – Outline Indicative Construction Programme



The nature of offshore work requires operations to be planned on a 24 hour, seven days a week basis; however work will not be continuous over the whole construction programme. All the above durations are subject to change which may arise, for example, from weather, site conditions, equipment lead times and supply programmes, sequential work requirements, and logistical issues.

4.5.2 Operation / Maintenance and Decommissioning

It is likely that the Project will be managed, operated and maintained from an onshore facility for the duration of its anticipated 50-year lifetime. Should any onshore infrastructure be required to support Operation and Maintenance (O&M) this will be subject to the relevant onshore planning procedures and does not form part of the Application. Onshore activities may be combined in one or more locations and will include the following:

- Control room for remote operation of the Wind Farm;
- Port facilities where vessels, maintenance equipment, spares and consumables are stored; and
- Onshore operations base for management of work and personnel.

O&M activities may be required at any time, 24 hours per day, 365 days per year.

Most control activities will be undertaken remotely from shore using a control centre. However offshore access and intervention will be required to maintain and potentially repair or refit plant and equipment and

will utilise crew transfer vessels, support vessels or helicopter operations. Maintenance can be generally separated into three categories:

- Planned maintenance: This includes general inspection and testing, investigation of faults and minor fault rectification, as well as replacement of consumables. It is anticipated that these events will be undertaken during summer months as the weather is likely to be more favourable, offering an increased maintenance window. Scheduled maintenance and inspection of each wind turbine is likely to occur every six to twelve months. Inspections of support structures and subsea cables will be performed on a periodic basis.
- Unplanned maintenance: This applies to defects occurring that require rectification out-with the planned maintenance periods. The scope of such maintenance would range from small defects on non-critical systems to failure or breakdown of main components potentially requiring them to be repaired or replaced.
- Periodic overhauls: These will be carried out in accordance with equipment manufacturer's warranty and specifications. These are likely to be planned for execution in periods of the year with the best access conditions.

In time, a Decommissioning Programme will be prepared for the Wind Farm and OfTW, and will be subject to approval from Scottish Ministers following the requirements of the Energy Act 2004 (see Section 3.2.6.2).

For the purpose of this Scoping Report the following has been assumed for decommissioning:

- It is assumed that the duration of the works associated with the removal of the major components are similar to those outlined for installation; and
- It is assumed that the vessel types, number of vessels, and number of vessel movements required for the removal of the major components are similar to those outlined for construction.

5 Proposed EIA Methodology

5.1 Introduction

This section presents an outline of the methodology to be employed for the Project EIA. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects and presents the methodology for the identification and evaluation of potential cumulative and inter-related impacts.

5.2 Regulations and Guidance

The impact assessment methodology draws upon several EIA principles, regulations and guidance documents, including:

- Relevant EIA regulations (see Section 3.2.4);
- Assessment of the environmental impact of offshore wind-farms (OSPAR Commission, 2008);
- Relevant guidance issued by other government and non-governmental organisations (e.g. licensing and EIA guidance published by MS-LOT and SNH); and
- Receptor specific guidance documents (e.g. Ecological Impact Assessment [EcIA] guidance issued by the Chartered Institute of Ecology and Environmental Management [CIEEM]).

It will also give due regard to the requirements of the Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), the Marine (Scotland) Act 2010 and the Electricity Act 1989.

5.3 Application of the Design Envelope

The Project EIA will utilise the design envelope approach, also known as the 'Rochdale Envelope' approach. This approach, described in Chapter 4: Description of Development, allows for a project to be assessed on the basis of project design parameters that are not specific at the time of writing, but are indicated with a range of potential values.

It is not possible to provide precise final details of the Project, or the way it will be built, a number of years ahead of the time it will be constructed. In the offshore wind sector, improvements in technology and construction methodologies occur frequently and information provided as part of the consent application could become rapidly outdated, resulting in an uneconomical and potentially unbuildable project.

Under the design envelope approach, for each impact assessment the maximum adverse scenario from within the range of potential options for each development parameter will be identified, and the assessment will be undertaken on this basis. This approach is consistent with that taken in the Original EIA.

Chapter 4 sets out the design envelope parameters and identifies the range of potential Project design values for all relevant components of the Project. For each of the topic chapters within the Project ES, and for each of the impacts assessed, the design envelope considered will be the scenario which would give rise to the greatest potential impact. For example, if several turbine types remain possible, then the assessment of the Project will be based on the turbine type known to have the greatest impact. This may be the turbine type with the largest footprint, the greatest tip height or the largest area of seabed required during construction, depending upon the topic under consideration. If, after undertaking the impact assessment it is shown that no significant effect is anticipated, it can be assumed that any Project parameters equal to or less than those assessed in this design envelope will have environmental effects of the same level or less and will therefore also have no significant effect upon the receptors for the topic under consideration.

By employing the design envelope approach, NnGOWL seeks to retain a reasonable level of flexibility in design of the Wind Farm and OfTW within certain maximum extents and ranges, all of which will be fully assessed in the ES.

It is NnGOWL's intention to refine the design envelope throughout the EIA process as further technical, environmental and design information becomes available.

5.4 Reference to the Original EIA

The Project ES will be a standalone document which in some areas will use information from the Original ES as a basis for the Project assessments (this information will be represented in full in the Project ES alongside the updated assessments for the Project). This approach makes use of the wealth of environmental data previously gathered.

5.5 Characterisation of the Existing Environment

The characterisation (description) of the existing environment will be undertaken in order to determine the baseline conditions in the area covered by the Wind Farm and the Offshore Export Cable Corridor and relevant surrounding study areas for those issues scoped into the ES. This will involve the following steps:

- Study areas defined for each receptor based on the relevant characteristics of the receptor (e.g. mobility/range);
- Review available information;
- Review likely or potential impacts that might be expected to arise from the Project;
- Determine if there is sufficient data to make the EIA judgements with sufficient confidence;
- If further data is required, ensure data gathered is targeted and directed at answering the key question and filling key data gaps; and
- Review information gathered to ensure the environment can be sufficiently characterised in sufficient detail.

5.6 Assessment of Potential Effects

The approach the EIA team will take to making balanced assessments will be guided by both EIA specialists and technical specialists using available data, new data (where required), experience and expert judgement. In order to provide a consistent framework and system of common tools and terms, where appropriate, a matrix approach will be used to frame and present the judgements made. For each topic the latest guidance or best practice will be used and therefore definitions of sensitivity and magnitude of impact will be tailored to each receptor. The impact assessment will consider the potential for impacts during construction, operation and decommissioning.

5.6.1 Identification of Potential Effects

This scoping report sets out the potential environmental effects and identifies, by reference to the Original EIA, those that are proposed to be scoped in or scoped out of the EIA process (see also Chapter 2 of this report); the final list of topics to be considered in the EIA process for the Project will be confirmed following receipt of the Scoping Opinion and through further discussions with relevant stakeholders and MS-LOT.

5.6.2 Defining Magnitude and Sensitivity

The EIA for those potential effects scoped in will describe the level of significance of effects arising from the Project using a standard EIA methodology. The assessment process will consider the potential magnitude of the change to the baseline conditions arising from the Project and the sensitivity of the particular receptor under consideration[4].

Categorisation of magnitude of change will vary for specific receptors/technical assessments but will broadly follow the principles set out in Table 5-1 below in so far as they are relevant.

Table 5-1. Magnitude of effect.

Magnitude	Definition
High	Total loss or major alteration to key elements/features of the baseline conditions
Medium	Partial loss or alteration to one or more key elements/features of the baseline conditions
Low	Minor shift away from the baseline conditions
Negligible	Very slight change from baseline conditions

In the case of assessing sensitivity, the specific scale of sensitivity is dependent on the discipline but in general it may be defined in terms of quality, value, rarity or importance of the receptor being assessed. The ability of a receptor to adapt to change, tolerate, and/or recover from potential impacts will be key in assessing its sensitivity to the impact under consideration.

The scale of sensitivity will be classed as 'Low', 'Medium' or 'High'. In carrying out individual assessments, a more specific scale of increasing sensitivity will be defined where this is appropriate. Guidance will also be taken from the value attributed to elements through designation or protection under law.

Expert judgement is particularly important when determining the sensitivity of receptors. For instance, an Annex II species (under the Habitats Directive) would have a high value, but if it was highly tolerant of an impact or had high recoverability it would follow that the sensitivity in this instance should reflect the ecology rather than default to protected status taking precedence.

5.6.3 Evaluation of Significance

The consideration of magnitude of potential effect and sensitivity of the receptor will determine an expression, which may be quantitative or qualitative and often informed by expert judgement, for the significance of the residual positive and negative effects. Table 5-2 sets out how the interaction between magnitude (which is related to the extent of the physical change, its spatial extent, duration and frequency)

[4] Note that for certain topics an alternative approach to assessment may be applied where this is consistent with relevant guidance or best practice; where this is the case the approach will be described in the ES.

and the value of the resource or the number and sensitivity of the receptor are combined to provide a judgment of significance.

Table 5-2. Significance of impacts.

		Sensitivity of resource receptors			
		Negligible	**Low**	**Medium**	**High**
Magnitude of Impact	**Negligible**	Not significant	Minor	Minor	Moderate
	Low	Minor	Minor	Moderate	Moderate
	Medium	Minor	Moderate	Moderate	Major
	High	Moderate	Moderate	Major	Major

For the purposes of this assessment those residual positive and adverse effects indicated as Moderate or Major are considered significant in so far as they may require mitigation and should be considered potentially material to the decision-making process.

A description of the approach to impact assessment and the interpretation of significance levels will be provided within each section of the ES. This approach will ensure that the definition of impacts is transparent and relevant to each topic under consideration.

5.6.4 Mitigation

Where impact assessment identifies that an aspect of the Project is likely to give rise to significant environmental effects, mitigation measures, above and beyond any embedded mitigation incorporated into the assessment process (as described in Section 2.3), will be proposed to avoid impacts or reduce them to acceptable levels.

For the purposes of the EIA, two types of mitigation have been defined and these will be identified in the ES:

- Embedded mitigation, consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, or measures otherwise incorporated as controls on the construction or operation of the Project (see also Section 2.3), will be included as considerations in assessing significance during the EIA process; and
- Additional mitigation, consisting of mitigation measures that are identified as being necessary as a result of the EIA process to reduce or eliminate any effects that are predicted to be significant, which are subsequently adopted as Project commitments.

5.6.5 Assessing Residual Effects

Following the identification of any necessary additional mitigation measures, impacts will be re-assessed and all residual significance will be described. Where no mitigation measure is proposed, a discussion will explain why the significance cannot be reduced.

5.7 Cumulative Impact Assessment

As well as the Project EIA, a separate consideration of the Project with other relevant projects is also required under EIA law. Therefore, each technical chapter of the EIA will include a cumulative assessment which will consider the impacts arising from the Project alone and cumulatively with other relevant plans, projects and activities.

European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (1999) provide a definition of cumulative and in combination effects which has been used in this document.

"Cumulative impacts are impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project".

A list of plans, projects and activities that may act cumulatively with the Project has been developed for the purposes of this scoping exercise. This list will be re-affirmed during consultation with MS-LOT and key stakeholders prior to EIA commencing.

The list of plans, projects and activities considered in this Scoping Report (and specifically in topic chapters 6 to 19) has been updated from that presented in the Original ES and is set out in Appendix B. Each topic chapter within this Scoping Report confirms which of the listed plans, projects and activities have been considered in the scoping of cumulative effects on that specific receptor group.

Note that, in relation to other proposed or consented offshore wind farm projects, the most up to date publicly available information will be applied in relation to the relevant project parameters to be applied in completing the CIA (e.g. turbine numbers, turbine tip heights etc.).

5.8 Inter-related and Transboundary Effects

The Project EIA will consider the inter-relationships between the aspects of the environment that are likely to be affected by the construction, operation and decommissioning of the Project. To serve as an example, the separate impacts of noise and habitat loss may in combination have an effect upon a single receptor, such as marine mammals. Such consideration of inter-related effects will also include cumulative impacts.

Given the location of the Project and the likely key receptors, potential transboundary effects are considered unlikely and it is the intention not to consider them within the Project EIA.

6 Geology and Water Quality

6.1 Introduction

This section of the Scoping Report confirms the Geology and Water Quality receptors of relevance to the Project and considers the potential effects on them resulting from construction, operation and maintenance and decommissioning. Reference is made to the baseline data gathered to inform the EIA for the Originally Consented Project, and to the outcomes of impact assessment presented in the Original ES.

6.2 Baseline Data

This section identifies the baseline data sources that can be used to characterise the Geology and Water Quality receptors within and around the Project, drawing predominantly from the data sources used to inform the Original EIA, but updated with more recent data where available. Commentary is provided on the sufficiency of this data as a basis for Scoping the Project EIA.

A variety of relevant datasets were collated and analysed to inform the EIA for the Originally Consented Project. Data was drawn from site specific surveys and publicly available regional datasets. Those datasets considered to be relevant to the Project are listed in Table 6-1.

Table 6-1. Baseline data sources from the Original EIA – Geology and Water Quality

Data Source	Study/Data Name	Survey/Study Overview
NnGOWL commissioned site-specific surveys and studies		
NnGOWL	Geophysical survey (EMU, 2010)	Hydrographic and geophysical surveys of the Development Area conducted providing data on seabed sediments, seabed features and potential mobility comprising of: ● Side scan sonar; ● Swath bathymetry; ● Sub bottom profiling; and ● Acoustic ground discrimination.
NnGOWL	Geotechnical survey (Gardline, 2010).	Geotechnical survey comprising of: ● Vibrocore, ● Cone penetrometer test (CPT), and; ● Borehole sampling.
NnGOWL	Benthic characterisation survey (EMU, 2010)	Included the collection and analysis of seabed grab samples and underwater photographs and video used to identify geological seabed characteristics. A Shipek grab was used to collect samples for contaminant analysis comprising of the following: ● Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn);

Data Source	Study/Data Name	Survey/Study Overview
		• Poly aromatic hydrocarbons; • Poly chlorinated biphenyls; and, • Organotins (dibutylin, tributylin).
Regional datasets and studies		
British Geological Society (BGS)	Tay Forth geological datasets (1986a, 1986b, 1987)	BGS data sets of the seabed sediments and solid and quaternary geology.
SNH	Habitat mapping (Bates *et al.*, 2003)	Broad scale mapping of habitats in the Firth of Tay and Eden Estuary.
International Council on the Exploration of the Sea (ICES)	Dataset on Ocean Hydrography	The ICES database compiles a history of oceanographic data from 1877 to present. The database holds seabed sediment samples collected in 1995 that were analysed for contaminant analysis and overlap with the eastern side of the Wind Farm Area.
BGS	Offshore regional report (Gatliff *et al.*, 1994)	Summary of the geology of the central North Sea.
SNH	Coastal geological characteristics (Ramsay & Brampton, 2000a; 2000b)	Summary of the main geologic, geomorphologic and related anthropogenic (e.g., coastal infrastructure) characteristics of the Scottish North Sea coastline in the vicinity of the proposed Development Area.
Historic Scotland	Coastal assessment survey (Robertson & Miller, 1997)	Summary of survey results conducted along the Fife Ness to Newburgh coastline to determine effects of coastal erosion on geological and archaeological receptors.
SEPA	Scottish River Basin Management Plan (SEPA, 2009)	Details potential pollution sources relevant to the Project.
SEPA	Bathing water quality datasets (SEPA, 2011a)	Summary of coastal bathing water quality.
SEPA	Water quality summary – shellfish (SEPA, 2011b)	Summary of water quality and pollution sources along the coastline from Fife Ness to Elie.

6.2.1 Data Validity

NnGOWL, on advice of their technical consultants, are of the opinion that the data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections demonstrate the adequacy of the available data in relation to spatial coverage and age.

6.2.1.1 Data Spatial Coverage

As identified in Table 6-1, NnGOWL-commissioned site specific surveys were carried out within the vicinity of the Development Area. A comprehensive desk based review of regional and national studies was completed to identify relevant datasets covering the outer Firth of Forth and Tay area in and around the Development Area. The location and extent of the Development Area will cover the same portion of seabed assessed within the Original ES. It is therefore considered that the spatial coverage of the original data describing the geology and water quality in the region remains valid for the Development Area in terms of spatial coverage.

6.2.1.2 Age of the Data

The site specific survey data reported in the Original ES were collected between the years 2009 and 2010. The description of the regional geology considered historical data supplemented by the site-specific survey data. Water quality data included the most recently available regional data collected by SEPA and ICES up until 2011 and 2009 respectively.

It is considered unlikely that any significant alteration to the geology and water quality within the survey area will have taken place between the time of surveying and the present given the stable nature of the geology in the area and the general trends in water quality. Given the distance of the Development Area from any registered disposal sites or any other marine activities that has the potential to substantially affect water quality it is considered unlikely that there has been a significant change since the submission of the Original ES. No significant change in the coastal water quality at the landfall location has been reported since the submission of the Original ES based on the bathing water monitoring results published annually (SEPA, 2016).

6.2.2 Review of Baseline Characteristics

Within the Wind Farm Area, the water depth is between 40 m and 58 m Lowest Astronomical Tide (LAT), with the deeper water in the west of the site. The seabed consists of a series of mounds, each approximately 1 km across and up to 6 m high. The sediments mainly comprise muddy sand, fine to very fine sand and gravelly sand. These are underlain by Quaternary sediments, which reach up to 73 m thick in two palaeochannels that cross the site. The bedrock beneath this consists of Carboniferous limestones in the east and sandstones in the west. Along the Offshore Export Cable Corridor, the sediment is mainly muddy sand, but this is interrupted by a series of igneous dykes about 10 km offshore. The seabed then transitions to bedrock at the coast, consisting of Carboniferous limestone.

The Wind Farm Area is over 20 km from any registered disposal sites, and observed suspended sediment concentrations (SSC) are low (10 mg/l). Various sediment contaminants were measured and most were below the recognised standards for potential impacts. However, there were slightly elevated values of arsenic in the south of the offshore site, and cadmium along the cable route. The cable route landfall is within a designated bathing water at Thorntonloch. In 2011, this achieved ‘excellent’ status. There are also designated shellfish waters to the west of the offshore site: Fife Ness to Elie.

6.3 Design Envelope

Table 6-2 sets out the worst case scenario defined by the EIA for the Originally Consented Project for Geology and Water Quality (NnGOWL, 2012) and compared to the proposed worst case scenario for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process. The Scoping Report considers the worst case scenario reported in the Original ES as the final impact determinations were not significant and no further assessment work was carried out in relation to the Project design envelope reported in the Addendum (NnGOWL, 2013).

Table 6-2. Worst case design scenario definition – Geology and Water Quality

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction			
Disturbance to contaminated sediments due to foundation installation activity resulting in changes to water quality / designated waters	Worst case: Number of structures - 126 turbines and 2 OSPs with 4 legged jackets or gravity base foundations. Maximum volume of dredged material per turbine = 5,000 m^3(based on 35m diameter GBS). Maximum volume of dredge material per OSP = 114,012m^3.	Worst case: Number of structures: 56 x 6 legged wind turbine jackets. 2 x 6 legged OSPs.	Reduction in the number of installed structures and no pre-installation dredging required due to no gravity base foundations in the Project design envelope.
Disturbance to contaminated sediments due to cable trenching resulting in changes to water quality / designated waters	Based on trenching of 2 x 33 km Offshore Export Cables and 140 km of inter-array cable.	Based on trenching of 2 x 43 km Offshore Export Cables and 140 km of inter-array cable.	No change in the inter-array cable length, 10 km increase per Offshore Export Cable.
Increased Suspended Sediment Concentrations (SSC) resulting from cable trenching resulting in changes to water quality / designated waters	Based on trenching of 2 x 33 km Offshore Export Cables and 140 km of inter-array cable. Increased suspended sediment based on modelling parameters detailed in Chapter 9: Physical Processes.	Based on trenching of 2 x 43 km Offshore Export Cables and 140 km of inter-array cable.	No change in the inter-array cable length, 10 km increase per Offshore Export Cable.
Changes to water quality / designated waters resulting from accidental spills or	Total number of vessels not confirmed but will likely comprise of heavy lift vessels, jack up vessels,	Total number of vessels not confirmed but will likely comprise of heavy lift vessels, jack up	There is no anticipated change in the required construction vessels although each vessel will

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
leaks of pollutants	cable lay vessels, support vessels, barges and tugs, and crew transfer vessels.	vessels, cable lay vessels, support vessels, barges and tugs, and crew transfer vessels.	be required to be on site for a shorter period of time due to the reduction in installed infrastructure.
Changes to water quality / designated waters resulting from direct drilling in the coastal or inter-tidal area	2 x horizontally direct drilled Offshore Export Cable ducts at the landfall location.	2 x horizontally direct drilled Offshore Export Cable ducts at the landfall location.	No change in design envelope.
Changes to water quality / designated waters resulting from cable trenching in the coastal or inter-tidal area	Trenching of two Offshore Export Cables at the landfall location.	Trenching of two Offshore Export Cables at the landfall location.	No change in design envelope.
Changes to geology below the seabed resulting from direct drilling operations	2 x horizontally direct drilled Offshore Export Cable ducts at the landfall location.	2 x horizontally direct drilled Offshore Export Cable ducts at the landfall location.	No change in design envelope.
Changes to hydrodynamics due to machinery, trenching and rock armouring during nearshore cable installation.	2 x Offshore Export Cables trenched and covered with rock armouring	2 x Offshore Export Cables trenched and covered with rock armouring	No change in design envelope.
Changes to hydrodynamics due to machinery and trenching and rock cutting operations during Offshore Export Cable installation	2 x Offshore Export Cables trenched and covered with rock armouring	2 x Offshore Export Cables trenched and covered with rock armouring	No change in design envelope.
Operation and Maintenance			
Changes in hydrodynamics affecting coastline geology as a result of rock armouring nearshore of the landfall location	2 x trenched Offshore Export Cables protected by rock armouring in the nearshore area	2 x trenched Offshore Export Cables protected by rock armouring in the nearshore area	No change in design envelope.
Changes to SSC affecting bacteria as a result of scour effects from nearshore rock armouring	2 x trenched Offshore Export Cables protected by rock armouring in the nearshore area	2 x trenched Offshore Export Cables protected by rock armouring in the nearshore area	No change in design envelope.

As noted in Section 4.4, each of the export cables are now anticipated to be up to 43 km long to allow for flexibility in locating the OSPs within the Wind Farm Area. The seabed area affected by the increase in Offshore Export Cable lengths will fall wholly within the Wind Farm Area. The Original EIA considered disturbance effects based on pre-installation seabed dredging at 125 turbine locations prior to installation of gravity based structures within the Wind Farm Area. The overall area of seabed disturbance therefore falls within the design envelope detailed in the Original ES.

Table 6-3. Comparison of approximate area of seabed disturbed comparing the design envelope set out in the Original ES and the design envelope for the Project relevant to Geology and Water Quality

	Approximate area of seabed disturbance (km^2)	
	Originally Consented Project	**Project**
Turbine Foundation installation	0.31	0.01
OSP foundation installation	0.0009	0.0004
Inter-array cable installation	1.4	1.4
Offshore Export Cable installation	0.66	0.86
Total	**2.37**	**2.27**

6.4 Project Embedded Mitigation

A range of mitigation measures to minimise environmental effects were captured within the design envelope for the Originally Consented Project and would apply equally to the Project, as follows:

- Construction contractors will be required to produce Site Environmental Management Plans (SEMP) and Pollution Control and Spillage Response Plans prior to construction works. These plans will further reduce the probability of accidental spillage and formalise a contingency plan in the event that one does occur.

6.5 Consent Conditions

A number of consent conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4, NnGOWL anticipate that any future consents may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so.

Table 6-4 sets out the conditions attached to the Consents for the Originally Consented Project which have some direct relevance to the management of environmental effects on Geology and Water Quality.

Table 6-4. Consent conditions for the Originally Consented Project relevant to Geology and Water Quality

Original Consent Requirement	Relevance to Geology and Water Quality
Environmental Management Plan	Setting out, for approval, relevant environmental management and mitigation measures, including pollution prevention and contingency measures, to be applied during the construction and operation of the Project.
Marine Pollution	Setting out, for approval, relevant management measures to mitigate risk of accidental

Original Consent Requirement	Relevance to Geology and Water Quality
Contingency Plan	spills and subsequent remedial action, response measures relating to spills and collision incidents and practices used to refuel vessels at sea if relevant.
Chemical Usage	Ensure that all chemicals which are to be utilised in the Works have been approved in writing by MS-LOT prior to use.
Environmental Protection	Ensure that any debris or waste material placed below MHWS during Construction and Operation of the Project is removed from site as soon as is reasonable practicable, for disposal at a location above MHWS approved by SEPA. Ensure substances and objects deposited are inert (or appropriately coated or protected so as to be rendered inert) and do not contain toxic elements which may be harmful to the environment. Ensure that if oil based drilling muds are utilised that they are contained within a zero-discharge system.
Bunding and storage facilities	Ensure suitable bunding and storage facilities are employed to prevent the release of fuel oils, lubricating fluids associated with the plant and equipment.

6.6 Scoping of the Project EIA

Table 6-5 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification. The Original ES considered the potential impacts on the following receptors:

- Coastline;
- Sandbanks; and,
- Water Quality.

However, the Original ES concluded that there are no sandbanks or significant bedforms (receptors) in the vicinity of the Development Area. Sandbanks were therefore screened out of the assessment as it was concluded that there was no pathway of effect. In line with this approach sandbanks are not considered further within this Scoping report.

The embedded mitigation (see Section 6.4) was included within the assessment conclusions as set out in the Original EIA and therefore only the residual effects have been presented in these tables.

Table 6-5. Summary of potential effects on Geology and Water Quality

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction (and decommissioning)				
Disturbance to contaminated sediments due to foundation installation activity	Water quality / designated waters	Not significant	Scoped out	Changes to water quality as a result of release of contaminants from disturbed sediments during foundation installation were not considered to be significant in the Original ES. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Disturbance to contaminated sediments due to cable trenching	Water quality / designated waters	Minor significance	Scoped out	Changes to water quality as a result of release of contaminants from disturbed sediments were considered to be of minor significance in the Original ES. Although the Offshore Export Cables for the Project are longer than those assessed in the Original EIA, the overall area of seabed disturbance still remains within the worst case design envelope as set out and assessed within the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Increased Suspended Sediment Concentrations (SSC) resulting from cable trenching	Water quality / designated waters	Minor significance	Scoped out	Changes to water quality as a result of increased SSC were considered to be of minor significance in the Original ES. Although the Offshore Export Cables for the Project are longer than those assessed in the Original EIA, the overall area of seabed disturbance still remains within the worst case design envelope as set out and assessed within the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Accidental spills or leaks of pollutants	Water quality / designated waters	Minor significance	Scoped out	Changes to water quality as a result of accidental pollution incidents were considered to be of minor significance in the Original ES. Based on the reduced scale of the Project the predicted effects will be no greater than and likely less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Increased suspended	Water quality /	Minor	Scoped	Changes to water quality as a result of HDD were considered to

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
sediment resulting from direct drilling in the coastal or inter-tidal area	designated waters	significance	out	be of minor significance in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Increased suspended sediment resulting from cable trenching in the coastal or inter-tidal area	Water quality / designated waters	Minor significance	Scoped out	Changes to water quality as a result of cable trenching were considered to be of minor significance in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Changes below the seabed resulting from direct drilling operations	Coastline	Not significant	Scoped out	Changes to coastal geology as a result of HDD were considered to be not significant in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Changes to hydrodynamics due to machinery, trenching and rock armouring during nearshore cable installation.	Coastline	Minor significance	Scoped out	Changes to nearshore hydrodynamics as result of trenching and rock armouring operations were considered to be of minor significance in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Changes to hydrodynamics due to machinery and trenching and rock cutting operations during Offshore Export Cable installation	Coastline	Minor significance	Scoped out	Changes to the coastline as result of trenching and rock cutting operations were considered to be of minor significance in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Operation and Maintenance				
Changes in hydrodynamics resulting from rock armouring nearshore of the landfall location	Coastline	Minor significance	Scoped out	Changes to nearshore hydrodynamics as result of the presence of rock armouring in the nearshore were considered to be of minor significance in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Changes to SSC affecting bacteria as a result of scour effects from nearshore rock armouring	Bathing water quality	Not significant	Scoped out	Changes to water quality resulting from local scour in the nearshore were considered to be not significant in the Original ES. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.

6.6.1 Scoping of Cumulative Impact Assessment

The CIA set out in the Original ES considered the potential cumulative effects on coastline geology and water quality resulting from changing hydrodynamics arising from the Firth of Forth offshore wind projects. It considers the results of the Forth and Tay Modelling Scenario (FTMS) described in full in Chapter 9: Physical Processes of the Original ES which confirmed that there would be no cumulative effects on hydrodynamics that may lead to changes in water quality from disturbed sediments or on the coastline in the study area. Effects on water quality from pollution incidents were concluded to have an extremely low probability of occurrence given the embedded mitigation and management measures to be adopted and were therefore not considered cumulatively.

A review of other plans, projects and activities (selected from the list in Appendix B) indicates that there are no other current plans, projects and activities that should be considered in this CIA based on the distance from the Development Area and cumulative impacts on water quality and geology are therefore scoped out of the Project ES.

6.7 Approach to EIA

Based on the conclusions of the Original ES and considering the reduced scale of the Project by comparison to the Originally Consented Project, and in light of the embedded mitigation to be adopted, it is concluded that all of the potential effects on Geology and Water Quality should be scoped out of the Project EIA. Therefore, it is proposed that no detailed assessment of Geology and Water Quality would be included within the ES.

6.8 Scoping Questions – Geology and Water Quality

- Do you agree that the existing data available to describe the Geology and Water Quality baseline remains sufficient to describe the physical environment in relation to the Project?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Geology and Water Quality receptors?
- Do you agree that the assessment of Geology and Water Quality receptors should be scoped out of the Project EIA?
- Do you agree that the cumulative effects on Geology and Water Quality receptors should be scoped out of the Project EIA?

6.9 References – Geology and Air Quality

Bates, C.R., Moore, C.G., Malthus, T., Mair, J.M., and Karpouzli, E., 2003. *Broad scale mapping of habitats in the Firth of Tay and Eden Estuary, Scotland.* Scottish Natural Heritage.

British Geological Survey, 1986a. *Tay Forth, Sea Bed Sediments*, 1:250 000 Series.

British Geological Survey, 1986b. *Tay Forth*, *Solid*, 1:250 000 Series.

British Geological Survey, 1987. *Tay Forth, Quaternary*, 1:250 000 Series.

EMU, 2009. *Neart na Gaoithe proposed offshore wind farm and cable routes geophysical survey for Neart na Gaoithe Offshore Wind Limited*.

EMU, 2010. *Neart na Gaoithe proposed offshore wind farm, benthic ecology characterisation Survey. Report for Neart na Gaoithe Offshore Wind Ltd.*

ICES (International Council for the Exploration of the Sea), 2009. *Dataset on Ocean Hydrography.* The International Council for the Exploration of the Sea, Copenhagen.

Gardline, 2010. *Neart na Gaoithe offshore wind farm project preliminary geotechnical investigations*. Geotechnical report for Neart na Gaoithe Offshore Wind Ltd.

Gatliff, R. W., Richards, P. C., Smith, K., Graham, C. C., McCormac, M., Smith, N. J. P., Long, D., Cameron, T. D. J., Evans, D., Stevenson, A. G., Bulat, J., and Ritchie, J. D., 1994. *United Kingdom offshore regional report: the geology of the central North Sea*. London, HMSO for the British Geological Survey.

Ramsay, D. L., and Brampton, A. H., 2000a. *Coastal Cells in Scotland: Cell 1 – St. Abbs Head to Fife Ness.* Scottish Natural Heritage Research, Survey and Monitoring Report No. 143.

Ramsay, D.L., and Brampton, A.H., 2000b. *Coastal Cells in Scotland: Cell 2 – Fife Ness to Cairnbulg point*. Scottish Natural Heritage Research, Survey and Monitoring Report No. 144.

Robertson, P., and Miller, K., 1997. *Coastal assessment survey for Historic Scotland. Fife – Fife Ness to Newburgh*.

SEPA (Scottish Environmental Protection Agency), 2009. *Scotland river basin management plan.* Available online from: http://www.sepa.org.uk/water/river_basin_planning.aspx [accessed 17 Feb 2012].

SEPA (Scottish Environment Protection Agency), 2011a. *Season 2011: Summary of results.* Available online from: http://www.sepa.org.uk/water/bathing_waters/results/summary_of_last_season.aspx [accessed 26 Oct 2011].

SEPA (Scottish Environment Protection Agency), 2011b. *Fife Ness to Elie.* Available online from: http://apps.sepa.org.uk/shellfish/pdf/4.pdf [accessed 07 Oct 2011].

SEPA (2016) *Scottish bathing waters: 2016.* Available from: http://www.sepa.org.uk/media/219168/1282_sepa_bathing_waters_2016_web.pdf [accessed on: 28th April 2017].

7 Physical Processes

7.1 Introduction

This section of the Scoping Report confirms the physical processes of relevance to the Project and considers the potential effects resulting from construction, operation and maintenance and decommissioning. Reference is made to the baseline data gathered to inform the EIA for the Originally Consented Project, and to the outcomes of impact assessment presented in the Original ES.

7.2 Baseline Data

This section identifies the baseline data sources that can be used to characterise the physical processes within and around the Project, drawing predominantly from the data sources used to inform the Original Project EIA, but updated with more recent data where available. Commentary is provided on the sufficiency of this data as a basis for Scoping the Project EIA.

A variety of physical processes datasets were collated and analysed to inform the EIA for the Originally Consented Project. Data was drawn from site surveys and studies commissioned by NnGOWL. Those datasets considered to be relevant to the Project are listed in Table 7-1 below.

Table 7-1. Baseline data sources from the Original EIA – Physical Processes

Data Source	Study/Data Name	Survey Overview
NnGOWL / Inch Cape Offshore Limited (ICOL)	Metocean survey (Partrac, 2010)	Metocean data in and around the Wind Farm Area: ● Four Acoustic Current Doppler Profile (ADCP) moorings situated across the outer Firth of Forth and Tay area encompassing both the NnG and Inch Cape Wind Farm areas; seven months of data from December 2008 to July 2010; both elevations and current velocity profiles measured; ● Four moored wave buoys situated across the Firth of Forth and Tay study area with one in the Development Area; seven months of data from December 2009 to July 2010; wave heights, periods and directions measured; ● One meteorological buoy moored at NnG for two months from May 2010, to measure near-bed currents turbulence and Total Suspended Solids (infer from optical backscatter); ● Limited suspended sediment concentration data at NnG collected on 12 July 2010 (six samples at each of three depths in the water column); and ● A Particle Size Distribution (PSD) obtained from a sediment trap deployed at NnG during the main metocean survey.
NnGOWL	Geophysical survey (EMU, 2010)	Hydrographic and geophysical surveys of the Wind Farm Area and Offshore Export Cable Corridor conducted providing data on seabed sediments, seabed features and potential mobility comprising of: ● Side scan sonar; ● Swatch bathymetry; and

Data Source	Study/Data Name	Survey Overview
		• Acoustic ground discrimination.
NnGOWL	Geotechnical survey (Gardline, 2010).	Geotechnical survey conducted providing PSD data suitable for input to the coastal processes assessment.
NnGOWL	Benthic characterisation survey (EMU, 2010)	As part of the benthic survey PSD data from grab samples was collected suitable for informing the coastal processes assessment. 112 grab samples of surface sediment (28 within the Wind Farm Area and 43 within one tidal excursion of the Wind Farm Area, remaining stations were collected along two Offshore Export Cable route options and reference locations), collected in 2009.
Modelling and Assessment		
Intertek METOC	Hydrodynamic and Spectral Wave Model Calibration and Validation (Intertek METOC, 2011) Physical Processes Technical Report (Intertek METOC, 2011)	Development and validation of a hydrodynamic and spectral wave model used to determine any changes resulting from the project parameters detailed within the Original Application on the oceanographic regime (meaning water levels, currents and waves but not winds), the sedimentary environment and the resulting coastal processes. The assessment comprised of the following: • Construction, calibration and validation of the modelling system by comparing modelled output with measured observations of water levels, current speeds and directions, wave heights, wave directions and wave periods; • Determination of baseline conditions through analysis of field data, and subsequent modelling of baseline conditions using the Forth and Tay Modelling System (FTMS). • Assessment of the change to baseline conditions due to the NnG Project. This has been achieved by including structures in the FTMS to represent the effect of the turbines and their foundations on the hydrodynamic regime; • Assessment of the fate and behaviour of disturbed sediment due to any activities relating to the development, using the FTMS model; • Assessment of the amount of scour that might result around the structures through the use of well-known empirical equations, combined with relevant sediment information obtained in the field surveys, and flow information provided by the FTMS; • Assessment of cumulative effects from the Inch Cape and Seagreen developments together with the Neart na Gaoithe development by running the same scenarios but with additional structures included to represent turbines in these other development areas as well as the Neart na Gaoithe development; and • Recommendation of appropriate mitigation measures to minimise any changes, and any suitable monitoring campaigns to ensure predicted changes are not exceeded.

7.2.1 Data Validity

NnGOWL, on advice of their technical consultants, is of the opinion that the data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections demonstrate the adequacy of the available data in relation to spatial coverage and age.

7.2.1.1 Data Spatial Coverage

As identified in Table 7-1, NnGOWL-commissioned site specific surveys were carried out within the vicinity of the Development Area. Regional collaborative studies were also commissioned jointly by NnGOWL and ICOL covering the outer Firth of Forth and Tay area in and around the NnG and Inch Cape Offshore Wind Farms. The location and extent of the Development Area will cover the same portion of seabed assessed within the Original ES. It is therefore considered that the spatial coverage of the original data describing the physical environment, and associated modelling studies describing the potential changes to the environment, remain valid for the Development Area in terms of spatial coverage.

7.2.1.2 Age of the Data

As described above and detailed within Table 7-1, site specific survey data reported in the Original ES were collected between the years 2009 and 2010, and were used alongside broader scale, contextual data from a variety of sources to inform the baseline.

It is considered unlikely that any significant alteration to the physical processes in the survey area will have taken place between the time of surveying and the present given the predictable nature of the wave and tide regime as previously described and summarised in Section 7.2.2 below, other than potentially minor changes to the seabed features, such as sandwaves or ripples. Therefore, it is concluded that the data remains adequate to provide a basis for the assessment of potential effects on the physical environment and in respect of this Scoping process.

7.2.2 Review of Baseline Characteristics

The hydrodynamic conditions across the Development Area are relatively uniform with a mean spring tidal range of 4.6 m. The current speeds reach approximately 0.6 m/s and 0.4 m/s on the flooding mean spring tide and flooding mean neap tide respectively. The 50 year return storm surf current is of comparable strength at approximately 0.6 m/s.

The significant wave height across the Development Area reaches approximately 6 m with a wave period between 2 and 9 seconds and is most frequently from the north-northeast direction.

During survey work, there were relatively few bedforms identified across the Development Area suggesting that there is little sediment transport and a relatively stable seabed. The seabed mobility was classed as ‘slightly mobile’ in the Original ES.

Chapter 9 of the Original ES presents the full baseline characteristics of Physical Processes across the area of interest.

7.3 Design Envelope

Table 7-2 sets out the worst case scenario defined by the Original EIA for metocean and coastal processes (NnGOWL, 2012) compared to the proposed worst case scenario for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process. The Scoping Report considers the worst case scenario reported in the Original ES as the final impact determinations were not significant and no further

assessment work was carried out in relation to the Project design envelope reported in the Addendum (NnGOWL, 2013).

Table 7-2. Worst case design scenario definition – Physical Processes

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction			
Changes to water levels resulting from installation equipment and construction activity	Installation equipment and vessels comprising of jack-up rigs, heavy lift vessels, cable laying barges, and ancillary and support vessels on site for the duration of the two-year construction phase. Assessment based on installation of 125 Gravity Base Structures (GBS) plus two jacket foundations (OSPs), up to 140 km of inter-array cables and 2 x 33 km Offshore Export Cables.	Installation equipment and vessels comprising of jack-up rigs, heavy lift vessels, cable laying barges, and ancillary and support vessels on site for the duration of the construction phase. Number of structures = 56 turbines plus two OSPs using 6-legged jacket foundations. Subsea cabling comprises up to 140 km of inter-array cabling and 2 x 43 km Offshore Export Cables.	No change in installation equipment, main construction activities, inter-array or Offshore Export Cables. Reduction in number of structures and removal of gravity base foundations from the design envelope.
Changes to tidal currents resulting from installation equipment and construction activity	As per Changes to water levels as detailed above.	As per Changes to water levels as detailed above.	No change in installation equipment, main construction activities, inter-array or Offshore Export Cables. Reduction in number of structures and removal of gravity base foundations from the design envelope.
Changes to wave height resulting from installation equipment and construction activity	As per Changes to water levels as detailed above.	As per Changes to water levels as detailed above.	No change in installation equipment, main construction activities, inter-array or Offshore Export Cables. Reduction in number of structures and removal of gravity base foundations from the design envelope.
Changes to Suspended	Seabed preparation for 125 Gravity Base Structures (GBS) with 35 m	Number of structures =	Reduction in number of turbines from 125 to 56.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Sediment Concentrations (SSC) resulting from installation equipment and construction activity	diameter base (NnGOWL, 2012). Release of sediment due to foundation dredging prior to GBS installation have been modelled using the following parameters: ● Maximum volume of dredged material per turbine = 5,000 m^3, as per the design envelope for 35m diameter GBS (based on a 50 m x 50 m (2,500 m^2) square area dredged to a depth of 2 m. ● Maximum volume of dredge material per OSP = 114,012m^3 as OSPs have been modelled as four tightly spaced turbines. ● Number of structures assessed = 126 turbines and two OSPs. The scenario considered was based on complete coverage of the Development Area (to investigate the greatest area of impact) using 1000 m spacing along the line and 630 m between lines and based on 5,000 m^3 dredged material per turbine. For this assessment the worst case estimate of dredged material has been used for the model. In reality, it is unlikely that the largest excavations will be necessary across the entire Development Area and therefore the results should be considered as conservative as a macro level. Modelling also included cable burial up to 1.5 m below the seabed for up to 140 km of inter-array cabling and for 2 x 33 km Offshore Export Cables buried between 1m and 3m below the seabed.	56 turbines and 2 OSPs No seabed preparation anticipated for installation of 6 legged jackets. There is the potential for drilling during pile installation. Drilling would produce significantly smaller sediment volumes than GBS dredging. Cable burial up to 3 m depth of up to 140 km of inter-array and interconnector cabling and for 2 x 43 km Offshore Export Cables buried between 1m and 3m below the seabed.	No preparatory seabed dredging will be required for the 6-legged jackets prior to installations (as compared to GBS). There is no anticipated change in inter-array cable infrastructure. Offshore Export Cables may be up to 10 km longer than detailed within the Original ES. The additional area of disturbance associated with the Offshore Export Cable remains within the overall area of disturbance considered within the worst-case design envelope detailed within the ES for the Originally Consented Project (see Table 6-3).
Changes to seabed features (bedforms) resulting from	As per Changes to Suspended Sediment Concentrations detailed above.	As per Change to Suspended Sediment Concentrations detailed above.	As per Change to Suspended Sediment Concentrations detailed above and removal of

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
installation equipment and construction activity			gravity base foundations from the design envelope.
Changes to the sediment regime resulting from installation equipment and construction activity	As per Changes to water levels as detailed above.	As per Changes to water levels as detailed above.	No change in installation equipment or main construction activities. Reduction in number of structures and removal of gravity base foundations from the design envelope.
Changes to coastal processes resulting from installation equipment and construction activity	As per Changes to water levels as detailed above.	As per Changes to water levels as detailed above.	No change in installation equipment or main construction activities. Reduction in number of structures and removal of gravity base foundations from the design envelope.
Operation and Maintenance			
Changes to water levels resulting from presence of offshore infrastructure	Effects on hydrodynamics were modelled using the FTMS based on the following input parameters: ● 126 gravity base structures with a base diameter of 35 m and conical height of 34 m; ● Turbine spacing of 1,008 m along the line and 126 m between the line.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the seabed.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.
Changes to tidal currents resulting from presence of offshore infrastructure	As per Changes to water levels detailed above effects on hydrodynamics were assessed using the FTMS.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the seabed.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.
Changes to wave height resulting from presence of offshore	As per Changes to water levels detailed above effects on hydrodynamics were assessed using the FTMS.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
infrastructure		seabed.	opposed to GBS.
Changes to SSC resulting from presence of offshore infrastructure	As per Changes to water levels detailed above effects on hydrodynamics were assessed using the FTMS.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the seabed.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.
Changes to the sediment regime resulting from presence of offshore infrastructure	As per Changes to water levels detailed above effects on hydrodynamics were assessed using the FTMS.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the seabed.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.
Changes to coastal processes resulting from presence of offshore infrastructure	As per Changes to water levels detailed above effects on hydrodynamics were assessed using the FTMS.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the seabed.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.
Changes to seabed features (bedforms) resulting from scour	Assessment based on 125 structures comprised of 3 or 4 legged jackets, plus two OSPs comprised of 4-8 legged jackets.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the seabed.	Reduction in number of offshore structures.
Decommissioning			
Changes to water levels resulting from removal of offshore infrastructure.	Removal of offshore infrastructure comprising of 125 turbines and GBS, 2 OSPs and jacket substructures.	Removal of offshore infrastructure comprising of 56 turbines plus two OSPs and associated substructures.	Reduction in the number of offshore turbines and associated substructure foundations.
Changes to tidal currents resulting from removal of offshore infrastructure.	Removal of offshore infrastructure comprising of 125 turbines and GBS, 2 OSPs and jacket substructures.	Removal of offshore infrastructure comprising of 56 turbines plus two OSPs and associated substructures.	Reduction in the number of offshore turbines and associated substructure foundations.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Changes to wave height resulting from removal of offshore infrastructure.	Removal of offshore infrastructure comprising of 125 turbines and GBS, 2 OSPs and jacket substructures.	Removal of offshore infrastructure comprising of 56 turbines plus two OSPs and associated substructures.	Reduction in the number of offshore turbines and associated substructure foundations.
Changes to SSC resulting from removal of offshore infrastructure	Removal of offshore infrastructure comprising of 125 turbines and GBS, 2 OSPs and jacket substructures.	Removal of offshore infrastructure comprising of 56 turbines plus two OSPs and associated substructures.	Reduction in the number of offshore turbines and associated substructure foundations.
Changes to seabed features (bedforms) resulting from removal of offshore infrastructure	Removal of offshore infrastructure comprising of 125 turbines and GBS, 2 OSPs and jacket substructures.	Removal of offshore infrastructure comprising of 56 turbines plus two OSPs and associated substructures.	Reduction in the number of offshore turbines and associated substructure foundations.
Changes to the sediment regime resulting from removal of offshore infrastructure	Removal of offshore infrastructure comprising of 125 turbines and GBS, 2 OSPs and jacket substructures.	Removal of offshore infrastructure comprising of 56 turbines plus two OSPs and associated substructures.	Reduction in the number of offshore turbines and associated substructure foundations.

7.4 Embedded Mitigation

A range of mitigation measures to minimise environmental effects were captured within the design envelope for the Originally Consented Project and would apply equally to the Project, as follows:

- A nearshore survey should be completed to inform the design of the intertidal and nearshore cable laying, and thus minimise impacts;
- A variety of techniques may be employed to reduce or eliminate scour. The following measures will be considered: rock armouring, mattressing, and frond mats;
- Cables will be suitably buried or will be protected by other means when burial is not practicable;
- No additional mitigation was proposed in the Original ES due to the low magnitude of the predicted changes to metocean and coastal processes (and when considering a conservative worst case scenario).

7.5 Consent Conditions Commitments

A number of consent conditions were attached to the Section 36 and the Generating Station and OfTW Marine Licences to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project will incorporate similar licence conditions where necessary to manage the environmental risk commensurate with the Project design envelope.

Table 7-3 sets out the conditions attached to the Consents for the Originally Consented Project which have some direct relevance to the management of environmental effects on Physical Processes.

Table 7-3 Consent conditions for the Originally Consented Project relevant to Physical Processes

Original Consent Requirement	Relevance to Physical Processes
Project Environmental Monitoring Plan	Setting out, for approval, the proposed environmental monitoring programme, to include as relevant and necessary the monitoring of Physical Processes.
Restoration of the site	Requirement at the point of decommissioning to restore the site to its original condition thereby ensuring no lasting effects on Physical Processes
Environmental protection	Requiring restoration of the beach profile following completion of the works.

7.6 Scoping of the Project EIA

Table 7-4 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification.

The embedded mitigation (see Section 7.4) was included within the assessment conclusions as set out in the Original EIA and therefore only the residual effects have been presented in these tables.

Table 7-4. Summary of potential effects on Physical Processes.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction				
Changes to water levels resulting from installation equipment and construction activity (including Offshore Wind Farm and OfTW)	Near field	Negligible /No impact	Scoped out	Changes to water levels during construction is considered to be negligible the near-field with none predicted in the far-field and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those
	Far field	None		

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Changes to tidal currents resulting from installation equipment and construction activity (including Offshore Wind Farm and OfTW)	Near field	Negligible / No impact	Scoped out	Changes to tidal currents during construction are considered to be negligible in the near field with none predicted in the far field and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far Field	None		
Changes to wave height resulting from installation equipment and construction activity (including Offshore Wind Farm and OfTW)	Near Field	Negligible / No impact	Scoped Out	Changes to wave height during construction is considered to be negligible in the near field with none predicted in the far field and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far field	None		
Changes to Suspended Sediment Concentrations (SSC) resulting from installation equipment and construction activity (including Offshore Wind Farm and OfTW)	Near field	No impact	Scoped out	Changes to SSC during construction activities are considered to be minor in the near field with none noted in the far field and therefore not significant. Although there is likely to be an increase in the installed length of Offshore Export Cable the overall area of seabed disturbance associated with the Project remains within the worst case design envelope assessed in the Original EIA therefore the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far field	None		
Changes to seabed features (bedforms) resulting from	Near field	Minor	Scoped out	Changes to seabed features through deposition of material disturbed during construction activities are considered to be minor for near field seabed features and none noted in relation to far field seabed
	Far field	None		

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
installation equipment and construction activity (including Offshore Wind Farm and OfTW)				features and therefore not significant. Although there is likely to be an increase in the installed length of Offshore Export Cable the overall area of seabed disturbance associated with the Project remains within the worst case design envelope assessed in the Original EIA therefore predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Changes to the sediment regime resulting from installation equipment and construction activity (including Offshore Wind Farm and OfTW)	Near field	Negligible / No Impact	Scoped Out	Changes to the sediment regime during construction is considered to be negligible in the near field with none noted in the far therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far field	None		
Operation and Maintenance				
Changes to water levels resulting from presence of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to water levels during operation and maintenance is considered to be negligible in both the near field and far field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to tidal currents resulting from presence of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Minor*	Scoped out	Changes to tidal currents during operation and maintenance is considered to be minor in the near field and negligible in the far field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those
	Far-field	Negligible		

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Changes to wave height resulting from presence of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to wave height during operation and maintenance is considered to be minor in the near-field and negligible in the far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to SSC resulting from presence of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to SSC during operation and maintenance is considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to the sediment regimes resulting from presence of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to sediment regimes during operation and maintenance are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to coastal processes resulting from presence of offshore	Near-field	Not applicable due to distance from shore	Scoped out	Changes to coastal processes during operation and maintenance is considered to be negligible in the far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
infrastructure (including Offshore Wind Farm and OfTW)	Far-field	Negligible		Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Changes to seabed features (bedforms) resulting from presence of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	No impact	Scoped out	Changes to seabed features during operation and maintenance is considered to be minor in the near field with none anticipated in the far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	None		
Changes in tidal currents and waves resulting from rock armour protection over nearshore cable (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to tidal currents and wave height at the landfall location during operation and maintenance are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Decommissioning				
Changes to water levels resulting from removal of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to water levels as a result of decommissioning works are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Changes to tidal currents resulting from removal of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to tidal currents as a result of decommissioning works are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to wave height resulting from removal of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to wave height as a result of decommissioning works are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to SSC resulting from removal of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to SSC as a result of decommissioning works are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		
Changes to seabed features (bedforms) resulting from removal of offshore infrastructure (including Offshore Wind	Near-field	Negligible	Scoped out	Changes to seabed features as a result of decommissioning works are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that
	Far-field	Negligible		

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Farm and OfTW)				further assessment should be scoped out of the ES for the Project.
Changes to sediment regime resulting from removal of offshore infrastructure (including Offshore Wind Farm and OfTW)	Near-field	Negligible	Scoped out	Changes to the sediment regime as a result of decommissioning works are considered to be negligible in both the near-field and far-field, and therefore not significant. The increase in Offshore Export Cable length does not change the assessment of this potential effect. Therefore, based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Far-field	Negligible		

7.6.1 Scoping of Cumulative Impacts Assessment

The CIA for Physical Processes is set out in the Original ES and considers the potential cumulative effects arising from the Firth of Forth offshore wind projects. The scope and approach was agreed through the FTOWDG and associated agreements related to physical processes. The agreed approach focused on the effects on the physical environment arising from the interaction of the offshore wind farms detailed below, with all other activities scoped out on the basis of distance from the Project and the predicted changes in metocean conditions due to the wind farms and OfTW being negligible at all these sites. The cumulative effects were explicitly modelled by incorporating the worst case design scenarios of the three projects into the FTMS.

In line with the FTOWG agreed approach and for the purposes of this Scoping of the Physical Processes CIA, the following list confirms the plans, projects and activities (selected from the list in Appendix B) considered in the scoping of the CIA. The scope of the CIA was determined by the boundaries of the FTMS study area.

- Inch Cape Offshore Wind Farm (as consented); and
- Seagreen Alpha and Bravo (as consented).

Table 7-5 summarises the post-mitigation (residual) significance for all cumulative effects considered and details whether the potential cumulative effect has been scoped out of the Project EIA, with a relevant justification.

Table 7-5. Summary of potential effects on Physical Processes– the Project with other plans, projects and activities

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction			
Changes to water levels resulting from installation equipment and construction activity	None	Scoped out	The cumulative projects under consideration remain the same as those considered in the Original EIA but with a significant reduction in the scale of the Project when compared to the modelled parameters. It is anticipated that there will be a similar reduction in the scale of the other projects. The cumulative effects would therefore be less than those previously presented in the Original ES which were considered to be not significant.
Changes to tidal currents resulting from installation equipment and construction activity	None	Scoped out	
Changes to wave height resulting from installation equipment and construction activity	None	Scoped out	
Changes to Suspended Sediment Concentrations (SSC) resulting from installation equipment and construction activity	None	Scoped out	
Changes to seabed features (bedforms) resulting from installation equipment and construction activity	None	Scoped out	
Changes to the sediment regime resulting from installation equipment and construction activity	None	Scoped out	
Operation and Maintenance			
Changes to water levels resulting from presence of offshore infrastructure	Negligible	Scoped out	The cumulative projects under consideration remain the same as those considered in the Original EIA but with a significant reduction in the scale of the Project when compared to the modelled parameters. It is anticipated that there will be a similar reduction in the scale of
Changes to tidal currents resulting from presence of offshore infrastructure	Negligible	Scoped out	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Changes to wave height resulting from presence of offshore infrastructure	Minor*	Scoped out	the other projects. The cumulative effects would therefore be less than those previously presented in the Original ES which were considered to be not significant.
Changes to SSC resulting from presence of offshore infrastructure	Negligible	Scoped out	
Changes to the sediment regimes resulting from presence of offshore infrastructure	Negligible	Scoped out	
Changes to coastal processes resulting from presence of offshore infrastructure	Negligible	Scoped out	
Changes to seabed features (bedforms) resulting from presence of offshore infrastructure	None	Scoped out	
Changes in tidal currents and waves resulting from rock armour protection over nearshore cable	None	Scoped Out	
Decommissioning			
Changes to water levels resulting from removal of offshore infrastructure.	Negligible	Scoped out	The cumulative projects under consideration remain the same as those considered in the Original EIA but with a significant reduction in the scale of the Project when compared to the modelled parameters. It is anticipated that there will be a similar reduction in the scale of the other projects. The cumulative effects would therefore be less than those previously presented in the Original ES which were considered to be not significant.
Changes to tidal currents resulting from removal of offshore infrastructure	Negligible	Scoped out	
Changes to wave height resulting from removal of offshore infrastructure	Negligible	Scoped out	
Changes to SSC resulting from removal of offshore infrastructure	Negligible	Scoped out	
Changes to seabed features (bedforms) resulting from removal of offshore infrastructure	Negligible	Scoped out	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Changes to sediment regime resulting from removal of offshore infrastructure	Negligible	Scoped out	

* No residual impact score assigned in Original ES, score assigned for the purposes of this scoping report based on the narrative presented in the ES and the Original EIA methodology.

7.7 Approach to EIA

Based on the conclusions of the Original ES and considering the reduced scale of the Project by comparison to the Originally Consented Project, and in light of the embedded mitigation to be adopted, it is concluded that all of the potential effects on physical processes would not be significant and should be scoped out of the Project EIA. Therefore, it is proposed that no detailed assessment of Physical Processes resource would be included within the ES.

7.8 Scoping Questions – Physical Processes

- Do you agree that the existing data available to describe the Physical Processes baseline remains sufficient to describe the physical environment in relation to the Project?
- Do you agree that the modelling of the potential effects on the Physical Processes receptors (and applying the worst-case scenario for the Originally Consented Project cumulatively with the worst-case scenario for the Inch Cape and Seagreen projects) provide an appropriate and precautionary basis for assessing the potential impacts of the Project?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Physical Processes receptors?
- Do you agree, considering the embedded mitigation in place, that the assessment of Physical Processes receptors should be scoped out of the Project EIA for the forthcoming Application?
- Do you agree that the cumulative effects on Physical Processes receptors should be scoped out of the Project EIA?

7.9 References – Physical Processes

EMU, 2010$_a$. *Neart Na Gaoithe Proposed Offshore Wind Farm Benthic Ecology Characterisation Survey*, Final Report. Report No: 09/J/1/03/1483/0943.

EMU, 2010$_b$. *Neart Na Gaoithe Proposed Offshore Wind Farm and Cable Routes Geophysical Survey*. Report No. 09/J/1/02/1447/0917.

Gardline, 2011. *Firth of Forth Area Neart na Gaoithe Offshore Wind Project Preliminary Geotechnical investigations July 2010 to October 2010, Geotechnical Report*. Report No 8448.

Intertek METOC, 2011$_a$. *Inch Cape and Neart na Gaoithe Offshore Wind Farms Coastal Processes Assessment: Hydrodynamic and Spectral Wave Model Calibration and Validation*. Report Reference P1476_RN2636_Rev0

Intertek METOC, 2011$_b$. *Coastal Processes Assessment for Neart na Gaoithe Offshore Wind Farm*. Technical Report. Report Reference P1476_RN2709_Rev2

Partrac, 2010. *Forth and Tay Metocean Survey, Summary Data Report*. P1127.05.D008s04.

8 Air Quality

8.1 Introduction

This section of the Scoping Report describes the potential changes in air quality that may occur through the release of exhaust emissions associated with the construction, operation and maintenance, and decommissioning of the Project. Other atmospheric effects considered in this section include potential localised changes to meteorology such as fog. Reference is made to the baseline data gathered to inform the EIA for the Originally Consented Project, and to the outcomes of impact assessment presented in the Original ES.

8.2 Baseline Data

This section identifies the baseline data sources that can be used to characterise ambient air quality within and around the Project, drawing predominantly from the data sources used to inform the ES. Commentary is provided on the sufficiency of this data as a basis for Scoping the Project EIA.

A variety of air quality datasets were analysed to inform the EIA for the Originally Consented Project. Those datasets considered to be relevant to the Project are listed in Table 8-1 below. The data sources are more fully described in the Original ES Chapter 10 and supporting technical studies (NnGOWL, 2012).

Table 8-1. Baseline data sources from the Original ES – Air Quality

Data Source	Name	Date
Department of Energy and Climate Change (DECC) (2011a)	The offshore Energy Strategic Environmental Assessment (SEA) 2	2011
DECC (2011b)	Digest of UK Energy Statistics 2011	2011
Department for Environment, Food and Rural Affairs (Defra) (2007)	Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 2	2007
IPCC (2007)	Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change	2007
Institute of Petroleum (2000)	Guidelines for the calculation of estimates of energy use and gaseous emissions in the decommissioning of offshore structures	2000
Marine Scotland (2010)	Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters:	2010

Data Source	Name	Date
	Volume 1: Environmental Report	
Statistical Datasets	Name	Date
Defra (2010)	UK Ship Emissions Inventory	2010
Met Office (2011)	Royal Air Force (RAF) Leuchars meteorological site 2010 wind analysis data, and Firth of Forth visibility data	2011
Scottish Government (2011)	Scottish Air Quality Data	2011
NnGOWL	Vessel type and vessel strategy data	2011
Defra (2009)	NAEI Emissions Factor Database	2009

8.2.1 Data Validity

The inherent difficulty in collecting offshore air quality data, combined with a variety of adjacent onshore ambient air quality and meteorological data, and modelled offshore emissions data, meant it was not considered necessary to undertake an air quality survey in the vicinity of the Development Area for the purposes of conducting the EIA for the Originally Consented Project.

NnGOWL, on the advice of their technical consultants, is of the opinion that the baseline data presented and the assessments undertaken as part of the Original ES remain sufficient to meet the requirements needed to effectively characterise the emissions from the three main stages of the Project development (construction, operation and maintenance and decommissioning).

8.2.1.1 Data Spatial Coverage

The location and extent of the Development Area will cover the same portion of seabed assessed within the Original ES. It is therefore considered that the spatial coverage of the original data describing the Air Quality, and associated studies describing the potential changes to the environment, remain valid for the Development Area in terms of spatial coverage.

8.2.1.2 Age of the Data

As described above and detailed within Table 8-2, literature and statistical data on air quality were collected from sources for the period 2000 to 2011. The broader scale, contextual data used to inform the baseline was based on the UK National Atmospheric Emissions Inventory which used shipping movements in UK waters to create a 5 km x 5 km grid of atmospheric emissions based on 2007 shipping data. The National Atmospheric Emissions Inventory was updated in 2014 based on more recent shipping information. A comparison of the data indicated a similar pattern with peaks in gaseous emissions in the Inner Forth and Inner Tay areas and low values of NO_x, SO_2, and CO_2 at the offshore Offshore Wind Farm Area (Defra, 2014). Therefore, it is concluded that the data remains adequate to provide a basis for the assessment of potential effects on Air Quality and in respect of this Scoping process.

8.2.2 Review of Baseline Characteristics

8.2.2.1 Air Quality

The total annual mass emissions of Nitrous Oxides (NO_X), Sulphur Dioxide (SO_2), and Carbon Dioxide (CO_2) within the Development Area were modelled based on 2007 data to inform the Original EIA. The total annual emissions are presented in Table 8-2. The data represents the effective baseline for emissions within the Development Area as reported in the Original ES.

Table 8-2. Total modelled annual mass emissions within the Wind Farm Area

Gaseous Emission	Total annual emissions (tonnes (t))
NO_X	7.33
SO_2	2.60
CO_2	340.38

Although there are no revised modelling figures for the Development Area based on the 2014 data, the estimates of gaseous emissions along the shipping routes around the Development Area indicate a similar pattern and volume as reported in the ES based on the UK National Atmospheric Emissions Inventory (Defra, 2014).

8.2.2.2 Meteorology

The site meteorological conditions influence the dispersal of atmospheric emissions. The data used for the assessment of wind speed and direction were obtained from the Leuchars Station monitoring site. The Leuchars Station data show a predominant westerly wind direction, with a resultant vector of 279° - this direction is away from the local coast. Offshore winds tend to be more stable and stronger than onshore winds, hence the wind speeds at the Wind Farm Area are expected to be higher than those recorded at the Leuchars Station monitoring site; however, wind direction will be comparable.

Visibility data are recorded by the UK Met Office for the Firth of Forth - a summary of the recorded observations between 1981 and 2010, are presented in Table 8-3. Visibility of less than 1 km is considered to be fog. The observed data (Table 8-3.) shows that conditions of fog have occurred on average 1.1% of the time between 1981 and 2010.

Table 8-3. Firth of Forth visibility data 1981 - 2010

Parameter	Measurement									
Visibility (m)	0 - 40	50 - 190	200 - 490	500 - 990	1000 - 1990	2000 - 3990	4000 - 9990	10000 - 19990	20000 - 49990	50000 +
Occurrence (%)	0.1	0.5	0.2	0.3	0.6	1.5	8	27	56.4	5.4

Chapter 10 of the Original ES presents the full baseline characteristics of Air Quality across the area of interest.

8.3 Design Envelope

Table 8-4 sets out the worst case estimated annual emissions defined by the EIA for the Originally Consented Project for Air Quality (NnGOWL, 2012).

For construction, the estimate used the most likely worst case scenario of gravity base foundations, and assumed that the installation of the foundations and turbines would be evenly distributed across two years, and the substation and all cable installation would occur in the first year. Total operation and maintenance emissions associated with the Project used the most likely worst case scenario of a "mother vessel" strategy. These emissions figures did not include the potential reduction in emissions associated with the displacement of traditional thermal generation sources. Effects associated with the decommissioning of the Project were considered to be identical to those associated with the construction with the exception of array and Offshore Offshore Export Cables emissions which it was assumed would be left in-situ.

Table 8-4. Worst case design scenario definition – Air quality

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction (and Decommissioning)			
Exhaust emissions from vessels	Estimated vessel fuel use: ● Development year 1: 141,761 tonnes; ● Development Year 2: 14,185 tonnes The emissions estimate were based on the required transport and installation vessels to install 128 turbine locations of which 125 would be built using GBS, 2 OSPs on 4 – 6 leg jackets, 140 km of inter-array cabling and 2 x 33 km Offshore Export Cables over a 2 year construction period.	Similar transport and installation vessels will be required to install the Project infrastructure. Vessels involved in foundation substructure and turbine installation are likely to be required for a shorter duration. Transport and installation vessels required for up to 56 turbines, 2 OSPs, 140 km of inter-array cabling and 2 x 43 km Offshore Export Cables over a 2 - 3 year construction period.	No new emissions estimates are available based on the Project design envelope. The same installation vessels will be required and the overall construction period will be between 2 – 3 years. Although vessels involved in installation of the Offshore Export Cable may be on site for longer due to the additional Offshore Export Cable length this will be offset by the reduction in vessels associated with foundation and turbine transport and installation. It is anticipated that construction vessels will be on site for a shorter period of time given the smaller scale of the
NO_X and SO_2 Emissions from Vessels	Estimated NO_X emissions: ● Development year 1: 11.0 tonnes; ● Development Year 2: 1.1 tonnes	Same construction vessels required, however, vessels involved in turbine and foundation installation will present on site for a shorter duration.	

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
	Estimated SO_2 emissions: ● Development year 1: 7.6 tonnes; ● Development Year 2: 0.8 tonnes Based on vessels assumptions as detailed in *Exhaust emissions from vessels*.		Project and emissions will therefore be less than assessed in the Original ES.
CO_2 Emissions from Vessels	Estimated CO_2 emissions: ● Development year 1: 456.9 tonnes; ● Development Year 2: 45.7 tonnes Based on vessels assumptions as detailed in *Exhaust emissions from vessels*.	Same construction vessels required, however, vessels involved in turbine and foundation installation will present on site for a shorter duration.	
Operation and Maintenance			
Creating/enhancing sea fog from turbine operations	Up to 125 turbines	Up to 56 turbines	55 % reduction in number of turbines will result in reduced influence on sea fog in the proximity of the Wind Farm Area.

8.4 Embedded Mitigation

The impact of emissions from Construction and O&M vessels on air quality was assessed as not significant in the Original ES and as a result no embedded mitigation measures were considered necessary. However, a number of standard mitigation measures to minimise environmental effects were proposed within the Original ES and would apply equally to the Project, as follows:

- As all atmospheric emissions associated with the development are from vessel emissions, total emissions will be reduced by taking total vessel emissions/fuel use into account when designing the final installation, operation and maintenance, and decommissioning strategies to minimise as far as practicable the number of vessel movements and installation time required;
- Additionally, all vessels employed during the Project development will comply with the Merchant Shipping (Prevention of Air Pollution from Ships) Regulations 2008 and where practicable, contracts with the vessels will include a requirement for energy management, to minimise energy usage; and

- No mitigation options were considered necessary for localised meteorological impacts.

8.5 Consent Conditions Commitments

A number of consent conditions were attached to the Section 36 and Marine Licences. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project will incorporate similar licence conditions where necessary to manage the environmental risk commensurate with the Project design envelope. No such conditions were attached to specifically address concerns over potential effects on Air Quality.

8.6 Scoping of the Project EIA

Table 8-5 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification.

The embedded mitigation (see Section 8.4) was included within the assessment conclusions as set out in the Original EIA and therefore only the residual effects have been presented in these tables.

Table 8-5. Summary of potential effects on Air Quality

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA		Justification
Construction (and Decommissioning)				
Exhaust emissions from construction vessels	Inhalation by marine mammals	Not significant	Scoped out	Exhaust emissions from construction vessels are considered to be not significant, representing an insignificant contribution to total emissions. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Inhalation by humans	Not significant	Scoped out	
NO_X and SO_2 emissions from construction vessels	Acid deposition affecting multiple receptors	Not significant	Scoped out	NO_X and SO_2 emissions from construction vessels are considered to be not significant, representing an insignificant contribution to total emissions. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA		Justification
CO_2 emissions from construction vessels	Climate change affecting multiple receptors	Not significant	Scoped out	CO_2 emissions from construction vessels was considered to be not significant in the Original EIA, representing an insignificant contribution to total emissions. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Operation and Maintenance				
Emissions from O&M vessel and helicopter movements	NA	Scoped out	Scoped out	Given the exposed nature of the offshore environment with strong winds, flat topography and a prevailing wind direction away from the coast, impacts on air quality are not considered to be significant and further consideration is proposed to be scoped out of the EIA.
Spinning of blades creating/enhancing sea fog	Fog affecting humans and birds	Not significant	Scoped out	The Original ES concluded that it was unlikely that wind turbines would create additional fog, although they may enhance the effect local to turbines under conditions where fog is already present. Given the low percentage of fog in the Firth of Forth this was not considered significant Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.

The effects associated with the decommissioning of Neart na Gaoithe were considered in the Original ES to be no greater than those associated with the construction.

8.6.1 Scoping of Cumulative Impacts Assessment

At a local level, the Original ES concluded that cumulative impacts from other offshore wind farm developments would only arise where other construction or decommissioning activities were being undertaken within a very close temporal and spatial scale. It was considered likely that the Inch Cape Offshore Wind Farm and the Seagreen Alpha and Bravo Offshore Wind Farms development would have some construction activities occurring at the same time as the Project. However, due to the nature of atmospheric dispersion (i.e. separated sources would, for the most part, have their emissions carried in the same direction, rather than toward each other), it was considered highly unlikely that even activities being

undertaken at the same time, within a few hundred metres of each other, would give rise to any additional noticeable cumulative effect. On this basis the Original ES concluded that cumulative effects on Air Quality would be not significant.

Given that the receptor sensitivity remains the same as originally described, it is concluded that the significance rating for cumulative impacts on air quality at the local level arising from the Project will remain not significant. Cumulative impacts on local air quality will therefore be scoped out of the Project EIA.

At a regional and global level, cumulative impact from atmospheric emissions associated with the installation, operation, and decommissioning of other offshore wind farm developments would not contribute significantly to the total CO_2, NO_X, and SO_2 emissions released into the atmosphere within the UK or globally, and once operational each development is likely to provide a net negative impact on regional and global CO_2, NO_X, and SO_2 emissions, through the displacement of traditional thermal sources of electricity generation. Cumulative impacts on a regional and global scale could potentially include: other industry/ commercial/ recreational vessels, oil and gas projects, and onshore UK emission sources such as power stations (or in the case of climate change - all global CO_2 and greenhouse gas emissions). However, it is not reasonable in the context of this Project to assess the significance of global CO_2 emissions, or the potential long-range transboundary impacts of national NO_X and SO_2 emissions. These issues are being considered and managed through international agreements and the UNECE convention on long-range transboundary air pollution, and as such will be scoped out of the Project EIA.

8.7 Approach to EIA

Based on the conclusions of the Original ES and considering the reduced scale of the Project by comparison to the Originally Consented Project, it is concluded that all of the potential effects on air quality should be scoped out of the Project EIA. Therefore, it is proposed that no detailed assessment of Air Quality would be included within the ES.

8.8 Scoping Questions – Air Quality

- Do you agree that the existing data available to describe the Air Quality baseline remains sufficient to describe the atmospheric conditions in relation to the Project?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the assessment of Air Quality receptors and the reduction in the scale of the Project, that Air Quality should be scoped out of the Project EIA for the forthcoming Application?
- Do you agree that the cumulative effects on Air Quality receptors be scoped out of the Project EIA?

8.9 References - Air Quality

DECC (Department of Energy and Climate Change), 2011a. The Offshore Energy Strategic Environmental Assessment 2 Post Consultation Report. Department of Energy and Climate Change.

DECC (Department of Energy and Climate Change), 2011b. Digest of UK Energy Statistics 2011. Department of Energy and Climate Change. London, TSO.

Defra (Department for the Environment and Rural Affairs), 2007. Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2. London, TSO. Available online from: http://www.defra.gov.uk/publications [accessed 18 Oct 2011].

Defra (Department for the Environment and Rural Affairs), 2009. National Atmospheric Emissions Inventory Emission Factors Database, Defra. Available online from: http://naei.defra.gov.uk/emissions/ [accessed 27 Oct 2011].

Defra (2014) National Atmospheric Emissions Database, UK Emissions Interactive Map. http://naei.defra.gov.uk/data/gis-mapping [Accessed on 05th May 2017]

Institute of Petroleum, 2000. Guidelines for the Calculation of Estimates of Energy use and Gaseous Emissions in the Decommissioning of Offshore Structures. London, Institute of Petroleum.

IPCC (Intergovernmental Panel on Climate Change), 2007. Summary for Policy Makers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available online from: http://www.ipcc.ch/publications_and_data [accessed 18 Oct 2011].

Marine Scotland, 2010. Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters, Volume 1: Environmental Report. Edinburgh, Marine Scotland. Available online from: http://www.scotland.gov.uk/Resource [accessed 27 Oct 2011].

Met Office, 2011. RAF Leuchars monitoring site ADMS 4 Dataset. Fitzroy Road, Exeter, Met Office.

Marine Mammal References

Scottish Government, 2011. Scottish Air Quality Data.

9 Ornithology

9.1 Introduction

This section of the Scoping Report presents information on ornithology of relevance to the Project and considers the potential effects resulting from construction, operation and maintenance and decommissioning. Reference is made to the baseline data gathered to inform the Originally Consented Project, and to the outcomes of impact assessment presented in the Original ES.

9.2 Baseline Data

This section describes the baseline data sources available to describe the ornithology within and around the Development Area, drawing predominantly from the data sources used to inform the EIA for the Originally Consented Project (NnGOWL, 2012) and the subsequent ES Addendum (NnGOWL, 2013). Commentary is provided on the sufficiency of this data as a basis for Scoping the Project EIA.

A variety of relevant datasets were collated and analysed to inform the EIA for the Originally Consented Project. Data was drawn from site surveys and studies commissioned by NnGOWL. Those datasets considered to be relevant to the Project are listed in Table 9-1 below.

Table 9-1 Baseline data sources from the Original Project EIA and ES Addendum

Data Source	Study / Data name	Survey Overview
NnGOWL	Baseline Seabird Surveys	• Monthly boat-based seabird surveys • Covered Neart na Gaoithe Wind Farm Area and buffer extending out to 8km • Covered period November 2009 – October 2012 (3 consecutive years of baseline data)
FTOWDG	Daunt *et al.*, 2011a Daunt *et al.*,2011b	• GPS tracking of guillemot, razorbill and kittiwake on the Isle of May • GPS tracking of kittiwake and observations of guillemot trips at Fowlsheugh & St Abb's Head

In addition, the following references will be used to inform the ornithology assessment:

- Band, W. (2012). Using a collision risk to assess bird collision risk for offshore wind farms. Report to SOSS;
- Cook, A.S.C.P & Robinson, R.A. 2015. Testing sensitivity of metrics of seabird population response to offshore wind farm effects. JNCC Report No. 553. JNCC, Peterborough.
- Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. and Burton, N.H.K. (2014). The avoidance rates of collision between birds and offshore turbines. BTO Research Report No. 656;

- Freeman, S., Searle, K., Bogdanova, M., Wanless, S. & Daunt, F. 2014. Population dynamics of Forth and Tay breeding seabirds: Review of available models and modelling of key breeding populations. Ref: MSQ-0006. Final Report to Marine Scotland Science.
- Furness R. W., Wade, H. M. and Masden E.A. (2013) Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management 119 pp.56-66;
- Furness, R.W. (2015) Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report Number 164. 389 pp;
- JNCC (2015). Seabird Displacement Impacts from Offshore Wind Farms: report of the MROG Workshop, 6- 7th May 2015. JNCC Report No 568. JNCC Peterborough;
- MacArthur Green. 2014. Bass Rock Gannet PVA. Report to Marine Scotland Science.
- MacArthur Green. (2016) Qualifying impact assessments for selected seabird populations: A review of recent literature and understanding. Report commissioned by Vattenfall, Statkraft and Scottish Power Renewables;
- Marine Scotland. (2014a) Application For Consent Under Section 36 Of The Electricity Act 1989 And Applications For Marine Licences Under The Marine (Scotland) Act 2010 For The Construction And Operation Of The Neart Na Gaoithe Offshore Windfarm. Marine Scotland's Consideration Of A Proposal Affecting Designated Special Areas Of Conservation ("SACs") Or Special Protection Areas ("SPAs");
- Marine Scotland (2014b) Strategic Assessment of Collision Risk of Scottish Offshore Windfarms to Migrating Birds;
- Marine Scotland. (2014c) Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03);
- Searle, K., Mobbs, D., Butler, A., Bogdanova, M., Freeman, S., Wanless, S. & Daunt, F. 2014. Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03). Final Report to Marine Scotland Science.
- Statutory Nature Conservation Bodies (SNCBs). (2017). Interim Displacement Advice Note. Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf;
- SNH. (2014) Interim Guidance On Apportioning Impacts From Marine Renewable Developments To Breeding Seabird Populations In Special Protection Areas. http://www.snh.gov.uk/docs/A1355703.pdf;
- SNH. (2017) Seasonal Periods for Birds in the Scottish Marine Environment. http://www.snh.gov.uk/docs/A2200567.pdf;
- Thaxter, C.B. Lascelles, B. Sugar, K. Cook, A.S.C.P. Roos, S. Bolton, M. Langston, R.H.W. and Burton, N.H.K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation; and
- Wade H.M., Masden. E.A., Jackson, A.C. and Furness, R.W. (2016). Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. Marine Policy 70, 108–113. Available online at doi:10.1016/j.marpol.2016.04.045

9.2.1 Data Validity

NnGOWL, on the advice of their technical consultants, are of the opinion that the data previously collected as part of the Original ES and Addendum is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Wind Farm Area. The following sections demonstrate the sufficiency of the available data in relation to spatial coverage and age.

9.2.1.1 Data Spatial Coverage

The baseline survey data reported in the Original ES and ES Addendum covered the Wind Farm Area and a surrounding buffer extending out to 8 km around the Wind Farm Area. A series of transects spaced 2 km apart and running in a north-west to south-easterly direction across the Development Area and 8 km buffer area were surveyed each month over the three year period. This survey design maximised spatial coverage in the vicinity of the wind farm area thereby allowing survey data to be placed in context with the wider surrounding area. The location and extent of the Wind Farm Area will cover the same portion of seabed assessed within the Original ES. It is therefore considered that the spatial coverage of the original data describing the ornithological receptors remains valid for the Development Area in terms of spatial coverage.

9.2.1.2 Age of the Data

As described above and detailed within Table 9-1 site specific survey data reported in the Original ES and ES Addendum were collected between November 2009 and October 2012 (i.e. a 3-year consecutive period) and were used, alongside broader scale, contextual data from a variety of sources, to inform the baseline.

It is considered unlikely that any significant alteration to the seabird populations and distribution in the survey area will have taken place between the time of surveying and the present, other than natural variations associated with, for example, small-scale variations in prey distribution. Therefore, it is concluded that the data remains adequate to provide a basis for the assessment of potential effects on birds and in respect of this Scoping process.

SNH has provided advice to MS-LOT that no new site based surveys are required (whether digital aerial or boat-based) for applications within the timeframe of the Application to which this Scoping Report relates. This advice was circulated to developers by email on 16th February 2017.

9.2.2 Review of Baseline Characteristics

Chapter 12 of the Original ES presents the full baseline characteristics of birds across the area of interest, including monthly population estimates for the Wind Farm Area and buffer area, flight height and breeding colony populations within mean maximum foraging range for the first two years of baseline surveys. Results for the three years of baseline surveys together with an assessment of impacts based on these data were presented in the ES Addendum.

In Year 1, surveys were conducted over 32 days between November 2009 and October 2010, with a total of 3,734.6 km surveyed. In Year 2, surveys were conducted over 28 days between December 2010 and October 2011, with a total of 3,429.5 km surveyed. In Year 3, surveys were conducted over 32 days between November 2011 and October 2012, with a total of 3,237.2 km surveyed.

Complete coverage of both the offshore site and buffer area was achieved in all months in Year 1. In Year 2, there was no survey coverage in November due to bad weather, however full coverage was achieved in all other months. In Year 3, there was partial survey coverage in September and no survey coverage in December due to bad weather, however full coverage was achieved in all other months.

A total of 29 seabird species were identified on surveys in the Wind Farm Area and 8 km buffer area in Year 1 (November 2009 to October 2010). In Year 2, 26 seabird species were recorded in the Wind Farm Area and 8 km buffer area (November 2010 to October 2011). In Year 3, 28 seabird species were recorded in the Wind Farm Area and 8 km buffer area (November 2011 to October 2012).

Within just the NnG Wind Farm Area, 22 species were recorded in Year 1. The three most frequently recorded species in the offshore site in Year 1 were gannet, puffin and guillemot, which together accounted for 62.3% of all birds recorded. In Year 2, 16 species were recorded in the Wind Farm Area, with gannet, guillemot and puffin again the three most frequently recorded species, although the ranking was slightly different. These three species accounted for 77.1% of all birds recorded. In Year 3, 17 species were recorded in the Wind Farm Area, with gannet, guillemot and puffin again the three most frequently recorded species. These three species accounted for 72.9% of all birds recorded.

Overall, 95.5% of all flying birds on baseline surveys were recorded flying below 27.5 m in height, i.e. below the wind turbine rotor swept zone. No birds were recorded flying above an estimated height of 120 m on baseline surveys.

For fulmar, sooty shearwater, Manx shearwater, guillemot, razorbill and puffin, all or nearly all birds were recorded flying at less than 27.5 m in height. For other seabirds, a greater proportion of birds were recorded flying above 27.5 m i.e. in the wind turbine rotor swept zone, for example 4.8% of kittiwakes (n=6,945), 4.8% of gannets (n= 41,250), 9.2% of lesser black-backed gulls (n=358), 19.3% of great black-backed gulls (n=553) and 21.7% of herring gulls (n=1,646) were recorded flying above 27.5 m.

Species accounts presenting a summary of the baseline surveys for each species, together with information on the species status and sensitivity, as well as an assessment of impacts were included in the Original ES and ES Addendum. These assessments concluded that there would be no significant effects either from the Project alone or cumulatively with the other Forth and Tay offshore projects for all species apart from puffin, where barrier effects (and correspondingly, all effects combined) were predicted to be of minor significance during the breeding season.

9.3 Design Envelope

Table 9-2 sets out the worst case scenario defined by the Original ES and ES Addendum for Ornithology (NnGOWL, 2012) compared to the proposed worst case scenario for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process.

Table 9-2 Worst case Scenario Definition – Ornithology

Potential Effect	Original Project Design Envelope (NnGOWL, 2012; NnGOWL,2013)	Project Design Envelope	Difference
Construction (and Decommissioning)			
Vessel disturbance	Vessels comprising jack-up rigs, heavy lift vessels, cable laying barges, and ancillary and support vessels on site for the duration of the construction phase.	Similar vessels will be required however, the time each vessel is required on site is expected to be shorter in duration due to the reduced scale of the	Reduced Project scale likely to lead to fewer vessel movements and a reduced level of disturbance.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012; NnGOWL,2013)	Project Design Envelope	Difference
		Project.	
Operation			
Displacement and barrier effects	The following turbine parameters were used: ● Up to 125 turbines (Original ES) ● Up to 90 turbines (ES Addendum) ● Min turbine spacing approx. 450 m	The Wind Farm Area boundary remains unchanged. The following turbine parameters will be used: ● Up to 56 turbines ● Min turbine spacing approx. 800 m	● Fewer turbines ● Increased turbine spacing / reduced density
Vessel disturbance from Operation and Maintenance activities	Between 5 – 10 visits per year per turbine, plus two visits of scheduled maintenance per turbine per year. Up to 90 turbines.	The O&M strategy is still to be agreed and will be included within the ES for the Project.	Reduction in the number of visits per year based on reduced number of turbines.
Collision mortality	The following turbine parameters were used: ● Up to 125 turbines (Original ES) ● Up to 90 turbines (ES Addendum)	The following turbine parameters will be used: ● Up to 56 turbines	Reduction in number of turbines. NnGOWL will also include more detailed site based data as inputs for collision models, for example a breakdown of monthly RPM based on wind data collected on site, which was not available for the Original ES.

9.4 Embedded Mitigation

A range of Embedded Mitigation measures to minimise environmental effects were captured within the design envelope for the Originally Consented Project and would apply equally to the Project, as follows:

- The number of turbines was reduced from a maximum of 125 at the time of the Original Application to a maximum of 90 at the time of the addendum. The reduced turbine numbers and increased spacing was anticipated to reduce the risk of collision, displacement and barrier effects. This has been further reduced to a maximum of 56 turbines.
- Increasing the turbine height has the potential to reduce the risk of collision for a number of seabirds, many of which rarely fly above about 25 m but occur regularly at around 20 m. Therefore an increase in turbine height can cause a reduction in the number of predicted collisions.

Minimum rotor height was increased from 26m above LAT in the Original ES to 30.5 in the ES Addendum.

9.5 Consent Conditions Commitments

A number of consent conditions were attached to the Section 36 and the Generating Station and OfTW Marine Licences to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project will incorporate similar licence conditions where necessary to manage the environmental risk commensurate with the Project design envelope. Table 6-4Table 9-3 sets out the conditions attached to the Consents for the Originally Consented Project which have some direct relevance to the management of environmental effects on Ornithology.

Table 9-3. Consent conditions for the Originally Consented Project relevant to Ornithology

Original Consent Requirement	Relevance to Ornithology
Environmental Management Plan	Setting out, for approval, relevant environmental management and mitigation measures to be applied during the construction and operation of the Project. Such approval may be given only following consultation with SNH, the JNCC, SEPA, RSPB Scotland and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers. The EMP must be regularly reviewed by the Company and the Forth and Tay Regional Advisory Group ("FTRAG") over the lifespan of the Development, and be kept up to date (in relation to the likes of construction methods and operations of the Development in terms of up to date working practices) by the Company in consultation with the FTRAG.
Vessel Management Plan	Setting out, for approval, details of the number, types and specification of vessels required, minimising the use of ducted propellers, how vessel management will be co-ordinated during construction and operation, locations of ports, frequency of vessel movements and indicative vessel transit corridors. This will mitigate disturbance or impact to marine mammals and birds.
Project Environmental Monitoring Programme	Setting out, for approval, the proposed environmental monitoring programme, to include as relevant and necessary details of pre-construction, construction (if considered appropriate by the Scottish Ministers) and post-construction monitoring surveys for birds. In addition the PEMP should detail the participation by the Company in a National Strategic Bird Monitoring Framework ("NSBMF") and surveys to be carried out in relation to regional and / or strategic bird monitoring including but not necessarily limited to: 1. The avoidance behaviour of breeding seabirds around turbines; 2. Flight height distributions of seabirds at wind farm sites; 3. Displacement of kittiwake, puffin and other auks from wind farm sites; and 4. Effects on survival and productivity at relevant breeding colonies. All initial methodologies for the above monitoring must be approved, in writing, by the Scottish Ministers and, where appropriate, in consultation with the FTRAG. This will ensure that appropriate and effective monitoring of the impacts of the Development

Original Consent Requirement	Relevance to Ornithology
	on birds is undertaken.
Participation in the Forth and Tay Regional Advisory Group (FTRAG)	Participation in the FTRAG with respect to monitoring and mitigation for ornithology.

In addition, the Original Section 36 Consent included a requirement to submit for approval an 'optimal design for the development', the purpose of that requirement being to minimise the barrier and displacement effects on kittiwake. Given the reduction in the scale of the Project and likely corresponding reduction in effects on kittiwake (alone and in-combination), NnGOWL does not anticipate there to be any need for a condition of this nature in any future consent granted for the Project. This will be subject to review pending the outcomes of the EIA and HRA process and the predicted impacts on the relevant kittiwake populations.

9.6 Scoping of the EIA for the Project

The following table summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification. The embedded mitigation (Section 9.4) was included within the assessment conclusions and therefore only the residual effects have been presented in these tables. For the purposes of the Project EIA, it is proposed to assess displacement and barrier effects together.

Table 9-4. Summary of potential effects - Ornithology

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
Construction and Decommissioning				
Vessel disturbance from Construction activities	Flying birds were scoped out of Original ES. Displacement of foraging birds by vessels was assessed.	Not significant	Scoped out	Disturbance of foraging birds due to construction activity was concluded to be not significant in the Original EIA & ES Addendum. Based on the reduced scale of the Project (fewer turbines), the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Operation & Maintenance				
Displacement and barrier	Gannet, kittiwake, guillemot,	Not significant	Scoped in	Barrier effects during Operation were concluded to be of Minor significance for puffin in the

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
effects	razorbill			Original EIA & ES Addendum.
	Puffin	Minor significance from Barrier effects	Scoped in	Displacement and barrier effects during Operation were concluded to be not significant for the remaining four species in the Original EIA & ES Addendum. These species have been scoped in to the ES for the Project on the basis of numbers of birds recorded within the Development Area in the breeding season, and the presence of SPA breeding colonies within mean maximum foraging range of the Project.
	Fulmar, sooty shearwater, Manx shearwater, Arctic skua, great skua, gull species (except kittiwake), common & Arctic tern, little auk	Not significant	Scoped out	Displacement and barrier effects during Operation were concluded to be not significant for these species in the Original EIA & ES Addendum. These species have been scoped out of the ES for the Project on the basis of lack of evidence of displacement from published sources for these species, as well as the absence of breeding colonies within mean maximum foraging range (shearwaters, skuas, little gull, little auk) and the low numbers of species recorded within the site on baseline surveys in the breeding season (shearwaters, black-headed gull, common gull, skuas, terns, little auk). It is predicted that effects will be no greater than those concluded in the Original EIA & ES Addendum.
Collision mortality	Gannet, Arctic skua, great skua, little gull, black-headed gull, common gull, lesser black-backed gull, herring gull, great black-backed gull & kittiwake	Not significant	Scoped In	Collision effects during Operation were concluded to be not significant for these species in the Original EIA & ES Addendum. These species have been scoped in to the ES for the Project on the basis of flight heights recorded during baseline surveys, where more than 1% of recorded flight height was within the rotor-swept zone in the Original ES.
	Fulmar, sooty shearwater, Manx shearwater, common tern, Arctic tern,	Not significant	Scoped Out	Collision effects during Operation were concluded to be not significant for these species in the Original EIA & ES Addendum. These species have been scoped out of the ES for the Project on the basis of flight heights recorded

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
	guillemot, razorbill, little auk & puffin			during baseline surveys, where recorded flight height was almost entirely well below the rotor-swept zone in the Original ES & ES Addendum. For sooty shearwater, Manx shearwater, common tern and razorbill, all birds were recorded flying below rotor height. Very low numbers of fulmars (0.1%), Arctic terns (0.2%), guillemots (0.01%) and puffins (0.04%) were recorded flying at rotor height.
Disturbance from Operation and Maintenance activities	Flying birds were scoped out of Original ES. Displacement of foraging birds by vessels was assessed.	Not significant	Scoped out – vessels Scoped in – helicopters	Disturbance of foraging birds due to vessel disturbance from operation and maintenance activities was concluded to be not significant in the Original EIA & ES Addendum. Based on the reduced scale of the Project (fewer turbines), the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project. The potential for using helicopters in O&M activities will be scoped into the EIA.
All effects combined	Gannet and kittiwake are the only two species for which both collision and displacement/ barrier effects were predicted. All other species listed above were only predicted to be affected by one impact or the other.	Not significant	Scoped in	All effects combined during Operation were concluded to be not significant for these two species in the Original EIA & ES Addendum. These species have been scoped in to the ES for the Project on the basis of numbers of birds recorded within the Development Area in the breeding season, the presence of SPA breeding colonies within mean maximum foraging range of the Project, and the flight height recorded on baseline surveys.

9.6.1 Scoping of the Cumulative Impact Assessment

The CIA will consider the potential for cumulative and in-combination effects with the following projects:

- Inch Cape Offshore Wind Farm (as consented); and
- Seagreen Alpha and Bravo (as consented).

It is understood that like NnG, these projects are progressing scoping for updated designs – potentially with reduced numbers of turbines. These reduced design envelopes will also be considered in the CIA.

As seabirds may spend significant periods of time outside the Forth and Tay area, there is the potential for them to be affected by other offshore developments more remote from the Project. As a result the scope of the CIA will consider the potential for cumulative and in-combination effects associated additional projects. Table 9-5 sets out a number of additional projects and states whether they are considered potentially relevant to the CIA for the Project EIA.

Table 9-5 Additional projects to be considered in the CIA

Project Name	Requiring further assessment as part of the CIA for the Project EIA	Justification
Hywind Scotland Pilot Park	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Hywind therefore this project will be considered in CIA for breeding season impacts.
Moray Offshore Renewables Wind Farm (eastern development area)	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Moray EDA therefore this project will be considered in CIA for breeding season impacts.
Moray Offshore Renewables Wind Farm (western development area)	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Moray WDA therefore this project will be considered in CIA for breeding season impacts.
Beatrice Offshore Windfarm Ltd (BOWL)	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and BOWL therefore this project will be considered in CIA for breeding season impacts.
Dounreay Tri floating wind demonstration project	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Dounreay Tri therefore this project will be considered in CIA for breeding season impacts.
Kincardine Offshore Wind Farm	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and KOWF therefore this project will be considered in CIA for breeding season impacts.
Aberdeen Bay Offshore Wind farm	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Aberdeen Bay OWF therefore this project will be considered in CIA for breeding season impacts.
Methil Wind Turbine	Yes for gannet, kittiwake, guillemot, razorbill, puffin	Forth Islands SPA is within mean maximum foraging range of both NnG and Methil therefore this project will be considered in CIA for breeding season impacts.
Blyth Offshore Wind farm	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Blyth Offshore Wind Farm therefore this

Project Name	Requiring further assessment as part of the CIA for the Project EIA	Justification
		project will be considered in CIA for breeding season impacts.
Blyth Offshore Wind Demonstration Site	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Blyth Offshore Wind Demonstration Site therefore this project will be considered in CIA for breeding season impacts.
Teesside Offshore Wind farm	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Teesside Offshore Wind Farm therefore this project will be considered in CIA for breeding season impacts.
Dogger Bank Creyke Beck A & B, and Teeside A & B	Yes for gannet only	Bass Rock (Forth Islands SPA) is within mean maximum foraging range of both NnG and Dogger Bank Creyke Beck A & B and Teeside A & B therefore these projects will be considered in CIA for breeding season impacts.
Forthwind offshore wind demonstrator	Yes for gannet, kittiwake, guillemot, razorbill, puffin	Forth Islands SPA is within mean maximum foraging range of both NnG and Forthwind offshore wind demonstrator therefore this project will be considered in CIA for breeding season impacts.

Table 9-6 summarises the post-mitigation (residual) significance for all cumulative effects considered in the Original ES and Addendum and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

Table 9-6 Summary of Potential Effects on Ornithology – Project with Other Plans, Projects and Activities

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
Construction and Decommissioning				
Vessel disturbance from Construction activities	Flying birds were scoped out of Original ES. Displacement of foraging birds by vessels was assessed.	Not significant	Scoped out	Although there are additional projects under consideration for the CIA, it is considered that there will be no cumulative disturbance impacts arising from vessels associated with construction activities due to the distances involved between these projects. In addition, there has been a significant reduction in the scale of the Project. With a recently published reduction in the scale of Inch Cape from 213 (at EIA) to 110 turbines (consented), potentially now reduced as low as 72, these combined reductions will reduce the risk of impacts. It is

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
				also considered unlikely that construction activities for all projects will be undertaken at the same time. The cumulative effects would therefore be no greater and likely less than those previously presented in the Original ES & ES Addendum which were considered to be not significant.
Operation & Maintenance				
Displacement & Barrier effects	Gannet, kittiwake, guillemot, razorbill and puffin	Not significant	Scoped in	Cumulative displacement and barrier effects during Operation were concluded to be not significant for these five species in the Original EIA & ES Addendum. These species have been scoped in to the CIA for the Project EIA on the basis of numbers of birds recorded within the Development Area in the breeding season, and the presence of SPA breeding colonies within mean maximum foraging range of the Project and other projects.
	Fulmar, sooty shearwater, Manx shearwater, Arctic skua, great skua, gull species (except kittiwake), common & Arctic tern, little auk	Not significant	Scoped out	Cumulative displacement and barrier effects during Operation were concluded to be not significant for these species in the Original EIA & ES Addendum. These species have been scoped out of the CIA for the Project EIA on the basis of lack of evidence of displacement from published sources, as well as the absence of breeding colonies within mean maximum foraging range (shearwaters, skuas, little gull, little auk) and the low numbers of species recorded within the NnG site on baseline surveys in the breeding season (shearwaters, black-headed gull, common gull, skuas, terns, little auk).
Collision mortality	Gannet, Arctic skua, great skua, little gull, black-headed gull, common gull, lesser black-backed gull, herring gull, great black-backed gull &	Not significant	Scoped In	Cumulative collision effects during Operation were concluded to be not significant for these species in the Original EIA & ES Addendum. These species have been scoped in to the CIA for the Project EIA on the basis of flight heights recorded during baseline surveys, where more than 1% of recorded flight height was within the rotor-swept zone in the Original ES.

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
	kittiwake			
	Fulmar, sooty shearwater, Manx shearwater, common tern, Arctic tern, guillemot, razorbill, little auk & puffin	Not significant	Scoped Out	Cumulative collision effects during Operation were concluded to be not significant for these species in the Original EIA & ES Addendum. These species have been scoped out of the CIA for the Project EIA on the basis of flight heights recorded during baseline surveys, where recorded flight height was almost entirely well below rotor height in the Original ES & ES Addendum. For sooty shearwater, Manx shearwater, common tern and razorbill, all birds were recorded flying below rotor height. Very low numbers of fulmars (0.1%), Arctic terns (0.2%), guillemots (0.01%) and puffins (0.04%) were recorded flying above rotor height.
Vessel disturbance from Operation and Maintenance activities	Flying birds were scoped out of Original ES. Displacement of foraging birds by vessels was assessed.	Not significant	Scoped out	Although there are additional projects under consideration for the CIA, it is considered that there will be no cumulative disturbance impacts arising from vessels associated with operation and maintenance activities due to the distances involved between these projects. In addition, there has been a significant reduction in the scale of the Project and It is anticipated that there will be a similar reduction in the scale of the other projects, which will reduce any such impacts at project level. The cumulative effects would therefore be no greater and likely less than those previously presented in the Original ES & ES Addendum which were considered to be not significant.
All effects combined	Gannet and kittiwake are the only two species for which both collision and displacement/ barrier effects were predicted. All other species listed above were only	Not significant	Scoped in	Cumulative All effects combined during Operation were concluded to be not significant for these two species in the Original EIA. These species have been scoped in to the CIA for the Project EIA on the basis of numbers of birds recorded within the Development Area in the breeding season, the presence of SPA breeding colonies within mean maximum foraging range of the Project, and the flight height recorded on baseline surveys.

Potential Effect	Residual Impact Significance (NnGOWL, 2012, NnGOWL,2013)		Scoped in or out of the Project EIA	Justification
	predicted to be affected by one impact or the other.			

9.7 Approach to EIA

9.7.1 Definition of Assessment Periods

An obvious feature of the results of the baseline survey work is the strong seasonality in the numbers of a species present in the survey area. This reflects the timing of the breeding season and the movement of birds between areas where they breed, moult and spend the winter.

SNH has recently produced a table showing the key Seasonal Periods for Birds in the Scottish Marine Environment (SNH 2017). The table gives recommended periods when species should be considered when planning activity in the Scottish marine environment. The seasonal definitions that are being considered for the Project ES are based on this information (Table 9-7), with differences outlined below.

Table 9-7 Definition of seasons for breeding species to be considered for assessment

Species	Breeding	Post-breeding	Non-breeding
Fulmar	April to Sept		Oct to March
Gannet	March to Sept		Oct to Feb
Lesser black-backed gull	March to Aug		Oct to Feb
Herring gull	April to Aug		Sept to March
Great black-backed gull	April to Aug		Sept to March
Kittiwake	April to Aug	Sept & Oct	Nov to March
Guillemot	April to July	Aug to Oct	Nov to March
Razorbill	April to July	Aug to Oct	Nov to March
Puffin	April to Aug	Sept & Oct	Nov to March

For fulmar, gannet and the large gull species, two periods will be used; the 'breeding period' and the 'non-breeding period'. The core breeding and non-breeding periods largely match the SNH season table, although for herring gull and great black-backed gull the 'breeding site attendance' period in March highlighted in the SNH table will be considered as the non-breeding season in the Project ES.

For the remaining species (kittiwake, guillemot, razorbill, puffin), it is proposed to use an additional late summer 'post-breeding period'. This broadly corresponds to the time when adult guillemots and razorbill and kittiwake are undergoing wing moult (Ginn and Melville 1983) and when particularly high densities of

all four species occurred in the study area. For the three auk species, the post-breeding period is defined as August to October. For kittiwake the post-breeding period is defined as September and October (Table 9-7).

9.7.2 Approach to Collision Risk Modelling

It is intended to use the SOSS Band Model (Band 2012) to assess the bird collision risks presented by the Project alone, and in-combination with other offshore wind farm projects. The Band model has evolved since its publication in 2012 and is available in both a basic form (referred to as Options 1 and 2), and an extended form (referred to as Options 3 and 4). The publication of the Band model was accompanied by a report providing data on the flight heights of marine birds specifically for use in the extended Band model (Cook et al., 2012). In 2013, further figures for flight heights of marine birds were made available and subsequently published by Johnston et al., (2014a). In 2014, corrected figures were made available and subsequently published (Johnston et al., 2014b).

Although the new assessment for the Project on its own will present collision estimates using Band model Options 1-4, NnGOWL intend to use site-specific flight height data to assess collision impacts (i.e. Band Option 1). This is because three years of flight height data was collected during baseline surveys, so the dataset is considered to be more representative of the site than generic data. SNH advice on how to use the SOSS Band Model states that "It is entirely possible that the ecological circumstances of a particular site differ from those in the sites used to generate the generic data, and hence bird behaviours and flight heights may not be well represented by the generic data." (Band 2012).

However, the lack of sufficiently detailed flight height data from site surveys for all wind farm projects means that Option 1 (or Option 4) cannot be applied for the CIA of the Project, and all other projects. For the CIA, Option 1 (site specific data) will be used for the Project. For other wind farm projects where figures using Option 1 have been published, these will be used. For projects that have only published figures based on Option 2 (generic flight height data), these will be used to assess cumulative collision impacts in the assessment.

Although an alternative model for calculating collision risk has been recently published (Masden, 2015), it is understood that there are a number of areas of the model that require additional work. This additional work is currently at the tendering stage, with outputs due later in 2017. However, this is likely to be too late for the submission of the Project ES, therefore collision risk modelling will only be conducted using the SOSS Band Model, as outlined above.

9.7.2.1 Avoidance rates

Regarding avoidance rates, it is noted that whilst the BTO report (Cook et al., 2014) recommended avoidance rates of 99.2% for kittiwake and 98.9% for gannet, it is understood that SNH currently recommends the use of an avoidance rate of 98.9% for both kittiwake and gannet. The Project assessment will present collision estimates using avoidance rates of 98.9% for gannet, and both 98.9% and 99.2% for kittiwake, although the assessment will be based upon an avoidance rate of 98.9%.

9.7.2.2 Model Parameters

In order to improve the accuracy of the SOSS Band Model outputs, work will be conducted to improve the level of detail on some of the model input parameters. This will primarily make use of additional wind data collected on site which was not available for the original ES. This data includes more detail on wind speeds, and will allow monthly breakdowns of wind speeds to be applied to the model. In addition, it will also provide more detailed monthly values for turbine revolutions per minute and blade pitch which will be applied to the model.

In addition, turbine availability will be considered in further detail, in relation to maintenance plans, factoring in planned turbine maintenance. Cut in and cut-out turbine speeds will also be examined.

In addition to turbine parameters, levels of nocturnal activity of species such as gannet and kittiwake will be factored in. For the assessment presented in the Original Application, a nocturnal activity factor of 2 was used for gannet, and 3 for kittiwake. This was based on an expert review (Garthe and Hüppop, 2004), rather than data collected in the field. It should be noted that the original use of these activity scores was categorical, rather than to represent a scale of 0 to 100% of daytime activity. A recent review of information from tagging studies during the breeding season suggests that based on recorded tagging evidence of zero bird activity at night, the nocturnal activity levels used in the Band model are too high. The review recommended that nocturnal activity levels in the model should be set at zero, not 2 and 3 respectively for gannet and kittiwake (MacArthur Green 2015).

For gannet, five tagging studies were presented in the MacArthur Green (2015) review. Three of these were from the breeding season. Garthe et al., (1999) deployed data loggers on chick-rearing adult gannets in Shetland, with the data recording no flight activity during darkness. Similarly, Hamer et al., (2000) deployed satellite transmitters on chick-rearing adult gannets at the Bass Rock and also found that there was no flight activity by birds at sea during the hours of darkness. A further study by Hamer et al., (2007) involving adult gannets from the Bass Rock in the breeding season recorded similar results.

Studies by Garthe et al. (2012) on tagged gannets from the Bass Rock in 2002, 2003 and 2008 found that birds in autumn and winter spent a mean of 0.5% of the night in flight. The MacArthur Green (2015) review estimated that flight activity at night in winter was approximately 2% of the daytime level. The review concluded that if 25% of daylight activity is used as the correction for nocturnal flight in winter for CRM then this will overestimate collision numbers in winter.

Based on the above, the standard rate applied in CRM of 25% of daylight level based on the Garthe and Hüppop (2004) score of 2 for gannet nocturnal flight activity is inappropriate for gannets throughout the year. A nocturnal activity score of zero will therefore be used in the Project assessment for gannet.

For kittiwake, four tagging studies were presented in the review, with three of these from the breeding season. From radio-tracking studies of breeding kittiwakes in Shetland in a period when food supply was poor and adults were working to their maximum capacity to feed chicks, Hamer et al. (1993) inferred that adults on foraging trips were roosting on the sea throughout the hours of darkness with no flight activity recorded at night. A study on the Isle of May deployed activity loggers on breeding kittiwakes in June and reported that 'birds did not fly at all during the darkest part of the night', but that during daylight hours the birds at sea spent about 60% of the time flying and 40% on the water (Daunt et al., 2002). A third study using GPS loggers on breeding kittiwakes reported that birds spent 35% of daylight hours at sea in flight, but that birds on long foraging trips and away from the colony overnight spent 100% of the period of darkness at night resting on the sea surface (Kotzerka et al., 2010).

A study using geolocator data loggers on adult kittiwakes during migration and winter from a colony in the Pacific recorded that birds spent less than 5% of darkness in flight, with the little nocturnal flight activity that did occur was more often on nights with bright moonlight (Orben et al., 2015). Nocturnal flight activity of adult kittiwakes studied by Orben et al. (2015) during migration and the winter months was therefore very considerably less than the 50% of daylight level used as the standard rate applied in CRM as based on the Garthe and Hüppop (2004) score of 3 for kittiwake nocturnal flight activity.

Based on the above, the standard rate applied in CRM of 50% of daylight level based on the Garthe and Hüppop (2004) score of 3 for kittiwake nocturnal flight activity is therefore inappropriate for kittiwakes throughout the year. Tagging studies have shown that kittiwakes undertake 0% flight activity during darkness in the breeding season and very low flight activity during darkness in the migration and non-

breeding season. A nocturnal activity score of zero will therefore be used in the Project assessment for kittiwake.

For the remaining species that will be considered for CRM, activity scores from Garthe and Hüppop (2004) and Furness et al. (2013) will be used to set nocturnal flight activity, as there are few published tagging studies available for these species.

The Project has three years of baseline density of flying bird data available, and mean density of flying birds per month across the three years was used for collision modelling in the last ES. It is intended to use mean density of flying birds per month across the three years for collision modelling in the new ES.

9.7.2.3 Age ratios

For gannet, kittiwake and other species e.g. gulls that can be aged in the field, it is intended to apply the age ratios of adult to immature birds based on NnGOWL's three years of boat-based survey data to collision estimates for assessment purposes. This is because the SPA reference populations refer to breeding adult birds only. In order to compare estimated collisions of adult birds against these SPA reference populations, it will be necessary to work out the number of adult birds in the collision estimates. This approach was also used in the Original ES.

9.7.3 Approach to assessing Displacement and Barrier Effects

Displacement is defined as the potential for the Offshore Wind Farm and associated human activities to reduce or prevent birds, including flying birds, from using an offshore wind farm, and can therefore be considered as habitat loss. There may also be associated effects on adult survival and chick productivity at breeding colonies within foraging range of the offshore wind farm.

Barrier effects can occur when flying birds travel around an offshore wind farm instead of passing through it. Barrier effects may have an impact on the time and energy budget of foraging birds by causing them to make longer flights between their breeding colonies and foraging locations.

For the purposes of the Project EIA, it is proposed to assess displacement and barrier effects together. Current advice from the SNCBs (2017) states that "It is recognised that a proportion of the birds recorded in wind farm areas may be transiting through the site (and therefore potentially affected by barrier effects, rather than displacement from the wind farm area) and that this is more likely to be the case for flying birds. However, at present we do not have enough evidence to separate these impacts out and apportion to the two groups. Therefore, it is assumed that total numbers of birds on site (flying and on water) are subject to displacement impacts. However, as remote tracking of seabirds continues to expand our knowledge on seabird behaviour it may be possible to provide further information on the relative impacts of both issues – this position will be kept under review."

The approach to assessing displacement and barrier effects is outlined below.

9.7.3.1 Displacement and barrier effects

The SNCBs have recently published interim guidance on how to present assessment information on the extent and potential consequences of seabird displacement from offshore wind farm developments (SNCBs, 2017). This updates a previous guidance note on assessing displacement effects published by JNCC and NE that was used in the Original ES (NnGOWL, 2012) and ES Addendum (NnGOWL, 2013) (JNCC & NE 2012).

9.7.3.2 Required inputs

The following inputs will be presented, as detailed in the SNCB Interim Guidance on displacement (2017):

- Full details of survey techniques;
- Site-based density estimates to include birds on water and in flight;
- Proportions of different age classes of birds (where possible);
- Monthly population estimates presented for three years pre-consent monitoring;
- Raw count data to be included in report appendices;
- Counts to be assessed as mean seasonal peaks (averaged over the years of survey);
- Population estimates for the development footprint and also for the development footprint plus a standard displacement buffer of 2 km; and
- Full details of the development (with worst case and typical scenarios) including size of development footprint alone and size plus 2km buffer.

Survey techniques will be outlined in the Project ES. Site-based monthly density estimates for birds on the water and in flight derived from DISTANCE software will also be presented, covering the period from November 2009 to October 2012 (three years). In addition, the seasonal three-year mean peak of estimated numbers of each species to be assessed will be presented for the Development Area and a 2km buffer.

9.7.3.3 Species to be considered

Species to be assessed for displacement have been selected based on site-specific survey data and also on published sensitivity scores (Furness and Wade, 2012, Furness et al., 2013 & Wade et al., 2016). Species for which displacement effects will be assessed are shown in bold in Table 9-8.

Table 9-8. Species to be considered for displacement assessment, based on estimated numbers recorded on Neart na Gaoithe baseline surveys between November 2009 and October 2012, and evidence from published data sources

Species	DISTANCE analysis possible	Estimated numbers recorded within site		Sensitivity score for displacement
		Breeding	Non-breeding	
Fulmar	Yes	61	59	1
Sooty shearwater	Yes	n/a	46	1
Manx shearwater	Yes	n/a	68	2
Gannet	**Yes**	**1,153**	**405**	**1**
Arctic skua	No	n/a	0	2
Great skua	No	n/a	3	2
Little gull	Yes	n/a	268	?
Black-headed gull	No	n/a	0	2
Common gull	No	n/a	0.09 birds/km	2
Lesser black-backed	No	0.14 birds/km	0.15 birds/km	1

Species	DISTANCE analysis possible	Estimated numbers recorded within site		Sensitivity score for displacement
		Breeding	Non-breeding	
gull				
Herring gull	Yes	40	31	1
Great black-backed gull	Yes	5	18	2
Kittiwake	**Yes**	**1,772**	**340**	**2**
Common tern	No	n/a		3
Arctic tern	Yes	n/a	628	3
Guillemot	**Yes**	**1,896**	**1,060**	**3**
Razorbill	**Yes**	**212**	**227**	**3**
Little auk	Yes	n/a	2,122	2
Puffin	**Yes**	**3,267**	**404**	**3**

Based on Table 9-8 it is intended that five species will be assessed for displacement effects in the Project ES. These species were selected based on whether sufficient numbers were recorded on baseline surveys to allow DISTANCE analysis to be conducted; whether they occurred in significant numbers in the breeding season, when displacement or barrier effects are most likely to be significant; on the sensitivity score for displacement/habitat use flexibility; and if they had been included in previous assessments of displacement effects (e.g. Marine Scotland, 2014a). The remaining species will be scoped out from the displacement assessment.

9.7.3.4 Predicting effects of displacement

It is understood that CEH are currently developing a tool, commissioned by Marine Scotland, to help predict the effects of displacement on birds, which will estimate displacement effects on survival and productivity. It is understood that the tool will cover guillemot, razorbill and kittiwake, but not gannet or puffin.

If available at the time of assessment, NnGOWL will consider using this tool to inform displacement and barrier assessments. The SNCBs Interim Guidance on displacement will form the basis for assessing displacement effects for guillemot, razorbill and kittiwake. For gannet, the previous CEH assessment will be used qualitatively to assess displacement effects, in-combination with the SNCBs Interim Guidance on displacement. The approach outlined in the Interim Guidance from SNCBs will also be followed to assess displacement and barrier effect impacts on puffin.

9.7.3.5 Displacement levels

As outlined in the SNCB Interim Guidance (2017), predicted displacement of seabirds for the Project and a 2km buffer will be presented as gridded matrix tables, in 10% intervals from 0% to 100%. In addition, the matrix tables will also present mortality levels from 0% to 100%, in 1% intervals between 0% and 5%, and 10% intervals between 10% and 100%. This approach was also used in the Original ES and Addendum.

While the full range of potential displacement and mortality impacts will therefore be presented, the most likely displacement levels and mortality scenarios will be highlighted within the matrix, along with published evidence to support the levels used for the assessment.

At the time initial displacement rates were chosen for Marine Scotland's Appropriate Assessment (Marine Scotland, 2014a), the most recent design information detailed in the Addendum (NnGOWL, 2013) was for a maximum of 90 turbines.

The Consent was ultimately granted for 75 turbines following a subsequent reduced design. The July 2015 Consent Variation allowed for designs using either 75 or 64 turbines. The Project design being scoped at present will have a maximum of 56 turbines. The reduction in the number of turbines has led to an increase in minimum between-turbine spacing and an overall reduction in turbine density within the Wind Farm Area.

It is noteworthy that, compared with all existing wind farms where monitoring has been undertaken, turbine spacing for the Project (as well as for other Forth and Tay projects) will be considerably greater. Table 9-9 below sets out estimates of average turbine density of the Project plus other wind farms for comparison.

Table 9-9. Turbine spacing and density

Wind Farm	Number of Turbines	Site Area (km^2)	Site Turbine Density (turbines/km^2)
Neart na Gaoithe (2017)	56	105	0.5
Seagreen Alpha (2014)	75	197	0.4
Seagreen Bravo (2014)	75	194	0.4
Inch Cape (2014)	110	150	0.7
Robin Rigg (Scotland)	58	18	3.2
Arklow Bank (Ireland)	7	2	3.5
Kentish Flats (England)	30	10	3.0
Thanet (England)	100	35	2.9
Greater Gabbard (England)	140	146	1.0
Alpha Ventus (Germany)	12	4	3.0
Egmond aan Zee (Netherlands)	36	24	1.5
Prinses Amalia (Netherlands)	60	17	3.5
Horns Rev 1 (Denmark)	80	21	3.8
Horns Rev 2 (Denmark)	49	33	1.5

As a result of this increased turbine spacing, NnGOWL consider it appropriate that lower displacement rates should be applicable in the Project assessment. The SNCB response to the Consent Variation (dated

18th September 2015) acknowledged that the reduction in the number of turbines from 75 to 64 turbines "*could potentially reduce the predicted levels of seabird displacement*" (SNH & JNCC 2015).

In the Marine Scotland appropriate assessment, a displacement level of 40% was used for Neart na Gaoithe for kittiwake, with a displacement level of 30% for Seagreen A & B projects (Marine Scotland, 2014a). While a displacement level of 30% was also recommended by Marine Scotland for Inch Cape, due to time constraints, it is understood that a 40% level was used for displacement modelling. The recent Kincardine offshore wind farm appropriate assessment also used a level of 30% to assess kittiwake displacement (Marine Scotland, 2017).

Results from monitoring at operational wind farms indicate that kittiwakes are not likely to be displaced from offshore wind farms. Typically, studies at existing wind farms show either no significant change or small increases in kittiwake numbers compared to pre-construction numbers at these sites (e.g. Diersche and Garthe, 2006, N Power Renewables 2008, Leopold et al., 2011).

It has been suggested in previous discussions regarding likely levels of displacement, that the majority of studies to date do not involve wind farms located close to seabird colonies. However, both the Robin Rigg OWF and Arklow Bank OWF projects have kittiwake breeding colonies within mean maximum foraging range of the turbines (60 km) (Thaxter et al., 2012); St Bees Head in Cumbria is approximately 20 km from the Robin Rigg OWF, while Wicklow Head is approximately 10 km from the Arklow Bank OWF.

Evidence from three years of post-construction monitoring at Robin Rigg Offshore Wind Farm suggests that kittiwakes are not displaced. Statistical modelling and the standardised raw data both suggest an increase in kittiwake abundance during the operational phase, with evidence of greater usage of the Wind Farm Area during operation for kittiwakes on the sea. Statistical analysis of kittiwake flight data does not show any evidence of change in abundance between the pre-construction, construction and operational phases of the project (Canning et al., 2013).

Post-construction monitoring at Arklow Bank, Ireland reported an increase in kittiwake numbers compared to baseline numbers, concentrated within ca. 10 km of the turbine array, based on five years of post-construction survey data. The overall increase in kittiwake numbers and their proximity to the turbines was positively associated but not significantly so (Barton et al., 2009).

Based on the latest advice on assessing displacement (SNCBs, 2017) and available published evidence, NnGOWL intend to assess kittiwake displacement using a precautionary level of 20%. This guidance suggests the use of sensitivity scoring indices such as Furness et al. (2013) and Bradbury et al. (2014) as a basis to determine the likely degree of displacement. Kittiwake scored 2 for both categories ('Disturbance Susceptibility' or 'Habitat Specialization') listed in the SNCB guidance, which states that "*As a general guide, any species scoring 3 or more under either category, and which is present in the OWF site or buffer should be progressed to the matrix stage unless there is strong empirical evidence to the contrary*." Although the kittiwake score was below 3, NnGOWL intend to take a precautionary approach and present kittiwake displacement levels in the assessment for the Project.

NnGOWL intend to use a mortality rate of 5% in the assessment, whilst also presenting the full range of 0-100%.

The SNCB guidance also discusses how the sensitivity score could be applied to determine the likely level of displacement to be considered in the assessment. The guidance states that "for auk species the SNCBs would typically advise a displacement level of 30-70% (guillemot and razorbill have a 'Disturbance Susceptibility' score of 3). For diver species, a displacement level of 90-100% is likely to be advised (red-throated diver has a 'Disturbance Susceptibility' score of 5 and empirical studies report high levels of displacement). Some species with 'Disturbance Susceptibility' scores of 1 (e.g. northern fulmar) may not be

displaced or may be hardly displaced. If assessment of these species is recommended in a particular case, usually a displacement level of 10% or less is assumed." Given that kittiwake has a Disturbance Sensitivity score of 2, NnGOWL intend to assess displacement for kittiwake using a level of 20%.

An assumed level of 60% displacement was used for guillemot and razorbill in the Original ES (NnGOWL, 2012) and Addendum (NnGOWL, 2013) and the four Forth and Tay wind farm projects in the MS AA (Marine Scotland, 2014a). For puffin, the Marine Scotland Appropriate Assessment applied a level of 60% displacement for Neart na Gaoithe, 50% for Inch Cape and 40% for Seagreen A & B. However, the more recent (2016) Kincardine OWF HRA document used displacement rates and mortality rates of 50% to assess guillemot, razorbill and puffin. These were considered by SNH to be "highly precautionary", according to the Marine Scotland AA for the KOWL project (Marine Scotland, 2017).

The extent to which guillemots and razorbills are displaced from operational wind farms differs between studies. A recent review of displacement reported that results suggest incomplete displacement of guillemots from operational offshore wind farms. The review concluded that individual studies often found statistically weak evidence of displacement, but with some impact apparently to a maximum distance from turbines of up to 2-3 km (MacArthur Green 2016).

Results from monitoring at Robin Rigg offshore wind farm (Walls et al. 2013) and Thanet offshore wind farm (Percival 2013) showed some displacement of guillemots/razorbills, although levels were not statistically significant. At Robin Rigg offshore wind farm, post-construction data suggested a decline in razorbill numbers during the construction phase, both within the turbine area and across the site as a whole. However, numbers appeared to increase again post-construction, although further monitoring was recommended (Walls et al., 2013).

A study at Kentish Flats offshore wind farm found that guillemots/razorbills (mostly guillemots), were not significantly displaced, although birds were only present in small numbers (Gill et al. 2008). At Arklow Bank offshore wind farm there was no statistical difference in the number of guillemots recorded between pre and post-construction (Barton et al., 2009). Results from one year of post-construction monitoring at Lincs OWF found no indication that displacement effects on guillemots were taking place (HiDef 2014).

At Greater Gabbard OWF, there was some evidence of an overall reduction in the density of guillemots and razorbills observed in the development areas between pre-construction and construction periods, however preliminary information from post-construction studies indicates that an apparent increase in densities was observed following construction (Haskoning DHV 2014).

Vanermen et al. (2015) found that displacement of guillemots and razorbills at Bligh Bank offshore wind farm was statistically significant, with a 64% reduction of razorbills, and a 71% reduction of guillemots within the operating wind farm. Statistically significant displacement of guillemots was also recorded at Alpha Ventus (Mendel et al. 2014, 2015).

Results from Egmond aan Zee and the adjacent Princess Amalia offshore wind farms did not conclusively show that guillemots were displaced from either of these wind farms (Leopold et al., 2011). Where guillemots were significantly displaced (2 out of 9 survey visits), displacement was not total, with birds still recorded within both wind farms. However, the authors suggest that high turbine density at Princess Amalia wind farm probably increased displacement of guillemots. Unlike guillemots, razorbills were never recorded within the adjacent Princess Amalia wind farm where turbine density was higher. It was concluded that razorbills may be totally displaced only when turbine density exceeds a particular point. Overall, the authors concluded that the magnitude of the displacement effect for guillemots and razorbills was less than 50% (Leopold et al., 2011).

The Project design envelope being scoped at present will have a maximum of 56 turbines. As a result of increased turbine spacing, and available published evidence, NnGOWL consider it appropriate that lower displacement rates should be applicable for these species in the Project assessment, compared to the rates used in the Original ES and ES Addendum. NnGOWL intend to assess displacement for guillemot, razorbill and puffin using a level of 40%.

NnGOWL intend to assess mortality resulting from displacement for guillemot, razorbill and puffin using a level of 5%. The full range of 0-100% will also be presented.

An assumed level of 90% displacement was used for gannet in the Original ES (NnGOWL, 2012) and Addendum (NnGOWL, 2013). In the MS AA (Marine Scotland, 2014a), a displacement rate of 60% was used for all four Forth and Tay projects for Gannet. However, the recent Kincardine OWF HRA document used a rate of 75% to assess Gannet displacement, and a mortality rate of 50%. These rates were described as "highly precautionary" by Marine Scotland in the KOWF AA (Marine Scotland 2017). As a result of the increased turbine spacing, and available published evidence, NnGOWL intend to assess displacement for gannet using a level of 75%.

Due to the large foraging range of the species, mortality from displacement is expected to be extremely low. NnGOWL intend to assess mortality resulting from displacement for gannet using a level of 2%.

9.7.3.6 Cumulative Impact Assessment

As outlined in the latest Displacement guidance (SNCBs, 2017), the SNCBs recommend that a similar approach be taken to additively combining multiple project's displacement impacts, to that undertaken for a single project. In addition, the following recommendations are made:

- Any differences in assumptions about species sensitivity to displacement or habitat flexibility between individual project sites should be clearly identified, explained and agreed with SNCBs prior to further analysis.
- All areas should be assumed to be at carrying capacity, unless there is specific evidence to the contrary.
- Where displacement assessments may have varied between historic and more recent projects, efforts should be made to standardise approaches.
- If necessary historic assessments and matrices should be revisited to re-analyse site-based abundance data and bring it into line with current thinking on likely displacement levels, mortality rates, seasons and buffer zones for relevant species.

NnGOWL intend to follow SNCB guidance for CIA, as outlined above.

9.7.3.7 Assessment of combined effects

As recommended in the latest displacement guidance (SNCBs, 2017), displacement impacts and collision impacts will be added together for assessment of total impacts. While this precautionary approach will involve some degree of double counting, there is no agreed means of distinguishing between birds which might be subject to collision and those that may be displaced.

This will relate to two species – gannet and kittiwake, as these are the only species which will be considered for both displacement and collision impacts.

9.7.3.8 Assessment of Population-level effects

Population level effects will be assessed by conducting Population Viability Analysis (PVA) for the key species to compare predicted population levels and sizes after 50 years of operation between scenarios with and without a wind farm present. It is anticipated that this work will be based on existing published PVAs (e.g. Freeman et al. 2014, MacArthur Green 2014).

PVA outputs will be analysed with regard to recent publications on the sensitivity of different metrics (Cook & Robinson 2015). The key metrics likely to be used will be the counterfactuals of the 50 year population size and the population growth rate, based on the scenario with and without a wind farm present. Other metrics may also be considered, depending on their suitability.

A similar approach to assess population-level effects will be undertaken for the CIA assessment, where possible. A qualitative assessment will be made where suitably comparable estimates of effects are not available.

9.7.4 Potential effects during Decommissioning

At this stage, decommissioning effects are expected to be similar to those described for the construction phase, and are therefore likely to be limited to disturbance from vessels associated with decommissioning activities. The magnitude of collision mortality during the decommissioning phase is assumed to be negligible, as any turbines present will not be rotating. Therefore, this risk will not be assessed in the ES.

9.8 Scoping Questions

- Are you satisfied that the three-year baseline survey dataset detailed in the Original ES is still valid and has not changed significantly since the submission of the Original Application?
- Are you satisfied with the proposed definition of seasons for breeding species to be used in the assessment?

9.8.1.1 Assessment of Collision impacts

- Are you satisfied with the species to be considered within any future assessment?
- Are there any additional species that should be taken into account?
- Are you satisfied with the use of Band Option 1 (site-specific) data to estimate collisions for the Project on its own?
- For assessing cumulative impacts, are you satisfied with the use of Band Option 1 (site-specific) data for projects where available, and Band Option 2 (generic) data for projects where site-specific data is not available?
- Are you satisfied with the use of an avoidance rate of 98.9% for gannet in the Collision Risk Modelling?
- Are you satisfied with the use of an avoidance rate of 98.9% for kittiwake in the Collision Risk Modelling? Or should an avoidance rate of 99.2% be used for kittiwake?
- Are you satisfied with the use of a nocturnal activity factor of zero for both gannet and kittiwake in the collision modelling?
- Are you satisfied with the use of mean density of flying birds per month across the three years for the collision modelling?

- For gannet and kittiwake, are you satisfied with the application of age ratios of adult to immature birds based on NnGOWL's three years of boat-based survey data to collision estimates for assessment purposes?

9.8.1.2 Assessment of Displacement & Barrier Effects

- Are you satisfied with the species to be considered within any future assessment?
- Are there any additional species that should be taken into account?
- Are you satisfied with the proposal to assess displacement and barrier effects together, as advised in current guidance from the SNCBs?
- Are you satisfied with the application of the SNCB Interim Guidance on Displacement to assess the effects of displacement and barrier effects on gannet and puffin?
- Given the reduction in turbine numbers and associated decrease in turbine density, are you satisfied with the use of a displacement level of 20% for kittiwake?
- Are you satisfied with the use of a mortality rate of 5% arising from displacement for kittiwake?
- Given the reduction in turbine numbers and associated decrease in turbine density, are you satisfied with the use of a displacement level of 40% for guillemot, razorbill and puffin?
- Are you satisfied with the use of a mortality rate of 5% arising from displacement for guillemot, razorbill and puffin?
- Given the reduction in turbine numbers and associated decrease in turbine density, are you satisfied with the use of a displacement level of 75% for gannet?
- Are you satisfied with the use of a mortality rate of 2% arising from displacement for gannet?

9.8.1.3 Cumulative Impact Assessment

- Are you satisfied with the list of projects to be considered for the CIA?
- Are there any additional projects that you think should also be considered?
- For Forth & Tay projects that have submitted scoping reports for a new application, should the CIA worst case scenarios be based on existing consents, or on details provided in the scoping report for the new application?

9.9 References - Ornithology

Band, W. (2012). Using a collision risk to assess bird collision risk for offshore wind farms. Report to SOSS.

Barton, C., Pollock, C. & Harding, N. 2009. Arklow Bank seabird and marine mammal monitoring programme. Year 8. A report to Airtricity.

Bradbury, G., Trinder, M., Furness, B., Banks, A.N, Caldow, R.W.G. and Hume, D.,2014. 'Mapping Seabird Sensitivity to Offshore Wind Farms'. *PLoS ONE*. 9(9): e106366

Canning, S., Lye, G. & Kerr, D. 2013. Analysis of Marine Ecology Monitoring Plan Data from the Robin Rigg Offshore Wind Farm, Scotland (Operational Year 3). A report to E.ON Climate & Renewables.

Cook, A.S.C.P., L.J. Wright and N.H.K. Burton, 2012. A Review of flight heights and avoidance rates of birds in relation to offshore windfarms. Crown Estate Strategic Ornithological Support Services (SOSS), project SOSS-02.

Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. and Burton, N.H.K. 2014. The avoidance rates of collision between birds and offshore turbines. BTO Research Report No. 656.

Cook, A.S.C.P & Robinson, R.A. 2015. Testing sensitivity of metrics of seabird population response to offshore wind farm effects. JNCC Report No. 553. JNCC, Peterborough.

Daunt, F., Benvenuti, S., Harris, M.P., Dall'Antonia, L., Elston, D.A. and Wanless, S. (2002). Foraging strategies of the black-legged kittiwake *Rissa tridactyla* at a North Sea colony: evidence for a maximum foraging range. Marine Ecology Progress Series, 245, 239-247.

Daunt, F., Bogdanova,M., Newell, M., Harris, M. and Wanless, S. 2011a. GPS tracking of common guillemot, razorbill and black-legged kittiwake on the Isle of May, summer 2010. A report to FTOWDG.

Daunt, F., Bogdanova,M., Redman, P., Russell, S. and Wanless, S. 2011b. GPS tracking of black-legged kittiwake and observations of trip durations and flight directions of common guillemot at Fowlsheugh and St Abb's Head, summer 2011. A report to FTOWDG.

Diersche, V. & Garthe, S. 2006. Literature review of offshore wind farms with regard to seabirds. *In:* Zucco, C., Wende, W., Merck, T., Köchling, I. & Köppel, J. (eds.) *Ecological research of offshore wind farms: international exchange of experiences (Project No. 804 46 001), Part B: Literature review of the ecological impacts of offshore wind farms.* Bonn, Germany: BfN-Skripten.

Freeman, S., Searle, K., Bogdanova, M., Wanless, S. & Daunt, F. 2014. Population dynamics of Forth and Tay breeding seabirds: Review of available models and modelling of key breeding populations. Ref: MSQ-0006. Final Report to Marine Scotland Science.

Furness, R.W. and Wade, H. 2012. Vulnerability Of Scottish Seabirds To Offshore Wind Turbines. MacArthur Green Ltd.

Furness, R.W., Wade, H. and Masden, E.A. (2013). Assessing vulnerability of seabird populations to offshore wind farms. Journal of Environmental Management, 119, 56-66.

Furness, R.W. 2015. Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report Number 164. 389 pp.

Garthe, S., Grémillet, D. and Furness, R.W. (1999). At-sea activity and foraging efficiency in chick-rearing northern gannets (*Sula bassana*): a case study in Shetland. Marine Ecology Progress Series, 185, 93-99.

Garthe, S. and Hüppop, O. (2004) Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. J. Appl. Ecol. 41: 724–734.

Garthe, S., Ludynia, K., Hüppop, O., Kubetzki, U., Meraz, J.F. and Furness, R.W. (2012). Energy budgets reveal equal benefits of varied migration strategies in northern gannets. Marine Biology, 159, 1907-1915.

Gill, J.P., Sales, D., Pinder, S. and Salazar, R. 2008. Kentish Flats wind farm 5th ornithological monitoring report. Environmentally Sustainable Systems report to Kentish Flats Ltd.

Ginn, H. B. and Melville, D. S. 1983. Moult in birds (BTO guide). British Trust for Ornithology.

Hamer, K.C., Monaghan, P., Uttley, J.D., Walton, P. and Burns, M.D. (1993). The influence of food supply on the breeding ecology of kittiwakes *Rissa tridactyla* in Shetland. Ibis, 135, 255- 263.

Hamer, K.C., Phillips, R.A., Wanless, S., Harris, M.P. and Wood, A.G. (2000). Foraging ranges, diets and feeding locations of gannets in the North Sea: evidence from satellite telemetry. Marine Ecology Progress Series, 200, 257-264.

Hamer, K.C., Humphreys, E.M., Garthe, S., Hennicke, J., Peters, G., Grémillet, D., Phillips, R.A., Harris, M.P. and Wanless, S. (2007). Annual variation in diets, feeding locations and foraging behaviour of gannets in the North Sea: flexibility, consistency and constraint. Marine Ecology Progress Series, 338, 295-305.

Haskoning DHV. 2014. Greater Gabbard Offshore Wind Farm: 5th Annual Ornithological Monitoring Report.

HiDef. 2014. Lincs Wind Farm First annual post-construction aerial ornithological monitoring report.

ICOL, 2012. (*pers. comm,* ICOL, 2012) Inch Cape Offshore Wind Farm First Annual Ornithological Report.

JNCC & NE Interim Advice Note. 2012. Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments.

Johnston, A., Cook, A. S. C. P., Wright, L. J., Humphreys, E. M., Burton, N. H. K. 2014a. Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology, 51: 31–41. doi: 10.1111/1365- 2664.12191. First published online 23/12/2013.

Johnston, A., Cook, A. S. C. P., Wright, L. J., Humphreys, E. M., Burton, N. H. K. 2014b. Corrigendum to Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology, 51: 31–41. doi: 10.1111/1365-2664.12260. First published online 6/5/2014.

JNCC (2015). Seabird Displacement Impacts from Offshore Wind Farms: report of the MROG Workshop, 6-7th May 2015. JNCC Report No 568. JNCC Peterborough.

Kotzerka, J., Garthe, S. and Hatch, S.C. (2010). GPS tracking devices reveal foraging strategies of black-legged kittiwakes. Journal of Ornithology, 151, 459-467.

Leopold, M. F., Dijkman, E. M. & Teal, L. 2011. Local Birds in and around the Offshore Wind Farm Egmond aan Zee (OWEZ) (T-0 & T-1, 2002-2010). Texel, The Netherlands: Wageningen IMARES.

MacArthur Green. 2014. Bass Rock Gannet PVA. Report to Marine Scotland Science.

MacArthur Green. 2015. Sensitivity analysis of collision mortality in relation to nocturnal activity factors and wind farm latitude. East Anglia Three Ornithology Evidence Plan Volume 3, Technical Appendix 13.1. Expert Topic Group Meeting 6, Appendix 7.

MacArthur Green. 2016. Qualifying impact assessments for selected seabird populations: A review of recent literature and understanding. Report commissioned by Vattenfall, Statkraft and ScottishPower Renewables.

Marine Scotland. 2014. Application For Consent Under Section 36 Of The Electricity Act 1989 And Applications For Marine Licences Under The Marine (Scotland) Act 2010 For The Construction And Operation Of The Neart Na Gaoithe Offshore Windfarm. Marine Scotland's Consideration Of A Proposal Affecting Designated Special Areas Of Conservation ("SACs") Or Special Protection Areas ("SPAs").

Marine Scotland. 2014a. Strategic Assessment of Collision Risk of Scottish Offshore Windfarms to Migrating Birds.

Marine Scotland. 2014b. Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03).

Marine Scotland. 2017. Application For Consent Under Section 36 Of The Electricity Act 1989 And Application For A Marine Licence Under The Marine (Scotland) Act 2010 And The Marine And Coastal Access Act 2009 For The Construction And Operation Of Kincardine Offshore Windfarm Limited.

Masden, E.A. (2015). Developing an avian collision risk model to incorporate variability and uncertainty. Scottish Marine and Freshwater Science Report Vol 6 No 14.

Mendel, B., Kotzerka, J., Sommerfield, J., Schwemmer, H., Sonntag, N. and Garthe, S. 2014. Effects of the alpha ventus offshore test site on distribution patterns, behaviour and flight heights of seabirds. Federal Maritime and Hydrographic Agency, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety; Springer Fachmedien, Wiesbaden.

Mendel, B., Sonntag, N., Sommerfeld, J., Kotzerka, J., Müller, S., Schwemmer, H., Schwemmer, P. and Garthe, S. 2015. Untersuchungen zu möglichem Habitatverlust und möglichen Verhaltensänderungen beiSeevögeln im Offshore-Windenergie-Testfeld (TESTBIRD). Schlussbericht zum Projekt Ökologische Begleitforschung am Offshore-Testfeldvorhaben alpha ventus zur Evaluierung des Standarduntersuchungskonzeptes des BSH (StUKplus). FTZ Westküste, Büsum.

NnGOWL. 2012. Mainstream Neart na Gaoithe Offshore Wind Farm Ornithology Technical Report June 2012

NnGOWL. 2013. Mainstream Neart na Gaoithe Offshore Wind Farm Ornithology Technical Report June 2013

Npower Renewables. 2008. North Hoyle Offshore Wind Farm Final Annual FEPA Monitoring Report (2006-7) & Five Year Monitoring Programme Summary.

Orben, R.A., Irons, D.B., Paredes, R., Roby, D.D., Phillips, R.A. and Shaffer, S.A. (2015). North or south? Niche separation of endemic red-legged kittiwakes and sympatric black-legged kittiwakes during their non-breeding migrations. Journal of Biogeography, 42, 401-412.

Percival, S.M. 2013. Thanet Offshore Wind Farm Ornithological Monitoring 2012-2013. Ecology Consulting report to Vattenfall.

Petersen, I. K., Christensen, T. K., Kahlert, J., Desholm, M. & Fox, A. D. 2006. Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark. National Environmental Research Institute. Report to DONG energy and Vattenfall A/S.

Pettersson, J. 2005. The impact of offshore wind farms on bird life in Southern Kalmar Sound, Sweden: a final report based on studies 1999-2003. Department of Animal Ecology, Lund University, Sweden.

Searle, K., Mobbs, D., Butler, A., Bogdanova, M., Freeman, S., Wanless, S. & Daunt, F. 2014. Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03). Final Report to Marine Scotland Science.

Seagreen. 2012. Seagreen Wind Energy Environmental Statement Projects Alpha and Bravo. Seagreen Wind Energy Reference: A4MRSEAG-Z-DOC100-SPR-060.

SNCBs. 2017. Interim Displacement Advice Note. Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments. http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf

SNH. 2014. Interim Guidance On Apportioning Impacts From Marine Renewable Developments To Breeding Seabird Populations In Special Protection Areas. http://www.snh.gov.uk/docs/A1355703.pdf

SNH. 2017. Seasonal Periods for Birds in the Scottish Marine Environment. http://www.snh.gov.uk/docs/A2200567.pdf

SNH & JNCC. 2015. Neart Na Gaoithe Offshore Wind Farm SNH & JNCC Comments on the Consent Variation.

Thaxter, C.B. Lascelles, B. Sugar, K. Cook, A.S.C.P. Roos, S. Bolton, M. Langston, R.H.W. and Burton, N.H.K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation.

Vanermen, N., Onkelinx, T., Courtens, W., Van de walle, M., Verstraete, H. and Stienen, E.W.M. 2015. Seabird avoidance and attraction at an offshore wind farm in the Belgian part of the North Sea. Hydrobiologia (2015) 756:51–61

Wade H.M., Masden. E.A., Jackson, A.C. and Furness, R.W. (2016). Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. Marine Policy 70, 108–113. Available online at doi:10.1016/j.marpol.2016.04.045

Walls, R., Canning, S., Lye, G., Givens, L., Garrett, C. & Lancaster, J. 2013. Analysis of Marine Environmental Monitoring Plan Data from the Robin Rigg Offshore Wind Farm, Scotland (Operational Year 1) Technical Report. E.ON Climate & Renewables.

10 Marine Mammals

10.1 Introduction

This chapter presents information on the marine mammals of relevance to the Project and considers the potential effects on them resulting from construction, operation and maintenance, and decommissioning. Reference is made to the baseline data gathered to inform the EIA for the Originally Consented Project, and to the outcomes of the impact assessment presented in the Original ES.

10.2 Baseline Data

This section describes the baseline marine mammal data available to support the Project EIA. Much of the marine mammal baseline data were obtained during site specific surveys undertaken between 2009 and 2012 and presented in the Original ES submitted in July 2012, and the Addendum, submitted in July 2013. Additional data from other sources have become available since 2013 and will be used to support the Project EIA where relevant. Commentary is provided on the sufficiency of the baseline data as a basis for scoping the Project EIA.

A variety of datasets were collated and analysed to inform the EIA for the Originally Consented Project. Data was obtained from site surveys and studies commissioned by NnGOWL. Those datasets considered to be relevant to the Project are listed in Table 10-1 below.

Table 10-1: Baseline data sources from the Original Project EIA

Data Source	Study / Data name	Survey Overview
NnGOWL	Baseline Marine Mammal Surveys (ES Chapter 13 and Addendum)	Boat based surveys commissioned by NnGOWL to record bird and marine mammal in and around the Wind Farm Area: ● Three years of monthly boat based surveys undertaken between 2009 and 2012. ● Covered the Wind Farm Area and 8 km buffer.
FTOWDG	Bottlenose dolphin baseline characterisation for the Firth of Tay (Quick and Cheney, 2011: Appendix 13.3)	A report prepared by SMRU providing background information on the abundance and distribution of bottlenose dolphins in the Forth and Tay: ● Report presents a summary of data collected between 2003 and 2010. ● Review of the information on total bottlenose dolphin population size. ● Connectivity of bottlenose dolphin between the Tay and the Moray Firth SAC. ● Provides recommendations for further work including the use of more recent data to provide more robust bottlenose dolphin densities in the area and the re-deployment of C-PODs.
FTOWDG	Baseline seal information for the	A report prepared by SMRU presenting an analysis of existing satellite telemetry and aerial survey data to describe the abundance and

Data Source	Study / Data name	Survey Overview
	FTOWDG area (Sparling *et al.,* 2012: Appendix 13.4)	distribution of harbour and grey seals in the Firths of Forth and Tay, specifically to inform site specific and cumulative assessments of the likely nature and extent of potential impacts from the development of offshore wind farms in the region. The report presents: ● The regional seal populations up to 2009. ● Results from seal tagging studies undertaken between 1989 and 2008. ● A summary of the seal diet in the region.
NnGOWL	Marine Mammal acoustic and visual surveys (Gordon, 2012: Appendix 13.5).	Ship based surveys commissioned by NnGOWL to collect visual and acoustic marine mammal data: ● Two years of monthly visual surveys undertaken between 2009 and 2011. ● One year of acoustic data collected between 2010 and 2011. ● Estimates of absolute abundance and densities of seals and harbour porpoise within the Wind Farm Area.
FTWODG	Analysis of aerial survey data (Grellier and Lacey, 2012: Appendix 13.6 and Macleod and Sparling, 2011)	Analysis of aerial survey data collected by The Crown Estate: ● 24 days of aerial survey data collected between 28 May 2009 and 20 March 2010 ● Surveys covered the wider Firths of Forth and Tay region. ● Density estimates of seals, harbour porpoise and white-beaked dolphins are presented.
Modelling and Assessment		
NnGOWL	Noise modelling (Nedwell and Mason, 2012: Appendix 13.1)	Underwater noise modelling commissioned by NnGOWL to estimate the potential impacts from noise arising from piling activities associated with the construction of the Offshore Wind Farm on marine mammals (and fish): ● Modelling undertaken using the INSPIRE version 3.3.0 model. ● Model assessed potential impacts from noise on harbour porpoise, bottlenose dolphin, white-beaked dolphin and minke whale. ● Assessment based on dB_{ht} threshold criteria with traumatic injury occurring at 130 dB_{ht} and behavioural impacts at 90 and 75 dB_{ht}. ● Assessment based on the installation of four 2.5 m or 3.5 m piles at each turbine. ● Included cumulative impact assessment from construction piling

Data Source	Study / Data name	Survey Overview
		at Inch Cape and Seagreen Alpha and Bravo offshore wind farms.
FTOWDG	SAFESIMM Noise Impact Assessment (Sparling *et al*., 2012: Appendix 13.2)	Presents the outputs from the SAFESIMM model on harbour seal, grey seal and bottlenose dolphin: ● Modelling undertaken using the SAFESIMM model to estimate the potential effects of piling noise marine mammals. ● Model assessed four piling scenarios for the Wind Farm Area and one each for Inch Cape and Seagreen. ● Model presents predicted number of seals and bottlenose dolphin at risk of auditory injury and disturbance from piling activities at the Wind Farm Area.

10.2.1 Data Validity

NnGOWL, on the advice of their technical consultants, are of the opinion that the data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections discuss the sufficiency of the available data in relation to spatial coverage and age.

10.2.1.1 Data Spatial Coverage

As identified in Table 10-1, NnGOWL commissioned site specific boat-based surveys between November 2009 and October 2012, which covered the Wind Farm Area and an 8 km buffer (Figure 10.1). The results from these surveys were presented in Chapter 13 of the ES and within the ES Addendum. Additional boat-based surveys were commissioned between 2009 and 2011 specifically to obtain both visual and acoustic data on seals and harbour porpoise within the Wind Farm Area.

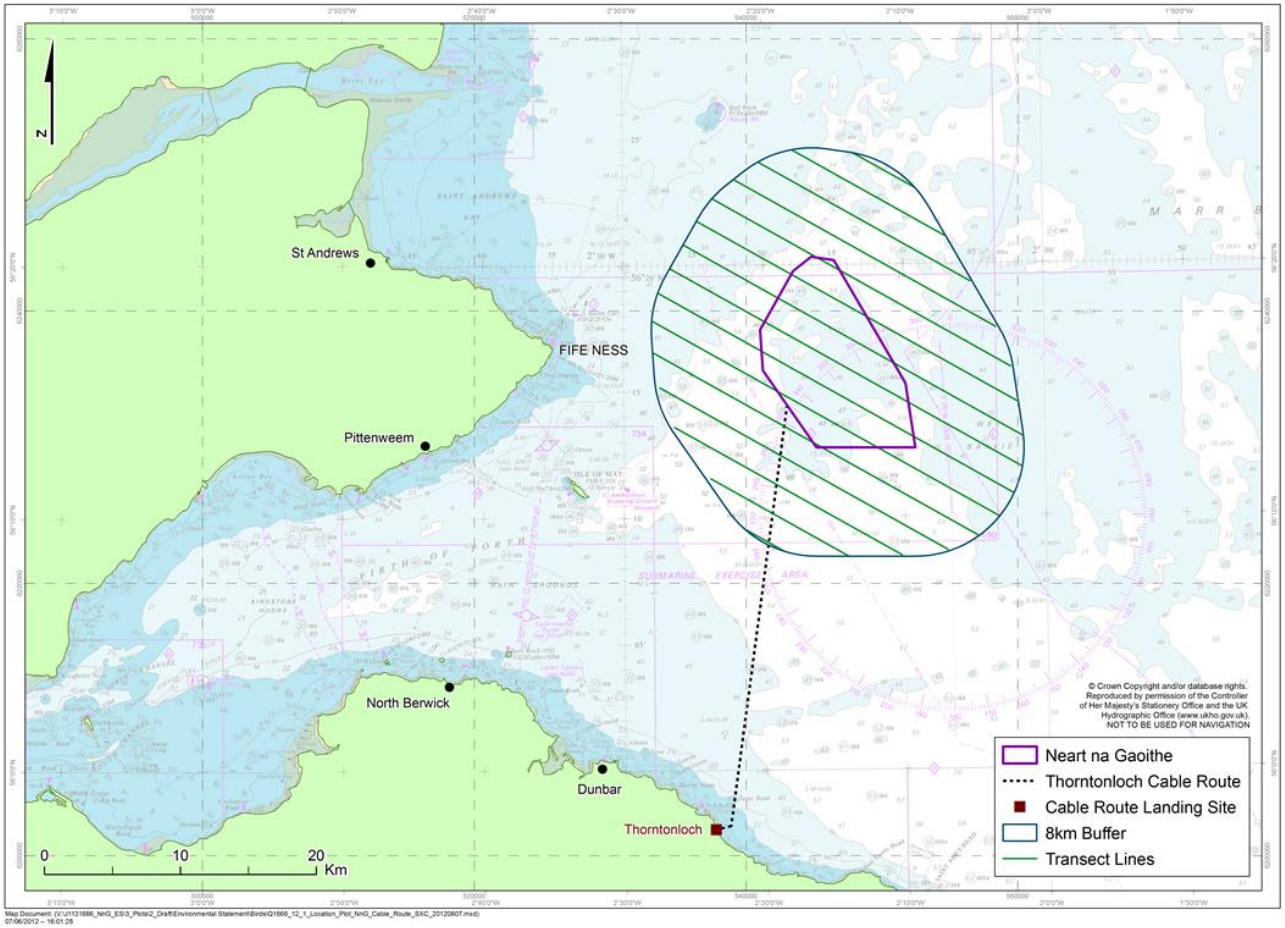


Figure 10.1. Areas of Neart na Gaoithe site specific boat based surveys undertaken between 2009 and 2012.

Data from surveys undertaken across the wider Firths of Forth and Tay area include aerial surveys undertaken between 2009 and 2010 and acoustic surveys to detect bottlenose dolphins using C-PODs in coastal waters.

The location and extent of the Wind Farm Area will cover the same area as previously assessed for the Originally Consented Project. It is therefore considered that the spatial coverage of the original data describing the distribution and abundance of marine mammals potentially affected by the Project remain valid in terms of spatial coverage.

10.2.1.2 Age of the Data

As described above, site specific survey data reported in the Original ES were collected over a period of three years between 2009 and 2012. In addition to the site specific data, additional data from a variety of sources have been collected within the Firths of Forth and Tay region over a period of many years. The latest data used within the Original ES and Addendum, prepared for the Originally Consented Project, was from 2012. Any additional data relevant to the Project which have become available since the Original Application was made, will be included within the future marine mammal assessment.

It is recognised that both the distribution and populations of marine mammals can and do change over time. Possible daily and seasonal changes in the distributions of marine mammals within the Firths of Forth and Tay area are considered likely to have been captured within the existing baseline environmental data

and are not predicted to have substantially changed since the collection of the data. Larger scale and longer term changes in the distribution of marine mammals have been reported from wide scale surveys, e.g. changes in harbour porpoise and minke whale distributions across the North Sea over a ten year period (Hammond *et al*., 2013). However, such changes typically occur over a period of many years and no significant changes in the distributions or populations of marine mammals likely to be impacted by the Project are considered likely to have occurred in the five years since the last baseline data were collected.

Therefore, it is concluded that the baseline data remains adequate to provide a basis for the assessment of potential effects on marine mammals.

10.2.2 Review of Baseline Characteristics

This section presents a brief overview of the marine mammals recorded within the Firths of Forth and Tay area that could potentially be affected by the Project.

10.2.2.1 Marine Mammals in the Study Area

Six species of marine mammal regularly occur within the Firth of Forth and Forth of Tay area: harbour porpoise, white-beaked dolphin, bottlenose dolphin, minke whale, grey seal and harbour seal. A further seven species of cetacean: common dolphin, white-sided dolphin, Risso's dolphin, killer whale, long-finned pilot whale, humpback whale and sperm whale, have also been recorded occasionally within the area but are considered to be scarce or rare in the region (Reid *et al.* 2003).

A total of four species of cetacean and two species of pinniped were recorded during three years of site-specific baseline marine mammal surveys (Table 10-2), with sightings made throughout the year (Table 10-3). No bottlenose dolphins were recorded during surveys, although they are known to occur frequently within the nearshore areas of the region and may potentially be impacted by the proposed development.

The following provides a baseline summary of the species recorded during baseline surveys as well as for bottlenose dolphin.

Table 10-2. Annual total of marine mammals recorded during site-specific boat based surveys undertaken between 2009 and 2012

Species	Year 1	Year 2	Year 3	Total
Harbour porpoise	89	83	107	279
White-beaked dolphin	0	16	2	18
Orca	0	1	0	1
Minke whale	2	10	8	21
Grey seal	43	57	39	139
Harbour seal	5	17	18	40

Table 10-3. Monthly totals of marine mammal sightings recorded during three years of site specific surveys

Species	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Harbour porpoise	22	38	6	58	36	38	2	0	4	34	14	27	279
White-beaked dolphin	0	0	1	0	0	0	12	5	0	0	0	0	18
Orca	0	0	0	0	0	0	0	0	0	0	0	1	1
Minke whale	6	1	0	0	0	0	1	4	0	4	1	4	21
Grey seal	7	5	7	10	31	13	8	2	9	12	9	26	139
Harbour seal	6	2	3	6	1	6	7	2	1	3	1	2	40

10.3 Design Envelope

Table 10-4 identifies the activities undertaken during the construction, operation and decommissioning of the Offshore Wind Farm and its associated infrastructure that could impact on marine mammals. Activities described in the Originally Consented Project design envelope (NnGOWL, 2012) are compared with those proposed in the Project design envelope and any differences are identified. Reference to the Originally Consented Project design envelope is based on the design envelope outlined in the Original ES unless further assessment on marine mammal receptors were conducted based on the design envelope presented in the Addendum.

Table 10-4. Worst case design scenario definition – Marine Mammals.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012; NnGOWL, 2013)	Project Design Envelope	Difference
Construction			
Vessel disturbance	Vessels comprising jack-up rigs, heavy lift vessels, cable laying barges, and ancillary and support vessels on site for the duration of the construction phase.	It is anticipated that the type and number of vessels operating during the construction period will be broadly similar to the Original Project design envelope however each vessel type will be present on site for a shorter duration.	No change in construction vessels required however, duration on site of construction vessels associated with foundation and turbines installation and commissioning is likely to be reduced due to reduced scale of the Project.
Piling noise	The Original ES was for the installation of up to 125 turbines. This was reduced to 90 turbines	The Project is for the installation of up to 56 turbines. 6 piles per	A reduction in the maximum number of turbines and the maximum number of piles.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012; NnGOWL, 2013)	Project Design Envelope	Difference
	as detailed in the Addendum. 4 piles per foundation (maximum).	foundation (maximum).	
	Approximately 3% of piles will be driven only, 7% of piles will be drilled only. 90% of piles will be driven-drilled – of these an average of 30% of the pile will be drive and 70% drilled.	Approximately 3% of piles will be driven only, 7% of piles will be drilled only. 90% of piles will be driven-drilled – of these an average of 30% of the pile will be drive and 70% drilled.	No change in the methods used for installation of foundations.
	Pile diameter between 2.5 m and 3.5 m.	Pile diameter up to 3.5 m	No increase in the pile diameter.
	Four piles per foundation	Six piles per foundation	Increase in the maximum number of piles per foundation but a reduction in the number of foundations.
	Duration of piling between 62-180 hours for 4 piles. Jacket installation 12-24 hrs. (includes time for setting up and changing equipment between piling locations).	Duration of piling up to 180 hours for 6 piles. Jacket installation up to 24 hours. (This includes time for setting up and changing equipment between piling locations).	Same maximum duration of piling at each turbine location. Same maximum duration of jacket installation.
	Drive only: maximum hammer energy of 1635 Kj. Drive-drill-drive: maximum hammer energy of 1200 Kj.	Drive only: maximum hammer energy of 1635 Kj. Drive-drill-drive: maximum hammer energy of 1200 Kj.	No change in maximum hammer energy.
Drilling noise	The Original ES was for the installation of up to 125 turbines. This was reduced to 90 turbines as detailed in the Addendum.	The Project is for the installation of up to 56 turbines.	A reduction in the number of turbines and therefore possible reduction in the duration of noise impacts

Potential Effect	Original Project Design Envelope (NnGOWL, 2012; NnGOWL, 2013)	Project Design Envelope	Difference
	An estimated 7% of piles will be drilled only. 90% of piles will be driven-drilled – of these an average of 30% of the pile will be drive and 70% drilled.	An estimated 7% of piles will be drilled only. 90% of piles will be driven-drilled – of these an average of 30% of the pile will be drive and 70% drilled.	No significant change in the proportion of piles that will require drilling
Installation of Offshore Substation Platforms	Between 4 and 8 x 3.5 m piles.	Up to 6 x 3.5 m piles.	Reduced maximum from 8 to 6 piles.
Operation			
Operational noise	Wind Farm Area in which turbines may be installed 105 km^2.	Wind Farm Area remains at 105 km^2.	No change
	Up to 125 turbines based on Original ES and 90 in the Addendum.	No change in the level of noise from individual operating turbines but a reduction in the total number of turbines to 56 turbines.	Reduction in number of turbines.
Disturbance from maintenance vessels	Between 5 – 10 visits per year per turbine, plus two visits of scheduled maintenance per turbine per year. Up to 125 turbines in the ES and 90 turbines in the Addendum.	No anticipated change in the number of visits per year with a reduction in the number of turbines to 56.	Reduction in the number of visits per year based on reduced number of turbines.
Electromagnetic Fields from Offshore Export Cables	The Offshore Export Cables will be HVAC and will be trenched and buried.	The Offshore Export Cables will be HVAC and will be trenched and buried.	No change

Decommissioning impacts will be primarily from vessel noise and are predicted to be lower than those arising from construction activities.

10.4 Project Embedded Mitigation

A range of Embedded Mitigation measures to minimise environmental effects were captured within the design envelope for the Originally Consented Project and would apply equally to the Project, as follows:

- Minimise the duration of piling activities. Where practicable, preferentially selecting installation techniques that emit least amount of sound;
- Optimising soft start procedures;
- Minimising driven piling through more drilling;
- Use of Acoustic Deterrent Devices and/or visual and acoustic detection devices; and
- Minimise as far as practicable the number of vessels used during the construction and operational periods.

10.5 Consent Conditions Commitments

A number of conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project will incorporate similar licence conditions to manage the environmental risk commensurate with the Project design envelope. Table 6-4Table 10-5 sets out the conditions attached to the Consents for the Originally Consented Project which have some direct relevance to the management of environmental effects on marine mammals.

Table 10-5. Consent conditions for the Originally Consented Project relevant to Marine Mammals

Original Consent Requirement	Relevance to Marine Mammals
Piling Strategy	Setting out, for approval, the piling methods, in accordance with the Application and detailing associated mitigation incorporating data collected as part of pre-construction survey work to demonstrate how effects on bottlenose dolphin, harbour seal and grey seal will be adequately mitigated.
Noise registry	Prior to the commencement of piling activities the proposed date(s), location(s) and nature of the piling activities undertaken must be reported. In the event piling is to be carried out for more than 10 consecutive days, submit quarterly noise registry reports.
Vessel Management Plan	Requires details of the vessels to be used and working practices to reduce the use of ducted propellers.
Environmental Management Plan	Setting out, for approval, relevant environmental management and mitigation measures to be applied during the construction and operation of the Project.
Project Environmental Monitoring Plan	Setting out, for approval, the proposed environmental monitoring programme, to include the participation in surveys to be carried out in relation to marine mammals as set out in the Marine Mammal Monitoring Programme
Participation in the Scottish	Requires participation in the SSMEG with respect to research, monitoring and

Original Consent Requirement	Relevance to Marine Mammals
Strategic Marine Environmental Group (SSMEG)	mitigation programmes for marine mammals.
Participation in the Forth and Tay Regional Advisory Group (FTRAG)	Participation in the FTRAG with respect to monitoring and mitigation for marine mammals.

10.6 Scoping of the Project EIA

Table 10- summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification.

The embedded mitigation (Section 10.4) was included within the assessment conclusions set out in the Original ES and Addendum, therefore only the residual impact significance has been presented in Table 10-7. Summary of potential effects on Marine Mammals.

It should be noted that the conclusions presented in Table 10-6 relate only to the EIA requirements for the Project and do not in any way presuppose the requirements of assessment for HRA or, possible, future EPS licence.

Table 10-6. Summary of potential effects on Marine Mammals

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction				
Disturbance resulting from vessel noise	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to vessel noise was concluded to be not significant in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Disturbance resulting from vessel presence (including collision)	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to vessel presence was concluded to be not significant in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Piling noise during installation of foundations	Harbour porpoise	Lethal Effect (PTS): not significant Noise displacement (TTS): minor significance Partial displacement (behavioural): minor significance	Scoped in	Disturbance from piling noise was previously considered to range from not significant to moderate significance on the marine mammal species recorded within the Wind Farm Area. Since the submission of the Original Application published studies suggest that the levels at which the onset of auditory injury for some marine mammals occur may be lower than previously considered (e.g. Lucke *et al*. 2009). The National Marine Fisheries Service (NMFS) have published alternative criteria for auditory injury based on the findings of these recent studies (NMFS 2016). It is proposed to scope in all marine mammal species for further consideration in the EIA and NnGOWL is seeking clarification from SNCBs and MS on whether the NMFS criteria is recommended to inform assessments.
	White-beaked dolphin	Lethal Effect (PTS): not significant Noise displacement (TTS): not significant Partial displacement (behavioural): not significant	Scoped in	
	Bottlenose dolphin	Lethal Effect (PTS): not significant Noise displacement (TTS): minor significance Partial displacement (behavioural): minor significance	Scoped in	
	Minke whale	Lethal Effect (PTS): not significant Noise displacement (TTS): not significant Partial displacement (behavioural): not significant	Scoped in	
	Harbour Seal	Lethal Effect (PTS): moderate	Scoped in	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
		significance Noise displacement (TTS): moderate significance Partial displacement (behavioural): moderate significance		
	Grey Seal	Lethal Effect (PTS): minor significance Noise displacement (TTS): minor significance Partial displacement (behavioural): minor significance	Scoped in	
Drilling noise during installation of foundations	All marine mammal species in the area	Not significant	Scoped out	Disturbance to marine mammals due to drilling noise was concluded to be not significant in the Original EIA. Based on the reduced scale of the Project the predicted effects will be no greater than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Increased SSC during cable installation (inter-array and export cabling)	All marine mammal species in the area	Not significant	Scoped out	Disturbance to marine mammals due to increased SSC concluded to be not significant in the Original EIA. The design envelope relating to the inter-array remains unchanged compared to the Original Application and although there has been an increase in Offshore Export Cable length within the Offshore Wind Farm, the EIA determinations are considered to remain valid and it is proposed that further assessment should be scoped out of the ES for the Project.
Increased noise	All marine	Not significant	Scoped	Disturbance to marine mammals due to

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
associated with cable installation (inter-array and export cabling)	mammal species in the area		out	noise produced during cable installation was concluded to be not significant in the Original EIA. The design envelope relating to the inter-array remains unchanged compared to the Original Application and although there has been an increase in Offshore Export Cable length within the Offshore Wind Farm, the EIA determinations are considered to remain valid and it is proposed that further assessment should be scoped out of the ES for the Project.
Operation				
Noise arising from operating wind turbines	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to operational turbine noise was concluded to be not significant in the Original EIA. Based on the reduced scale of the Project the predicted effects will be no greater than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Noise disturbance from operation and maintenance vessels	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to vessel noise was concluded to be not significant in the Original EIA. Based on the reduced scale of the Project the predicted effects will be no greater than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Disturbance from operation and maintenance vessel presence	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to vessel presence was concluded to be not significant in the Original EIA. Based on the reduced scale of the Project the predicted effects will be no greater than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				Project.
Electromagnetic fields from inter-array and Offshore Export Cables	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to electromagnetic fields around inter-array and Offshore Export Cables was concluded to be not significant in the Original EIA. The design envelope relating to the inter-array remains unchanged compared to the Original Application and although there has been an increase in Offshore Export Cable length within the Offshore Wind Farm, the EIA determinations are considered to remain valid and it is proposed that further assessment should be scoped out of the ES for the Project.
Increased SSC associated with inter-array and Offshore Export Cable operation and maintenance activities	All marine mammal species	Not significant	Scoped out	Disturbance to marine mammals due to cable operation and maintenance activities was concluded to be not significant in the Original EIA. The design envelope relating to the inter-array and Offshore Export Cable remains unchanged compared to the Original Application. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.

The potential effects resulting from construction activities are likely to be equal to or greater than the effects of decommissioning the Project. On this basis and noting the requirement to produce a Decommissioning Programme it is proposed that potential effects from decommissioning be scoped out of the ES for the Project.

10.6.1 Scoping of Cumulative Impacts Assessment

The CIA associated with the Original EIA incorporated a collaborative approach developed by the regional FTOWDG. Although the CIA primarily focused on cumulative effects resulting from the Forth and Tay projects it was acknowledged that marine mammals, as mobile species, may spend significant periods of time outside this area and may therefore be affected by other offshore developments more remote from the Project. The scope of the Original CIA considered the cumulative and in-combination effects associated

with the projects below and these will be considered in the scoping of the CIA. Parameters to be considered are provided in brackets:

- Inch Cape Offshore Wind Farm (as-consented and re-scoped parameters to be considered);
- Seagreen Alpha and Bravo (as-consented and re-scoped parameters to be considered);
- Beatrice Offshore Wind Farm (project consent plan parameters to be considered);
- Moray Offshore Wind Farm (Western Development Area) (as-consented parameters to be considered, unless this changes within the timescale of the EIA);
- Aberdeen Harbour Expansion Project (as consented parameters to be considered).

Table 10-7 sets out additional projects considered to be potentially relevant to the CIA for the Project EIA and discusses whether these should be scoped in or scoped out of the forthcoming assessment.

Table 10-7. Additional projects potentially considered in the CIA for the Originally Consented Project.

Project Name	Requiring further assessment as part of the CIA for the Project EIA	Justification
Aberdeen Harbour Expansion Project (as consented parameters to be considered)	Scoped out	Potential for noise impacts to arise during construction of the harbour in Nigg Bay. However, it is predicted that construction of the harbour expansion will be completed before future possible construction may occur at NnG
Blyth Offshore Wind Farm	Scoped out	No piling is proposed for this project therefore there is no potential for significant cumulative or in-combination effects.
Kincardine Offshore Wind Farm	Scoped out	No piling is proposed for this project therefore there is no potential for significant cumulative or in-combination effects.
Teeside Offshore Wind Farm	Scoped out	The distance between NnG and this project is considered too great to result in overlapping noise effects.
Dogger Bank Offshore Wind Farm	Scoped out	The distance between NnG and this project is considered too great to result in overlapping noise effects.
Moray Offshore Wind Farm, Eastern Development Area	Scoped in	Although the timescale for the construction of this project is likely to be quite different from NnG, it will be considered for the CIA due to the potential for interactions marine mammals, particularly bottlenose dolphin.

Table 10-8 summarise the post-mitigation (residual) significance for all cumulative effects considered and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

Table 10-8. Summary of Potential Effects on Marine Mammals – Project with Other Plans, Projects and Activities.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the CIA for the Project EIA	Justification
Construction				
Disturbance resulting from vessel noise	All marine mammal species	Not significant	Scoped out	Given the reduced scale of the Project and the distance between projects, the predicted effects are not anticipated to be of greater significance than the Original ES and it is considered that further assessment should be scoped out.
Disturbance resulting from vessel presence (including collision)	All marine mammal species	Not significant	Scoped out	Given the reduced scale of the Project and the distance between projects, the predicted effects are not anticipated to be of greater significance than the Original ES and it is considered that further assessment should be scoped out.
Piling noise during installation of foundations	Harbour porpoise	Lethal Effect (PTS): not significant Noise displacement (TTS): minor significance Partial displacement (behavioural): minor significance	Scoped in	It is proposed to scope potential effects from piling noise into the CIA due to the recent evidence published since the application suggesting that marine mammal hearing thresholds may be lower than previously assessed.
	White-beaked dolphin	Lethal Effect (PTS): not significant Noise displacement (TTS): not significant Partial displacement (behavioural): not significant	Scoped in	
	Bottlenose dolphin	Lethal Effect (PTS): not significant	Scoped in	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the CIA for the Project EIA	Justification
		Noise displacement (TTS): minor significance Partial displacement (behavioural): minor significance		
	Minke whale	Lethal Effect (PTS): not significant Noise displacement (TTS): not significant Partial displacement (behavioural): not significant	Scoped in	
	Harbour Seal	Lethal Effect (PTS): moderate significance Noise displacement (TTS): moderate significance Partial displacement (behavioural): moderate significance	Scoped in	
	Grey Seal	Lethal Effect (PTS): minor significance Noise displacement (TTS): minor significance Partial displacement (behavioural): minor significance	Scoped in	
Drilling noise during installation of foundations	All marine mammal species in the area	Not significant	Scoped out	The projects under consideration that may cause a cumulative impact from drilling noise remain the same as those considered in the Original EIA. With a reduction in the scale of the Project it is anticipated that the cumulative effects would therefore be no greater and

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the CIA for the Project EIA	Justification
				likely less than those previously presented in the Original ES which were considered to be not significant.
Increased SSC during cable installation (inter-array and export cabling)	All marine mammal species in the area	Not significant	Scoped out	The design envelope relating to the inter-array remains unchanged compared to the Original Application and although there has been an increase in Offshore Export Cable length within the Offshore Wind Farm, the EIA determinations are considered to remain valid. The cumulative effects are predicted to be no greater than those previously presented in the Original ES which were considered to be not significant.
Increased noise associated with cable installation (inter-array and export cabling)	All marine mammal species in the area	Not significant	Scoped out	The design envelope relating to the inter-array remains unchanged compared to the Original Application and although there has been an increase in Offshore Export Cable length within the Offshore Wind Farm, the EIA determinations are considered to remain valid. The cumulative effects are predicted to be no greater than those previously presented in the Original ES which were considered to be not significant.
Operation				
Noise arising from operating wind turbines	All marine mammal species	Not significant	Scoped out	The cumulative projects under consideration remain the same as those considered in the

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the CIA for the Project EIA	Justification
Noise disturbance from operation and maintenance vessels	All marine mammal species	Not significant	Scoped out	Original EIA but with a significant reduction in the scale of the Project. The cumulative effects are predicted to be no greater and likely less than those previously presented in the Original ES which were considered to be not significant.
Disturbance from operation and maintenance vessel presence	All marine mammal species	Not significant	Scoped out	
Electromagnetic fields from inter-array and Offshore Export Cables	All marine mammal species	Not significant	Scoped out	
Increased SSC associated with inter-array and Offshore Export Cable operation and maintenance activities	All marine mammal species	Not significant	Scoped out	

10.7 Approach to EIA

The EIA will assess the potential impacts from noise arising from the proposed development on species identified during site-specific baseline surveys and bottlenose dolphin that are known to occur in the area. The populations against which the potential significance of impacts will be assessed will be those of the relevant Management Unit for each species which, for cetaceans are published in IAMMWG (2015) and for pinnipeds in SCOS (2015) and will take into consideration their conservation status.

It is intended to use noise modelling to help quantify the extent of any potential noise impacts. The model will meet the specifications described in the best practice guidelines for noise modelling for environmental impact assessment set out in Farcas *et al*. (2016) and take account of site specific environmental factors such as bathymetry, sound speed data, and sediment properties.

The outputs from the noise modelling will present the range at which the onset of PTS, TTS and disturbance may occur (Table 10-9). This will be based on both the Southall *et al.* (2007) and potentially also the NMFS (2016) thresholds for physical injury. The distances at which significant disturbance are predicted to occur will be based on two thresholds of 140 and 160 dB re 1 µPa rms.

In order to assess the potential effects on bottlenose dolphin, PVA will be used to assess the potential population level effects arising from disturbance. The outputs from the model will help inform the likely population level effects from the Project both alone and cumulatively with other known plans or projects.

The impact assessment on marine mammals will be based on:

- The baseline characteristics of the site, primarily from the three years of boat-based survey data and coastal data for bottlenose dolphins.
- Outputs from the noise model using thresholds.
- The use of best available published evidence on the extent, duration and effect of marine noise on marine mammals.
- The use of the PVA to assess potential impacts from noise on bottlenose dolphins.

Table 10-9. Noise thresholds against which potential impacts to marine mammals may be assessed

Species	Multi-pulse thresholds						
	Lethal Injury Threshold	Southall		NMFS		Disturbance	
		PTS Injury Threshold	TTS Injury Threshold	PTS Injury Threshold	TTS Injury Threshold		
	Un-weighted pk-pk (dB re 1uPa)	M-weighted SEL thresholds (dB re 1 µPa²s)				Marine mammals = Unweighted rms SPL (dB re 1 µPa) Fish = 0-peak (dB re 1 µPa)	
LFC	240	198	183	183	168	160	140
MFC	240	198	183	185	170	160	140
HFC	240	198	183	155	140	160	140
Pinnipeds	240	186	171	185	170	170	150

LFC = Low frequency cetacean, e.g. minke whale.
MFC = Mid-frequency cetacean, e.g. bottlenose dolphin and white-beaked dolphin.
HFC = High frequency cetacean, e.g. harbour porpoise.
Pinnipeds = grey seal and harbour seal.

10.8 Scoping Questions

- Are you satisfied that the baseline detailed in the Original ES is still valid and has not changed significantly since the submission of the Original Application?
- Are you satisfied with the species to be considered within any future assessment. Are there any additional species that should be taken into account?
- Are you satisfied with the use of management unit populations to assess potential impacts against?

- Are you satisfied with the use the PVA to assess potential population level impacts on bottlenose dolphins?
- Of the thresholds presented in Table 10-9, which do you consider the most suitable for assessment purposes?
- Are you satisfied with the proposed list of projects that will be considered as part of any cumulative assessment? Are there any other projects that should be considered?

10.9 References – Marine Mammals

Farcas, A., Thompson, P. M. and Merchant, N. D. 2016. Underwater noise modelling for environmental impact assessment. *Environmental Impact Assessment R*eview. 57: 114-122

Gordon, R., 2012. Marine Mammal Acoustic and Visual Surveys - Analysis of Neart Na Gaoithe data. Marine Ecological Research. June 2012.

Grellier, K. and Lacey, C. 2012. Analysis of The Crown Estate aerial survey data for marine mammals for the Forth and Tay Offshore Wind Developers Group region. SMRULSGW-2012-015. Unpublished report to The FTOWDG.

Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, M.L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O. & Vázquez, J.A. 2013. Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. *Biological Conservation* 164: 107-122.

IAMMWG. 2015. Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough.

ICOL, 2017. Inch Cape Scoping Report. Available from: http://www.gov.scot/Resource/0051/00517517.pdf. [Accessed on: 11/05/2017]

Lucke, K., Siebert, U., Lepper, P. a, and Blanchet, M.-A. 2009. Temporary shift in masked hearing thresholds in a harbour porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. *The Journal of the Acoustical Society of America*, *125*(6), 4060-70.

Macleod, K. and Sparling, C. 2011. Assessment of The Crown Estate Aerial survey marine mammal data for the Firth of Forth development areas. Report for FTOWDG. SMRU Ltd.

Nedwell, J.R. and Mason, T.I. 2012. Modelling of noise during impact piling operations at the Neart na Gaoithe offshore wind farm in the Firth of Forth. Subacoustech Environmental Report No. E297R0106.

NMFS, 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p. National Marine Fisheries Service.

Quick, N. and Cheney, B. 2011. Cetacean Baseline: Characterisation for the Firth of Tay based on existing data: Bottlenose dolphins. SMRU report December 2011.

SCOS 2015. Scientific Advice on Matters Related to the Management of Seal Populations: 2014. SCOS (Special Committee on Seals).

Southall, B., Bowles, A., Ellison, W., Finneran, J., Gentry, Ro., Greene Jr., C., Kastak, D., Ketten, D., Miller, J., Nachtigall, P., Richardson, W., Thomas, J. and Tyack, P. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific recommendations. *Aquatic Mammals*. 33(4), 411-521.

Sparling, C.E., Russell, D.F., Lane, E., Grellier, K., Lonergan, M.E., McConnell, B.J., Matthiopoulous, J. and Thompson, D. 2011. *Baseline Seal Information for the FTWODG Area*. SMRUL-FDG-2012-0 to FTOWDG. May 2012 (unpublished).

Sparling, C. Harris, C. Donovan, C. and Milazzo, L. 2012. *FTOWDG SAFESIMM Noise Impact Assessment – Seals and Bottlenose dolphins (Neart na Gaoithe)*. SMRU Report: SMRU-MRP-2-12-004.

11 Benthic Ecology

11.1 Introduction

This section of the Scoping Report confirms the benthic ecology receptors of relevance to the Project and considers the potential effects on them resulting from construction, operation and maintenance and decommissioning. Reference is made to the original baseline data collected to inform the Originally Consented Project EIA and to the determinations of the impact assessment presented in the Original ES.

11.2 Baseline Data

This section identifies the baseline data sources that will be used to characterise the Benthic Ecology receptors within the Development Area, drawing predominately from the data sources used to inform the Originally Consented Project EIA but updated where possible with more recent data. Commentary is provided on the sufficiency of this data as a basis for scoping the Project.

A variety of benthic datasets were collected and analysed to inform the Original ES. Data was drawn from NnGOWL commissioned site specific surveys and studies, and from a desktop review of publicly available data. Table 11-1 sets out those datasets considered to be relevant to the Project.

Table 11-1. Baseline datasets from the Originally Consented Project EIA - Benthic Ecology

Data Source	Study / Data name	Survey Overview
NnGOWL-commissioned site-specific surveys		
NnGOWL	Geophysical surveys (EMU, 2009)	Geophysical survey comprising of Side Scan Sonar (SSS), Acoustic Ground Discrimination System (AGDS) and swath bathymetry within and around the Wind Farm Area and Offshore Export Cable Corridor.
NnGOWL	Sub-tidal benthic survey (EMU, 2010)	Sub tidal sampling within and around the Wind Farm Area and Export Cable Route Corridor. Comprising of the following components: ● Wind Farm Area: ■ Hamon grab for faunal analysis and Particle Size Analysis (PSA) and Drop Down Video (DDV) collected at 28 locations within the Wind Farm Area, 43 around the periphery of the site boundary and 7 reference locations; ■ Epibenthic beam trawls collected at 6 locations within the Wind Farm Area and 4 around the periphery of the site boundary; ■ Shipek sediment sampled for contaminant analysis at 9 locations within the Wind Farm Area and 2 around the periphery of the site boundary. ● Offshore Export Cable Corridor: ■ Hamon grab and DDV collected at 6 locations along the Export Cable Route Corridor and 7 reference locations

		either side of the corridor; ■ Epibenthic beam trawls collected at 3 locations along the Export Cable Route Corridor; ■ Shipek sediment sampled for contaminant analysis at 4 locations along the Export Cable Route Corridor. Sample locations were selected based on a randomly stratified design following review of the interpreted geophysical data (multibeam, SSS and AGDS).
NnGOWL	Intertidal biotope mapping survey (EMU, 2010)	Intertidal GPS biotope at a 500 m wide cable corridor at the landfall location at Thorntonloch. Comprising of a mapping survey, core sampling and dig over survey to identify habitat distribution.
NnGOWL	Habitat mapping (EMU, 2010)	Interpretation of sub-tidal and intertidal benthic datasets for biotope classification and mapping within and around the Wind Farm Area, Export Cable Route Corridor and landfall location.
NnGOWL	Preliminary assessment of coarse sediment benthic habitats (EMU, 2011)	Data interpretation to determine potential presence of geogenic stony reef within and around the Wind Farm Area.
Broad scale regional data		
JNCC	EUSeaMap - Mapping European Seabed Habitats (MESH, 2010)	EU seabed predictive mapping and benthic survey data covering the Development Area.
Department of Trade and Industry	Strategic Environmental Assessment (SEA) for region 5 (Eleftheriou *et al.*, 2004)	Broad scale data on the benthic environments including the Forth and Tay region.
SNH	Broad scale intertidal survey of the Firth of Forth (Posford Haskoning, 2002)	Broader intertidal data collected across the wider Firth of Forth area.
JNCC	The Marine Nature Conservation Review (MNCR) of East Scotland (Brazier et al., 1998)	Broad scale data on the benthic environments in the region in the vicinity of the Development Area.

11.2.1 Data Validity

NnGOWL, on the advice of their technical consultants, are of the opinion that the data previously collected to inform the Originally Consented Project EIA is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections demonstrate the sufficiency of the available data in relation to spatial coverage and age.

11.2.1.1 Spatial Coverage

As identified in Table 11-1, site specific surveys were carried out within the vicinity of the OWF and Offshore Export Cable Corridor. The location and extent of the Development Area will cover the same portion of seabed assessed within the Original ES. It is therefore considered that the spatial coverage of the original data describing the Benthic Ecology remain valid for the Development Area in terms of spatial coverage.

11.2.1.2 Age of the Data

The site-specific survey data was collected in 2009 and was used alongside broader scale, contextual data from a variety of sources, detailed in Table 11-1, to inform the Originally Consented Project EIA. Since the collection of the baseline data there has been no further construction or development activity within the Development Area that is likely to significantly affect or alter the previously identified habitats and benthic communities. Therefore, it is considered that the baseline data collected in 2009 adequately represents the benthic receptors for the purposes of this scoping exercise.

No more recently collected data was identified with coverage of the Development Area or the wider Forth and Tay region. However, in reviewing the broad scale datasets detailed in Table 11-1; it should be noted that although the datasets are not necessarily more contemporary, the habitats characterising the Development Area do not represent rare of particularly sensitive benthic habitats and are typical of the benthic habitats in the region.

11.2.2 Review of Baseline Characteristics

The Wind Farm Area is generally characterised by a muddy and muddy sand group of biotopes, which are characterised by a large fine mud component. The faunal assemblage is made up of burrowing crustacean species such as *Nephrops*, and also seapens, brittlestars, polychaete worms and bivalve molluscs. There are also areas of mixed coarse sediment in small assemblages with species such as brittlestars, and the colonial soft coral dead man's fingers.

The Offshore Export Cable Corridor is also characterised by similar muddy habitats, with similar species found. Further inshore there are areas of cobbles, pebbles and gravels, with species such as lobsters and keel worms present. The offshore habitats identified through site specific survey work are typical of habitats across this area of the North Sea.

In the intertidal zone on Thorntonloch beach there are a range of habitats including exposed rock, cobbles and shingle and sand.

Some of these habitats and representative species, such as burrowed mud, are considered to be of nature conservation importance, however the site does not overlap with any areas currently designated as protected for this or any other benthic habitat features.

Chapter 14 of the Original ES presents the full baseline characteristics of Benthic Ecology across the area of interest.

11.3 Design Envelope

Table 11-2 sets out the worst case scenario defined by the Originally Consented Project EIA for benthic ecology (NnGOWL, 2012) compared to the proposed worst case scenario for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process. The Scoping Report considers the worst-case scenario reported in the Original ES as the final impact determinations were not significant and no further assessment work was carried out in relation to the Project design envelope reported in the Addendum (NnGOWL, 2013).

Table 11-2. Worst case design scenario definition - Benthic Ecology

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction (and Decommissioning)			
Direct Habitat Disturbance	125 x wind turbines on 4 leg jacket foundations and installation (including scour protection) = 0.52 km^2; 2 x Substation foundation and installation = 0.01 km^2; Inter-array cable plough based on 140km of array cabling and installation vessel anchors = 1.58 km^2; Offshore Export Cable plough based on 2 x 33 km Offshore Export Cables and installation vessel anchors = 0.75 km^2	56 x wind turbines on 6 leg jacket foundations (including scour protection) = 0.23 km^2 2 x Substation foundation and installation = 0.0005 km^2; Inter-array cable plough based on 140km of array cabling and installation vessel anchors = 1.58 km^2; Offshore Export Cable plough based on 2 x 43km Offshore Export Cables and installation vessel anchors = 0.84 km^2	Reduction in number of installed wind turbine foundations. Increase in the length of the two Offshore Export Cables. No change to OSPs or inter-array cable infrastructure. The overall area of direct seabed habitat disturbance has reduced by 0.2 km^2.
Increased SSCs sediment deposition and scour	125 GBS with pre-installation dredging to 2m depth across a 50 m x 50 m area of seabed; 140 km of inter-array cabling trenched to a depth of 2m; 2 x 33 km export cabling trenched to a depth of 2m.	56 turbines on 6 legged jacket (no pre-installation dredging required). 140 km of inter-array cabling trenched to a depth of up to 3m; 2 x 43 km export cabling trenched to a depth of up to 3m.	No pre-installation dredging required at turbine locations. Increased length of Offshore Export Cable. No change to OSP or Inter-Array Cable infrastructure. The increased SSC associated with installation of the Offshore Export Cable is offset by the reduction in SSC due to the fact the GBS are no longer being considered. Therefore, and

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
			potential effects associated with Increased SSC would fall within the worst case design envelope previously considered in the Original EIA.
Operation and Maintenance			
Direct Loss of Habitat	75 x GBS wind turbine foundations[5] plus scour protection around each structure = 0.17 km^2; Substation foundations based on 4 leg jacket foundation = 0.001 km^2; Inter-array cable scour protection = 0.14 km^2 and Offshore Export Cable scour protection = 0.05 km^2.	56 x turbines on 6 leg jacket foundations. Jacket foundations installed on 3.5 m diameter piles = 0.013 km^2. Substation foundations based on 6 leg jacket foundation = 0.0005 km^2; Inter-array cable scour protection = 0.14 km^2 and Offshore Export Cable scour protection = 0.05 km^2.	Reduction in number of turbines and reduction in footprint at each foundation location due to use of jackets. No change to OSPs or cable infrastructure. It is anticipated that the lengths of Offshore Export Cable within the Wind Farm Area will be buried and therefore no additional scour protection is required.
Introduction of new substrate	128 GBS wind turbine foundations[6] (30 m diameter and 34 m cone height) plus scour protection = 0.23 km^2; Substation foundations = unknown;	56 wind turbines 6 leg jacket foundations = 0.013 km^2 footprint at the seabed. 2 x 6 leg jacket substation foundations = 0.0005 km^2;	Reduction in number of turbine foundations. No change in OSPs or cable infrastructure.

[5] The worst case scenario of loss of habitat was considered to be 75 foundations with a 1600 m^2 footprint rather than the 125 foundation scenario with a 700 m^2 footprint.

[6] 128 locations were identified although the ES confirmed only 125 turbines would be installed. The assessment took into consideration every location identified.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
	Inter-array cable scour protection = 0.14 km^2; and Offshore Export Cable scour protection = 0.09 km^2	Inter-array cable scour protection = 0.14 km^2; and Offshore Export Cable scour protection = 0.09 km^2	
Change in hydrodynamics resulting from presence of turbine foundations	Effects on hydrodynamics were modelled using the FTMS based on the following input parameters: ● GBS with a base diameter of 35 m and conical height of 34 m; ● Turbine spacing of 1,008 m along the line and 630 m between the line; ● The model considered a worst-case layout using the minimum possible turbine spacing, therefore the worst-case scenario comprised of 126 turbines.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30m x 30 m footprint at the seabed.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.
Electromagnetic Fields	Inter-array cables = 140 km buried between 1-3 m. Offshore Export Cables = 2 x 33 km buried up to 2m.	Inter-array cables = 140 km buried between 1-3 m. Offshore Export Cables = 2 x 43 km buried up to 3m.	No change in Inter-Array cable infrastructure. Increase in length of both of the Offshore Export Cables but no change to cable specification or burial.

11.4 Embedded Mitigation

A range of measures to minimise environmental effects were captured within the design envelope for the Originally Consented Project and would apply equally to the Project, as follows:

- Cable burial to an appropriate trenching depth to limit the rise in sediment temperature and prevent macrozoobenthic fauna from direct harm as well as limit physical changes that may impair the ecological functioning of benthic communities and to increase the distance between benthic species and electro-magnetic field (EMF) associated with subsea cabling;
- Conduct a pre-construction cable route survey to identify any sensitive seabed habitats. Should any such habitats be recorded, the Offshore Export Cable Corridor will be micro-sited, via consultation with Scottish Natural Heritage (SNH) and other stakeholders.
- Although no significant impact arising from the installation of the cables is predicted, it is considered good practice to minimise the extent of any unnecessary habitat disturbance. On this basis, material displaced as a result of cable burial activities should, where techniques allow, be back-filled in order to promote recovery.

11.5 Consent Conditions

A number of conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so.

11.6 Scoping of the Project EIA

Table 11-3 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification.

The embedded mitigation (Section 11.4) was included within the assessment conclusions set out in the Originally Consented Project EIA and therefore only the residual effects have been presented in these tables.

Table 11-3. Summary of potential effects on Benthic Ecology

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction (and Decommissioning)				
Direct Habitat Disturbance **(Offshore Wind Farm)**	SS.SMx.CMx.OphMx	Minor significance	Scoped out	Direct habitat disturbance on each biotope within the Offshore Wind Farm site was predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	SCS.CCS SS.SSa.OSa.(OfusAfil) SS.SMu.CSaMu (ThyNten; AfilMysAnit and AfilNten)	Minor significance		
	SS.SMu.CFiMu.SpnMeg	Minor significance		
	CR.MCR.EcCr (FaAlCr.Pom and Adig)	Minor significance		
Increase in SSC and sediment settlement/smothering **(Offshore Wind Farm)**	SS.SMu.CFiMu.SpnMeg	Minor significance	Scoped out	Increased SSC and sediment settlement effects on each biotope within the Offshore Wind Farm site was predicted to be of minor significance in the Original EIA.
	SS.SMx.CMx.OphMx	Minor significance		

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
	SS.SMu.CSaMu SS.SCS.CCS SS.SSa.OSa.(OfusAfil)	Minor significance		Based on the overall reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	CR.MCR.EcCr	Minor significance		
Direct Habitat Disturbance **(Subtidal Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten, AfilMysAnit, AfilNten SS.SMu.CFiMu.SpnMeg	Minor significance	Scoped out	Direct habitat disturbance on each biotope within the subtidal Offshore Export Cable Corridor was predicted to be of minor significance in the Original EIA. The Offshore Export Cables will be longer than those assessed in the Original EIA. However, the effects relating to Direct Habitat Disturbance resulting from the extra cabling infrastructure will be within the Wind Farm Area and remain within the worst-case design scenario considered in the Original EIA which took into account installation of 125 foundation substructures. It is considered that the EIA determinations therefore remain valid and further assessment should be scoped out of the ES for the Project.
Increase in SSC and sediment settlement/smothering **(Subtidal Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten, AfilMysAnit, AfilNten SS.SMu.CFiMu.SpnMeg	Not significant	Scoped out	Increased SSC and sediment settlement effects on each biotope within the subtidal Offshore Export Cable Corridor was predicted to be not significant in the Original EIA. The Offshore Export Cables will be longer than those assessed in the Original EIA. However, the effects relating to Increased SSC resulting from the extra cabling infrastructure will be within the Wind Farm Area and remain within the worst-case design scenario considered in the Original EIA which took into account installation of 125 GBS.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				It is considered that the EIA determinations therefore remain valid and further assessment should be scoped out of the ES for the Project.
Direct Habitat Disturbance **(Intertidal Offshore Export Cable installation)**	LS.LSa.MoSa; LR.FLR.Eph.EntPor; LR.MLR.BF.Rho	Not significant	Scoped out	Direct habitat disturbance on each biotope within the intertidal Offshore Export Cable Corridor was predicted to be not significant in the Original EIA. Although the Offshore Export Cable has increased in length, this will not change the sensitivity of the receptor or the magnitude of the impact. Therefore, the EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Increase in SSC and sediment settlement/smothering **(Intertidal Offshore Export Cable installation)**	LS.LSa.MoSa; LR.FLR.Eph.EntPor; LR.MLR.BF.Rho	Not significant	Scoped out	Increased SSC and sediment settlement effects on each biotope within the intertidal Offshore Export Cable Corridor was predicted to be not significant in the Original EIA. Although the Offshore Export Cable has increased in length, this will not change the sensitivity of the receptor or the magnitude of the impact. Therefore, the EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Operation and Maintenance				
Direct Loss of Habitat **(Offshore Wind Farm)**	SS.SMu.CFiMu.SpnMeg SS.SMx.CMx.OphMx SS.SMu.CSaMu SS.SCS.CCS SS.SSa.OSa.(OfusAfil)	Minor significant	Scoped out	Direct loss of habitat was predicted to be of minor significance in the Original EIA on each biotope within the Offshore Wind Farm site. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
	CR.MCR.EcCr			should be scoped out of the ES for the Project.
Introduction of new substrate – New substrate materials **(Offshore Wind Farm)**	Biotopes in offshore site, e.g., those with epibenthic assemblages SS.SCS.CCS and CR.MCR.EcCr	Minor significant	Scoped out	Changes resulting from colonisation of new substrata was predicted to be of minor significance in the Original EIA on each biotope within the Offshore Wind Farm site. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Introduction of new substrate – Pathway for alien or invasive species **(Offshore Wind Farm)**	All biotopes in offshore site.	Not significant	Scoped out	Changes resulting from colonisation of invasive non-native species on new substrata was predicted to be not significant in the Original EIA on each biotope within the Offshore Wind Farm site. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Change in hydrodynamics resulting from presence of turbine foundations	SS.SMu.CFiMu.SpnMeg SS.SMx.CMx.OphMx SS.SMu.CSaMu SS.SCS.CCS SS.SSa.OSa.(OfusAfil) CR.MCR.EcCr	Minor significance	Scoped out	Effects on biotopes within the Offshore Wind Farm site as a result of changes in hydrodynamic conditions was predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Direct Habitat Loss **(Subtidal Offshore Export Cable Corridor**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Not significant	Scoped out	Direct habitat loss on each biotope within the subtidal Offshore Export Cable Corridor was predicted to be not significant in the Original EIA. Although the Offshore Export Cable has increased in length, this will not change the sensitivity of the receptor or the magnitude of the impact. Therefore, the EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Introduction of new substrate – New substrate materials **(Subtidal Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Not significant	Scoped out	Changes resulting from colonisation of new substrata was predicted to be not significant in the Original EIA. Although the Offshore Export Cable has increased in length, this will not change the sensitivity of the receptor or the magnitude of the impact. Therefore, the EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Electromagnetic field **(Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Minor significance	Scoped out	Effects resulting from electromagnetic fields were predicted to be of minor significance in the Original EIA. The length of the Offshore Export Cables has increased compared to the Original Application but there has been no change to cable specification or burial. The Original ES concluded that the vulnerability of species present at the Wind Farm Area was negligible in relation to EMF. The magnitude of the effect is still considered to be low. The EIA determinations would therefore remain unchanged. It is considered that further assessment should be scoped out of the ES for the Project.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Seabed sediment heating **(Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Not significant	Scoped out	Effects resulting from heating of seabed sediments were predicted to be not significant in the Original EIA. The length of the Offshore Export Cables has increased compared to the Original Application but there has been no change to cable specification or burial. The Original ES concluded that the vulnerability of species present at the Wind Farm Area where the extra cable length relates was negligible in relation to sediment heating effects. The magnitude of the effect is still considered to be negligible. The EIA determinations would therefore remain unchanged. It is considered that further assessment should be scoped out of the ES for the Project.

11.6.1 Scoping of Cumulative Impacts Assessment

The CIA included within the Original ES considered the proposed Inch Cape Offshore Wind Farm and Seagreen's Alpha and Bravo Offshore Wind Farms in conjunction with the Original Application and was based upon a worst case scenario of all three projects being constructed at the same time. All other plans, projects or activities were considered to be too distant from the Development Area for significant cumulative effects on benthic ecological receptors.

The following list confirms the other plans, projects and activities considered in the scoping of the CIA in respect of Benthic Ecology:

- Inch Cape Offshore Wind Farm (as consented);
- Seagreen Alpha and Bravo Wind Farms (as consented);

A review of other plans, projects and activities (selected from the list in Appendix B) indicates that there are no other current plans, projects and activities that should be considered in this CIA.

Table 11-4 summarises the post-mitigation (residual) significance for all cumulative effects considered in the Originally Consented Project EIA CIA and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

Table 11-4. Summary of Potential Effects on Benthic Ecology – Project with Other Plans, Projects and Activities

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction (and Decommissioning)				
Direct Habitat Disturbance (Offshore Wind Farm)	SS.SMx.CMx.OphMx SCS.CCS SS.SSa.OSa.(OfusAfil) SS.SMu.CSaMu (ThyNten; AfilMysAnit and AfilNten) SS.SMu.CFiMu.SpnMeg CR.MCR.EcCr (FaAlCr.Pom and Adig)	Not significant	Scoped out	The same projects are considered within this scoping exercise as considered within the Original CIA. However, the overall design envelope of the Project has been significantly reduced in the scale when compared to Original EIA. The cumulative effects would therefore be no greater and likely less than those previously presented in the Original ES which were considered to be not significant.
Increase in SSC and sediment settlement/smothering (Offshore Wind Farm)	SS.SMu.CFiMu.SpnMeg SS.SMx.CMx.OphMx SS.SMu.CSaMu SS.SCS.CCS SS.SSa.OSa.(OfusAfil) CR.MCR.EcCr	Not significant	Scoped out	
Direct Habitat Disturbance (Subtidal Offshore Export Cable Corridor)	SS.SMu.CSaMu.ThyNten, AfilMysAnit, AfilNten SS.SMu.CFiMu.SpnMeg	Not significant	Scoped out	
Increase in SSC and sediment settlement/smothering (Subtidal Offshore Export Cable Corridor)	SS.SMu.CSaMu.ThyNten, AfilMysAnit, AfilNten SS.SMu.CFiMu.SpnMeg	Not significant	Scoped out	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Direct Habitat Disturbance **(Intertidal Offshore Export Cable installation)**	LS.LSa.MoSa; LR.FLR.Eph.EntPor; LR.MLR.BF.Rho	Not significant*	Scoped out	
Increase in SSC and sediment settlement/smothering **(Intertidal Offshore Export Cable installation)**	LS.LSa.MoSa; LR.FLR.Eph.EntPor; LR.MLR.BF.Rho	Not significant*	Scoped out	
Operation and Maintenance				
Direct Loss of Habitat **(Offshore Wind Farm)**	SS.SMu.CFiMu.SpnMeg SS.SMx.CMx.OphMx SS.SMu.CSaMu SS.SCS.CCS SS.SSa.OSa.(OfusAfil) CR.MCR.EcCr	Not significant	Scoped out	The same projects are considered within this scoping exercise as considered within the Original CIA. However, the design envelope of the Project has been significantly reduced in the scale when compared to Original Wind Farm Area. The cumulative effects would therefore be no greater and likely less than those previously presented in the Original ES which were considered to be of minor significance or not significant.
Introduction of new substrate – New substrate materials **(Offshore Wind Farm)**	Biotopes in offshore site, e.g., those with epibenthic assemblages SS.SCS.CCS and CR.MCR.EcCr	Minor significance	Scoped out	
Introduction of new substrate – Pathway for alien or invasive species **(Offshore Wind Farm)**	All biotopes in offshore site.	Not assessed explicitly. However, it was considered unlikely given that there are no records of non-natives invading biotopes that are present at the Wind Farm Area, nor are there any records of non-natives on novel	Scoped out	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
		substrata closest to the site, i.e. breakwaters.		
Change in hydrodynamics resulting from presence of turbine foundations	SS.SMu.CFiMu.SpnMeg SS.SMx.CMx.OphMx SS.SMu.CSaMu SS.SCS.CCS SS.SSa.OSa.(OfusAfil) CR.MCR.EcCr	Not significant	Scoped out	
Direct Habitat Loss **(Subtidal Offshore Export Cable Corridor**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Not significant	Scoped out	
Introduction of new substrate – New substrate materials **(Subtidal Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Minor Significance	Scoped out	
Electromagnetic field **(Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Not significant	Scoped out	
Seabed sediment heating **(Offshore Export Cable Corridor)**	SS.SMu.CSaMu.ThyNten; AfilMysAnit; AfilNten; SS.SMu.CFiMu.SpnMeg.	Not significant	Scoped out	

11.7 Approach to EIA

Based on the conclusions of the Original ES and considering the reduced scale of the Project by comparison to the Originally Consented Project, it is concluded that all of the potential effects on Benthic Ecology should be scoped out of the Project EIA. Therefore, it is proposed that no detailed assessment of benthic ecology receptors should be included within the ES.

11.8 Scoping Questions

- Do you agree that the existing data available to describe the Benthic Ecology baseline remains sufficient to describe the physical environment in relation to the Project?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Benthic Ecology receptors?
- Do you agree that the assessment of Benthic Ecology receptors should be scoped out of the Project EIA?
- Do you agree that the cumulative effects on Benthic Ecology receptors should be scoped out of the Project EIA?

11.9 References – Benthic Ecology

Brazier, D.P., Davies, J., Holt, R.H.F., & Murray, E. 1998. Marine Nature Conservation Review Sector 5. South-east Scotland and north-east England: area summaries. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).

Eleftheriou, A., Basford, D. and Moore D. C., 2004. Synthesis of Information on the Benthos of Area SEA 5. Report for the Department of Trade and Industry. Final Draft May 2004. Available online from: http://www.offshoresea.org.uk/consultations/SEA_5/SEA5_TR_Benthos_Elef.pdf [accessed Mar 2011].

EMU, 2009a. Geophysical survey report . Commercial in Confidence

EMU, 2010. Neart na Gaoithe Proposed Offshore Wind Farm: Benthic Ecology Characterisation Survey. Report to Neart na Gaoithe Offshore Wind Limited. June 2010. Report No. 09/J/1/03/1483/0943.

EMU, 2011. Preliminary Assessment of Coarse Sediment Benthic Habitats. July 2011. Report Number: J/1/03/1665

MESH (Mapping European Seabed Habitats), 2010. Mapping European Seabed Habitats. Available online from: http://www.searchmesh.net [accessed Mar 2010].

Posford Haskoning, 2002. Broad scale intertidal survey of the Firth of Forth. Scottish Natural Heritage Commissioned Report F01aa407

12 Fish and Shellfish Ecology

12.1 Introduction

This chapter confirms the fish and shellfish receptors of relevance to the Project and considers the potential effects on them resulting from construction, operation, maintenance and decommissioning of the Project. Reference is made to the baseline data gathered to inform the Original Application, and to the outcomes of impact assessment presented in the Original ES.

12.2 Baseline Data

This section identifies baseline data sources that can be used to characterise the fish and shellfish resource within and around the Development Area, drawing predominantly from the data sources used to inform the Original EIA, but updated where necessary with more recent data. Commentary is provided on the sufficiency of this data as a basis for scoping the Project EIA.

A variety of fish and shellfish datasets were collated and analysed to inform the EIA for the Originally Consented Project. Data was drawn from specific surveys and studies of the Development Area that were commissioned by NnGOWL and from a desktop review of publicly available information. Further fish and shellfish data was provided within the Addendum (NnGOWL, 2013). Those datasets considered to be relevant to the Project are listed in Table 12-1 below. The data sources are more fully described in Chapter 15 of the Original ES (NnGOWL, 2012) and Appendix 1 and 2 of the Addendum (NnGOWL, 2013).

Table 12-1. Baseline datasets from the Original EIA – Fish and Shellfish

Data Source	Study / Data Name	Survey Overview
NnGOWL Site Specific Surveys		
NnGOWL	Geophysical characterisation survey, (Emu Ltd., 2009).	Geophysical survey including side scan sonar, AGDS and swath bathymetry was undertaken over the proposed Wind Farm Area and local surrounding areas and also along each cable route option to acquire seabed physical data and further inform the Original EIA.
NnGOWL	Original ES Appendix 14.1: Benthic Ecology Characterisation Survey (Emu Ltd, 2010)	Emu Ltd was commissioned to undertake a series of benthic ecology sampling surveys of the Wind Farm Area, the cable route options and associated intertidal areas where the cables were proposed to make landfall. Fish and shellfish resources were sampled using a scientific beam trawl to provide a primary description of the site-specific communities, within, and peripheral to, Wind Farm Area. A total of 19 stations were trawled. Grab samples were also taken. Ten species of fish were caught within the Development Area. Four species are of commercial importance. No rare or protected species were found.

Data Source	Study / Data Name	Survey Overview
External / pre-existing broader scale data and studies		
Benthic data	Mapping European Seabed Habitats (MESH) project	Database of predicted broad-scale seabed habitats based on known physical conditions. A pan-European collaboration which plans to classify and map seabed habitats across the north east Atlantic area.
Spawning and nursery grounds of selected fish species in UK waters	Ellis *et al.* (2012)	Pelagic and demersal fish species spawning and nursery ground data in a regional and national context.
Spawning and nursery mapping dataset	Ellis *et al.* (2010)	Mapping of spawning and nursery areas of species to be considered in Marine Protected Areas (MPAs) (Marine Conservation Zones (MCZs)). Final Report on development of derived data layers for 40 mobile species considered to be of conservation importance.
Fish maps for Herring, Spurdog and Thornback ray	International Council for Exploration of the Seas (ICES) (2006a, 2006b and 2006c)	An atlas of North Sea fish, including fact sheets of key species and distribution maps.
Fishery Sensitivity Maps	Coull, K.A. *et al.* (1998)	Fishery sensitivity maps for British Waters. Maps have been compiled from data collected and collated by Fisheries Research Services (FRS) and Centre for the Environment, Fisheries and Aquaculture Science (Cefas)
Overview of the coastal and sea conditions	Barne, J. H. *et al.* (1997)	Overview of Region 4 South-east Scotland: Montrose to Eyemouth. Peterborough Joint Nature Conservation Committee (JNCC) (Coastal Directories Series).
Electromagnetic Fields and Wind Farm Cable Research	CMACS *et al.* (2003), Gill, A.B. *et al.* (2005)	Research into the environmental impacts of electromagnetic fields associated with offshore wind farm cables.
Electromagnetic Fields and Subsea Noise	Gill, A. B. *et al.* (2010)	Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel.
Demersal Gear Catches - 2011	Marine Scotland (2011; pers. comm.)	Site specific data on sandeel, cod and scallops.
Sensitivity of	MarLIN (2011).	The marine life information network (MarLIN) 'evidence

Data Source	Study / Data Name	Survey Overview
marine species and habitats		base' comprises a review of the effects of human activities and natural events on marine species and habitats. Most of the 'evidence base' is presented in a sensitivity assessment review but the other evidence-based resources are also available.
Natura 2000 data and maps	SNH SiteLink Interactive Website	Information on the qualifying features and conservation objectives for the River South Esk, River Tay and River Teith Special Areas of Conservation (SACs).
Demersal fish species data	Greenwood and Hill (2003), Greenwood *et al.* (2002)	Spawning and nursery ground data for demersal fish species in a regional and national context.
Pelagic and demersal fish spawning and nursery data	Coull *et al.* (1998)	Pelagic and demersal fish species spawning and nursery ground data in a regional and national context.
Pelagic and demersal fish species spawning and nursery data	Cefas (2001)	Pelagic and demersal fish species spawning and nursery ground data.
International Herring Larvae Survey (IHLS) data (ICES)	Payne, M.R. (2010)	Data on herring larvae distribution in the North Sea.
Journals, PhD theses, white papers, research articles	See References Section of Chapter 15 of Original ES (NnGOWL, 2012).	Various literature sources and research findings associated with potential effects upon fish and shellfish in relation to offshore wind farms and Offshore Export Cables.

A review of available data (Table 12-1) and site specific survey data was undertaken to identify key species present, or likely to be present, in the Development Area to inform the Original EIA; however individual key fish and shellfish receptors were not singled out for consideration in the impact assessment. The approach taken was that all potential effects were considered at each of the development phases, with the corresponding impact on all fish and shellfish species assessed as a whole. The impact assessment therefore considered all fish and shellfish species, but highlighted those with particular vulnerabilities to a specific type of impact.

12.2.1 Data Validity

NnGOWL, on the advice of their technical consultants, is of the opinion that the data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections demonstrate the adequacy of the available data in relation to spatial coverage and age. Where additional data of relevance is available, this

has been reviewed and presented in the 'Review of Baseline Characteristics'. In addition, where any new research has been published since the Original ES and Addendum were compiled, which could affect the overall assessment of sensitivity of a receptor or magnitude of an impact, this has been reviewed and summarised.

12.2.1.1 Data Spatial Coverage

As identified in Chapter 4 and Figure 4-1, the Development Area forming the Project covers the same area as the Original Application and has not changed in location or size. Therefore, the area of seabed that was surveyed during the benthic surveys in 2009, assessed within the Original ES and included within the Originally Consented Project remains the same. It is therefore concluded that the spatial coverage of the Original ES site specific data remains valid for the Project in terms of spatial coverage.

12.2.1.2 Age of Data

The site specific survey data (benthic and geophysical surveys) for the Original ES were collected in 2009, and this data was compared to broader scale, contextual information from a variety of other, publicly available, data sources as listed in Table 12-1. The grab and beam trawl sampling stations were allocated based on the fish and shellfish areas of interest, including spawning, nursery and feeding grounds, refuge areas for crustaceans and migration routes for the local area (which encompassed the Offshore Wind Farm and the Offshore Export Cable Corridor). The locations of the sampling stations were informed by geophysical information gathered in 2009, in addition to desk based information including MESH predicted habitat data. Locations were specified to provide a representative, but not exhaustive, coverage of the different areas and ground conditions. It is considered that the age of the site specific survey data is not an issue since no major physical changes are considered likely to have occurred to the seabed / physical environment within the Development Area since 2009, which would be likely to result in significant habitat (and therefore species community) alterations.

The key habitats used by fish for spawning and as nursery grounds, were defined through reference to key literature presented in Coull *et al.* (1998) and Ellis *et al.* (2012). Both these studies are currently widely used by industry and are considered to represent the 'worst case' as a basis for considering potential impacts on these key habitats. No update to these references has occurred since the Originally Consented Project was assessed and as such they remain the key sources of data on spawning and nursery habitats and the data is therefore considered to remain valid as a basis for the Project EIA.

12.2.2 Review of Baseline Characteristics

Chapter 15 of the Original ES presented the full baseline characteristics for Fish and Shellfish Ecology across the Development Area. This baseline was further established with respect to salmonids and relevant SACs as well as EMF-sensitive species through the additional information provided within the Habitats Regulations Appraisal (Appendix 1 of the Addendum) and within a separate EMF assessment (Appendix 2 of the Addendum).

Baseline characterisation of the Development Area was undertaken through a combination of site-specific survey and a detailed review of existing literature and data. The proposed Wind Farm Area was characterised by a marine environment that is typical of the North Sea region. The benthic habitats were dominated by muddy and muddy sand environments, with patches of mixed coarse sediment. The Offshore Export Cable Corridor was also characterised by similar muddy habitats, but further inshore there are areas of cobbles, pebbles and gravels; while the intertidal zone had a range of more habitats including rock, cobbles, shingle and sand.

The fish and shellfish species and populations that were found to be present are characteristic of these benthic environments and the site specific beam trawls confirmed that the following types of species were present:

- Pelagic fish (those that inhabit the water column) – species included herring, sprat and mackerel. These species are exploited commercially as well as being an important prey for larger fish and marine mammals. Herring spawning areas coincide with the inshore region of the Offshore Export Cable Corridor. Herring, sprat and mackerel nursery grounds are found in the Wind Farm Area. Whiting (egg stages only) were also recorded;
- Demersal fish (bottom feeders that live on or near the seabed) – A total of 11 species were recorded including gadoids (such as cod and haddock), monkfish, flatfish species and sandeel. Whiting spawning grounds are thought to occur within the Offshore Wind Farm, with lemon sole, cod and plaice also spawning in the region. Nursery grounds for cod, whiting, lemon sole, blue whiting, plaice, ling and hake are thought to be present in the Wind Farm Area. Due to the relatively high mud content, habitats within the Development Area are unlikely to be suitable for sandeel populations;
- Elasmobranchs (sharks, skates and rays) - Several species of elasmobranchs have been reported in the region, namely spurdog, lesser spotted dogfish, thornback ray, cuckoo ray, tope and basking shark. Spurdog and tope breeding grounds coincide with the Development Area;
- Migratory fish (those that are known to migrate through the area and who spend only part of their life cycle in the marine environment) – These species include Atlantic salmon, sea trout, Twaite shad, Allis shad, smelt, European eel, river lamprey and sea lamprey. These species are assumed to be present around the Offshore Export Cable Corridor rather than the Wind Farm Area due to their coastal migratory routes. The freshwater pearl mussel has an association with salmonids and so require consideration in conjunction with these species; and
- Shellfish species - including crabs, lobsters, Nephrops scallops and squid. Forty species of shellfish were recorded in the 2 metre (m) beam trawls of which five are commercially targeted in the region (brown and pink shrimp, Norway lobster, whelk and Queen scallop). Data from Marine Scotland suggests that the Development Area does not support scallop populations.

No rare or protected fish or shellfish species were recorded as being present, although the pelagic species are Priority Marine Features (PMFs) in certain life stages. Many of the species recorded are also of conservation importance due to their rarity or sensitivity, such as sandeel, spiny dogfish and Atlantic salmon.

More recent data sources have been examined in order to confirm the baseline. Commercial fisheries data provides an insight into the range of species found within the region of the Development Area, although landings data is not exhaustive as bycatch are not recorded and the list of species is bias towards those of commercial importance. A review of the fish sensitivity maps updated in 2014 and presented on Marine Scotland's National Marine Planning Interactive (NMPI) tool (Marine Scotland, 2017) confirms that the key areas for spawning and nursery remain the same as in 2012.

The data reviewed from the period after the production of the Original ES agrees with that presented in the Original ES and highlights the same key species as those previously identified.

Recent research on salmonids and the effects of EMF, as well as more recent research on the migration routes of Atlantic salmon has become available since the Original ES (Godfrey *et al.,* 2014). Research looking at the behavioural response of Atlantic salmon to piling noise (Harding *et al.*, 2016) when exposed

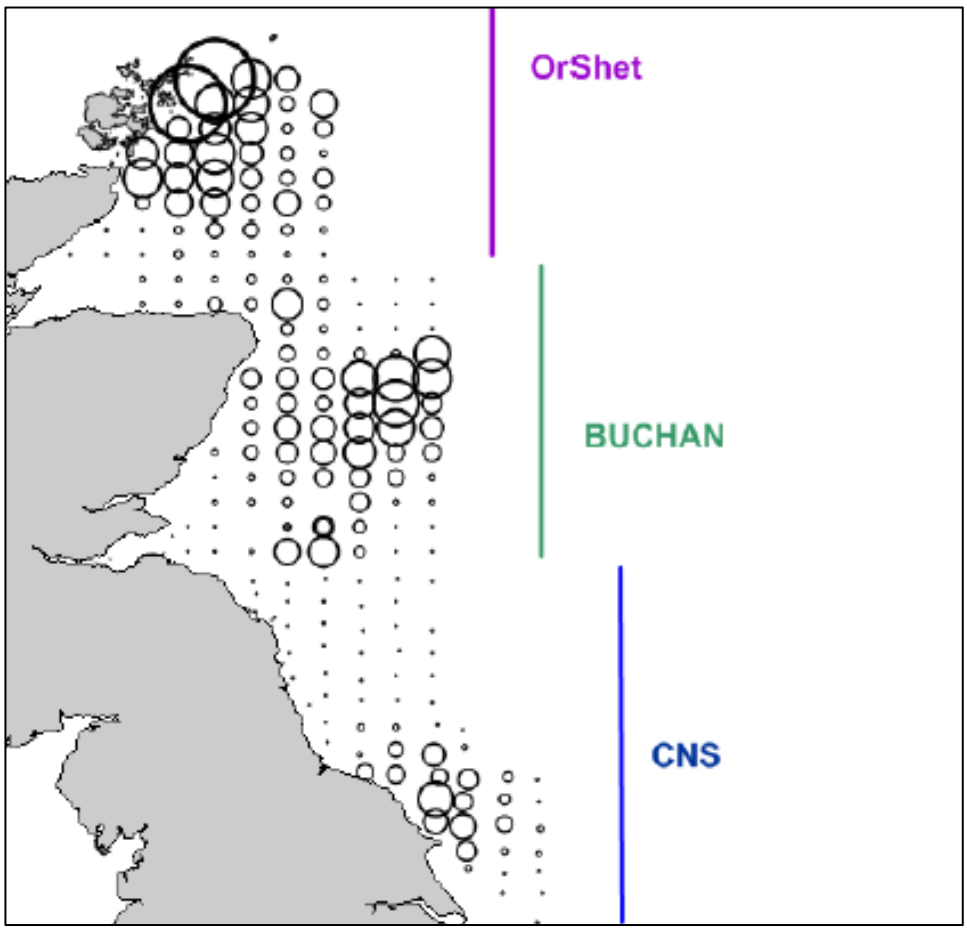
to real piling noise in a dock filled with seawater showed that no significant avoidance behaviour or physiological response during pile driving was found to occur.

Marine Scotland Science have also conducted extensive research on the response and behaviour of Atlantic salmon and European eel to EMF. This concludes that no unusual behaviour was observed during the experiments when fish passed through magnetic fields, regardless of size (Orpwood *et al.*, 2015).

It has been thought likely for some time that adult Atlantic salmon migration routes follow the coastline and recent research has confirmed this to be the case (Malcom *et al.*, 2010; and Malcolm *et al.*, 2013). As such, it is concluded that it is unlikely that Atlantic salmon will be found in the Development Area.

The most recent data from the International Herring Larval Surveys (IHLS) conducted in 2014 for the central North Sea area (Buchan) (ICES, 2015) indicates that there is limited herring spawning activity in close proximity to the Development Area (see Figure 12-1).

Figure 12-1 North Sea herring - Abundance of larvae < 10 mm (n/m²) in the Orkney, Buchan and Central North Sea and abundance of larvae < 11 mm (n/m²) in the southern North Sea as obtained from the International Herring Larvae Surveys (maximum circle size = 4 000 n/m²) (from ICES, 2015)



12.3 Design Envelope

Table 12-2 sets out the worst-case scenario defined by the Original ES for Fish and Shellfish Ecology (NnGOWL, 2012) compared to the proposed worst case scenario for the Project. This is provided at a level of detail that is sufficient to draw conclusions in relation to the scoping process. The worst-case scenario design envelope for the Original ES has been identified using the information provided in Section 15.5.1 of the Original ES.

Table 12-2. Worst Case Scenario Definition – Fish and Shellfish Ecology

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction and Decommissioning			
Direct temporary habitat disturbance	125 x Wind turbines on 4 leg jacket foundations and installation (including scour protection) = 0.52 km^2; 2 x Substation foundation and installation = 0.01 km^2; Inter-array cable plough based on 140km of array cabling and installation vessel anchors = 1.58 km^2; Offshore Export Cable plough based on 2 x 33 km Offshore Export Cables and installation vessel anchors = 0.75 km^2	56 x wind turbines on 6 leg jacket foundations (including scour protection) = 0.23 km^2 2 x Substation foundation and installation = 0.0005 km^2; Inter-array cable plough based on 140km of array cabling and installation vessel anchors = 1.58 km^2; Offshore Export Cable plough based on 2 x 43km Offshore Export Cables and installation vessel anchors = 0.84 km^2	Reduction in number of installed wind turbine foundations. Increase in the length of the two Offshore Export Cables. No change to OSPs or inter-array cable infrastructure. The overall area of direct seabed habitat disturbance has reduced by 0.2 km^2.
Increased suspended sediments concentration sediment deposition and scour	125 GBS with pre-installation dredging to 2m depth across a 50 m x 50 m area of seabed; 140 km of inter-array cabling trenched to a depth of 2m; 2 x 33 km export cabling trenched to a depth of 2m.	56 turbines on 6 legged jacket (no pre-installation dredging required). 140 km of inter-array cabling trenched to a depth of up to 3m; 2 x 43 km export cabling trenched to a depth of up to 3m.	No pre-installation dredging required at turbine locations. Increased length of Offshore Export Cable. No change to OSP or Inter-Array Cable infrastructure. The increased SSC associated with installation of the Offshore Export Cable is offset by the reduction in SSC due to the fact the GBS are no longer being considered. Therefore any potential effects associated with Increased SSC would fall within the worst case design envelope

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
			previously considered in the Original EIA.
Noise and vibration from construction	Number of structures: 125 turbines (500 piles) and 2 OSPs (up to 16 piles). Assessment based on four legged jackets using 3.5 m piles per turbine and 8 legged jackets at each OSP location using a 3.5m pile.	Number of structures: 56 turbines (336 piles) and 2 OSPs (up to 12 piles). Assessment based on six legged jackets using 3.5 m piles at turbine and OSP locations.	Reduction in total number of piles required from 516 to 348 (152 less). It is anticipated that the six-leg jacket foundation will reduce the required penetration depth per pile resulting in further reductions in piling time.
Operation and Maintenance			
Direct loss of habitat	75 x GBS wind turbine foundations[7] plus scour protection around each structure = 0.17 km^2; Substation foundations based on 4 leg jacket foundation = 0.001 km^2; Inter-array cable scour protection = 0.14 km^2 and Offshore Export Cable scour protection = 0.05 km^2.	56 x turbines on 6 leg jacket foundations. Jacket foundations installed on 3.5 m diameter piles = 0.013 km^2. Substation foundations based on 6 leg jacket foundation = 0.0005 km^2; Inter-array cable scour protection = 0.14 km^2 and Offshore Export Cable scour protection = 0.065 km^2.	Reduction in number of turbines and reduction in footprint at each foundation location due to use of jackets. No change to OSPs or cable infrastructure. It is anticipated that the lengths of Offshore Export Cable within the Wind Farm Area will be buried and therefore no additional scour protection is required.
Change in hydrodynamics	Effects on hydrodynamics were modelled using the FTMS based on the following input parameters: ● GBS with a base	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a 30 m x 30 m footprint at the mudline.	Reduction in number of structures and reduction in impedance associated with 6-legged jackets as opposed to GBS.

[7] The worst case scenario of loss of habitat was considered to be 75 foundations with a 1600 m^2 footprint rather than the 125 foundation scenario with a 700 m^2 footprint.

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
	diameter of 35 m and conical height of 34 m; • Turbine spacing of 1,008 m along the line and 630 m between the line; • The model considered a worst case layout using the minimum possible turbine spacing, therefore the worst case scenario comprised of 126 turbines.		
Noise from operation of Offshore Wind Farm	Qualitative assessment based on the operation of 125 turbines.	Based on the operation of 56 turbines.	Reduction in noise due to fewer turbines and less operational requirements
Introduction of new substrate	128 GBS wind turbine foundations[8] (30 m diameter and 34 m cone height) plus scour protection = 0.23 km^2; Substation foundations = unknown; Inter-array cable scour protection = 0.14 km^2; and Offshore Export Cable scour protection = 0.09	56 wind turbines 6 leg jacket foundations = 0.013 km^2 footprint at the seabed. 2 x 6 leg jacket substation foundations = 0.0005 km^2; Inter-array cable scour protection = 0.14 km^2; and Offshore Export Cable scour protection = 0.12 km^2	Reduction in number of turbine foundations. No change in OSPs or cable infrastructure.

[8] 128 locations were identified although the ES confirmed only 125 turbines would be installed. The assessment took into consideration every location identified.

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
	km^2		
EMF	15 circuits, 140km of cabling. Two inter-array cables buried between 1 – 3m in depth. Where this cannot be achieved (up to 20%) cable will be laid on seabed and cable protection will be used. Direct width impact of 2m. 33km of Offshore Export Cable, two cables.	14 circuits, 140km of cabling. Two inter-array cables buried between 1 – 3m in depth. Where this cannot be achieved (up to 20%) cable will be laid on seabed and cable protection will be used. Direct width impact of 2m. 43km of Offshore Export Cable, two cables.	No change in inter- array cables or Offshore Export Cable lengths. Up to date research confirms that EMF emissions are unlikely to be significant.
Temporary direct habitat loss from operation and maintenance vessels	Total temporary direct habitat disturbance is 0.05 km^2	Total temporary direct habitat disturbance is 0.05 km^2	No change to O&M requirements.

12.4 Embedded Mitigation

A range of mitigation measures to minimise environmental effects were captured within the design envelope for the Original Project and would apply equally to the Project, as follows:

- A soft start procedure is incorporated into the start of piling in order to reduce the potential for noise related fatality and injury. This has been built into the design and noise modelling calculations;
- As part of the Site Environmental Management Plan (SEMP) for piling operations, the developer is required to complete an assessment of the effectiveness for fish of all available mitigation measures for piling noise;
- Inter-array, interconnector and Offshore Export Cables will be suitably buried (at a minimum of 1m) or will be protected by other means when burial is not practicable. This will reduce the potential for effect and exposure of electromagnetically sensitive species to the strongest electromagnetic fields;
- To minimise the extent of any unnecessary habitat disturbance, material displaced as a result of cable burial activities will be back filled, where possible, in order to promote recovery; and
- Cable specifications will be used that reduce EMF emissions as per industry standards and best practice such as the relevant IEC (International Electrotechnical Commission) specifications.

12.5 Consent Conditions

A number of consent conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 12-3 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of environmental effects on Fish and Shellfish Ecology.

Table 12-3. Consent conditions for the Originally Consented Project relevant to Fish and Shellfish

Original Consent Requirement	Relevance to Fish and Shellfish Ecology
Piling Strategy	Setting out, for approval, the piling methods, in accordance with the Application and detailing associated mitigation incorporating data collected as part of pre-construction survey work to demonstrate how the risk to Atlantic salmon, cod and herring will be managed.
Project Environmental Monitoring Plan	Setting out, for approval, the proposed environmental monitoring programme, to include as relevant and necessary the monitoring of sandeels, marine fish and diadromous fish.
Participation in the Forth and Tay Regional Advisory Group (FTRAG)	Participation in the FTRAG with respect to monitoring and mitigation of diadromous and commercial fish.
Participation in the Scottish Marine Environment Group (SSMEG)	Participation in the SSMEG with respect to monitoring and mitigation of diadromous and commercial fish.
Participation in the 'National Research and Monitoring Strategy' for Diadromous Fish	Engage with and participate in the delivery of the strategic salmon and trout monitoring strategy at a local level (the Forth and Tay).

12.6 Scoping of the EIA for the Project

Table 12-4 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

The embedded mitigation (Section 12.4) was included within the assessment conclusions from the Original ES and therefore only the residual effects have been presented in these tables.

Table 12-4. Summary of Potential Effects on Fish and Shellfish

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction and Decommissioning				
Habitat disturbance due to Installation of turbines, subsea cables and associated structures ***(Offshore Wind Farm Area)***	Fish and shellfish populations	Minor significance	Scoped Out	Habitat disturbance was predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Increase in suspended sediment concentration (SSC) due to installation of turbines, subsea cables and associated structures ***(Offshore Wind Farm Area)***	Fish and shellfish populations	Minor significance	Scoped Out	As above for habitat disturbance due to installation of turbines, subsea cables and associated structures
Increase in sediment settlement/ smothering due to installation of turbines, subsea cables and associated structures ***(Offshore Wind Farm Area)***	Fish and shellfish populations	Minor significance	Scoped Out	As above for habitat disturbance due to installation of turbines, subsea cables and associated structures
Pile driving creating noise and vibration due to Installation of jacket foundations	Fish and shellfish species – traumatic hearing loss	Not significant	Scoped Out	As above for habitat disturbance due to installation of turbines, subsea cables and associated structures
	Herring – behavioural response (avoidance)	Minor to moderate significance	Scoped Out	Behavioural response of herring resulting from pile-driving noise was predicted to be of minor to moderate significance. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES, which presented an assessment of 125 turbine

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				foundations, compared with the new maximum of 56. In accordance with the S36 consent conditions for the Originally Consented Project it is anticipated that a Piling Strategy will be required under any future consents issued to the Project. Further mitigation will be considered and detailed for approval in the Piling Strategy to minimise the risk to herring during piling activity. It is considered that further assessment should be scoped out of the ES for the Project.
	Cod – behavioural response (avoidance)	Minor significance	Scoped Out	Behavioural response of cod to piling noise was predicted to be of minor significance. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
	Flatfish species - behavioural response (avoidance)	Minor significance	Scoped Out	As above for effects on Cod – behavioural response (avoidance).
	Salmon and sea trout - behavioural response (avoidance)	Minor significance	Scoped Out	Behavioural response of Atlantic Salmon to piling noise was predicted to be of minor significance. Harding *et al.* (2016) found that the behavioural response of Atlantic salmon to piling noise when exposed to real piling noise in a dock filled with seawater showed that no significant avoidance behaviour or physiological was observed. In light of this recent research and based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				out of the ES for the Project.
	Sandeel - behavioural response (avoidance)	Minor significance	Scoped Out	As above for effects on Cod – behavioural response (avoidance).
Direct habitat disturbance due to Installation of Offshore Export Cables	Fish and shellfish populations	Minor significance	Scoped Out	Direct habitat disturbance resulting from cable installation was predicted to be of minor significance in the Original EIA. The Offshore Export Cables will be longer than those assessed in the Original EIA. However, the effects relating to Direct Habitat Disturbance resulting from the extra cabling infrastructure will be within the Wind Farm Area and remain within the overall worst-case design scenario considered in the Original EIA which took into account installation of 125 turbine foundations. It is considered that the EIA determinations therefore remain valid and further assessment should be scoped out of the ES for the Project.
Sediment re-suspension and smothering from sediment disturbance during Offshore Export Cable burial	Fish and shellfish populations	Not significant	Scoped Out	Direct habitat disturbance resulting from cable installation was predicted to be not significant in the Original EIA. The Offshore Export Cables will be longer than those assessed in the Original EIA. However, the effects relating to Increased SSC resulting from the extra cabling infrastructure will be within the Wind Farm Area and remain within the worst-case design scenario considered in the Original EIA which took into account installation of 125 GBS. It is considered that the EIA determinations therefore remain valid and further assessment should be scoped out of the ES for the Project.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Operation & Maintenance				
Habitat loss due to presence of turbine foundations and inter-array cabling with scour protection	Fish and shellfish populations	Minor significance	Scoped Out	Habitat loss was predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Tides, current speeds due to presence of turbine foundations and inter-array cabling with scour protection	Fish and shellfish populations	Minor significance	Scoped Out	Effects resulting from changes in hydrodynamics were predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
New substrate materials due to presence of turbine foundations and inter-array cabling with scour protection	Fish and shellfish populations	Minor significance	Scoped Out	Effects resulting from the addition of new substrata were predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Operational noise from gearbox and generator of wind turbines	Fish and Shellfish populations	Minor significance	Scoped Out	Effects resulting from operational noise were predicted to be of minor significance in the Original EIA. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the ES for the Project.
Seabed sediment heating from subsea	Fish and shellfish	Not significant	Scoped Out	Effects resulting from increased seabed sediment temperatures were

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
cables (inter-array and Offshore Export Cables)	populations			predicted to be not significant in the Original EIA. The length of the Offshore Export Cables has increased compared to the Original Application but there has been no change to cable specification or burial. The Original ES concluded that the vulnerability of species present at the Wind Farm Area where the extra cable length relates was low in relation to sediment heating effects. The magnitude of the effect is still considered to be negligible. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.
Electromagnetic fields from subsea cables (inter-array and Offshore Export Cables)	Fish and shellfish populations	Not significant	Scoped Out	Effects resulting from electromagnetic fields were predicted to be not significant in the Original EIA. The length of the Offshore Export Cables has increased compared to the Original Application but there has been no change to cable specification or burial. The Original ES concluded that the vulnerability of species present at the Wind Farm Area was low in relation to EMF. The magnitude of the effect is still considered to be low. The EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the ES for the Project.

12.6.1 Scoping of Cumulative Impacts Assessment

The CIA included within the Original ES considered the proposed Inch Cape Offshore Wind Farm and the Seagreen Alpha and Bravo Offshore Wind Farms in conjunction with the Original Application and was based upon a worst case scenario of all three projects being constructed at the same time. The Original ES looked at potential cumulative effects with respect to direct disturbance of habitats, increases in SSC and changes in underwater noise and vibration levels. The assessment was informed by the outcomes of noise modelling and sediment transport modelling. The CIA was also completed through collaboration with the Forth and Tay Offshore Wind Developers Group (FTOWDG) and sharing of construction information and design envelopes.

The following list confirms the other plans, projects and activities considered in the scoping of the CIA in respect of Fish and Shellfish Ecology:

- Inch Cape Offshore Wind Farm (as consented);
- Seagreen Alpha and Bravo Wind Farms (as consented);

A review of other plans, projects and activities (selected from the list in Appendix B) indicates that there are no other current plans, projects and activities that should be considered in this CIA. However, it is acknowledged that ICOL have recently submitted a Scoping Report setting out a Project design envelope for the Inch Cape Offshore Wind Farm. Consideration of the Project design envelope have also been considered where relevant in the Scoping of the CIA for the Project EIA.

Table 12-5 summarises the post-mitigation (residual) significance for all cumulative effects considered and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

Table 12-5. Summary of Potential Effects on Fish and shellfish – Project with Other Plans, Projects and Activities

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the CIA for the Project EIA	Justification
Construction and Decommissioning				
Habitat disturbance due to Installation of turbines, subsea cables and associated structures	Fish and shellfish populations	Minor significance	Scoped Out	The cumulative projects under consideration remain the same as those considered in the Original EIA but with a significant reduction in the overall scale of the Project. The cumulative effects would therefore be no greater and likely less than those previously presented in the Original ES which were considered to be of minor significance.
Increase in SSC due to installation of turbines, subsea cables and associated structures	Fish and shellfish populations	Minor significance	Scoped Out	
Increase in sediment settlement/ smothering due to installation of turbines, subsea cables and associated structures	Fish and shellfish populations	Minor significance	Scoped Out	
Pile driving creating noise and vibration due to Installation of jacket foundations	Fish and Shellfish Species – traumatic hearing loss	Not significant	Scoped Out	Traumatic hearing loss on fish and shellfish species was not considered cumulatively in the Original ES due to the highly localised scale where traumatic hearing loss is likely. This effect is therefore considered not significant, it is considered that further cumulative assessment

				be scoped out of the Project EIA.
	Herring – behavioural response (avoidance)	Moderate to major significance	Scoped Out	The behavioural response of herring was predicted to be of moderate or major significance cumulatively and in-combination with other plans and projects considered in the Original ES. Based on the significant reduction in the scale of the Project (from 125 to 56 turbines) and the most recent IHLS data, the cumulative effects will be no greater and likely less, than those reported in the Original ES. In accordance with the S36 consent conditions for the Originally Consented Project it is anticipated that a Piling Strategy will be required under any future consents issued to the Project. Further mitigation will be considered and detailed for approval in the Piling Strategy to minimise the risk to herring during piling activity. The Inch Cape Scoping Report (ICOL, 2017) confirms a reduction in the number of piles from 892 to 304 although with an increase in hammer energy, The increased hammer energy may result in a greater area of disturbance however, the overall piling time will be reduced. It is considered that any future consents issued to ICOL for a Project design envelope would mitigate any cumulative effects arising from the increased hammer energy. Therefore, it is considered that further cumulative assessment be scoped out of the Project EIA.
	Cod – behavioural response (avoidance)	Minor to moderate significance	Scoped Out	The behavioural response of cod, flatfish species, salmon, sea trout and sandeels was predicted to be of minor or moderate significance cumulatively and in-combination with other plans and projects considered in the Original ES. Based on the significant reduction in the scale of the Project the cumulative effects will be no greater and likely less, than those reported in the Original ES. As detailed above it is assumed that a Piling Strategy will be required to minimise the risk to fish species during piling activity. It is considered that further cumulative assessment be scoped out of the Project EIA.
	Flatfish species - behavioural response (avoidance)	Minor to moderate significance	Scoped Out	
	Salmon and sea trout - behavioural response	Minor to moderate significance	Scoped Out	

	(avoidance)			
	Sandeel - behavioural response (avoidance)	Minor significance	Scoped Out	
Direct habitat disturbance due to Installation of Offshore Export Cables	Fish and shellfish populations	Minor significance	Scoped Out	The cumulative projects under consideration remain the same as those considered in the Original Project EIA. Although there is an increase in length in relation to the Offshore Export Cable lengths the worst case design scenario associated with the Project remains within the parameters considered in the Original EIA which took into account 125 turbine support structures. The cumulative effects would therefore be no greater than those previously presented in the Original ES which were considered to be of minor significance or not significant.
Sediment re-suspension and smothering from sediment disturbance during Offshore Export Cable burial	Fish and shellfish populations	Minor significant	Scoped Out	
Operation & Maintenance				
Habitat loss due to presence of turbine foundations and inter-array cabling with scour protection	Fish and shellfish populations	Minor significance	Scoped Out	The cumulative projects under consideration remain the same as those considered in the Original Project EIA but with a significant reduction in the overall scale of the Project when compared to the parameters presented in the Original ES. The cumulative effects would therefore be no greater and possibly less than those previously presented in the Original Project ES which were considered to be of minor significance or not significant.
Tides, current speeds due to presence of turbine foundations and inter-array cabling with scour protection	Fish and shellfish populations	Minor significance	Scoped Out	
New substrate materials due to presence of turbine foundations and inter-array cabling with scour protection	Fish and shellfish populations	Minor significance	Scoped Out	
Operational noise from gearbox and generator of wind turbines	Fish and Shellfish populations	Minor significance	Scoped Out	
Seabed sediment heating from subsea cables (inter-array and Offshore Export Cables)	Fish and shellfish populations	Not significant	Scoped Out	

Electromagnetic fields from subsea cables (inter-array and Offshore Export Cables)	Fish and shellfish populations	Not significant	Scoped Out	

12.7 Approach to EIA

Based on the evidence summarised from the Original ES and considering the reduced scale of the Project by comparison to the Originally Consented Project, and in light of the embedded mitigation to be adopted, it is concluded that all of the potential effects on Fish and Shellfish receptors will be not significant or managed to minimize the risk to fish species in the vicinity of the Project. It is therefore concluded that Fish and Shellfish be scoped out of the Project EIA. Therefore, it is proposed that no detailed assessment of fish and shellfish would be included within the ES.

12.8 Scoping Questions

- Do you agree that the existing data available to describe the Fish and Shellfish Ecology baseline remains sufficient to describe the physical environment in relation to the Project?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Fish and Shellfish Ecology receptors?
- Do you agree that the assessment of Fish and Shellfish Ecology receptors should be scoped out of the Project EIA?
- Do you agree that the cumulative effects on Fish and Shellfish Ecology receptors should be scoped out of the Project EIA?

12.9 References – Fish and Shellfish Ecology

Barne, J. H., Robson, C. F., Kaznowska, S. S., Doody J. P., Davidson N. C. and Buck, A. L., 1997. Coasts and Seas of the United Kingdom Region 4 South-east Scotland: Montrose to Eyemouth. Peterborough JNCC (Coastal Directories Series).

Centre for Marine and Coastal Studies, Centre for Intelligent Monitoring Systems, Applied Ecology Research Group and EConnect Ltd. 2003. A Baseline Assessment of Electromagnetic fields generated by Offshore Windfarm Cables. Report to COWRIE. J2733/V1/07-03.

Coull, K. A., Johnstone, R and Rogers, S. I., 1998. Fishery sensitivity Maps in British Waters. Published and distributed by UKOOA Ltd. Available online from: http://cefas.defra.gov.uk/media/29947/sensi_maps.pdf.

Ellis, J. R., Milligan, S., Readdy, L., South, A., Taylor,N. and Brown, M., 2010. Mapping spawning and nursery areas of species to be considered in Marine Protected Areas (Marine Conservation Zones). Report No 1: Final Report on development of derived data layers for 40 mobile species considered to be of conservation importance. Project Code: MB5301. Available online from: http://randd.defra.gov.uk/Document.aspx?Document=MB5301_9578_FRP.pdf [Accessed April 2017].

Ellis, J. R., Milligan, S. P., Readdy, L., Taylor, N. and Brown, M..J., 2012. Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas, Lowestoft, 147: 56 pp.

EMU, 2009. Geophysical survey report . Commercial in Confidence

Emu Ltd. 2010. Neart Na Gaoithe Proposed Offshore Wind Farm Benthic Ecology Characterisation Survey. Final Report. A Report for: Neart na Gaoithe Offshore Wind Ltd. June 2010.

Gill, A.B., Gloyne-Phillips, I., Neal, K.J. & Kimber, J.A. 2005. COWRIE 1.5 Electromagnetic Fields Review. The potential effects of electromagnetic fields generated by sub-sea power cables associated with offshore wind farm developments on electrically and magnetically sensitive marine organisms – a review. Report to COWRIE.

Gill, A. B. and Bartlett, M. 2010. Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel. Scottish Natural Heritage, Commissioned Report No. 401. Available online from: http://www.snh.org.uk/pdfs/publications/commissioned_reports/401.pdf.

Godfrey, J.D., Stewart, D.C., Middlemas, S.J. & Armstrong, J.D. 2014. Depth use and movements of homing Atlantic salmon (*Salmo salar*) in Scottish coastal waters in relation to marine renewable energy development. Scottish Marine and Freshwater Science Vol 05, No 18.

Harding, H., Bruintjes, R., Radford, A. and Simpson, S. 2016. Measurement of Hearing in the Atlantic salmon (Salmo salar) using Auditory Evoked Potentials, and effects of Pile Driving Playback on salmon Behaviour and Physiology Scottish Marine and Freshwater Science Report Vol 7 No 11.

ICES 2006a. ICES CIEM ICES Fish Map – Herring. Available online from: http://www.ices.dk/marine-data/maps/Pages/ICES-FishMap.aspx.

ICES 2006b. ICES CIEM ICES Fish Map –Spurdog. Available online from: http://www.ices.dk/marine-data/maps/Pages/ICES-FishMap.aspx.

ICES 2006c. ICES CIEM ICES Fish Map –Thornback Ray. Available online from: http://www.ices.dk/marine-data/maps/Pages/ICES-FishMap.aspx.

ICES. 2015. Report of the Herring Assessment Working Group for the Area South of 62ºN (HAWG), 10-19 March 2015, ICES HQ, Copenhagen, Denmark. ICES CM 2015/ACOM:06. 850 pp.

ICOL, 2017. Inch Cape Scoping Report. Available from: http://www.gov.scot/Resource/0051/00517517.pdf. [Accessed on: 11/05/2017]

Mainstream Renewable Power (NnGOWL 2012). Neart na Gaoithe Offshore Wind Farm Environmental Statement. July 2012).

Mainstream Renewable Power (NnGOWL 2013). Neart na Gaoithe Offshore Wind Farm. Addendum of Supplementary Environmental Information. June 2013.

Malcolm, I., Godfrey, J. and Youngson, A.F. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. Scottish Marine and Freshwater Science Report, 1(14). http://www.scotland.gov.uk/Resource/Doc/295194/0111162.pdf

Malcolm, I., Armstrong, J.D., Godfrey, J.D., Maclean, J.C. and Middlemas, S.J. 2013. Marine Scotland Science Report 05/13 The Scope of Research Requirements for Atlantic Salmon, Sea Trout and European Eel in the Context of Offshore Renewables.

Marine Scotland 2011. Discussion and supply of data on specific species distributions [email] (Personal communication, 10 Aug 2011).

Marine Scotland 2017. Marine Scotland National Marine Planning Interactive (NMPi) tool. https://marinescotland.atkinsgeospatial.com/nmpi/ (Accessed 10/04/2017).

J. E. Orpwood, J.E., Fryer, R.J., Rycroft, P and Armstrong, J.D. 2015. Scottish Marine and Freshwater Science Volume 6 Number 8. Effects of AC Magnetic Fields (MFs) on Swimming Activity in European Eels *Anguilla anguilla*.

Payne, M.R. 2010. Mind the gaps: a state-space model for analysing the dynamics of North Sea herring spawning components. ICES Publications. Available online from http://icesjms.oxfordjournals.org.

SNH 2012. SNHi Information Service: SiteLink [accessed for River South Esk, River Tay and River Teith SACs]. Available online from http://gateway.snh.gov.uk/sitelink.

13 Commercial Fisheries

13.1 Introduction

This chapter describes the scoping rationale for the Project EIA, focusing on the content of the commercial fisheries baseline and the approach to assessing the potential impacts on commercial fisheries receptors during the construction, operation and maintenance and decommissioning phases. Reference is made to the baseline data gathered to inform the EIA for the Originally Consented Project, and to the outcomes of impact assessment presented in the Original ES.

13.2 Baseline Data and Information

This section identifies the baseline data sources that can be used to characterise the commercial fisheries within and around the Project, drawing predominantly from the data sources used to inform the Original ES. Commentary is provided on the sufficiency of this data as a basis for Scoping the Project EIA.

As no single data set adequately describes commercial fishing within a discrete area such as an offshore wind farm, datasets were obtained, collated and analysed from a variety of national, regional and local sources to inform the EIA for the Originally Consented Project. The data and information used are fully described in Appendix 16.1: Commercial Fisheries Baseline Technical Report of the Original ES.

Table 13-1. Baseline datasets used for the Original ES

Data Source	Dataset	Data used	Data period
MMO	Fishing effort by ICES rectangle	Filtered by relevant category by year.	2000-2009
MMO	Landings values by ICES rectangle	Filtered by relevant category by year.	2000-2009
MMO	Landings by weight and species by ICES rectangle	Filtered by relevant species by year.	2000-2009
MMO	Averaged monthly effort and landings values by vessel category and species	Filtered by relevant category by year	2000-2009
MMO	Surveillance sightings	Filtered by method	2000-2009
MMO	Satellite tracking vessel monitoring system (VMS) data	All UK vessels over 15.0 metres speed filtered	2005 - 2008
MSS	Satellite tracking	Vessels over 15.0 metres in length by gear and species targeted	2007-2009
ICES/Europa/MMO	Published fisheries controls and legislation	Annual pressure stock quotas Vessel licensing	2000-2009

Data Source	Dataset	Data used	Data period
		Days at sea restriction Shellfish Entitlements Statutory Instruments National and local effort and method controls	
Direct Consultation	District Fisheries Officers (DFO)s; Scottish Fishermen's Federation (SFF); Fishermen and their representatives, including: Pittenweem fishermen; Dunbar fishermen; Port Seton and Cockenzie Fishermen's association; Eyemouth Fishery Office; Fisheries Industry Representatives (FIR); Arbroath Fishermen's Association; South East fishermen's Group; Anstruther Fishery Office; Eyemouth Fishery Office; Aberdeen Fisheries Office; Individual fishermen	Identities and specifications of vessels fishing the area. Fishing operating patterns in the area. Fishing grounds by method and species targeted	2010 -2011

13.2.1 Data and Information Validity

13.2.1.1 Data and Information Sources and Types

NnGOWL, on the advice of their technical consultants, considers that the sources and types of data and information previously collected as part of the EIA for the Originally Consented Project, remain valid and are consistent with those used and approved by regulators and stakeholders for subsequent OWF applications within UK territorial waters.

13.2.1.2 Data Spatial Coverage

The Development Area forming the Project covers the same area as the Original Application and has not changed in location or size. The specific sea areas for which data and information were obtained for the Original ES therefore remain appropriate.

13.2.1.3 Age of Data

Commercial fisheries are subject to a number of short term factors which influence the types and levels of fishing activity within a given area. These can include changes to annual pressure stock quotas and days at

sea limits, short notice changes to national and regional legislation and control measures, market and cost factors, and vessel replacements and gear developments. In recent years there has also been the increasing use of Class A and B transponding AIS by fishing vessels, and in some cases the voluntary use of Succorfish VMS by under-15.0 metre vessels which add to the available datasets that can be used to described the baseline conditions.

Given these variables, it is considered appropriate to consult more up to date and available data in order to review the accuracy of the commercial fisheries baseline as described in Chapter 16 of the Original ES. Table 13-2, provides a summary of the available, updated datasets that will be consulted.

Table 13-2. Available Commercial Fisheries Datasets

Data Source	Dataset	Available Data Coverage
MMO	Fishing effort by ICES rectangle	2006- 2015 datasets
MMO	Landings values by ICES rectangle	2006- 2015 datasets
MMO	Landings by weight and species by ICES rectangle	2006- 2015 datasets
MMO	Averaged monthly effort and landings values by vessel category and species	2006- 2015 datasets
MMO	Surveillance sightings	2006- 2015 datasets
MMO	Satellite tracking VMS data	2010-2015
MSS	Satellite tracking	Use of most up-to-date data available
ICES/ Europa/ MMO	Published fisheries controls and legislation	2010-2016
Direct Consultation	DFOs; SFF; Fishermen and their representatives, including: Pittenweem fishermen; Dunbar fishermen; Port Seton and Cockenzie Fishermen's association; Eyemouth Fishery Office; FIRs; Arbroath Fishermen's Association; South East fishermen's Group; Anstruther Fishery Office; Eyemouth Fishery Office;	2010 onwards

Data Source	Dataset	Available Data Coverage
	Aberdeen Fisheries Office; Individual fishermen	
Marine Traffic/ Navigation Risk Assessment (NRA)	Selected on review of data and information presented in the NRA as relevant to fishing vessels.	
Marine Traffic	AIS records relevant to fishing vessels	
Succorfish data	Small vessel position data as recorded by the voluntary Succorfish system as available.	

13.3 Design Envelope

Table 13-3 sets out the worst case scenarios defined in the commercial fisheries section of the Original ES (NnGOWL, 2012) compared to those for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process.

Parameters relating to the worst case scenario of commercially important fish and shellfish species, the impact of which has an indirect effect of commercial fisheries, are given in Chapter 12, Fish and Shellfish Ecology.

Table 13-3 Worst Case Scenario Definitions – Commercial Fisheries

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference Between Envelopes
Construction and Decommissioning			
Loss or restricted access to fishing grounds due to Offshore Wind Farm construction activities	Maximum number of turbines: 125 Minimum distances between turbines: 450 metres Area of seabed occupied by jackets including scour protection based on 125 GBS with 8m of scour protection: 0.14 km^2 Safety zones around turbine installation activities:500 m Construction period: 2 years Number of substations:2	Maximum number of turbines: 56 Minimum distances between turbines: approx. 800 metres Area of seabed occupied by jackets based on 56 x 6 leg jacket foundations (including scour protection) = 0.013 km^2 Safety zones around turbine installation activities:500 m Construction period: 2 - 3 years Number of substations:2	45% reduction in the number of turbines. Reduced footprint per substructure and greater spacing between structures. No difference in substation or inter-array cable infrastructure. No change in overall construction period although there may be a reduction in time spent on site for each construction
Increased steaming times as a result of safety zones and construction activities at the Wind Farm Area.			
Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Wind Farm.			
Displacement of fishing vessels into other areas due to construction activities at the Wind Farm Area			

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference Between Envelopes
	Total seabed occupied by substation (piles, legs and scour protection): 0.001 km^2 Inter-array cables with total length of 140km Cable burial likely to involve ploughing/cutting/jetting or rock cover. Burial depth up to 1-1.5m	Total seabed occupied by substation (piles, legs and scour protection): 0.0005 km^2 Inter-array cables with total length of 140km Cable burial likely to involve ploughing/cutting/jetting or rock cover. Burial depth up to 3m	vessel.
Increased steaming times as a result of construction activities at the Offshore Export Cable Corridor. **Loss or restricted access to fishing grounds due to Offshore Export Cable installation activities** **Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Export Cable.** **Displacement of fishing vessels into other areas due to construction activities along the Offshore Export Cable Corridor**	No of Cables: 2 Maximum Length: 33km Cable Corridor width: 300m Burial depth: up to 1-3m 500 m safety zone around major construction activities at Offshore Wind Farm structures.	No of Cables: 2 Maximum Length: 43km Burial depth: up to 1-3m 500 m safety zone around major construction activities.	10 km increase in Offshore Export Cable Length, (within the Wind Farm Area). No change to installation activities
Operation & Maintenance			
Loss or restricted access to fishing grounds due to turbines and associated Wind Farm infrastructure. **Interference to transiting of fishing vessels as a result of the Offshore Wind Farm** **Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Wind Farm Area**	Maximum number of turbines: 125 Minimum distances between turbines: 450 metres Number of substations:2 Total area seabed occupied by substation (piles, legs and scour protection): 0.001 km^2	Maximum number of turbines: 56 Minimum distances between turbines: approx. 800 metres Number of substations:2 Total area seabed occupied by substation (piles, legs and scour protection): 0.0005 km^2	45% reduction in number of turbines and increased spacing between structures.

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference Between Envelopes
Displacement of fishing vessels due to the operational Wind Farm	140 km of buried or protected inter-array cables	140 km of buried or protected inter-array cables	
Loss or restricted access to fishing grounds due to the Offshore Export Cables.	2 x 33 km buried or protected Offshore Export Cables.	2 x 43 km buried or protected Offshore Export Cables.	10 km increase in Offshore Export Cable Length. No change to installation activities
Interference to transiting of fishing vessels as a result of the Offshore Export Cable Corridor			
Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Offshore Export Cable Corridor			
Displacement of fishing vessels due to the operational Offshore Export Cable			

13.4 Embedded Mitigation

A number of mitigation options, both embedded and for implementation, were identified within the design envelope for the Originally Consented Project, as well as during the consultation phase of the Original Application and during the on-going liaison maintained with fisheries stakeholders, their representatives and with MS-LOT. These are as follows:

- Establishment of and participation in a working group to assist with the following:
  - Dissemination of Project information;
  - Application of safety zones and implications for fisheries;
  - Navigation of Offshore Wind Farm construction and works vessels to and from the site (i.e., agreement of transit lanes to minimise interference to fishing activities, agreement for 'holding' areas for vessels in the event of bad weather);
  - Procedures in the event of interactions between Offshore Wind Farm construction and fishing activities (i.e. claims for lost and/or damaged gear);
  - Burial and protection of inter-array and export cabling;
  - Removal of seabed obstacles during and post-construction; and
  - Post-construction surveys and seabed rectification procedures.
- All infrastructure installed during the construction phase will be marked and lit, in line with standard industry practice, and relevant information will be distributed to fishermen through the agreed channels.

- Cables will be buried to a target depth of up to 1-3 m (for the Offshore Export Cable) or 1-1.5m (for the inter-array cables) where it is reasonably practicable to do so. In instances where adequate burial cannot be achieved then the developers will seek to install cable protection.
- Over trawl surveys will be carried out on export and inter-array cables where cable protection has been required to ensure that the protection scheme has been successful.

13.5 Consent Conditions Commitments

A number of consent conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 13-4 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of effects on Commercial Fisheries.

Table 13-4 Consent conditions for the Originally Consented Project relevant to Commercial Fisheries

Original Consent Requirement	Relevance to Commercial Fisheries
Navigational Safety Plan	Setting out, for approval, the navigational safety measures to mitigate navigational risk to commercial fisheries operating in the area.
Lighting and Marking Plan	Setting out, for approval, the navigational lighting strategy to be installed at the site to ensure safe marking of the structures and Development Area to mitigate the navigational risk to commercial fisheries operating in the area.
Participation in the Forth and Tay Regional Advisory Group (FTRAG)	Participation in the FTRAG with respect to monitoring and mitigation of commercial fish.
Participation in the Scottish Marine Environment Group (SSMEG)	Participation in the SSMEG with respect to monitoring and mitigation of commercial fish.
Commercial Fisheries Mitigation Strategy	Setting out, for approval, the mitigation strategy for each commercial fishery in the area that may be adversely affected by the Project.
Working Group	Continued membership of, and participation in the Forth & Tay Commercial Fisheries Working Group
FLO	Appointment of a Project Fishing Liaison Officer (FLO) to establish and maintain effective communications with fishery industry.
Navigational Safety (Construction)	Notify the UKHO prior to the commencement of construction to facilitate the promulgation of maritime safety information and updating of nautical charts and

Original Consent Requirement	Relevance to Commercial Fisheries
	publications through the national Notice to Mariners System. Issue local Notice to Mariners to ensure local mariners, fishermen's organisations and HM coastguard are aware of the Licensable Marine Activity. Consult with local harbour masters as appropriate. Ensure that details of the works are promulgates in the Kingfisher Fortnightly Bulletin [KIS-ORCA], prior to the commencement of the works to inform the Sea Fish industry of vessel routes, timings and the locations of Project Activities.
Markings, lighting and signals of the Works	Ensure that the Project is lit in accordance with the requirements of the relevant statutory stakeholders including marking of the site with appropriate construction buoyage during construction and continued lighting of the site following completion of construction as required by the MCA and NLB.
Markings, lighting and signals of the Works	Ensure that any vessels engaging in the work are marked in accordance with the International Rules for the Prevention of Collisions at Sea if under way and in accordance with the UK Standard Marking Schedule for Offshore Installations if secured to the seabed.
Navigational Safety (Operation)	Ensure appropriate notifications are made following completion of the works to all relevant stakeholders including UKHO, the Maritime Rescue and Coordination Centre Aberdeen and all mariners and fishermen's organisations. Ensure appropriate notifications are made through the Kingfisher Fortnightly Bulletin to inform the Sea Fish Industry.

13.6 Scoping of the EIA for the Project

Table 13-5 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification. The embedded mitigation (Section 13.4) was included within the Original assessment conclusions and therefore only the residual effects have been presented in these tables.

Table 13-5 Summary of potential effects on Commercial Fisheries.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction and Decommissioning			
Loss or restricted access to fishing grounds due to Offshore Wind Farm construction activities	Minor/ Moderate significance	Scoped in	The reduction in the number of turbines is likely to have the beneficial effect of reducing the

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Loss or restricted access to fishing grounds due to Offshore Export Cable installation activities	Minor/ Moderate significance	Scoped in	magnitude of potential effects relating to the construction (or decommissioning) of the Wind Farm Area. Effects relating to the installation of inter-array are likely to be no greater than that presented in the Original EIA on the basis that the design envelope remains the same. Although the increase in the length of Offshore Export Cable may result in increased presence of cable lay vessels this is offset by the reduction in installed infrastructure associated with the overall reduced scale of the Project when compared to the Original EIA. Despite this commercial fishing is subject to several short term factors which influence the types and levels of fishing activity within an area. As such it is proposed that potential effects on commercial fisheries be scoped in to the Project EIA and assessed against an updated baseline.
Increased steaming times as a result of safety zones and construction activities at the Wind Farm Area.	Minor significance	Scoped in	
Increased steaming times as a result of construction activities at the Offshore Export Cable Corridor.	Minor significance	Scoped in	
Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Wind Farm.	Minor significance	Scoped in	
Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Export Cable.	Minor significance	Scoped in	
Displacement of fishing vessels into other areas due to construction activities at the Wind Farm Area	Minor/ Moderate significance	Scoped in	
Displacement of fishing vessels into other areas due to construction activities along the Offshore Export Cable Corridor	Minor/ Moderate significance	Scoped in	
Operation & Maintenance			
Loss or restricted access to fishing grounds due to turbines and associated Wind Farm infrastructure.	Minor significance	Scoped in	The reduction in the number of turbines is likely to have the beneficial effect of reducing the magnitude of potential effects relating to the operation of the Wind Farm Area. The effects relating to the operation of inter-array and Offshore Export Cables are likely to be no greater than that presented in the Original EIA (minor or not significant) on the basis that the
Loss or restricted access to fishing grounds due to the Offshore Export Cables.	Not significant	Scoped in	
Interference to transiting of fishing vessels as a result of the Offshore Wind Farm	Minor significance	Scoped in	
Interference to transiting of fishing vessels as	Not	Scoped in	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
a result of the Offshore Export Cable Corridor	significant		same mitigation will be in place on the Project, i.e. burial of Offshore Export Cables or overtrawl surveys on protected Offshore Export Cables. As detailed above it is considered necessary to update the commercial fisheries baseline in and around the Development Area. As such it is proposed that potential effects on commercial fisheries be scoped in to the Project EIA.
Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Wind Farm Area	Minor significance	Scoped in	
Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Offshore Export Cable Corridor	Not significant	Scoped in	
Displacement of fishing vessels due to the operational Wind Farm	Minor significance	Scoped in	
Displacement of fishing vessels due to the operational Offshore Export Cable	Not significant	Scoped in	

13.6.1 Scoping of Cumulative Impacts Assessment

The assessment of the potential cumulative effects of the Originally Consented Project focused primarily on interactions with the other Firth and Tay offshore wind farm projects as a result of their proximity to the Development Area. Whilst it was recognised that fishing vessels may spend varying proportions of time fishing in areas beyond the Forth and Tay area and hence other offshore renewable developments may also affect them, it was not possible within the scope of the Original CIA to consider the extent of an impact on a vessel by vessel basis. Therefore, where relevant, the Original ES considered NnG within the context of remote fishing grounds around the UK, relevant to offshore renewable developments. It was considered that the Originally Consented Project would have a limited contribution to such impacts due to the relatively low level and small proportion of activity occurring within the site in relation to relevant nomadic fishing fleets.

On that basis the Original CIA considered the cumulative effects arising from the Project arising from:

- The Inch Cape Offshore Wind Farm; and
- The Seagreen Alpha and Bravo Offshore Wind Farms.

It is proposed that the CIA for the Project EIA applies the same principles as those detailed within the Original ES with a detailed focus on the Firth and Tay offshore wind farm projects. Cumulative effects will be considered on the nomadic fishing fleets where relevant and in line with the approach taken in the Original ES, and will consider the cumulative effects resulting from the Project in conjunction with the following list of projects in relation to nomadic fishing fleets operating in the area:

- The Inch Cape Offshore Wind Farm (as consented and as scoped); and
- The Seagreen Alpha and Bravo Offshore Wind Farms (as consented and as scoped);
- Aberdeen Offshore Wind Farm (as-built parameters to be considered);

- Hywind Demo (as-built parameters to be considered);
- Blyth Offshore (as-consented parameters to be considered);
- Beatrice Offshore Wind Farm (as detailed in the project consent plans);
- Telford, Stevenson and MacColl Offshore Wind Farms (as consented parameters to be considered);
- Kincardine Floating Offshore Windfarm (as-consented parameters to be considered).
- Moray Firth Offshore Wind Ltd Western Development Area (Planned); and
- Rampion Round 3 Zone (under construction).

Table 13-6**Error! Reference source not found.** summarises the post-mitigation significance for all cumulative effects considered in the Original CIA and details whether the potential effect has been scoped out of the CIA for the Project EIA, with a relevant justification.

Table 13-6. Summary of potential effects on Commercial Fisheries - the Project with other plans, projects and activities.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction and Decommissioning			
Loss or restricted access to fishing grounds due to Offshore Wind Farm construction activities	Minor/ Moderate significance	Scoped in	The reduction in the size of many of the projects considered in the CIA is likely to have the beneficial effect of reducing the magnitude of potential cumulative effects relating to the construction (or decommissioning). However, commercial fishing is subject to several short term factors which influence the types and levels of fishing activity within an area. As such it is proposed that potential cumulative effects on commercial fisheries be scoped in and assessed against an updated baseline.
Loss or restricted access to fishing grounds due to Offshore Export Cable installation activities	Minor/ Moderate significance	Scoped in	
Increased steaming times as a result of safety zones and construction activities at the Wind Farm Area.	Minor significance	Scoped in	
Increased steaming times as a result of construction activities at the Offshore Export Cable Corridor.	Minor significance	Scoped in	
Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Wind Farm.	Minor significance	Scoped in	
Fouling of static gear or changes to towing patterns due to construction and installation	Minor significance	Scoped in	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
vessels transiting to the Offshore Export Cable.			
Displacement of fishing vessels into other areas due to construction activities at the Wind Farm Area	Minor/ Moderate significance	Scoped in	
Displacement of fishing vessels into other areas due to construction activities along the Offshore Export Cable Corridor	Minor/ Moderate significance	Scoped in	
Operation & Maintenance			
Loss or restricted access to fishing grounds due to turbines and associated Wind Farm infrastructure.	Minor significance	Scoped in	The reduction in the size of many of the projects considered in the CIA is likely to have the beneficial effect of reducing the magnitude of potential cumulative effects relating to the operational phase. However, commercial fishing is subject to several short term factors which influence the types and levels of fishing activity within an area. As such it is proposed that potential cumulative effects on commercial fisheries be scoped in and assessed against an updated baseline.
Loss or restricted access to fishing grounds due to the Offshore Export Cables.	Not significant	Scoped in	
Interference to transiting of fishing vessels as a result of the Offshore Wind Farm	Minor significance	Scoped in	
Interference to transiting of fishing vessels as a result of the Offshore Export Cable Corridor	Not significant	Scoped in	
Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Wind Farm Area	Minor significance	Scoped in	
Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Offshore Export Cable Corridor	Not significant	Scoped in	
Displacement of fishing vessels due to the operational Wind Farm	Minor significance	Scoped in	
Displacement of fishing vessels due to the operational Offshore Export Cable	Not significant	Scoped in	

13.7 Approach to EIA

A material change to the baseline may result in changes in the levels of significance of the potential effects. The baseline would therefore be updated using the latest available fisheries data as detailed in Table 13-2. This would be supplemented by information collected through direct consultation with the fisheries

stakeholders including (but not limited to) those listed in Table 13-2. The updated baseline will identify those fisheries which will require further detailed consideration in the Project EIA due to a substantial change in baseline conditions.

Following the review of the updated commercial fisheries baseline, the potential effects considered in the Original ES and detailed above will be scoped into the Project EIA unless otherwise agreed with MS-LOT.

The Project design envelope will also be re-evaluated. Where it is necessary to undertake a further assessment the criteria outlined below in Table 13-7 and Table 13-8 will be used.

Table 13-7 Definitions of Sensitivity of Commercial fisheries Receptors.

Sensitivity	Definition
High	• Low spatial adaptability due to limited operational range and ability to deploy only one gear type. • Limited spatial tolerance due to dependence upon a single fishing ground. • Low recoverability due to inability to mitigate loss of fishing area by operating in alternative areas.
Medium	• Some spatial adaptability due to extent of operational range and / or ability to deploy an alternative gear type. • Moderate spatial tolerance due to dependence upon a limited number of fishing grounds. • Limited recoverability with some ability to mitigate loss of fishing area by operating in alternative areas.
Low	• High spatial adaptability due to extensive operational range and / or ability to deploy a number of gear types. • High spatial tolerance due to ability to fish a number of fishing grounds. • High recoverability due to ability to mitigate loss of fishing area by operating in range of alternative areas of the North Sea.
Negligible	• Category of fishing receptor with an extensive operational range and very high method versatility. • Vessels are able to exploit a large number of fisheries

Table 13-8 Definitions Magnitude of Effects.

Sensitivity	Definition
High	• A high proportion of total annual landings weights / values derived from Construction, Decommissioning and Operational footprints of the Project • The change to fishing activity is permanent.

Sensitivity	Definition
Medium	• A moderate proportion of total annual landings weights / values derived from Construction & Decommissioning and Operational footprints of the Project • The change is temporary but recovery within a reasonable timescale is not possible.
Low	• A low proportion of total annual landings weights / values derived from Construction, Decommissioning and Operational footprints of the Project • The change is temporary and recovery is possible within a reasonable timescale.
Negligible	• Receptor has very little or no history of fishing in the areas under consideration; and / or • The change is temporary and recovery is immediate.
No Change	• No impact, therefore no change in receptor condition.

The final assessment methodology will be informed by the following guidance documents and will be agreed with MS-LOT during consultation on the Project:

- Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2012) Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403, May 2012;
- Cefas, Marine Consents and Environment Unit (MCEU), Department for Environment, Food and Rural Affairs (DEFRA) and Department of Trade and Industry (DTI) (2004) Offshore Wind Farms - Guidance note for Environmental Impact Assessment In respect of FEPA and CPA requirements, Version 2;
- RenewableUK (2013) Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in offshore wind farms;
- Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Volume 1: Environmental Report; Marine Scotland 2010;
- Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009;Sea Fish Industry Authority and UK Fisheries Economic Network (UKFEN) (2012) Best practise guidance for fishing industry financial and economic impact assessments;
- Blyth-Skyrme, R.E. (2010) Options and opportunities for marine fisheries mitigation associated with wind farms. Final report for Collaborative Offshore Wind Research into the Environment contract FISHMITIG09. COWRIE Ltd, London;
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (2014);
- UK Oil and Gas (2008) Fisheries Liaison Guidelines - Issue 5; and

- International Cable Protection Committee (2009) Fishing and Submarine Cables - Working Together.

13.8 Scoping Questions

- Do you agree that there is a requirement to update and review the commercial fisheries baseline as specified?
- Do you agree that the data sources identified are sufficient to inform an update of the baseline for the Project EIA?
- Do you agree with the embedded mitigation as summarised above?
- Do you agree with the proposed scope of the cumulative impact assessment?

13.9 References – Commercial Fisheries

Blyth-Skyrme, R.E. (2010) Options and opportunities for marine fisheries mitigation associated with wind farms. Final report for Collaborative Offshore Wind Research into the Environment contract FISHMITIG09. COWRIE Ltd, London;

Brown and May Marine Ltd., 2011. Neart na Gaoithe Offshore Wind Farm: Commercial Fisheries Assessment. Appendix 16.1 of the Neart na Gaoithe Environmental Statement.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2012) Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403, May 2012;

Cefas, Marine Consents and Environment Unit (MCEU), Department for Environment, Food and Rural Affairs (DEFRA) and Department of Trade and Industry (DTI) (2004) Offshore Wind Farms - Guidance note for Environmental Impact Assessment In respect of FEPA and CPA requirements, Version 2;

FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (2014);

International Cable Protection Committee (2009) Fishing and Submarine Cables - Working Together.

Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009;

Sea Fish Industry Authority and UK Fisheries Economic Network (UKFEN) (2012) Best practise guidance for fishing industry financial and economic impact assessments;

RenewableUK (2013) Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in offshore wind farms;

Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Volume 1: Environmental Report; Marine Scotland 2010; and

UK Oil and Gas (2008) Fisheries Liaison Guidelines - Issue 5.

14 Shipping and Navigation

14.1 Introduction

This chapter confirms the shipping and navigation receptors of relevance to the Project, and the expected potential effects during the construction, operation and maintenance and decommissioning phases. Reference is made to the baseline data gathered to inform the EIA for the Original Project, and to the outcomes of impact assessment presented in the Original Project ES.

In particular, reference has been made to the Navigation Risk Assessment (NRA (Anatec, 2012)), the shipping and navigation technical appendix used to inform the Original ES.

14.2 Baseline Data

14.2.1 Data Source Overview

The primary input to the Original Project NRA was 29 days of marine traffic survey data, recorded from a geotechnical survey vessel (the Ocean Discovery) working at the Wind Farm Area between August and October 2010. Data was collected via Automatic Identification System (AIS) data, radar, and visual observations.

AIS is required to be fitted aboard all vessels engaged in international voyages of 300 gross registered tonnage (GRT) and upwards, cargo ships of 500 GRT upwards not engaged in international voyages, and all passenger ships (carrying 12 or more passengers) irrespective of size, built on, or after 1 July 2002. At the time of the Ocean Discovery survey, all fishing vessels of length greater than 45 m were also required to carry and broadcast AIS (noting that, as of the 31st of May 2014, AIS carriage is mandatory for all fishing vessels with length of 15m and upwards). It is noted that some vessels not required to carry and broadcast AIS still choose to do so voluntarily.

During the Ocean Discovery survey vessels not broadcasting via AIS were recorded via radar or by visual observation.

The complete set of data sources used to inform the NRA for the Original Project NRA are listed below in Table 14-1.

Table 14-1 Baseline Data Sources – Shipping and Navigation

Data Source	Study/Data Name	Survey Overview
Site specific data		
NnGOWL	Marine traffic survey (NnGOWL, 2012)	Data collected via Automatic Identification System (AIS) data, radar, and visual observations over a 29 day survey period.
NnGOWL	Long term onshore AIS receiver data (NnGOWL, 2012)	Proving data over the following periods (AIS broadcasting vessels only); • November 2009 to May 2010; and • November 2010 to July 2011

Data Source	Study/Data Name	Survey Overview
Additional data sources		
Marine Scotland	Fishing Overflight Surveillance Data	Fishing vessel data collected visually between 2005 and 2009
Marine Scotland	Fishing Satellite Monitoring Data	Fishing vessel data collected via satellite during 2006 and 2008
British Marine Aggregates Producers Association (BMAPA) and The Crown Estate	Marine Aggregates Dredging Data	Dredging areas and dredger vessel routes
United Kingdom Hydrographic Office (UKHO)	UK Admiralty Charts	Navigational nautical charts
UKHO	Admiralty Sailing Directions (NP54) North Sea (West) Pilot (UKHO 2009)	Pilot book relevant geographically to the Project
QinetiQ and MCA	North Hoyle Radar Trials (MCA 2005)	Trials undertaken at the North Hoyle Wind Farm to study the impact of turbines upon marine communications and navigational equipment
British Wind Energy Association (BWEA), now Renewable UK (RUK)	Kentish Flats Radar Trials (RUK 2007)	A research project designed to obtain data on the effects of offshore wind farm structures on nearby vessel radar displays
Royal Yachting Association (RYA)	UK Coastal Atlas of Recreational Boating (RYA 2010)	Cruising routes used by recreational vessels

14.2.2 Data Validity

The Marine Traffic Survey data collected by the Ocean Discovery for the Original NRA met the requirements of the relevant guidance at the time, namely MGN 371, in terms of age, geographical coverage, and duration. There are no specific guidelines from the regulator as to time limits, or expiry dates of the other data sets.

This scoping exercise is based on the assumption that there have been no substantial changes to the baseline as considered in the Original NRA. However, as part of the Project EIA, each data source will be reviewed to confirm this is the case in order that any significant changes which may adversely affect the conclusions set out in this scoping report can be identified (noting that a greater worst case in terms of Development Area and number of turbines has already been considered in the Original ES). Where newer data is available, this will be used to validate the original baseline, with updates implemented as necessary

if any significant changes from the baseline are observed. This will ensure that the baseline characteristics considered for the Project ES are up to date).

It is noted that the current MCA guidance (MGN 543, replacing MGN 371) requires that marine traffic survey data be collected within a maximum of two years of the submission of an application for consent. As such, the data collected for the Original NRA would not fully satisfy the requirements of the current guidance. Consultation with the MCA will be undertaken as part of this scoping process to assess the validity of the existing traffic data with a view to establishing any additional requirements for the Project EIA.

14.2.3 Review of Baseline Characteristics

Chapter 17 of the Original ES presents the baseline characteristics for Shipping and Navigation receptors relevant to the Originally Consented Project. As part of the Project EIA, this section shall be reviewed and updated as necessary, based on any new information.

It is noted that updates are available to some of the data sources listed in Section 14.2.1, which will be reviewed as part of the Project EIA baseline review. The main available updates are summarised in Table 14-2 (note that marine traffic survey data was discussed in the previous section).

Table 14-2 Available Data Source Updates

Data Source	Original Project	Update
Fishing Overflight Surveillance Data	2005 to 2009	More recent data is available from Marine Scotland upon a freedom of information (FOI) request
Fishing Satellite Monitoring Data	2006 and 2008	More recent data is available from Marine Scotland upon a FOI request
MAIB Incident Data	2001 to 2010	Data available up to the end of 2014
RNLI Incident Data	2001 to 2010	Data available up to the end of 2014
Admiralty Charts	Most recently available at the time	2017
Admiralty Sailing Directions NP54	8th Edition 2009	10th Edition 2016

14.3 Design Envelope

Table 14-3 sets out the worst case scenario associated with the Development Area as defined by the EIA for the Originally Consented Project in terms of shipping and navigation, relative to the impacts presented in the Original ES, and compares it with the proposed worst case scenario to be considered in the Project. It is noted that impacts categorised as “broadly acceptable” under the FSA methodology and identified within the hazard identification stage of the Original EIA based on the worst case scenario have not been included in the table.

Table 14-3 Worst Case Scenario Definition – Shipping and Navigation

Potential Impact	Original Development Design Envelope	Project design envelope	Difference
Physical presence of Offshore Wind Farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure). *Receptors: commercial shipping, fishing vessels, recreational vessels*	Route deviations based on the Development Area (105 kilometres (km)^2)	Route deviations based on the Development Area (105 km^2)	No change.
	Allision risk assessment considered two worst case layout scenarios: ● Maximum number of turbines (128 locations, 125 of which will be constructed) ● Largest dimensions (15 x 15m, assuming 80 turbine locations, 75 of which will be constructed) Both layouts assumed four possible substation locations with a maximum of two to be constructed (each assumed to have dimensions of 50 x 50m)	Up to 56 turbines will be installed Maximum of two substations (approximately 30 x 30m)	Reduction in number of turbines. No change to the number of substations. Reduction in sea surface area of turbines.
Physical presence of Offshore Wind Farm structures and subsea cables, and presence of operation/maintenance vessels leading to an increase in the number of SAR incidents. In addition, passing vessels will deviate around structures leading to increased collision risk (vessel-to-vessel and vessel-to-structure). *Receptors: SAR resources*	Route deviations based on the Development Area (105 km^2)	Route deviations based on the Development Area (105 km^2)	No change.
	Allision risk assessment considered two worst case layout scenarios: • Maximum number of turbines (128 locations, 125 of which will be constructed) • Largest dimensions (15 x 15 m, assuming 80 turbine locations, 75 of which will be constructed) Both layouts assumed four possible substation locations with a maximum of two to be constructed (each assumed to have dimensions of 50 x 50m)	Up to 56 turbines will be installed Maximum of two substations (approximately 30 x 30m)	Reduction in number of turbines. Reduction in sea surface area of turbines.
	Array cables: Up to 15 circuits with up to 140 km of cable	Array cables: Up to 14 circuits with up to 140 km of cable	No change to design envelope.

Potential Impact	Original Development Design Envelope	Project design envelope	Difference
	Two Offshore Export Cables, 33km in length, buried up to 3m	Two Offshore Export Cables, 43 km in length, buried up to 3 m	Increase length of Offshore Export Cables.
Physical presence of Offshore Wind Farm structures causing radar interference to nearby traffic *Receptor: marine radar*	128 turbine locations, 125 of which will be constructed	Up to 56 turbines.	The decrease in turbine numbers is likely to result in a decrease in radar interference, however it should be noted that this is dependent on the final layout.
Physical presence of Offshore Wind Farm cables leading to a risk of hostile anchor interaction and vessel grounding *Receptor: commercial shipping*	Two Offshore Export Cables, 33 km in length, buried up to 3 m	Two Offshore Export Cables, 43 km in length, buried up to 3 m	Increase in Offshore Export Cable within the Wind Farm Area.
	Array cables: Up to 15 circuits with up to 140km of cable	Array cables: Up to 14 circuits with a total of up to 140 km of cable	No change
Physical presence of Offshore Wind Farm cables leading to a risk of fishing gear interaction (snagging) *Receptor: fishing vessels*	Two Offshore Export Cables, 33 km in length, buried up to 3 m	Two Offshore Export Cables, 43 km in length, buried up to 3 m	Increase in Offshore Export Cable within the Wind Farm Area.
	Array cables: Up to 15 circuits with up to 140 km of cable	Array cables: Up to 14 circuits with up to 140 km of cable	No change
Physical presence of Offshore Wind Farm cables leading to interference on small vessel navigation equipment *Receptor: recreational vessels*	Two Offshore Export Cables, 33 km in length, buried up to 3 m	Two Offshore Export Cables, 43 km in length, buried up to 3 m	Increase in Offshore Export Cable within the Wind Farm Area.
	Array cables: Up to 15 circuits with up to 140 km of cable	Array cables: Up to 14 circuits with a total of up to 140 km of cable	No change

14.4 Project Embedded Mitigation

The Original ES proposed a suite of mitigation measures relevant to shipping and navigation. Embedded mitigations measures which were required for the Project to successfully gain consent from a shipping and navigation perspective are detailed in Table 14-4. Each mitigation measure remains relevant to the Project, and as such will be included in the Project EIA as embedded mitigation where they remain relevant to the Project. Additional mitigation measures which are considered good industry practice and will be considered where appropriate in relation to the revised Project are detailed in

Table 14-5.

Table 14-4 Original Project Embedded Mitigation for Shipping and Navigation

Mitigation	Summary
Marked on Admiralty Charts	The Project will be charted by the UKHO using the magenta turbine tower chart symbol found in publication 'NP5011 -Symbols and Abbreviations used in Admiralty Charts'. The buried, subsea cables associated with the Project will also be charted on the appropriate scale charts. Offshore Offshore Export Cables will be charted by the UK Hydrographic Office on the appropriate scale charts and potential to note no anchorage areas over charted cables.
Information Circulation	Appropriate liaison to ensure information on the Offshore Wind Farm, Offshore Export Cable and special activities is circulated in Notice to Mariners (NtMs), Navigation Information Broadcasts and other appropriate media.
Lighting and Marking	The Project structures to be marked and lit in line with NLB and IALA (O-139) guidance. As per IALA, any lighting required for aeronautical purposes is to be shielded / arranged such that it is not visible to shipping.
Turbine Air Draught	Lowest point of rotor sweep at least 22 m above mean high water springs (MHWS) as per the MCA recommendation.
Cable protection (inter-array and export)	Cables will be protected appropriately taking into account fishing and anchoring practices. Positions of the cable routes notified to Kingfisher Information Services – Offshore Renewables Cable Awareness (KIS - ORCA) for inclusion in cable awareness charts and plotters for the fishing industry.
Compliance with relevant MCA Guidance[9] (MGN 543 and Annex 5)	Annex 5 specifies 'Standards and procedures for generator shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an OREI.'
Formulation of an Emergency Response Co-operation Plan as per MCA template	Creation of an ERCoP based on the MCA template and site Safety Management Systems (SMS), in consultation with the MCA.

[9] It is noted that the embedded mitigations given in the Original Project ES referenced the relevant guidance of the time, MGN 371. This has since been replaced by MGN 543.

Table 14-5. Additional mitigation measures that are considered good practice and will be considered in relation to the Project and applied where appropriate

Mitigation	Summary	Mitigation Type
Marine Control Centre	A Marine Control Centre will monitor vessel activity (AIS and non-AIS) by Closed Circuit Television (CCTV) and record the movements of ships around NNG as well as infield (company) vessels working at the Offshore Wind Farm. Possible errant vessels identified in construction areas or safety zones will be identified and contacted.	Best Practice
Subsea surveys of cables and burial depths	Periodic and planned surveys of cable routes to monitor burial depths/protection and seabed mobility (cable movement).	Best Practice
Safety zones and guard vessels	Construction safety zones of 500 m around major activities to exclude vessels not associated with the works from the offshore site. Guard vessels can be used to monitor passing traffic and contact vessels which could infringe the safety zones.	Best Practice

14.5 Consent Conditions Commitments

A number of conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 14-6 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of effects on shipping and navigation.

Table 14-6 Consent conditions for the Originally Consented Project relevant to Shipping and Navigation

Original Consent Requirement	Relevance to shipping and navigation
Description of the Development	Limits the impacts to no greater than the worst case scenario and therefore ensuring no greater effect can occur than that described through the EIA process.
In accordance with the ES	Requiring the Development to be constructed and operated in accordance with the terms of the Application including the Project ES (thereby ensuring no additional environmental impacts not previously considered can occur)
Construction Method Statement	Requires the final construction methods to be set out for approval to ensure that they remain consistent with the methods assessed in the Project ES and to ensure appropriate construction management taking into account mitigation measures to protect the environment and other users of the marine area.
Development Specification and Layout Plan	Setting out, for approval, the final design and layout of the Project to ensure it remains consistent with the design assessed in the ES as relevant to shipping and navigation.
Vessel Management Plan	Setting out, for approval, the number and types of vessels, vessel management practices, port and harbour locations, and transit routes relevant to the Project.
Navigational Safety Plan	Setting out, for approval, the navigational safety measures to mitigate navigational risk of other marine users operating in the area.
Cable Plan	Setting out, for approval, the location and installation methods for the cables (including

Original Consent Requirement	Relevance to shipping and navigation
	burial) to ensure they remain consistent with the installation process assessed in the ES and Addendum, as relevant to Shipping and Navigation.
Lighting and Marking Plan	Setting out, for approval, the navigational lighting strategy to be installed at the site to ensure safe marking of the structures and Development Area to mitigate the navigational risk to other marine users.
Navigational Safety (Construction)	Notify the UKHO prior to the commencement of construction to facilitate the promulgation of maritime safety information and updating of nautical charts and publications through the national Notice to Mariners System. Issue local Notice to Mariners to ensure local mariners, fishermen's organisations and HM coastguard are aware of the Licensable Marine Activity. Consult with local harbour masters as appropriate. Ensure that details of the works are promulgates in the Kingfisher Fortnightly Bulletin [KIS-ORCA], prior to the commencement of the works to inform the Sea Fish industry of vessel routes, timings and the locations of Project Activities.
Markings, lighting and signals of the Works	Ensure that the Project is lit in accordance with the requirements of the relevant statutory stakeholders including marking of the site with appropriate construction buoyage during construction and continued lighting of the site following completion of construction as required by the MCA and NLB.
Markings, lighting and signals of the Works	Ensure that any vessels engaging in the work are marked in accordance with the International Rules for the Prevention of Collisions at Sea if under way and in accordance with the UK Standard Marking Schedule for Offshore Installations if secured to the seabed.
Navigational Safety (Operation)	Ensure appropriate notifications are made following completion of the works to all relevant stakeholders including UKHO, the Maritime Rescue and Coordination Centre Aberdeen and all mariners and fishermen's organisations. Ensure appropriate notifications are made through the Kingfisher Fortnightly Bulletin to inform the Sea Fish Industry.
Markings, lighting and signals of the Works	Ensure that the Project is lit in accordance with the requirements of the relevant statutory stakeholders including marking of the site with appropriate construction buoyage during construction and continued lighting of the site following completion of construction as required by the MCA and NLB.

14.6 Scoping of the Project EIA

Table 14-7 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

Table 14-7 Summary of Potential Effects on Shipping and Navigation

Potential Impact	Receptor	Residual Impact Significance	Scoped In or Out	Justification
Construction				
Physical presence of Offshore Wind Farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Commercial shipping	Minor significance	Scoped out	The reduced size of the Project indicates it will have a lower or equal impact on commercial shipping as the Originally Consented Project. Given the mitigations in place during construction including the buoyed construction area this it is concluded that this effect be scoped out of further assessment in the Project EIA.
	Fishing vessels	Minor significance		
	Recreational vessels	Minor significance		
Operation & Maintenance				
Physical presence of Offshore Wind Farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure)	Commercial shipping	Moderate significance	Scoped In	Given the possibility for changes to the baseline shipping activity, it is proposed that further assessment of collision (both vessel-to-vessel and vessel-to-structure) is included in the Project EIA. It is noted that due to the reduced number of turbines, the vessel-to-structure collision risk is considered likely to be lower than that assessed in the Original ES but this cannot be confirmed without a traffic validation.
	Fishing vessels	Moderate significance	Scoped In	
	Recreational vessels	Minor significance	Scoped In	
Physical presence of Offshore Wind Farm structures and subsea cables, and presence of operation/maintenance vessels leading to an increase in the number of SAR incidents. In addition, passing vessels will deviate around structures leading to increased collision risk (vessel-to-vessel and vessel-to-structure).	SAR Resources	Minor significance	Scoped Out	Given the reduction in the number of turbines it is assumed that the number of vessels and personnel movements on site would also reduce, meaning that the impact would be equal or lower to that assessed. Therefore, further assessment should be scoped out of the Project EIA. It is assumed that additional mitigation measures already identified will be implemented.

Potential Impact	Receptor	Residual Impact Significance	Scoped In or Out	Justification
Physical presence of Offshore Wind Farm structures causing radar interference to nearby traffic	Marine Radar	Minor Significance (it is noted that no additional mitigation was considered necessary for this impact in the Original ES).	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.
Physical presence of Offshore Wind Farm cables leading to a risk of hostile anchor interaction and vessel grounding	Commercial Shipping	Not Significant	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA, given that it was originally assessed as Not Significant.
Physical presence of Offshore Wind Farm cables leading to a risk of fishing gear interaction (snagging)	Fishing Vessels	Minor Significance	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.
Physical presence of Offshore Wind Farm cables leading to interference on small vessel navigation equipment	Recreational Vessels	Not Significant	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.

14.6.1 Scoping of Cumulative Impacts Assessment

The Original ES considered cumulative impacts from local developments only, namely the Inch Cape and Seagreen wind farms. It is noted that a development can impact upon a vessel route beyond its immediate geographical area, however as no specific information was available at the time of the original ES, the assessment was localised.

Major ports within the Forth were also considered cumulatively, however it was determined that any impacts would be linked to the associated traffic movements rather than port functions (e.g., pilot boarding), as the Forth Ports limit is 8nm to the west. Any impacts arising were therefore covered in the vessel routeing assessment. Consultation with the Forth Ports identified proposals for three biomass plants within the Firth of Forth and Tay Region, however these were not considered due to a lack of information at the time. The current understanding is that these plans will not be going ahead.

It is noted that since the cumulative assessment conducted as part of the Original NRA, there have been no increases to the development areas of wind farms in close proximity to NNG, and it is therefore assumed that the worst case has already been assessed.

Taking the above into account, the following projects will be considered for the Project cumulative assessment:

- Inch Cape Offshore Wind Farm (as consented and as scoped);
- Seagreen Alpha and Bravo (as consented and as scoped);
- Kincardine Offshore Wind Farm (as consented parameters);
- European Offshore Wind Deployment Centre (EOWDC) (as built);
- Hywind Pilot Park (as consented parameters);
- Blyth Offshore Demonstrator Wind Farm (as consented parameters considered); and
- Beatrice Offshore Wind Farm (as detailed in project Consent Plans);
- Moray Offshore Round 3 Zone Telford, Stevenson, and MacColl Offshore Wind Farms (as consented parameters considered); and,
- Moray Western Development Area (as planned).

Table 14-8 summarises the expected post-mitigation significance of all cumulative effects considered in the Original ES. Where it is considered appropriate to scope out a cumulative effect at this stage, justification has been included in the table.

Table 14-8 Summary of Potential Effects on Shipping and Navigation – Project with Other Plans, Projects and Activities

Potential Impact	Receptor	Residual Impact Significance	Scoped in	Justification
Physical presence of Offshore Wind Farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Commercial shipping	Moderate significance	Scoped In	Given the possibility for changes to the baseline for shipping activity and for the cumulative developments, it is proposed that further assessment of collision (both vessel-to-vessel and vessel-to-structure) is included in the Project EIA. It is noted that due to the reduced number of turbines, the vessel-to-structure collision risk is considered likely to be lower than that assessed in the Original Project EIA but cannot be confirmed without a traffic validation.
	Fishing Vessels	Minor significance		
	Recreational Vessels	Minor significance		
Physical presence of Offshore Wind Farm structures and subsea cables leading to a depletion of SAR Resources	SAR Resources	Not significant	Scoped Out	Given the reduction in the number of turbine structures it is assumed that during the construction phase, the number of vessels and personnel movements on site would also reduce, meaning that the impact would be equal or lower to that assessed. Similarly, any impact during the operational phase will also be equal to or less than that originally assessed. Therefore, as this impact was considered to be Not Significant in the Original ES, it has been scoped out.

Potential Impact	Receptor	Residual Impact Significance	Scoped in	Justification
Physical presence of Offshore Wind Farm structures causing radar interference to nearby traffic	Marine Radar	Moderate Significance	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.
Physical presence of Offshore Wind Farm cables leading to a risk of hostile anchor interaction and vessel grounding	Commercial Shipping	Not Significant	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.
Physical presence of Offshore Wind Farm cables leading to a risk of fishing gear interaction (snagging)	Fishing Vessels	Minor Significance	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.
Physical presence of Offshore Wind Farm cables leading to interference on small vessel navigation equipment	Recreational Vessels	Not Significant	Scoped Out	It is not expected that changes to the design envelope would have significant effect upon this impact, and it should therefore be scoped out of the Project EIA.

During the scoping exercise for the Original EIA in-combination effects resulting from ports and other offshore operations were scoped out of the Original EIA on the basis that they were considered as part of the Shipping and Navigation baseline. The same approach is proposed for the Project EIA and no further in-combination effects will be considered in relation to these other activities.

14.7 Approach to EIA

Based on the EIA for the Originally Consented Project and considering the design envelope for the Project by comparison, it is concluded that the impacts should not increase from those set out in the Original ES.

However, given the change in regulator guidance (MGN 371 to MGN 543; see Section 14.7.1) and the potential for variations in shipping patterns when compared to the baseline presented in the Original NRA, it is proposed that an updated shipping and navigation assessment (traffic validation) be undertaken as part of the Project ES for those elements scoped in (see Section 14.6).

Should the traffic validation identify any significant changes, the production of a new NRA will be considered, in consultation with the MCA and in line with the approach set out in the following sections.

If the traffic validation exercises confirms that there has been no significant changes in shipping activity then the NRA for the Originally Consented Project will be used to inform the Project EIA.

14.7.1 Guidance and Legislation

The key guidance document used to inform the Original ES was Maritime Coastguard Agency (MCA) Marine Guidance Note (MGN) 371 (MCA 2008a). This document has since been replaced by MGN 543 (MCA 2016). It is noted that a post consent requirement will be for the Project to meet the requirements set out in MGN 543 including design of the Offshore Wind Farm and structures. This will be considered in the Project EIA.

Other key guidance documents used to inform the Original Project NRA are listed below.

- Department of Energy and Climate Change (DECC, 2005) – Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (note that this document was updated and now referenced MCA, 2015);
- International Association of Lighthouse Authorities (IALA) Recommendations O-139 (The Marking of Man-Made Offshore Structures, Edition 1) (IALA, 2008) (note that this document was updated in 2013);
- International Maritime Organisation (IMO, 2002) Guidelines for Formal Safety Assessment (FSA);
- MGN 372 (M+F) Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008); and
- Department for Business Energy and industrial Strategy BEIS (2011) - Guidance Notes: Applying for Safety Zones around Offshore Renewable Energy Installations.

14.7.2 Methodology for Shipping and Navigation

A marine traffic validation study along with desk-based research, and consultation undertaken as part of the Original Project EIA to establish the baseline assessment, allowed for the identification of impacts requiring further mitigation. As part of the Project EIA, a Formal Safety Assessment (FSA) will be undertaken in line with the IMO FSA Process (IMO, 2002).

The impact assessment will review and update the following sections of the FSA process undertaken for the Original Project NRA:

- Hazard log and ranking;
- Quantified navigational risk assessment for selected hazards;
- Base case and future case risk levels associated with certain hazards;
- Emergency response review; and
- Assessment of mitigation measures (updated to include all current, embedded mitigation).

A new hazard workshop is not considered necessary, as no changes to the initially identified hazards are anticipated.

14.7.3 Environmental Impact Assessment Methodology

The original NRA and subsequent FSA process were used to inform the EIA for the Originally Consented Project and will be similarly applied to the assessment of the Project. The assessment will consider effects on shipping and navigation, considering the nature, duration, magnitude and significance of the potential effects arising from the Wind Farm and OfTW during both construction and operational phases to the extent scoped into the assessment process. The definitions of vulnerability and magnitude that will be applied during this assessment process are described below.

14.7.4 Sensitivity/Vulnerability

A shipping and navigation receptor can only be sensitive if there is a pathway through which an effect can be transmitted between the source activity and the receptor (it is noted that as per the Original ES, the term "sensitivity" will be used in this chapter in place of "vulnerability", in line with the commonly used shipping and navigation terminology). When a receptor is exposed to an effect, the overall sensitivity of the receptor is determined and the process incorporates a degree of subjectivity. Sensitivity assessments for shipping and navigation receptors will use the following baseline data, along with expert opinion:

- Outputs of the previously held hazard workshop;
- Level of stakeholder concern;
- Time and/or distance of deviation;
- Number of transits of specific vessel and/or vessel type; and
- Lessons learnt from existing offshore wind developments.

The definitions of sensitivity to be used in the Project EIA are given in Table 14-9.

Table 14-9 Definition of terms relating to Shipping and Navigation Effect Sensitivity

Sensitivity	Definition
High	Feature of international importance e.g., IMO Routeing Measure such as a Traffic Separation Scheme (TSS) or Deep Water Route (DWR).
Moderate	Feature of national importance, e.g., busy shipping lanes and port approach routes/channels, such as Firth of Forth and River Tay, used by a range of ships, including medium/large size vessels.
Minor	Feature of local or regional importance, i.e., notable navigable channels used by small to medium sized vessels, such as coastal routes east/west of Bell Rock and off the Fife coast.
Negligible	Negligible impact in terms of shipping and navigation.

14.7.5 Magnitude

Determining the overall magnitude of shipping and navigation effects is a process based on expert opinion and professional judgement in combination with baseline data and assessments already undertaken in the Original NRA including:

- Consultation feedback from stakeholders and regular operators;
- Outputs of the previously held hazard workshop;
- Lessons learnt or research from previous developments especially effects associated with navigation and communication, where physical modelling is not available;
- Results of collision risk modelling in comparison with UK averages; and
- Analysis of baseline data where low confidence in data availability or clear evidence of effect (i.e., deviations) have been identified.

When assessing the magnitude of an effect, the geographical extent, the duration and the frequency of occurrence will all be considered.

The definitions of magnitude to be used in the Project EIA are given in Table 14-10.

Table 14-10 Definition of terms relating to Shipping and Navigation Effect Magnitude

Sensitivity	Definition
High	Total loss or very major alteration to internationally important shipping lanes, i.e., IMO routeing measures.
Moderate	Major alteration or loss of strategically important shipping lanes and navigational port approaches, i.e., shipping routes used by vessels headed in/out of Firth of Forth and River Tay.
Minor	Minor shift from baseline conditions leading to a partial loss or alteration to lower use navigable routes from baseline conditions, i.e., shipping routes and channels used by small and medium sized vessels using coastal routes.
Negligible	Very slight change from baseline shipping and navigation routeing.

14.7.6 Significance

Based on the potential magnitude of effect on shipping and navigation and the importance of the receptor (i.e., the vulnerability), the potential impacts on shipping and navigation will be predicted by applying the following significance terminology:

- **Not significant**: Impacts that are slight and negligible in terms of vessel navigation, collision risk and response to marine incidents;
- **Minor significance**: Impacts which are of generally small magnitude in terms of vessel navigation (e.g. minor deviation of small to medium sized vessels on local or regionally important routes), collision risk and response to marine incidents;
- **Moderate significance**: Impacts which are considered to be moderate in magnitude in terms of vessel navigation (e.g. moderate deviation on nationally important routes), collision risk and response to marine incidents; or
- **Major significance**: Impacts which are of greater magnitude, in terms of vessel navigation (e.g. large deviations on internationally important routes or loss of IMO routeing measures), collision risk and response to marine incidents.

14.8 Scoping Questions

- Do you agree that should a traffic validation exercise against recent AIS data confirm that there has been no significant change in the Shipping and Navigation baseline that the NRA for the Original EIA remains valid?
- Do you agree that if the NRA remains representative of the baseline then the conclusions of the Original EIA remain valid?
- Do you agree that the embedded mitigation from the Originally Consented Project and additional measures detailed in the S36 consent and marine licences are appropriate to the potential level of effect from the Project?

- Do you agree that the EIA should only focus on those receptors considered to be significantly affected by the Project?
- Do you agree that the Shipping and Navigation receptors, as detailed in Table 14-7 and Table 14-8, be scoped out of the Project EIA where appropriate?
- Do you agree that the embedded mitigation from the Originally Consented Project and additional measures detailed in the S36 consent and marine licences are appropriate to the potential level of effect from the Project?
- Do you agree with the list of Projects to be scoped in to the Shipping and Navigation CIA for the Project EIA?

14.9 References – Shipping and Navigation

Anatec (2012). Navigation Risk Assessment, Neart na Gaoithe Offshore Wind Farm. Aberdeen. March 2012.

BEIS (2011). Guidance Notes: Applying for Safety Zones around Offshore Renewable Energy Installations. 2011.

Department of Energy and Climate Change (DECC, 2005) – Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (note that this document was updated and now referenced MCA, 2015);

IMO (2002). Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule Making Process. London: International Maritime Organisation (IMO).

IALA (2008). 0-139 the Marking of Man-Made Offshore Structures. Edition 1 . Saint Germain en Laye, France: Internal Association of Marine Aids to Navigation and Light House Authorities.

IALA (2013). 0-139 the Marking of Man-Made Offshore Structures. Edition 2 . Saint Germain en Laye, France: Internal Association of Marine Aids to Navigation and Light House Authorities.

MCA (2008). Marine Guidance Note 372 (M+F) Guidance to Mariners Operating in the Vicinity of UK OREIs.

MCA (2016). Marine Guidance Notice 543, Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues. London: MCA.

RYA (2010). UK Coastal Atlas of Recreational Boating. 2010.

UKHO (2009). Admiralty Sailing Directions – North Sea (West) Pilot NP54. Eighth Edition. Taunton: UKHO.

UKHO (2016). Admiralty Sailing Directions – North Sea (West) Pilot NP54. Tenth Edition. Taunton: UKHO.

15 Military, Civil Aviation and Telecommunications

15.1 Introduction

This section confirms the civil and military aviation receptors of relevance to the Project, and considers the potential effects resulting from construction, operation and maintenance and decommissioning (including effects on radio and telecommunications systems).

Consideration is given to the proximity to operations of civil airports, the types of radar operating over the Development Area, civil aviation agencies including National Air Traffic Services (NATS) who is the main en-route air navigation services provider in the UK, offshore helicopter operations and relevant Ministry of Defence (MOD) operations.

Reference is made to the baseline data gathered to inform the Environmental Impact Assessment (EIA) of the Originally Consented Project, and to the outcomes of impact assessment presented in the Original Environmental Statement (ES).

15.2 Baseline Data

Aviation process datasets were collated and analysed to inform the EIA for the Originally Consented Project. A detailed literature review was completed to determine the baseline for Aviation to inform the Original EIA. The datasets considered to be relevant to the Project are listed in Table 15-1.

Table 15-1. Baseline data sources from the Original EIA – Military and Aviation and radio and telecommunications

Data Source	Study/Data Name	Study Overview
Site-specific surveys		
NnGOWL	Radar and Aviation Technical Assessment (Qinetiq, 2012)	Technical report detailing the radar, aviation and telecommunications baseline and assessment of effects.
NnGOWL	Aviation Lighting and Marking Requirements (Aardvark, 2012)	Detail of the propose light and marking strategy for the operational phase of the Offshore Wind Farm.
Literature Review Sources		

Data Source	Study/Data Name	Study Overview
Civil Aviation Publication (CAP) 764	Civil Aviation Authority (CAA) Policy and Guidelines on Wind Turbines (CAA, 2016a)[10]	Provides assistance to aviation stakeholders to help understand and address wind energy related issues, thereby ensuring greater consistency in the consideration of the potential impact of proposed wind farm developments.
CAP 670[11]	Air Traffic Services Safety Requirements (CAA, 2014b)	Sets out the safety regulatory framework and requirements associated with the provision of an air traffic service.
CAP 393	The Air Navigation Order 2016 and Regulations (CAA, 2016b)[12]	Sets out the provisions of the Air Navigation Order as amended together with regulations made under the Order. It is prepared for those concerned with day to day matters relating to air navigation that require an up to date version of the air navigation regulations and is edited by the Legal Advisers Department of the CAA. CAP 393 also includes application of lighting to turbines in UK territorial waters.
CAP 437[13]	Standards for Offshore Helicopter Landing Areas (CAA, 2016c)	Guidance on Standards provides the criteria applied by the CAA in assessing helicopter landing areas for worldwide use by helicopters registered in the UK. It includes design of winching area arrangements located on turbine platforms to represent current best practice.
Department of Trade and Industry (DTI)	Existing users and management initiatives relevant to SEA 5, Final Report (DTI, 2004)	The description of UK coastal users.
British Broadcasting Corporation (BBC)	UK television transmitters (BBC, 2011)	UK radio and television transmitter information.

[10] NB. At the time of the Original ES this would have been the 2009 edition

[11] NB. CAP670 was not included in the baseline for the Original ES, it is included here for completeness

[12] NB. At the time of the Original ES this would have been the 2010 edition

[13] NB. CAP437 was not included in the baseline for the Original ES, it is included here for completeness

Data Source	Study/Data Name	Study Overview
Digital One **Digital UK**	DAB Digital Radio Scottish transmitter information. (Digital One, 2011) Digital television switchover information (DigitalUK, 2011)	Digital audio broadcasting (DAB) transmitter databases.
Forth Ports	Forth Ports radar service description. (Forth Ports, 2011)	Vessel Traffic Services (VTS) description.
United Kingdom Hydrographic Organisation (UKHO)	Admiralty chart, Firth of Forth – Isle of May to Inchkeith, edition 3 (UKHO, 2002) Admiralty charts and publications, admiralty notices to mariners, section 2, weekly edition 12 (UKHO, 2004)	Firth of Forth admiralty charts.
LORAN-Europe	European LORAN-C network description. (LORAN-C, 2011)	Long range navigation (LORAN) network description
Met Office	National Meteorological Library and Archive, Fact Sheet 15 – Weather Radar (Met Office, 2011)	List of locations of UK meteorological radars
Ofcom	Sitefinder mobile phone base station database (Ofcom, 2011)	Mobile phone base station database.

Other data sources and guidance considered under a desktop review of the baseline environment definition include the following:

- CAA Visual Flight Rules Chart (CAA, 2016d).
- Military Aeronautical Information Publication (Mil AIP) (MOD, 2017).
- MOD United Kingdom (UK) Low-Flying System (UKLFS) Priority Areas Map (MOD, 2011).
- CAA, CAP 32 UK Integrated Aeronautical Information Package (UKIAIP). The UK IAIP is the main resource for information and flight procedures at all licensed UK airports as well as airspace, en-route procedures, charts and other air navigation information (NATS, 2017).
- Maritime and Coastguard Agency (MCA) MGN 543: Safety of Navigation Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016) contains information for operators and developers in formulating their emergency response plans and site safety management.
- Meteorological (Met) Office guidelines for wind farm developers: meteorological radar and other technical sites used for meteorology (Met Office, 2012).

15.2.1 Data Validity

NnGOWL, on the advice of their technical consultants, is of the opinion that the data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections demonstrate the adequacy of the available data in relation to spatial coverage and age. Spatial Coverage of Baseline Data

15.2.1.1 Data Spatial Coverage

The location and extent of the Development Area will cover the same portion of airspace assessed within the Original ES; therefore, it is considered that the spatial coverage of the original data describing the aviation environment remain valid for the Development Area in terms of spatial coverage.

15.2.1.2 Age of the Data

For the Originally Consented Project EIA, identification of receptors was based upon a desktop study of publicly available aeronautical documentation and aviation charts which are fully described within the Original ES Chapter 18 and supporting technical studies (NnGOWL, 2012).

NnGOWL consulted a number of aviation stakeholders to inform the Original ES and a number of consultees and receptors were scoped out from the consultation process as they were outwith the specified CAA consultation zones or criteria as detailed in the Civil Aviation Publication (CAP) 764: Policy and Guidelines on Wind Turbines (CAA, 2016a)[14]. Although the guidance documents have been updated since the analysis was completed for the Original Application; updates have not altered aviation baseline to an extent that additional receptors to those in the Original ES Chapter are required to be considered. Therefore, the data previously collected as part of the EIA for the Originally Consented Project is considered sufficient to effectively characterise the current baseline conditions within the Development Area.

No significant changes to airspace classification and operational use of airspace have occurred since the analysis was completed for the Original ES. Commentary is provided on the sufficiency of the baseline data as a basis for scoping the Project EIA.

The telecommunications infrastructure and locations remain the same as described in the Original ES with no further installation of masts or transmitters identified that would be affected by the Development Area.

Military practice and exercise areas were identified within the Forth and Tay region however these are no longer visible on Marine Scotland's planning portal. Nonetheless for the purposes of this Scoping Report it is assumed that these remain active (Marine Scotland, 2017).

15.3 Design Envelope

Table 15-2 sets out the worst case scenario defined by the EIA for the Originally Consented Project for Aviation (NnGOWL, 2012) compared to the proposed worst case scenario for the Project at a level of detail

[14] NB. At the time of the Original ES this would have been the 2009 edition

sufficient to draw conclusions in relation to the scoping process. The table also identifies the differences between the two design envelopes.

Effects on aviation and radar will be a consequence of the presence of the turbines once installed. No additional effects were identified in the Original ES during Operation and Maintenance. In line with this approach the effects and design envelope parameters detailed in Table 15-2 for all Project phases are considered simultaneously.

Table 15-2 Worst case Scenario Definition – Military and Aviation, radio and telecommunications

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction, Operation and Maintenance and Decommissioning Phases			
Military and Aviation			
Increase in risk due to clutter resulting from reflected turbine signals and Reduced detectability of aircraft resulting from shadowing behind turbines – Leuchars Station Primary Surveillance Radar (PSR)	The Original EIA considered four potential scenarios against each potential effect: ● 125 turbines with a maximum tip height of 175 m; ● 109 turbines with a maximum tip height of 171.25 m; ● 75 turbines with a maximum tip height of 175.5 m; ● 64 turbines with a maximum tip height of 197 m	Maximum spread of turbines will be based on 56 structures. Possible increase in maximum blade tip height up to approximately 230m. To be confirmed in ES.	Reduction in number of structures. Possible increase in the maximum blade tip height.
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **Leuchars Station Precision Approach Radar (PAR)**			
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **NATS En-route Ltd (NERL) Allanshill and Perwinnes PSR systems.** **Note: Aberdeen Airport utilizes radar data from these two systems in the provision of Air Traffic Services (ATS) to aircraft.**			
Increase in risk due to clutter resulting from reflected turbine signals and Reduced detectability of aircraft resulting from shadowing behind turbines – RAF Brizlee Wood and Buchan Air			

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Defence Radar (ADR) systems			
Increased meteorological radar clutter resulting in impacts on Quality of meteorological data			
Construction activities and structures reducing positional accuracy of Secondary Surveillance Radar (SSR)			
Physical obstruction and increased risk of collision around airfields			
Effects on Military Low Flying Aircraft resulting from increased collision risk			
Effects on activities carried out in military Practice and Exercise Areas (PEXAs)			
Search and Rescue (SAR) Flight Operations			
Radio and Telecommunications			
Effects on quality/interference of VHF communications	As detailed above in relation to effects on radar.	As detailed above in relation to effects on radar.	As detailed above in relation to effects on radar.
Effects on RACONs due to reflection from turbines			
Reduction or loss of Automatic Information Services (AIS)			
Reduction in positional accuracy of Loran	As detailed above in relation to effects on radar.	As detailed above in relation to effects on radar.	As detailed above in relation to effects on radar.
Interference resulting in reduction in positional accuracy of GPS			
Interference increasing difficulty in locating distress beacons/SARTs			

Potential Effect	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Reduction in bearing estimation accuracy			
Reduction/loss in coverage of mobile phone signals			
Reduction/loss in coverage of satellite phone signals			
Reduction/loss in picture of TV signals			
Reduction/loss in signal of public radio			
Intermittent or incomplete loss of data associated with Line-of-Sight links.			

15.4 Embedded Mitigation

A range of Embedded Mitigation measures to minimise effects on military and civil aviation were captured within the design envelope for the Original Application and would equally apply to the Project, as follows:

- Change of airspace regulations by designating area over the Offshore Wind Farm as a Transponder Mandatory Zone (TMZ) thus requiring aircraft to be equipped with and operate transponders; or
- Installation of a long-term infill radar system, either using a single onshore system or multiple offshore system.

Additional mitigation as required by current guidelines will also be implemented in agreement with the appropriate stakeholders. Guidelines to be considered include:

- CAP 393: The Air Navigation Order 2016 and Regulations Article 223 (CAA, 2016b) sets out the mandatory requirements for lighting of offshore wind turbines.
  - Legislation requires the fitting of obstacle lighting on offshore turbines with a height of 60 m or more above the level of the sea at the highest astronomical tide;
  - Where four or more turbines are located together in the same group, with the permission of the CAA, only those on the periphery of the group need to be fitted with at least one medium intensity steady red light positioned as close as reasonably practicable to the top of the fixed structure;
  - The obstruction light or lights must be fitted to show when displayed in all directions without interruption. The requirements of the angle of the plane of the beam and peak intensity levels are defined within CAP 393 (CAA, 2016b).
- CAP 437: Standards for Offshore Helicopter Landing Areas (CAA, 2016c) sets out a procedure to indicate to a helicopter operator that the turbine blades and nacelle are safely secured in position prior to helicopter hoist operations commencing.

- CAP 437 states that this is best achieved through the provision of a helihoist status light located on the nacelle of the turbine within the pilot's field of view, which is capable of being operated remotely and from the platform itself or from within the nacelle.
- A steady green light is displayed to indicate to the pilot that the turbine blades and nacelle are secure and it is safe to operate. A flashing green light is displayed to indicate that the turbine is in a state of preparation to accept hoist operations or, when displayed during hoist operations, that parameters are moving out of limits. When the light is extinguished this indicates to the operator that it is not safe to conduct helicopter hoist operations.
- Obstruction lighting in the vicinity of the winching area that has the potential to cause glare or dazzle to the pilot, or to a helicopter hoist operations crew member, should be switched off prior to, and during, helicopter hoist operations.

- Information will be circulated to relevant military and aviation stakeholders including NATS, MOD, and RenewableUK. Information on potential aviation obstructions will be promulgated within the UK IAIP and notified to the Defence Geographic Centre (DGC) for marking on aeronautical related charts and documentation.
- An Emergency Response Co-operation Plan (ERCoP) will be in place for the construction, operation and decommissioning phases of the Project.
  - The ERCoP will be completed initially in discussion between the developer and the MCA, Search and Rescue and Navigation Safety Branches. Detailed completion of the plan will then be in cooperation with the Coastguard Operations Centre (CGOC) responsible for maritime emergency response in the Development Area. The ERCoP will then be submitted to and approved by the MCA.
  - The ERCoP will detail specific marking and lighting of the turbines. The SAR helicopter bases will be supplied with an accurate chart of the turbine Global Positioning System (GPS) and will provide agreed SAR access lanes, helicopter access positions and spacing between turbines. Furthermore, the arrangements of liaison between NnGOWL and HM Coastguard in the event of an emergency response will be detailed together with an explanation of procedures and processes carried out at the Project control centre to shut down the turbines and the procedures for the CGOC to request this.

15.5 Consent Condition Commitments

A number of consent conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 15-3 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of effects on military and civil aviation.

Table 15-3. Consent conditions for the Originally Consented Project relevant to military and civil aviation

Original Consent Requirement	Relevance to Military and Civil Aviation
Lighting and Marking	Setting out for approval, the final lighting and marking of structures to ensure aviation

Original Consent Requirement	Relevance to Military and Civil Aviation
Plan	safety at the Offshore Wind Farm.
Air Traffic Control Mitigation Scheme (ATC Scheme)	Setting out, for approval, an ATC scheme to mitigate the adverse impacts of the Project on the air traffic control radar at Leuchars Station and the operations of the MOD.
Provision of Turbines and Construction Equipment above 150m LAT	Provide the positions and maximum heights of the turbines and construction equipment above 150m LAT and any offshore substation platform to the United Kingdom Hydrographic Office (UKHO) for aviation and nautical charting purposes to ensure aviation and navigational safety.

15.6 Scoping of the Project EIA

The Project has the potential to affect a number of additional civil and military aviation receptor groups as the airspace above and around the Project are used by both civil and military aircraft, which are tracked by radar systems operated by NATS and the MOD. The potential for impact to a radar system is a function of the radar's operational range, any blocking terrain between the radar and the Project and the operational requirements of the users of the radar system. Table 15-4 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification.

Table 15-4 Summary of potential effects on Military and Civil Aviation.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction			
Military and Aviation			
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **Leuchars Station Primary Surveillance Radar (PSR)**	Not Significant	Scoped Out	During construction, and prior to commissioning turbines blades will not be rotational. As a result the infrastructure will not be processed and presented onto Radar Data Display Systems (RDDS) by the radar. Therefore, there will be no impacts on radar systems during the construction phase. Agreed mitigation for the operational phase will be maintained until the last turbine is non-operational.
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **Leuchars Station Precision Approach**	Not Significant	Scoped Out	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Radar (PAR)			
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **NATS En-route Ltd (NERL) Allanshill and Perwinnes PSR systems.** **Includes utilization of data from these systems by Aberdeen Airport**	Not Significant	Scoped Out.	
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **RAF Brizlee Wood and RAF Buchan Air Defence Radar (ADR) systems**	Not Significant	Scoped Out.	
Increased meteorological radar clutter resulting in impacts on Quality of meteorological data	Not Significant	Scoped Out.	The UK Met Office recommends that no turbines be constructed within 5 kilometres (km) of a Weather Radar system and that an impact assessment is completed for turbines within 20 km of a system. The Project is closest to the Munduff Hill Weather Radar in Fife, located 61 km west of the Project.
Construction activities and structures impacting accuracy of Civil and Military Secondary Surveillance Radar (SSR) systems	Not Significant	Scoped Out.	Turbine effects on SSR can be caused due to the physical blanking and diffracting effects of the turbine towers depending on the size of the turbines and the Offshore Wind Farm, and that these effects are only a consideration when turbines are located within 10 km of an SSR installation. No SSR facilities are within 10 km of the Project boundary and are therefore no effect on SSR operations is expected.
Physical obstruction and increased risk of collision around airfields	Not significant	Scoped Out	During the construction and decommissioning of the Offshore Wind Farm, the presence and movement of certain construction vessels (e.g. tall cranes) may present a potential collision risk to aircraft and helicopter flight operations conducting

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
			SAR operations. Embedded mitigation and notification of construction and decommissioning of the Offshore Wind Farm and the lighting and promulgation on aviation charts will reduce any obstruction risk to flight operations and military low flying aircraft.
Effects on Military Low Flying Aircraft resulting from increased collision risk	Not Significant	Scoped Out	The Project is not in an area of priority with regard to the effects of wind energy development on military low flying operations. It is considered that the MOD is therefore unlikely to raise concerns with regard to military Low Flying activities with turbines.
Effects on activities carried out in military Practice and Exercise Areas (PEXAs)	Not Significant	Scoped Out	Temporary Reserved Area (TRA) 007A is directly above the Project Area active from Flight Level (FL) 195 (approximately 19,500 feet (ft)) up to FL 240. Activity is supported by the provision of radar services that utilise data from the Brizlee Wood and Buchan ADR systems and the Leuchars Station PSR. These systems will not be affected during the construction phase (see above in this table).
Search and Rescue (SAR) Flight Operations	Not Significant	Scoped Out	During the construction and decommissioning of the Offshore Wind Farm, the presence and movement of certain construction vessels (e.g. tall cranes) may present a potential collision risk to aircraft and helicopter flight operations conducting SAR operations. However, when on an operational mission, SAR helicopters are not constrained by the normal rules of the air, operating in accordance with their Aircraft Operator Certificate (AOC). This allows pilots total flexibility to manoeuvre using their best judgement thus making them highly adaptable to any environment in which they operate. Embedded mitigation and notification of

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
			construction and decommissioning of the Offshore Wind Farm and the lighting and promulgation on aviation charts will reduce any obstruction risk to SAR operations. Reduction in turbine numbers within the Project design envelope will reduce and compress the construction programme and surface vessel movements.
Radio and Telecommunications			
Effects on quality/interference of VHF communications	Minor Significant	Scoped Out	The Original EIA predicted that effects on telecommunications receptors would be not significant or minor significant. Based on the proximity to known transmitters and the reduced scale of the Project it is predicted that any effects would be no greater and likely less than those reported in the Original ES. Therefore, it is proposed that further assessment on telecommunications receptors be scoped out of further assessment in the Project EIA.
Effects on RACONs due to reflection from turbines	Not Significant	Scoped Out	
Reduction or loss of Automatic Information Services (AIS)	Minor Significant	Scoped Out	
Reduction in positional accuracy of Loran	Minor Significant	Scoped Out	
Interference resulting in reduction in positional accuracy of GPS	Minor Significant	Scoped Out	
Interference increasing difficulty in locating distress beacons/SARTs	Minor Significant	Scoped Out	
Reduction in bearing estimation accuracy	Minor Significant	Scoped Out	
Reduction/loss in coverage of mobile phone signals	Minor Significant	Scoped Out	
Reduction/loss in coverage of satellite phone signals	Minor Significant	Scoped Out	
Reduction/loss in picture of TV signals	Minor Significant	Scoped Out	
Reduction/loss in signal of public radio	Minor Significant	Scoped Out	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Intermittent or incomplete loss of data associated with Line-of-Sight links.	Not Significant	Scoped Out	
Operation and Maintenance			
Military and Aviation			
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **Leuchars Station Primary Surveillance Radar (PSR)**	Not Significant	Scoped Out	An increase in turbine blade tip height would produce similar impacts to those identified in the Original ES. NnGOWL is currently in consultation with the MOD to develop an ATC radar mitigation scheme. Additionally, the CAA have provided regulatory approval, and the MOD have agreed, to a transponder mandatory zone (TMZ) to cover the Wind Farm Area which will mitigate the effect of the Project on the Leuchars Station PSR. It is therefore proposed that this effect be scoped out of the Project EIA.
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **Leuchars Station Precision Approach Radar (PAR)**	Not Significant	Scoped Out	NnGOWL has committed to ensuring that no turbines will be built within the PAR safeguarded zone.
Increased meteorological radar clutter resulting in impacts on Quality of meteorological data	Not Significant	Scoped Out	The UK Met Office recommends that no turbines be constructed within 5 kilometres (km) of a Weather Radar system and that an impact assessment is completed for turbines within 20 km of a system. The Project is closest to the Munduff Hill Weather Radar in Fife, located 61 km west of the Project.
Construction activities and structures impacting accuracy of Civil and Military Secondary Surveillance Radar (SSR) systems	Not Significant	Scoped Out.	Turbine effects on SSR can be caused due to the physical blanking and diffracting effects of the turbine towers depending on the size of the turbines and the Offshore Wind Farm, and that these effects are only a

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
			consideration when turbines are located within 10 km of an SSR installation. No SSR facilities are within 10 km of the Project boundary and are therefore no effect on SSR operations is expected.
Physical obstruction and increased risk of collision around airfields	Not significant	Scoped Out	During the Operation Phase the presence and movement of certain construction vessels (e.g. tall cranes) may present a potential collision risk to aircraft Embedded mitigation and notification of construction and decommissioning of the Offshore Wind Farm and the lighting and promulgation on aviation charts will reduce any obstruction risk to flight operations and military low flying aircraft. Reduction in turbine numbers within the Project envelope will reduce surface vessel movements.
Effects on Military Low Flying Aircraft resulting from increased collision risk	Not Significant	Scoped Out	The Project is not in an area of priority with regard to the effects of wind energy development on military low flying operations. It is considered that the MOD is therefore unlikely to raise concerns with regard to military Low Flying activities with turbines within the Project boundary.
Effects on activities carried out in military PEXAs	Minor significance	Scoped In	Detectability of the Project by the Brizlee Wood and Buchan ADR systems in addition to the Leuchars Station PSR might affect the provision of ATS to aircraft operating in TRA 007A.
Search and Rescue (SAR) Flight Operations	Minor significance	Scoped Out	The Project may present a physical obstruction and affect SAR aircraft operations. However, when on an operational mission, SAR helicopters are not constrained by the normal rules of the air, operating in accordance with their Aircraft Operator Certificate (AOC). This allows pilots total flexibility to manoeuvre using their best judgement thus making them highly adaptable to any environment in which they operate.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
			Embedded mitigation as discussed in the Construction phase relating to SAR Flight operations are considered also relevant during the Operation Phase.
Use of helicopters for operation and maintenance of the Offshore Wind Farm	Not Assessed	Scoped In	The presence of helicopters in the vicinity of the Offshore Wind Farm may affect airspace usage, including Helicopter Main Routes. Consultation will be undertaken with relevant stakeholders to determine the nature and magnitude of any potential effects.
Radio and Telecommunications			
Effects on quality/interference of VHF communications	Minor Significant	Scoped Out	The Original EIA predicted that effects on telecommunications receptors would be not significant or minor significant. Based on the proximity to known transmitters and the reduced scale of the Project it is predicted that any effects would be no greater and likely less than those reported in the Original ES. Therefore, it is proposed that further assessment on telecommunications receptors be scoped out of further assessment in the Project EIA.
Effects on RACONs due to reflection from turbines	Not Significant	Scoped Out	
Reduction or loss of Automatic Information Services (AIS)	Minor Significant	Scoped Out	
Reduction in positional accuracy of Loran	Minor Significant	Scoped Out	
Interference resulting in reduction in positional accuracy of GPS	Minor Significant	Scoped Out	
Interference increasing difficulty in locating distress beacons/SARTs	Minor Significant	Scoped Out	
Reduction in bearing estimation accuracy	Minor	Scoped	

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
	Significant	Out	
Reduction/loss in coverage of mobile phone signals	Minor Significant	Scoped Out	
Reduction/loss in coverage of satellite phone signals	Minor Significant	Scoped Out	
Reduction/loss in picture of TV signals	Minor Significant	Scoped Out	
Reduction/loss in signal of public radio	Minor Significant	Scoped Out	
Intermittent or incomplete loss of data associated with Line-of-Sight links.	Not Significant	Scoped Out	

15.6.1 Additional Effects Previously Scoped out of the Original EIA

An increase in turbine blade tip height for the Project, compared to the Original Application, has the potential to bring a greater number of turbines into line of sight of a number of radar systems that are utilised for ATS provision and for Air Defence purposes in the area of the Project. These receptors were originally scoped out of the Original EIA but have been considered here for inclusion in the Project EIA (Table 15-5).

Table 15-5. Potential effects on receptors scoped out of the EIA for the Originally Consented Project.

Potential Effect	Scoped in or out of the Project EIA	Justification
Operation and Maintenance		
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **RAF Brizlee Wood and RAF Buchan ADR systems**	Scoped In	An increase in turbine blade tip height may introduce impacts on these two systems that were not considered to be affected by the original turbine parameters. Turbine detectability by these additional systems might lead to additional

Potential Effect	Scoped in or out of the Project EIA	Justification
Operation and Maintenance		
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **NERL Allanshill and Perwinnes PSR systems**	Scoped In	operational impacts and lead to a requirement to deliver technical mitigation for identified impacts.
Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines. **Aberdeen Airport utilization of data from the NERL Allanshill and Perwinnes PSR systems**	Scoped In	

15.6.2 Scoping of Cumulative Impacts Assessment

The following list confirms the other plans, projects and activities that have been considered in the scoping of the CIA for the Project EIA. It is assumed that those wind farms, both offshore and onshore, that have been consented, or are operational, have (or will have) technical mitigation in place (if required), which will mitigate effects to any relevant radar systems. Currently, for any other radar systems for which impacts are not mitigated it is assumed that any effects are deemed acceptable; however, the addition of unmitigated clutter created by the Project turbines could create a cumulative effect where existing detectable turbines are currently considered manageable.

Radar systems that have previously been mitigated against in the Original Application would be scoped out in all phases of the Project for the consideration of cumulative impact. However, during the operational phase of the Project, an increased turbine blade tip height has the potential to increase radar detectability of the turbines. The increase in blade tip height of the Project may bring radar systems into radar detectability which were previously scoped out.

As Inch Cape and the Seagreen Alpha and Bravo Offshore Wind Farms projects are at the same stage as the Project and in line with the approach taken in the Original EIA, these will be included in the CIA within the Project EIA. However, as the increased tip height may result in effects on radar systems beyond the Forth and Tay region the following projects will also be considered in the Project cumulative assessment:

- Inch Cape Offshore Wind Farm (as consented);
- Seagreen Alpha and Bravo (phase one) (as consented);
- Kincardine Offshore Wind Farm (as consented parameters);
- European Offshore Wind Deployment Centre (EOWDC) (as built);
- Hywind Pilot Park (as consented parameters);
- Blyth Offshore Demonstrator Wind Farm (as consented parameters considered); and

- Beatrice Offshore Wind Farm (as detailed in project Consent Plans);
- Moray Offshore Round 3 Zone Telford, Stevenson, and MacColl Offshore Wind Farms (as consented parameters considered); and,
- Moray Western Development Area offshore wind farm (as planned); and
- Kincardine Floating Offshore Wind Farm (as consented).

It is noted that ICOL have recently submitted a Scoping Report setting out an alternative design envelope to their previously consented project. As only one of the Inch Cape projects will be constructed the CIA for the Project EIA will consider cumulative effects based on the as consented parameters as listed above and on the as planned parameters as detailed within the ICOL Scoping Report separately (ICOL, 2017).

A number of potential effects assessed within the Original EIA were scoped out of cumulative assessment. Table 15-6 summarises the post-mitigation (residual) significance for all potential effects that were considered cumulatively details whether the potential effect has been scoped out of the Project EIA, together with a relevant justification.

Table 15-6 Summary of the Potential Cumulative Effects on Civil and Military Aviation– Project with Other Plans, Projects and Activities

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the CEA for the Project	Justification
Operation and Maintenance			
Increase in risk due to clutter resulting from reflected turbine signals – Leuchars Station PSR	Minor significance	Scoped in	The cumulative projects under consideration remain the same as those considered in the Original EIA. The Original ES concluded that the effects on the PSR at Leuchars Station would be of minor significance. However, although the scale of the Project has reduced the increase in hub height may result in a greater magnitude of effect cumulatively with the other projects. Therefore, effects on the PSR at Leuchars Station as a result of increased clutter will be Scoped in to the Project EIA.
Reduced detectability of aircraft resulting from shadowing behind turbines – Leuchars Station PSR	Minor significance	Scoped in	

As detailed above, the increase in turbine blade tip height for the Project, compared to the Original Application, has the potential to bring a greater number of turbines into line of sight of a number of radar systems that are utilised for ATS provision and for Air Defence purposes. The potential effects (as detailed in Table 15-5) on the following radar systems will also be considered within the CIA for the Project EIA:

- RAF Brizlee Wood;
- RAF Buchan ADR systems;
- NERL Allanshill PSR; and
- NERL Perwinnes PSR.

15.7 Approach to EIA

Based on the evidence provided in the EIA for the Originally Consented Project and considering the scope of the Project by comparison to the Original Application parameters, the increase in turbine blade tip height may bring the Project into radar detectability by radar systems that had previously been scoped out of the Original EIA.

Where this is the case, the EIA process will be supported by further desk-based studies including radar line of sight analysis between any potentially affected radar systems and the blade tip height of the turbines of the Project, in order to identify and examine in greater detail, the operational effect that radar detectability may create.

The aviation industry and the provision of air navigation services (including radar services) is regulated through extensive legislation; however, the main mechanism for regulating the relationship between aviation and offshore wind is through the Section 36 consenting system and the guidance listed in the document references.

To inform the EIA, consultation will be undertaken with the following agencies:

- The CAA;
- The MOD;
- UK MCA (SAR and lighting requirements);
- NERL; and
- Aberdeen Airport.

15.8 Scoping Questions - Aviation

- Do you agree that the existing data available to describe the Military and Aviation (including telecommunications) baseline remains sufficient to describe the current receptor groups in relation to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Military and Aviation receptors?
- Do you agree that the receptors identified in Table 15-4 should be scoped in or out of the Project EIA?
- Do you agree the potential increase in turbine height could affect the radar systems at RAF Brizlee Wood, RAF Buchan, NERL Allanshill and NERL Perwinnes?
- Do you agree that the cumulative effects identified in Section 15.6.2 should be scoped in to the Project EIA?

15.9 References – Military and Civil Aviation

BBC (British Broadcasting Corporation), 2011. *UK television transmitters*. Available online from: http://www.bbc.co.uk/reception/transmitters/tv [accessed 18 Jan 2011].

DAB Digital Radio, 2011. *DAB Digital Radio Scottish transmitter information*. Available online from: http://www.ukdigitalradio.com/coverage/currenttransmitters/default.asp?id=1 [accessed 24 Feb 2011].

DigitalUK, 2011. *Digital television switchover information*. Available online from: http://www.digitaluk.co.uk/postcodechecker/main/display/basic [accessed 24 Feb 2011].

DTI (Department of Trade and Industry), 2004. *Existing Users and Management Initiatives relevant to SEA 5, Final Report*.

Forth Ports Plc., 2011. *Forth Ports radar service description*. Available online from: http://www.forthports.co.uk/ports/marine [accessed 23 Feb 2011].

LORAN-C, 2011. *European LORAN-C network description*. Available online from: http://www.loran-europe.eu/news.php [accessed 23 Feb 2011].

Met Office, 2011. *National Meteorological Library and Archive, Fact Sheet 15 – Weather Radar*. Available online from: http://www.metoffice.gov.uk/weather/uk/radar/tech.html [accessed 23 Feb 2011].

Ofcom, 2011a. *Sitefinder mobile phone base station database*. Available online from: http://www.sitefinder.ofcom.org.uk [accessed 24 Feb 2011].

UKHO (United Kingdom Hydrographic Office), 2002. *Admiralty chart, Firth of Forth – Isle of May to Inchkeith*, edition 3, July 2000.

UKHO, 2004. *Admiralty charts and publications, admiralty notices to mariners*, section 2, weekly edition 12, 18 March 2004.

16 Maritime Archaeology and Cultural Heritage

16.1 Introduction

This section of the Scoping Report confirms the archaeology and cultural heritage receptors of relevance to the Project and considers the potential effects on them resulting from construction, operation and maintenance, and decommissioning. Reference is made to: the baseline data gathered to inform the EIA for the Originally Consented Project and specifically the outcomes of the impact assessment presented in the Original Environmental Statement (ES) Chapter 19 and supporting technical appendices (NnGOWL, 2012a).

16.2 Data Sources and Baseline Environment

This section identifies baseline data sources that can be used to characterise the marine cultural heritage resource within and around the Development Area, drawing predominantly from the data sources used to inform the Original ES but updated where possible with more recent data. Commentary is provided on the sufficiency of this data as a basis for scoping the Project EIA.

A variety of cultural heritage and archaeological datasets were collated and analysed to inform the Original ES. Data was drawn from site-specific surveys and studies commissioned by NnGOWL and from a desktop review of publicly available information. Those datasets considered to be relevant to the Project are listed in Table 16-1 below. The data sources are more fully described in the Original ES Chapter 19 and supporting technical studies (NnGOWL, 2012).

Table 16-1. Data sources from the Original Project EIA

Data Source	Study/Data Name	Survey Overview
NnGOWL	Geophysical survey (EMU, 2010).	Hydrographic and geophysical surveys of the Wind Farm Area and Offshore Export Cable Corridor conducted providing data on identification and accurate location of potential seabed archaeological and cultural heritage receptors. The surveys comprised: ● Side scan sonar; ● Swatch bathymetry; ● Magnetometry; and, ● Acoustic ground discrimination.
NnGOWL	Geotechnical survey (Gardline, 2010).	Geotechnical survey conducted providing a sediment log detailing whether submerged prehistoric layers (principally peat) were present.
UK Hydrographic Office (UKHO)	Data requested in 2012 for Original Project ES.	Identification and location of known wrecks and obstructions from records held by the UKHO covering the Wind Farm Area and Offshore Export Cable Corridor.

Data Source	Study/Data Name	Survey Overview
The Royal Commission on the Ancient and Historical Monuments of Scotland- (RCAHMS)	Data requested in 2012 for Original Project ES.	Identification and location of known cultural heritage receptors held by RCAHMS (now part of Historic Environment Scotland (HES)) covering the Wind Farm Area and Offshore Export Cable Corridor.
Angus Historic Environment Record (AHER)	Data requested in 2012 for Original Project ES covering viewshed from original blade tip height.	Identification of archaeology and cultural heritage receptors likely to have their setting changed due to Offshore Wind Farm construction/operation.
East Lothian Historic Environment Record (ELHER)	Data requested in 2012 for Original Project ES covering landfall of Offshore Export Cable.	Identification and location of known cultural heritage receptors in the inter-tidal zone held by East Lothian Council Archaeology Service (ELCAS).

16.2.1 Data Validity

NnGOWL, and their archaeological consultants Wessex Archaeology, are of the opinion that the geophysical and geotechnical data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current archaeology and cultural heritage baseline conditions within the Development Area.

However, Wessex Archaeology recommend that updated data requests are made to the UKHO, HES, AHER and ELHER as the previous requests are now five years old and a large quantity of data has been amended or added to these datasets during that period. The following sections discuss the adequacy (or otherwise) of the available data in relation to spatial coverage and age.

16.2.1.1 Data Spatial Coverage

As identified in Table 16-1, NnGOWL-commissioned site specific surveys were carried out within the vicinity of the Development Area and several data requests from national and regional repositories were made. Regional collaborative studies were also commissioned jointly by NnGOWL and Inch Cape Offshore Limited (ICOL) covering the outer Firth of Forth and Tay area in and around the Neart na Gaoithe and Inch Cape wind farms. The location and extent of the Development Area will cover the same portion of seabed assessed within the Original ES. It is therefore considered that the spatial coverage of the original data describing the physical environment, excluding the setting analysis, describing the potential changes to the environment, remain valid for the Development Area in terms of spatial coverage. Due to an increase in the overall height of the blade tip, an updated viewshed will cover a larger area than investigated in the Original Project ES and so the spatial coverage of the original setting analysis is deemed inadequate for the Project.

16.2.1.2 Age of the Data

As described above and detailed within Table 16-1, site specific geophysical and geotechnical survey data reported in the Original ES were collected during 2010, and were used alongside broader scale, contextual data from a variety of sources to inform the baseline.

It is known that updates, additions and edits to the data held by the UKHO, HES and the two council HERs have occurred and therefore the baseline datasets will be refreshed from these sources. An update to the baseline within the Maritime Archaeology and Cultural Heritage EIA chapter in this regard will be completed accordingly, although a full reassessment of the whole archaeological baseline including geophysical and geotechnical surveys is considered unnecessary as the data for these remains valid with a full coverage of the Development Area.

16.2.2 Review of Baseline Characteristics

The Original ES noted seven live and 11 dead wrecks/obstructions recorded within the Development Area and surrounding buffer area from the UKHO dataset, along with a further five anomalies of high archaeological potential and eight of medium potential discovered from archaeological assessment of the geophysical surveys. It also noted that the potential for submerged prehistoric deposits within the Development Area was low, requiring no further assessment. It also suggests that the potential for aviation archaeology to be encountered has previously been analysed as low, although the Forth approaches were on the path of Axis bombers attacking the naval installations on the Forth and Grangemouth Refinery during WWII.

The setting analysis for the Project identified eight Scheduled Monuments, two Category A Listed Buildings and two Gardens and Designed Landscapes which might have their setting affected by the Original Project, based on the viewshed form the original blade tip height. This dataset may increase in number due to the larger blade tip height proposed in the Project.

Chapter 19 of the Original Project ES presents the full baseline characteristics of the archaeology and cultural heritage across the area of interest.

16.3 Design Envelope

Table 16-2 sets out the worst case scenario defined by the Originally Consented Project ES Chapter 19-Maritime Archaeology and Cultural Heritage (NnGOWL, 2012) compared to the proposed worst case scenario for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process. The Scoping Report considers the worst case scenario reported in the Original ES as the final impact determinations were not significant and no further assessment work was carried out in relation to the Project design envelope reported in the Original ES Addendum (NnGOWL, 2013).

Table 16-2. Worst case design scenario definition – Marine Archaeology

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Construction and decommissioning			
Net impact of turbine foundations on the seabed	Maximum impact on the seabed based on: ● 80 turbines; ● Gravity base foundations with up to 53 m diameter (including scour protection); 1600 m² foundation footprint; and ● Seabed preparation by dredging with an average of 4,000 m3 dredged per foundation.	Installation equipment and vessels comprising of jack-up rigs, heavy lift vessels, cable laying barges, and ancillary and support vessels on site for the duration of the 2 - 3-year construction phase. Number of structures = 56 turbines.	Reduction in number of structures.
Net impact of offshore substation foundations on the seabed	Maximum impact on the seabed based on: ● Maximum number of substations (2); and ● Considered within the additional foundation options detailed above.	A maximum of two OSPs using 6-legged jacket foundations. No seabed preparation anticipated for installation of 6 legged jackets. There is the potential for drilling during pile installation. Drilling would produce significantly smaller sediment volumes than GBS dredging.	No preparatory seabed dredging will be required for the Project prior to jacket installations
Net impact of inter-array cabling on the seabed **Offshore Export Cable installation** **Temporary seabed disturbances** **Re-distribution of fine sediments**	Maximum impact on the seabed based on: ● 220 km maximum cable length; ● Up to 1.5 m cable burial depth; and ● Potential surface laying protection either mattress or rock-dumping ● 2 cables with up to maximum 500 m spacing between cables; ● Maximum burial depth – up to 3 m; ● Trenching using a plough; and ● Trenching using backhoe dredger (landfall). Maximum footprint based on: ● Feet of eight legged jack-up barges on	Subsea cabling includes up to 140 km of inter-array cabling and 2 x 43 km Offshore Export Cables. Cable burial up to 3 m of up to 140 km of inter-array cabling and 2 x 43 km Offshore Export Cables.	There is no anticipated change in Inter-Array Cable infrastructure and a 10 km increase in both Offshore Export Cables. This represents a 6 km increase than the worst case envelope considered in the Original ES which considered 220 km of cable infrastructure.

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
	seabed for 80 turbines. ● Fine sediments arising from seabed preparation and installation of 80 gravity base foundations and up to 220 km of inter-array cabling.		
Operation and Maintenance			
Turbine height and layout in relation to the setting of onshore receptors **Change in hydrodynamics**	A single option of 80 turbines was considered to offer the greatest visual impact. The worst case scenario is that these will be arranged in a grid on jacket foundations and that two OSPs will be required. The worst case scenario assumes the maximum correspondence between turbines and known receptors. Net impact in changes in hydrodynamics within the offshore site.	Number of structures = 56 turbines plus 2 OSPs on 6-legged jacket structures with a greater rotor tip height.	Reduction in number of turbines but increase in maximum blade tip height.

16.4 Embedded Mitigation

The primary method of mitigation when dealing with the unknown archaeological resource is the precautionary principle, based on the prevention of damage to receptors by proactively putting in place protective measures rather than attempting to repair damage after it has occurred. Therefore, the Original ES included provision for a series of mitigation measures to ensure that significant direct physical impacts would not occur during the construction, operation or decommissioning of the Offshore Wind Farm and associated infrastructure, as follows:

- Direct physical impact on all sites of cultural heritage interest identified will be avoided where possible through micrositing of both turbines and installation equipment (e.g. jack-ups);
- Where cultural heritage assets may potentially be subject to direct or indirect impacts, Archaeological exclusion zones (AEZ) will be implemented to prevent potential impacts from anchoring or installation of jack-up vessels;
- Exclusion zones of at least 100 m will be established around sites identified as being of high vulnerability, while an exclusion zone of a minimum 50 m will be established around those of medium vulnerability. In addition to the construction phase it is also anticipated that the implementation of AEZs will ensure cultural heritage assets are protected from potential impacts during the operation and decommissioning phases;
- Absolute exclusions zones of at least 300 m around all protected wrecks within the Development Area;
- Should further survey or investigation confirm the nature and characteristics of an identified asset then an AEZ can be maintained or removed as appropriate and in consultation and agreement with Historic Scotland (now HES);

- The implementation and monitoring of the AEZs will be maintained through the Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) highlighted below;
- In order to mitigate the risk of damage to any previously unrecorded archaeological remains a WSI and PAD will be prepared to mitigate construction impacts in the event of any unexpected archaeological discoveries during construction. This protocol will also include appropriate archaeological briefings for all personnel involved in the construction, operation and decommissioning activities associated with the proposed development. The PAD will be in place for the life of the proposed development and will be updated when required should details within the document change, for example contact details for key stakeholders; and
- Should it not be possible to avoid sites of cultural heritage interest, a full programme of archaeological investigation, which may include diver survey or Remotely Operated Vehicle (ROV) investigation, will be undertaken to identify the nature and extent of these sites. Subject to these investigations an appropriate mitigation strategy will be agreed with Historic Scotland (now HES).
- No mitigation was proposed for indirect physical impacts.

The mitigation set out in relation to the Original ES will be incorporated as embedded mitigation for the Project. This embedded mitigation remains applicable to the Offshore Export Cable Corridor up to Mean High Water Springs (MHWS) but as the area of intertidal between MHWS and Mean Low Water Springs is also covered by the Onshore Planning Application with East Lothian Council, it will be applied as part of the Onshore WSI which will be a Condition of that Application.

16.5 Consent Condition Commitments

A number of conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 16-4 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of effects on Maritime Archaeology and Cultural Heritage.

Table 16-3 Consent conditions for the Originally Consented Project relevant to maritime archaeology and cultural heritage

Original Consent Requirement	Relevance to marine archaeology and cultural heritage
Environmental Management Plan	Setting out, for approval, an EMP detailing a Written Scheme of Investigation (WSI) to be followed in the event of an archaeological discovery.
Marine Archaeology Reporting Protocol	Setting out, for approval, procedures to follow on discovery any marine archaeology during the construction, operation, maintenance and monitoring of the Project.

16.6 Scoping of the Project EIA

Table 16-4 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped in or out of the Project EIA, with relevant justification. The mitigation (Section 16.4) was included within the assessment conclusions set out in the Original Project EIA and therefore only the residual effects have been presented in these tables.

Table 16-4. Summary of potential effects on Maritime Archaeology and Cultural Heritage

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction			
Direct physical impact on known archaeological receptors on or in the seabed	Not significant	Scoped out	It is judged that a re-assessment of the existing geophysical or geotechnical survey datasets is not required. If future surveys are undertaken assessment may be undertaken to enhance the site-specific mitigation strategy as appropriate. Potential effects resulting from direct physical impact are likely to be reduced based on the overall reduction in the scale of the Project. Therefore, Direct physical impact on known archaeological receptors on or in the seabed should be scoped out of the Project EIA.
Damage to or removal of previously unknown features	Not significant	Scoped out	The coverage of the geophysical and geotechnical surveys is considered adequate to inform potential archaeological receptors that would show up in repeat surveys and therefore any further work may be scoped out.
Operation and Maintenance			
Impacts on the setting of cultural heritage assets	Not significant	Scoped in	The potential increase in maximum blade tip height even with the reduction in the number of turbines from 80 to 56 makes a reassessment of the setting appropriate. Additional receptors not previously assessed may need to be considered and an updated data request sent to AHER. Scope of this assessment to be agreed in consultation with appropriate Stakeholders. The ES baseline will be refreshed with the latest UKHO/HER/HES information to incorporate any data that may have been added in the last five years to ensure any newly identified archaeological discoveries are considered when applying Project mitigation as detailed in Section 16.4.
Damage to or removal of heritage features resulting from direct physical impacts, including anchoring.	Not significant	Scoped out	As this potential impact will have already been discussed and mitigated against during the Construction phase, it is considered safe to scope out further consideration of the effects during the operating phase. The Archaeology Reporting Protocol and Project mitigation will facilitate mitigation.
Decommissioning			
Direct physical	Not significant	Scoped out	As this potential impact will have already been discussed and

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
impact on known archaeological receptors on or in the seabed			mitigated against during the Construction phase, it is considered safe to scope out further consideration of the effects during the decommissioning phase.
Damage to or removal of previously unknown features.	Not significant	Scoped out	The coverage of the geophysical and geotechnical surveys is considered adequate to have located any potential archaeological receptors that would show up in repeat surveys and therefore any further work may be scoped out.

16.6.1 Scoping of Cumulative Impacts Assessment

The CIA for Archaeology and Cultural Heritage is set out in the Original ES (Section 19.8) and considers the potential cumulative effects arising from the Firth of Forth offshore wind projects. The scope and approach was agreed through consultation with Historic Scotland (now HES) and in conjunction with the Inch Cape Offshore Wind Farm and the Seagreen Alpha and Bravo Offshore Wind Farm developers. The agreed approach focused on the effects on the physical environment arising from the interaction of the offshore wind farms detailed below, with all other activities scoped out on the basis of distance from the Project and the predicted changes in setting for cultural heritage assets due to the Offshore Wind Farm and Offshore Export Cable Corridor being negligible at all but two of these sites, with only the Isle of May Priory and Isle of May Lighthouse registering as temporary Minor Impacts.

In line with the agreed approach for the Original EIA and for the purposes of this Scoping of the Archaeology and Cultural Heritage CIA, the following list confirms the other plans, projects and activities considered in the scoping of the CIA:

- Inch Cape Offshore Wind Farm (as consented); and
- Seagreen Alpha and Bravo (as consented).

It is noted that ICOL have recently submitted a Scoping Report setting out an alternative design envelope to their previously consented project. As only one of the Inch Cape projects will be constructed the CIA for the Project EIA will consider cumulative effects based on both the as consented parameters as listed above and on the as planned parameters as detailed within the ICOL Scoping Report separately (ICOL, 2017).

Table 16-5 summarises the post-mitigation (residual) significance for all cumulative effects considered in the Original ES and details whether the potential cumulative effect has been scoped out of the Project EIA, with a relevant justification.

Table 16-5. Summary of potential effects on Archaeology– the Project with other plans, projects and activities

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction, Operation and Maintenance and Decommissioning			
Effects on known sites and geophysical anomalies as a result of physical impacts arising from	Not significant	Scoped out	Potential effects resulting from changes to sediment transport processes, wave climate, water level and tidal regime during the construction, operation and decommissioning of the Originally Consented Project were considered to be Not significant. As the overall design envelope of the Project has been significantly reduced in the scale when compared to Original Wind Farm Area it is considered that cumulative effects would be no greater and likely less than those previously presented in the Original ES. Therefore it is proposed that further assessment be scoped out of the Project EIA.
Impacts on the setting of cultural heritage assets	Minor	Scoped in	Original ES noted a minor impact on Isle of May Priory and Isle of May Old Lighthouse, noting that this impact would be temporary for the life of the Wind Farm. As the Project plans to install a fewer number of larger turbines in their Projects, and therefore an update of the CIA even with the reduction in the number of turbines in both projects would be appropriate. Additional receptors than previously assessed may need to be considered. Scope of this assessment to be agreed in consultation with appropriate Stakeholders.

16.7 Approach to EIA

Based on the evidence summarised from the Original ES and considering the changes in scale of the Project by comparison to the Originally Consented Project, it is concluded that a full re-assessment of the archaeological baseline is not required and should be scoped out.

All the remaining physical potential effects on archaeology and cultural heritage associated with the Project should be scoped out of the Project EIA as seabed features identified by geophysical assessment and submerged prehistory are covered in the Original ES (EMU, 2011).

It is suggested that due to the changes in the number and increase in blade tip height of the turbines within the Development Area, a re-analysis of the setting of the previously identified archaeology and cultural heritage receptors within the Original EIA would be necessary, both for the Project alone and cumulatively. This settings analysis will be undertaken in conjunction with any SLVIA updates and in agreement with the relevant curators at HES and Local Authority Archaeology Services. An update to the Setting CIA is also scoped in, as similar changes have occurred to the other projects listed in the original CIA. Both of these will be completed in line with the following guidance:

- Managing Change in the Historic Environment: Setting (HES 2016a)
- Historic Environment Scotland Policy Statement (HES 2016b)

Using the methodology suggested within this guidance, the Setting Assessment will include:

- Step 1: Identify the designated historic assets using a GIS based viewshed.
- Step 2: Define and analyse the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced.
- Step 3: Evaluate the potential impact of the proposed changes.

16.8 Scoping Questions – Archaeology and Cultural Heritage

- Do you agree that the existing data available to describe the Archaeology and Cultural Heritage baseline remains sufficient to describe the archaeological environment in relation to the Project?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original Project EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Archaeology and Cultural Heritage receptors?
- Do you agree that the changes in turbine number and increase in blade tip height require an updated Settings analysis, in conjunction with any updated SLVIA analysis?
- Do you agree that the cumulative effects on archaeology and cultural heritage receptors should be scoped in to the Project EIA only where it applies to impacts on the settings of cultural heritage assets, based on the increase in turbine size for the Project?

16.9 References – Maritime Archaeology and Cultural Heritage

EMU, 2010. Neart na Gaoithe Proposed Offshore Wind Farm and Cable Routes Geophysical Survey for Neart na Gaoithe Proposed Offshore Wind. Report No. 09/J/1/02/1447/0917.

EMU (2011) Neart na Gaoithe Offshore Wind Farm Development. Archaeology Technical Report. Report number: 11/J/1/26/1667/1098.

Gardline Geosciences Ltd, 2010. 'Neart Na Gaoithe Offshore Wind farm Project, Preliminary Geotechnical Investigations, July-October 2010, Geotechnical Report'. Unpublished Client Report.

Historic Environment Scotland, 2016a. Managing Change in the Historic Environment: Setting. Available at https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=80b7c0a0-584b-4625-b1fd-a60b009c2549

Historic Environment Scotland, 2016b. Historic Environment Scotland Policy Statement. Available at https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/legislation-and-guidance/historic-environment-scotland-policy-statement/

NnGOWL, 2012. Neart na Gaoithe Offshore Wind Farm Environmental Statement, Chapter 19: Maritime Archaeology and Cultural Heritage. Available at http://mainstream-downloads.opendebate.co.uk/downloads/Chapter-19---Archaeology.pdf

NnGOWL, 2013. Neart na Gaoithe Offshore Wind Farm Environmental Statement Addendum, Technical Appendix 1: Design Parameters. Available at http://mainstream-

downloads.opendebate.co.uk/downloads/NnG-Addendum---Technical-Appendix-1---Design-Parameters.pdf

The Crown Estate, 2010. Model Clauses for Archaeological Schemes of Investigation – Offshore Renewables Projects. Available at: http://www.thecrownestate.co.uk/media/206123/wsi_renewables.pdf

17 Seascape, Landscape and Visual Impacts

17.1 Introduction

This section of the Scoping Report confirms the baseline for assessment of effects on the landscape and seascape, and on views and visual amenity. It considers the potential for significant effects on this baseline to arise as a result of the construction, operation and maintenance, and decommissioning of the Project. Reference is made to the baseline data gathered to inform the seascape, landscape and visual impact assessment (SLVIA) for the Originally Consented Project, and the outcomes of the SLVIA presented in the Original Project ES.

17.2 Baseline Sources

This section identifies the baseline sources that will be used to describe the physical features and characteristics of the seascape and landscape, and the nature of views and visual amenity, in the area around the Project. Generally, the data sources used to inform the Originally Consented Project SLVIA will be used, though this will be updated where appropriate with more recent information. Commentary is provided on the sufficiency of this information as a basis for Scoping the Project EIA. The Originally Consented Project SLVIA examined a study area defined as a radius of 50 km from the Offshore Wind Farm boundary, not including the Offshore Transmission Works.

Table 17-1. Baseline data sources from the Originally Consented Project SLVIA

Data Source	Study / Data Name	Overview
Forth and Tay Offshore Wind Developers Group	Regional Seascape Character Assessment: Aberdeen to Holy Island	Criteria-based characterisation of the seascape along the east coast of Scotland and Northern England, and evaluation of sensitivity to offshore wind energy development. Undertaken as a joint baseline to inform SLVIA for all offshore wind farms proposed in the Forth and Tay area.
Scottish Natural Heritage (SNH)	Landscape Character Assessments	A series of reports giving description and classification of onshore landscape character, published as part of a nationwide programme in 1998-1999. Relevant reports cover South and Central Aberdeenshire, Tayside, Fife, the Lothians and the Scottish Borders.
Local Planning Authorities (LPAs)	Development plans and background documents relating to local landscape designations	Local landscape designations identified in Fife, East Lothian and Scottish Borders.
Historic Scotland	Inventory of Gardens and Designed Landscapes	Database of nationally important designed landscapes across Scotland, including their location, extent and qualifying interests.
Met Office	Atmospheric visibility data	Average visibility, recorded at Leuchars Station over a 10

Data Source	Study / Data Name	Overview
		year period from January 2001 to December 2010.
Various	Wind farms within the study area.	A list of operational, consented and proposed wind farms within an agreed study area, compiled from information provided by SNH, LPAs, and wind energy developers.

17.2.1 Data Validity

The following sections discuss the sufficiency of the data in Table 17-1 in relation to spatial coverage and age.

17.2.1.1 Data Spatial Coverage

The datasets identified above cover the whole of the study area used for the Originally Consented Project SLVIA, and extend some distance beyond this area. Met Office data was collected at Leuchars Station, being the closest weather monitoring point to the Development Area. Since the site location and study area are unchanged, these data remain relevant to the Project.

17.2.1.2 Age of the data

The Regional Seascape Character Assessment referred to in the Originally Consented Project SLVIA was carried out in 2011. No regional-scale changes in the seascape or coastal landscape are known to have occurred since the Originally Consented Project SLVIA was carried out, therefore this data remains valid.

The landscape character assessments referred to in the Originally Consented Project SLVIA were undertaken in 1998 and 1999 as part of a national programme of assessment. Although now relatively old, these studies remain in regular use and continue to be relied upon by local planning authorities and others. SNH are planning a revised national database of landscape character that will update some of the earlier documents. However, this has not yet been published, and it is understood that it will not significantly change the characterisations presented in the earlier documents.[15] No regional-scale changes in the landscape are known to have occurred since the Originally Consented Project SLVIA was carried out, therefore this data remains valid.

Development plans are refreshed on a regular basis, and a number of local authorities have updated their approach to local landscape designations since the Originally Consented Project SLVIA was carried out. This includes new designations in some areas, and new justifications and 'special qualities' in other areas. The data on local landscape designations is therefore no longer valid.

[15] See statement on SNH website: http://www.snh.gov.uk/protecting-scotlands-nature/looking-after-landscapes/lca/

The Inventory of Gardens and Designed Landscapes, now maintained by Historic Environment Scotland, is a continually evolving database, with sites being added, removed or updated. The data on gardens and designed landscapes is therefore no longer valid.

Met Office visibility data continues to be collected on a daily basis. Although it is considered unlikely that the 10-year average of this data will have substantially changed, the data is between 7 and 17 years old, and would benefit from being updated.

The number and distribution of wind farms within the study area, including offshore wind farms, has changed as new wind farms are built, and applications are consented or refused. The data on operational, consented and proposed wind farms is therefore no longer valid.

17.2.2 Review of Baseline Characteristics

Chapter 21 of the Original Project ES presents the full baseline of landscape and visual character, and the nature of views and visual amenity, across the 50 km radius study area. The baseline considered in the SLVIA includes information about:

- The seascape character of the coastal part of the study area;
- The landscape character of the landward part of the study area;
- Landscape designations within the study area; and
- Existing visual amenity.

Seascape and landscape character is described in published character assessments that provide details of the 'key characteristics' of the seascape character units and landscape character types across the study area. Although localised changes in the landscape will have occurred since the Originally Consented Project SLVIA was carried out, no substantive change to these key characteristics has occurred across the study area.

There are no areas designated for their scenic quality at a national level within 50 km of the Development Area. A number of local landscape designations are identified by local planning authorities, including Aberdeenshire, Fife, East Lothian and the Scottish Borders. In addition, there are a number of sites on the Inventory of Gardens and Designed Landscapes that are within 50 km of the Development Area.

Likely viewers or visual receptors, whose visual amenity may be affected by the Project, include:

- Residents living in any of the settlements or individual residences across the area which lies within the Zone of Theoretical Visibility (ZTV) of the Offshore Wind Farm;
- Tourists visiting, staying in, or travelling through the area within the ZTV;
- Recreational users of the landscape, including those using golf courses, cycle routes and footpaths;
- Recreational users of the marine environment, including those involved in yachting, angling, people on boat trips to the Isle of May, and passengers on ships;
- Travellers (tourists, workers, visitors or local people) using transport (road and rail) routes passing through the study area;
- People working in the countryside or in any of the towns, villages or settlements and residences across the area lying within the ZTV of the Offshore Wind Farm; and
- People working in the marine environment, such as fishermen and crews of ships.

17.3 Design Envelope

For the purposes of the Originally Consented Project SLVIA, two alternative worst case scenarios were defined based on the range of turbine types being considered: a 'maximum height' scenario, and a 'maximum density' scenario. The key parameters for these scenarios are given in Table 17-2.

Table 17-2. Maximum effect scenarios from the Originally Consented Project SLVIA

Scenario	Number of turbines	Tip height above LAT	Hub height above LAT	Rotor diameter	Indicative layout	Turbine spacing (as indicative layout)
Maximum density	128	175 m	115 m	120 m	A	618 m
Maximum height	80	197 m	115 m	164 m	B	795 m

As described in Section 21.4.1 of the Originally Consented Project SLVIA, these parameters represent absolute worst case, rather than a realistic scenario. Both scenarios use layouts that include more turbines than would actually have been constructed, in order to assess the maximum effect.

This was refined in the Addendum to a single worst case scenario (Table 17-3), based on a slightly larger number of turbines, but otherwise similar to the 'maximum height' scenario.

Table 17-3. Refined maximum effect scenario from the Addendum

Number of turbines	Tip height above LAT	Hub height above LAT	Rotor diameter
90	197 m	115 m	164 m

The worst case parameters from the Originally Consented Project SLVIA are compared in Table 17-4 to the proposed worst case scenario for the Project, at a level of detail sufficient to draw conclusions in relation to the scoping process.

Table 17-4. Comparison of Worst Case Scenario Definition between the Project and the Original Application

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
Visibility of taller turbines across longer distances	Maximum geographical extent of visibility associated with a turbine of tip height 197m above LAT	Tallest proposed turbine will be greater than 197m above LAT to tip, up to a maximum of approximately 230m. The maximum height will	Taller turbines are likely to be more widely visible, and could result in impacts on more distant receptors

Potential Impact	Original Project Design Envelope (NnGOWL, 2012)	Project Design Envelope	Difference
		be confirmed in the ES.	
Visibility of a large number of turbines having greater visual presence	Maximum of 128 turbines (ES) Maximum of 90 turbines (Addendum)	Maximum of 56 turbines	A smaller number of turbines may reduce the apparent density of the development and its visual presence

17.4 Embedded Mitigation

Mitigation for wind farms is generally limited to the reduction of potential direct effects through detailed siting, and the reduction in adverse aesthetic effects through wind farm design. This is made clear in Siting and Designing Wind Farms in the Landscape (Scottish Natural Heritage, 2017).

The marine horizon is flat and uninterrupted, and all offshore wind farms are seen as rows of turbines. A Design Sensitivity Analysis carried out for the Original EIA concluded that an offset grid layout was visually preferred, in the greatest number of views.

Detailed siting of offshore turbines is driven by a range of physical and environmental constraints including localised geological conditions, ecology, aviation, navigation, wind resource, and marine archaeology. These constraints will determine an indicative layout for assessment. The finalised layout may differ, within the parameters of the design envelope, but the Originally Consented Project SLVIA concluded that the level of impact was unlikely to vary based on the detail of the layout.

17.5 Consent Conditions

A number of consent conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 17-5 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of effects on Seascape, Landscape and Visual Amenity.

Table 17-5. Consent conditions for the Originally Consented Project relevant to Seascape Landscape and Visual impacts

Original Consent Requirement	Relevance to Seascape, Landscape and Visual Impacts
Development Specification and Layout Plan	Setting out, for approval, the final design and layout of the Project to ensure it remains consistent with the design assessed in the ES as relevant to SLVIA.
Design Statement	Providing visualisations, for information, of the Offshore Wind Farm based on the final Development Specification and Layout Plan.

17.6 Scoping of the EIA for the Project

Table 17-6 summarises the post-mitigation (residual) significance for all effects considered in the Originally Consented Project SLVIA, and details whether the potential effect has been scoped out of the Project SLVIA, with a relevant justification.

Table 17-6. Summary of Potential Effects on Seascape, Landscape and Visual.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction			
Changes to visual amenity arising from intertidal cable laying	Major	Scoped in	Potential for significant effects.
Operation			
Changes to character of regional seascape units	Ranged from None to Moderate	Scoped in	There is potential for significant effects as a result of increased turbine height, therefore Changes to character of regional seascape units will be scoped into the Project EIA.
Changes to character of landscape character types	Ranged from None to Minor	Scoped out	The presence of the Offshore Wind Farm in the sea is unlikely to significantly affect the key characteristics of non-coastal landscapes. The changes to the design envelope are unlikely to alter this.
Changes to the character of gardens and designed landscapes	Ranged from None to Minor	Scoped out	The presence of the Offshore Wind Farm in the sea is unlikely to significantly affect the character of these areas. The changes to the design envelope are unlikely to alter this. Impacts on their significance as heritage assets will be considered in the Cultural Heritage chapter.
Changes to the special qualities of local landscape designations	Ranged from None to Minor	Scoped in	A number of changes in the baseline, including new designations and new definition of 'special qualities'. While significant effects are unlikely, this new information requires to be addressed. Therefore Changes to the special qualities of local landscape designations will be scoped into the Project EIA.
Changes in visual amenity experienced at	Ranged from None to Major	Scoped in	There is potential for significant effects as a result of increased turbine height, therefore Changes in visual amenity experienced at representative

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
representative viewpoints			viewpoints will be scoped into the Project EIA.
Changes in visual amenity experienced along routes	Ranged from None to Major	Scoped in	There is potential for significant effects as a result of increased turbine height, therefore Changes in visual amenity experienced along routes will be scoped into the Project EIA.

17.6.1 Scoping of Cumulative Impacts Assessment

The scope of the cumulative SLVIA considers a search area of 65 km radius from the Offshore Wind Farm boundary, as used in the Originally Consented Project SLVIA. The following list confirms the other offshore wind farms considered in the scoping of the cumulative SLVIA.

- Inch Cape Offshore Wind Farm (as consented);
- Seagreen Alpha and Bravo (as consented); and
- Forthwind Offshore Wind Demonstration Project (consented, 2 turbines).

In addition, onshore wind farms within 65 km will be considered in the cumulative SLVIA where they may give rise to significant cumulative impacts as a result of their scale and location. The list of onshore wind farms to be included in the assessment will be agreed with SNH and LPAs prior to the cumulative assessment being undertaken.

It is noted that ICOL have recently submitted a Scoping Report setting out an alternative design envelope to their previously consented project. As only one of the ICOL Projects will be constructed, the CIA for the Project EIA will consider cumulative effects based on the as consented parameters as listed above and on the as planned parameters as detailed within the ICOL Scoping Report (ICOL, 2017).

Table 17-7 summarises the post-mitigation (residual) significance for all cumulative effects considered in the Original Project SLVIA, and details whether the potential effect has been scoped out of the Project SLVIA, with a relevant justification.

Table 17-7. Summary of Potential Cumulative Effects on Seascape, Landscape and Visual.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Operation			
Changes to character of regional seascape units	Ranged from None to Moderate	Scoped in	There is potential for significant effects as a result of increased turbine height, therefore Changes to character of regional seascape units will be scoped into the Project EIA CIA.
Changes to character of landscape character types	Scoped out	Scoped out	Scoped out in the Originally Consented Project SLVIA.
Changes to the character of gardens and designed landscapes	Ranged from None to Minor	Scoped out	The presence of the Offshore Wind Farm in the sea is unlikely to significantly affect the character of these areas. The changes to the design envelope are unlikely to alter this. Impacts on their significance as heritage assets will be considered in the Cultural Heritage chapter.
Changes to the special qualities of local landscape designations	Ranged from minor to none	Scoped in	A number of changes in the baseline, including new designations and new definition of 'special qualities'. While significant effects are unlikely, this new information requires to be addressed. Therefore, changes to the special qualities of local landscape designations will be scoped into the Project EIA CIA.
Changes in visual amenity experienced at representative viewpoints	Ranged from Minor to Major	Scoped in	There is potential for significant effects as a result of increased turbine height, therefore Changes in visual amenity experienced at representative viewpoints will be scoped into the Project EIA CIA.
Changes in visual amenity experienced along routes	Ranged from None to Major	Scoped in	There is potential for significant effects as a result of increased turbine height, therefore Changes in visual amenity experienced at along routes will be scoped into the Project EIA CIA.

17.7 Approach to EIA

Based on the conclusions of the Originally Consented Project SLVIA, and considering the scale of the Project by comparison to the Originally Consented Project, it is concluded that the Project has the potential for

significant effects on seascape character and visual amenity, and an SLVIA chapter will therefore be included in the ES.

The SLVIA will consider effects upon:

- Coastal character and resources, including effects on the physical and aesthetic value of the coastal and marine seascape caused by changes in elements and qualities as a result of the offshore development;
- Implications for the special qualities of coastal designated landscapes, caused by changes in the character of coastal landscapes as a result of the offshore development; and
- Visual amenity, including effects upon potential viewers and viewing groups (e.g., residents, visitors, tourists) during day time and night time, caused by changes in the appearance of the landscape and/or seascape as a result of the development.

17.7.1 Guidance

The SLVIA will be carried out in accordance with the following guidance:

- Landscape Institute and Institute of Environmental Management and Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment*. 3rd edition. Routledge. ("GLVIA3");
- Scottish Natural Heritage (2017) *Siting and designing wind farms in the landscape*. Version 3;
- Scottish Natural Heritage (2017) *Visual Representation of Wind Farms: Good Practice Guidance*. Version 2.2;
- Scottish Natural Heritage (2012) *Onshore Renewables: Guidance on assessing the impact on coastal landscape and seascape*;
- Scottish Natural Heritage (2012) *Assessing the cumulative impact of onshore wind energy developments*;
- Landscape Institute (2011) Pho*tography and photomontage in landscape and visual impact assessment*. Advice Note 01/2011; and
- Enviros (2005) *Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report*. Prepared for the Department of Trade and Industry (DTI).

17.7.2 Baseline information

Baseline information is detailed above, and this will be further validated through field work and consultation with SNH, local planning authorities and Marine Scotland.

17.7.3 Impact Assessment Methodology

The approach to impact assessment will be based on the principles set out in the guidance listed above, primarily GLVIA3. Preparation of the SLVIA will involve the following key steps:

- The 'worst case' development parameters will be identified, and a study area will be determined and agreed through consultation – likely to be a 50 km radius from the Development Area;
- A ZTV of the proposed development will be generated across this area;
- The coastal landscapes of the study area will be analysed to identify landscape receptors, drawing on available coastal/seascape character assessments;

- The visual baseline will be recorded in terms of the different groups of people who may experience views of the proposed alignment, the places where they will be affected and the nature of their views and visual amenity, based on an update of work undertaken for the Originally Consented Project SLVIA;
- A series of assessment viewpoints will be selected in consultation with SNH and LPAs, based largely on viewpoints used in the Originally Consented Project SLVIA, as listed in Table 17-8, though taking note of post-application comments and potential changes in local views;
- In agreement with SNH, it is intended to reuse photography from the Originally Consented Project SLVIA where possible, though where new or relocated viewpoints are identified, photography will be captured to agreed technical standards;
- Visualisations (wirelines and photomontages) will be generated based on 3d modelling of the Offshore Wind Farm and other wind farms included in the cumulative assessment, and will be produced to standards agreed with SNH – the viewpoints to be illustrated with photomontages, including any requirement for night-time photomontages, will also be agreed with consultees;
- Potentially significant effects on coastal character will be identified, including implications for designated landscapes;
- Potentially significant effects on visual amenity will be identified;
- The level and significance of residual landscape and visual effects will be judged with reference to the sensitivity of the resource/receptor (its susceptibility and value) and magnitude of change (a combination of the scale and size of change, geographical extent and duration/reversibility); and
- The nature and scale of any cumulative landscape and visual impacts will be assessed on the same basis.

The SLVIA will be supported by mapped figures, photography and visualisations as required, to be prepared to agreed technical standards.

Table 17-8. Assessment viewpoints used in the Originally Consented Project SLVIA

No.	Viewpoint	Distance from Site Boundary (km)	Reason for Selection
2	Beach Road, Kirkton, St Cyrus	49.0	Car park offering beach access, and wide elevated views over Montrose Bay, on a coastal footpath.
5	Dodd Hill	43.9	Inland location on walking route offering views across Angus to the coast.
6	Braehead of Lunan	39.0	Representative of views from a hamlet, located on National Cycle Network (NCN) Route 1, enables views south over Red Head.
7	Arbroath	30.8	Listed building with an elevated platform and historic connection to the Bell Rock, now a museum.
8	Carnoustie	31.7	Recently upgraded promenade with car parking and beach access.
9	Dundee Law	44.9	Most prominent viewpoint in Dundee, a popular recreational location with large numbers of visitors, and long views down the Firth of Tay.

No.	Viewpoint	Distance from Site Boundary (km)	Reason for Selection
10	Tentsmuir	31.8	Forestry Commission car park in a popular recreational area. Views across sandbanks. Located on Fife Coastal Path and NCN Route 1.
11	Strathkinness	33.1	Within coastal hills, small settlement overlooking St Andrews and the Firth of Tay.
12	St Andrews, East Scores	28.2	Popular location within the town, by the abbey, overlooking St Andrews Bay, on the Fife Coastal Path.
13	Fife Ness, Lochaber Rock	15.5	Easternmost point of Fife, unobstructed views across the outer Firth and Tay, on the Fife Coastal Path.
14	Anstruther Easter	21.8	Representative of views from a coastal settlement at a local play park with foreshore access, on the Fife Coastal Path.
15	Largo Law	36.8	Elevated location, enabling wide views across the Firth of Forth, on a locally-signposted footpath
16	Isle of May	16.3	The island is a popular day-trip destination, and a useful proxy for marine views.
17	North Berwick Law	33.0	Popular walking destination close to North Berwick, enabling wide views over the Firth of Forth.
18	Dunbar	28.0	Marked as a viewpoint on an Ordnance Survey (OS) map, representative of views from coastal settlement, on John Muir Way.
19	West Steel	34.9	Elevated viewpoint enabling views across the coastal plain to the Firth of Forth.
20	Coldingham Moor	32.8	Elevated headland with wide seaward views, enabling northward views over the Firth of Forth.
21	St Abb's Head	33.0	Marked as a viewpoint on OS map, within National Trust for Scotland access land, offering extensive coastal views.

17.8 Scoping Questions – SLVIA

- Do you agree with the evaluation of the sufficiency of baseline data set out in Section 17.2?
- Is there any other baseline information that should be considered in the SLVIA?
- Do you agree with the approach to identifying the 'worst case' scenario for assessment in the SLVIA?
- Do you agree that effects can be scoped out of the SLVIA, and the cumulative assessment, as set out in Section 17.5?
- Have all the necessary offshore projects been identified at Section 1.5.1?

- Is the approach to SLVIA appropriate, including the guidance listed at Section 1.6.1, and the outline methodology at 1.6.3?
- Do you agree that the original baseline photography is fit for purpose and that it can be used again as the basis for photomontages?
- Can you confirm the locations of any night time visualisations that should be considered within the Project EIA?
- Should the SLVIA use the same set of viewpoint locations as the Originally Consented Project SLVIA, as listed in Table 17-8, or are there other viewpoint locations that need to be considered?

17.9 References – Landscape, Seascape and Visual Impacts

Aberdeenshire Council, 2006. Aberdeenshire Local Plan.

Aberdeenshire Council, 2010. Proposed Aberdeenshire Local Development Plan.

Angus Council, 2009. Angus Local Plan Review

Berwick upon Tweed Borough Council, 1999. Berwick upon Tweed Borough Local Plan.

David Tyldesley and Associates, 1999. Fife Landscape Character Assessment. Scottish Natural Heritage Review No 113.

Enviros 2005 Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report. Prepared for the Department of Trade and Industry (DTI).

East Lothian Council, 2008. East Lothian Local Plan

Fife Council, 2009a. St Andrews and East Fife Local Plan.

Fife Council, 2009b. Mid Fife Local Plan.

FTOWDG, 2011. Regional Seascape Character Assessment: Aberdeen to Holy Island. Produced for the FTOWDG by SLR Consulting, Land Use Consultants and Pegasus Planning Group.

Historic Scotland, 1987–2011. An Inventory of Gardens and Designed Landscapes in Scotland. Available online from: http://data.historic-scotland.gov.uk/pls/htmldb/f?p=2400:10:0 [accessed Oct 2011].

Land Use Consultants, 1999. Tayside Landscape Character Assessment. Scottish Natural Heritage Review No 122. Land Use Consultants, 2008. Fife Local Landscape Designation Review. Fife Council. Land Use Consultants in association with Carol Anderson and the Small Town and Rural Development Group

Landscape Institute 2011 Photography and photomontage in landscape and visual impact assessment. Advice Note 01/2011

Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment. 3rd edition. Routledge. (“GLVIA3”);

Scottish Borders Council, 2010. Scottish Borders Consolidated Local Plan.

Scottish Borders Council, 2011. Supplementary Planning Guidance: Draft Local Landscape Designations.

Scottish Natural Heritage 2017 Siting and designing wind farms in the landscape. Version 3;

Scottish Natural Heritage 2017 Visual Representation of Wind Farms: Good Practice Guidance. Version 2.2;

Scottish Natural Heritage 2012 Onshore Renewables: Guidance on assessing the impact on coastal landscape and seascape; and

Scottish Natural Heritage 2012 Assessing the cumulative impact of onshore wind energy developments.

18 Other Users

18.1 Introduction

This section of the Scoping Report sets out the other activities and marine users (collectively referred to as Other Users) of relevance to the Project (and not otherwise covered elsewhere in this scoping report) and considers the potential effects on them resulting from construction, operation and maintenance and decommissioning. Reference is made to the baseline data gathered to inform the Other Users and the Ordnance assessments for the Originally Consented Project, and to the outcomes of the impact assessment presented in the Original ES where appropriate.

18.2 Data Sources and Baseline Environment

This section identifies the baseline data sources that can be used to characterise the Other Users within and around the Development Area. Where relevant the baseline data draws on the data sources used to inform the Original Scoping Report (NnGOWL, 2009) and the Original EIA (NnGOWL, 2012). Where publicly available, more recent data has also been used to supplement and update the baseline descriptions. Commentary is provided on the sufficiency of this data as a basis for scoping the Project EIA.

18.2.1 Baseline Data

Information on the distribution and nature of the other coastal and marine users in the area surrounding the Development Area was obtained from a variety of sources, including websites and through consultation to inform the Original Scoping Report and Original ES. Relevant data sources included The Crown Estate's aggregate extraction licence data, waste disposal and dumping sites, Automatic Identification System (AIS) data, various coastal and marine recreational data, oil and gas infrastructure and licence area data, subsea cable and pipeline infrastructure data and other desk based literature review information derived from a desk based literature review.

No surveys specific to Other Users were undertaken as part of the Original ES. However, the outputs from related and complimentary surveys such as the metocean survey and associated model, the navigational AIS survey and risk model and ecology surveys were considered in the impact assessment. These studies predicted the effects of the Offshore Wind Farm on the resources that certain groups of Other Users rely on in undertaking their activities (for example, waves for surfing and fish stocks for fishing).

The data sources are more fully described in the Original ES Chapter 20 (ordnance) and Chapter 22 (Other Users) and supporting technical studies (Neart na Gaoithe, 2012).

18.2.1.1 Data Validity

The data previously collected as part of the Original Scoping exercise and Original ES is considered sufficient to meet the requirements needed to effectively describe the Other Users that may interact with the Project. This is because there are no changes to the proposed development area, use of port facilities or, broadly, to the construction process to be implemented. Additional, more up to date data has also been reviewed to ensure the Original Scoping conclusions and Original ES baseline remains valid and is included in the summary of the baseline under Section 18.2.2 below where appropriate. Further consideration of the sufficiency of the available data in relation to spatial coverage and age is presented below.

18.2.1.2 Data Coverage

The Development Area will remain the same as that used in the Original ES and so the data coverage remains adequate and suitable.

18.2.1.3 Age of Data

The datasets previously used to inform the Original ES, have been revisited to verify the validity of the previously interrogated data and check that no significant changes have taken place since the 2012 baseline was established. The updated baseline review is set out under Section 18.2.2.

18.2.2 Review of the Baseline Characteristics

18.2.2.1 Pipelines and cables

The Original Scoping Report confirmed that there are no cables or pipelines in the vicinity of the Development Area (and this receptor was subsequently scoped out of the Original ES); this remains the case with no additional subsea infrastructure having been installed since the Original ES was completed.

In 2008, The Crown Estate published a report on the potential feasibility of a subsea Eastern High Voltage Direct Current (HVDC) Subsea Link between Peterhead and Tyneside. Since the submission of the Original ES no further progress has been reported on the Eastern HVDC Subsea Link and, based on a review of the project website, the project will not be progressed further until after 2021[16].

18.2.2.2 Oil and Gas Activity

The Original Scoping Report identified that the Firth of Forth forms a focus of oil and gas activities with the Grangemouth refinery, oil storage and tanker terminals. However, no oil and gas activity was identified near the Development Area. As a result, this was scoped out of the Original Scoping Report.

Since the submission of the Original Application, a number of UK Seaward Leasing Rounds have been completed. There are no current oil or gas licenses issued covering the Development Area or the adjacent area.

On the 27th July 2016 the Oil and Gas Authority (OGA) invited applications for the 29th Seaward Leasing Round with a deadline of the 26th October 2016 for applications. Awards were announced on 23rd march 2017; no blocks were awarded in the vicinity of the Development Area[17].

A further Offshore 2016 Supplementary Leasing Round was initiated on the 6th of December with an application deadline set for the 7th of March 2017. No decisions have been made on licence offers associated with the Offshore 2016 Supplementary Round at the time of this scoping report but the maps

[16] https://www.ssepd.co.uk/EasternHVDClink/

[17] https://www.ogauthority.co.uk/licensing-consents/licensing-rounds/

published by the Oil and Gas Authority confirm that no blocks are on offer in the vicinity of the Development Area[18].

18.2.2.3 Marine Aggregate Extraction

The Original Scoping Report identified the location of two aggregate dredging sites; one located in the Tay Estuary (relinquished) and the other in the Inner Forth (licensed). Both of these licence areas have now been relinquished and there are no other existing or proposed aggregate dredging areas in Scottish Waters (Scottish Government, 2015).

18.2.2.4 Waste Disposal

The Original Scoping Report identified that there are no disposal sites or dumping grounds within the Development Area. A current review has confirmed that the nearest disposal site is 7.5km to the north-east and is classed as 'closed'. There is a disposal site for ammunitions, located 11.5km south-west of the Development Area that is not in use. Waste disposal was scoped out of the Original ES. The baseline is unchanged since the completion of the Original ES (Marine Scotland, 2016).

18.2.2.5 Marine and Coastal Recreation

A review of marine and coastal recreation commissioned by SNH (Land Use Consultants, 2007) was used to inform the Original ES. This has since been superseded by a Marine Scotland commissioned report (Land Use Consultants, 2016). The 2016 study corroborates the validity of the baseline presented in the Original ES. Furthermore, the 2016 update of the RYA's UK Coastal Atlas of Recreational Boating and the 2016 update to Marine Scotland's National Marine Plan interactive mapping portal have additionally both been used to review the baseline information for the purposes of this scoping report. The more recent available information confirms that there has been no significant change in the recreational use of the Development Area or nearby coastlines.

18.2.2.6 Ordnance

The Original ES (Chapter 20) concluded that Development Area is located in an area of the North Sea which is potentially at risk from ordnance due to historical or current military activity, especially from activity which occurred during WWII. Ordnance may be from practice ranges, torpedoes, or combat mines. In addition, the location of the area overlaps with current military firing ranges. Some wrecks in the area date from the WWI or WWII era and as such may contain UXO. This baseline description for UXO remains unchanged and valid.

18.2.2.7 Summary

The baseline information previously compiled and reported in Original ES has been updated where possible with the most contemporary available data and has been confirmed as remaining valid with respect to all Other User groups.

[18] https://www.ogauthority.co.uk/licensing-consents/licensing-rounds/

18.3 Design Envelope

Table 18-1 sets out the worst case scenarios, defined by the EIA for the Originally Consented Project for Other Users (including Ordnance) (NnGOWL, 2012) compared to the proposed worst case scenario for the Project at a level of detail sufficient to draw conclusions in relation to the scoping process.

Table 18-1. Worst case design scenario definition - Offshore Wind Farm and Offshore Export Cable

Potential Impact	Original Consented Project Design Envelope (NnGOWL 2012)	Project Design Envelope	Difference between Envelopes
Construction and decommissioning phase			
Increased SSC / turbidity / dispersal during installation of foundations, substructures and inter-array cables	Maximum number of turbines – 125 turbines and 2 OSPs. Seabed preparations for gravity base foundations – approximately 4,000 m^3 of dredged material per foundation, 530-1850m^3 gravel bed laid at each foundation location extending 2-4m beyond foundation structure. Total seabed occupied by gravity bases – 1800 m^2 Total seabed occupied by jacket - 225 m^2	Maximum number of turbines – up to 56 turbines and 2 OSPs. Seabed preparation - a seabed template with up to 6 legs will sit temporarily on the seabed during pile installation. Total seabed occupied by jacket – circa 60/810 m^2 (based on six 3.5m pin piles and total jacket footprint of approximately 30 x 30 m).	Removal of gravity bases from the design envelope, together with the reduced number of turbines, will result in a substantially reduced area of total seabed disturbed and an associated reduction in suspended sediments disturbed during construction (since there will not be seabed preparation by dredging as would have been the case for gravity bases).
Disturbing or causing loss in habitat for recreationally targeted species due to installation and presence of foundations, substructures and inter-array cables.	Maximum number of turbines – up to 125. Up to two OSS. Seabed preparations for gravity base foundations – approximately 4,000 m^3 of dredged material per foundation, 530-1850m^3 gravel bed laid at each foundation location extending 2-4m beyond foundation structure. Total seabed occupied by gravity bases – 1600 m^2 Total seabed occupied by jacket - 225 m^2	Maximum number of turbines – up to 56. Up to two OSS. Seabed preparation - a seabed template with up to 6 legs will sit temporarily on the seabed during pile installation. Total seabed occupied by jacket – circa 225 m^2 (based on six 3.5m pin piles and total jacket footprint of approximately 30 x 30 m).	Reduced total seabed disturbed and therefore disturbance or loss of habitat for recreationally targeted species due to the reduced number of turbines and the removal of gravity bases from the Project design envelope.

Potential Impact	Original Consented Project Design Envelope (NnGOWL 2012)	Project Design Envelope	Difference between Envelopes
Presence of construction safety zones resulting in displacement of activities, restriction of access to area.	Major installation vessels requiring safety zones include jack-up rigs, heavy lift vessels, cable laying barges.	Major installation vessels requiring safety zones include jack-up rigs, heavy lift vessels, cable laying barges.	The requirement for safety zones around major construction vessels is unchanged; however, installation time associated with piling or heavy lift vessels installing piles, jackets and turbines will be reduced given the smaller number of structures now proposed.
Changes to sediments, hydrodynamics and benthic environment due to offshore export cable installation.	2 x 33 km Offshore Export Cables and associated installation vessels	2 x 43 km Offshore Export Cables and associated installation vessels	Increase in Offshore Export Cable length.
Changes to hydrodynamic regime due to offshore export cable installation.			
Changes to sediments, hydrodynamics and benthic environment due to coastal and inter-tidal Offshore Export Cable installation.	2 x Offshore Export Cables buried or mechanically protected in the coastal area and installed using HDD or open cut trenching at landfall	2 x Offshore Export Cables buried or mechanically protected in the coastal area and installed using HDD or open cut trenching at landfall	No change in installation methodology; increase in Offshore Export Cable length.
Changes to hydrodynamic regime due to coastal and inter-tidal Offshore Export Cable installation.			
Increased noise, traffic disturbance due to Offshore Export Cable installation at the landfall location			
Restricted access at the landfall location during Offshore Export Cable installation			

Potential Impact	Original Consented Project Design Envelope (NnGOWL 2012)	Project Design Envelope	Difference between Envelopes
Operation and Maintenance			
Presence of offshore structures causing navigational hazards	Maximum number of turbines – 125 turbines and 2 OSPs. Minimum 450 m spacing	Maximum number of turbines – up to 56 turbines and 2 OSPs. Minimum 800 m spacing	Decreased due to either bigger spacing between turbines or turbines covering less of the Wind Farm Area and fewer structures.
Presence of offshore structures resulting in increased sightseeing activities	Maximum number of turbines – 125 turbines and 2 OSPs.	Maximum number of turbines – up to 56 turbines and 2 OSPs.	It is unlikely that the reduction in number of offshore structures will change the magnitude of this potential effect.

18.4 Embedded Mitigation

Embedded Mitigation for the Project will comprise of mitigation measures that were described in the Original ES (Chapter 22, NnGOWL, 2012), to minimise the potential effects on Other Users as follows:

- Marking of the proposed Project on Admiralty charts to aid navigation;
- Appropriate information circulation such as use of Notice to Mariners (NtM), Navigation Broadcasts and other appropriate media;
- Appropriate marking and lighting of structures associated with the Offshore Wind Farm in accordance with international guidance;
- Adequate turbine air draught: the lowest point of the rotor sweep will be at 22 m above MHWS as recommended by the MCA;
- Cables to be appropriately protected and post installation surveys may be undertaken to indicate status of cable burial to allow fishing practices and anchoring to recommence;
- The Project will be compliant with the MCA's Marine Guidance Note 71;
- Emergency Response and Cooperation Plans will be developed as per MCA recommendations; and
- Best practice measures may be implemented, which include development of a Marine Control Centre, routine subsea surveys to monitor cable burial status, and use of construction safety zones (as outlined above).

In addition, the following Embedded Mitigation set out in the Original ES (Chapter 22, NnGOWL, 2012), will be incorporated into the Project to mitigate any risk associated with the potential presence of unexploded ordnance:

- A risk assessment will be carried out prior to construction; and
- Full sea bed magnetometer scan, or other industry accepted method of UXO identification, may be undertaken prior to construction.

18.5 Consent Conditions Commitments

A number of consent conditions were attached to the Consents to manage the environmental risk associated with the Originally Consented Project. As detailed in Section 2.4 NnGOWL anticipate that any future consents issued to the Project may incorporate similar conditions to manage the environmental risk commensurate with the Project design envelope where it remains necessary to do so. Table 18-2Table 17-5 sets out the conditions attached to the Consents for the Originally Consented Project which have some relevance to the management of effects on Other Users.

Table 18-2 Consent conditions for the Originally Consented Project relevant to Other Users

Requirement	Relevant Consent Conditions for Other Users
Environmental Management Plan	Setting out, for approval, relevant environmental management and mitigation measures to be applied during the construction and operation of the Project including measures to minimise impacts on Other Users.
Navigational Safety Plan	Describes the navigational safety measures to be applied so as to mitigate the navigational risk to Other Users such as recreational sailors.
Lighting and Marking Plan	Detailing the agreed lighting and marking of the scheme so as to safeguard the safety of air and surface navigation.
Environmental protection	Requiring restoration of the beach profile following completion of the works (with the effect of also minimising effects on coastal amenity).
Various notifications	Notifications of the commencement and completion of the works and the proposed and final scheme details (including the nature and quantity of deposited objects and substances) to various bodies.
Navigational and aviation safety and charting	Requiring the issuing of notice to mariners and promulgation of details via Kingfisher Bulletins; also sets out requirements for lighting and marking.
Transportation audit sheet	Detailing the procedures to be followed where items are accidentally deposited on the seabed and subsequently for the recording and recovery of any such items.
Navigational safety	In addition to notifications, requirement for cable laying vessels to be equipped with AIS and for depths from cabling works not to be reduced by more than 5% without prior approval; restriction on use of radar or radio beacon use without prior approval by OFCOM.
Marking and Lighting	Requirements for marking and lighting of the site as directed by NLB, CAA and MOD and MCA (including requirement for marking of the area with buoys). Requirement for all vessels to be lit/marked in accordance with the COLREGS.

18.6 Scoping of the Project EIA

Considering the updated baseline and the findings of the Original Scoping Report and subsequent Scoping Opinion it remains the case that no interaction is predicted between the Project and the following marine users:

- Pipelines and cables;
- Oil and gas activities;
- Marine aggregate extraction; and
- Waste disposal sites.

As such, it is proposed that these topics also be scoped out of the Project ES and with no further consideration in this scoping report.

Table 18-3 summarises the post-mitigation significance for all effects on the remaining Other User groups considered in the Original ES and details whether the potential effect has been scoped out of the Project EIA, with relevant justification

Table 18-3. Summary of potential effects - Socioeconomics

Potential Impact	Receptor	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction				
Increased SSC / turbidity / dispersal during installation of foundations, substructures and inter-array cables	Recreational users: Scuba diving	Not significant	Scoped Out	The effect of foundations, substructures and inter-array cable installation on scuba diving activities was considered not to be significant. Based on the reduced scale of the Project the predicted effects will be no greater than and probably less than those presented in the Original ES. It is considered that further assessment should be scoped out of the Project EIA.
Disturbing or causing loss in habitat for recreationally targeted species due to installation and presence of foundations, substructures and inter-array cables.	Recreational fisheries – effects on target species	Not significant	Scoped out	The effect of foundations, substructures and inter-array cable installation on fish species, and, therefore, on recreational fishery activity was considered not to be significant. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the Project EIA.

Potential Impact	Receptor	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Presence of construction safety zones resulting in displacement of activities, restriction of access to area.	Scuba diving	Not significant	Scoped out	Displacement of recreational users due to implementation of construction safety zones was considered to be not significant or of minor significance. Based on the reduced scale of the Project the predicted effects will be less than those presented in the Original ES. It is considered that further assessment should be scoped out of the Project EIA.
	Sailing	Minor significance	Scoped out	
	Recreational fishing	Not significant	Scoped out	
Changes to, hydrodynamic regime due to offshore export cable installation.	Recreational users: surfers	Minor significance	Scoped out	The effects on coastal recreational users resulting from Offshore Export Cable installation at the near shore and landfall location was considered not to be significant or of minor significance. Although the length of the Offshore Export Cable has increased, this will not affect the sensitivity of the receptor or magnitude of the impact. Therefore, the EIA determinations therefore remain valid and it is considered that further assessment should be scoped out of the Project EIA.
Changes to sediments and benthic environment due to coastal and inter-tidal Offshore Export Cable installation.	Recreational fisheries due to effects on target species	Not significant	Scoped out	
Presence of nearshore and coastal safety zones during Offshore Export Cable installation	Canoeing, kayaking	Minor significance	Scoped out	
	Sailing	Not significant		
	Surfing, windsurfing and kitesurfing	Minor significance		
Increased noise, traffic disturbance due to Offshore Export Cable installation at the landfall location	Coastal recreational users: beach users, walkers, caravan park	Minor significance	Scoped out	

Potential Impact	Receptor	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Restricted access at the landfall location during Offshore Export Cable installation due to safety zones	Coastal recreational users: beach users, walkers, and similar	Minor significance	Scoped out	
Disturbance to the seabed during construction activities	Ordnance	n/a	Scoped Out	Effects resulting from unexploded ordnance was not explicitly assessed in the Original ES. Effects resulting from unexploded ordnance would present a major health and safety risk. However, mitigation measures would be implemented to minimise the risk associated with unexploded ordnance. As such, and with the embedded mitigation in place, it is considered that further assessment should be scoped out of the Project EIA.
Operation and Maintenance				
Presence of offshore structures including wind turbines and substations – increased sightseeing activities	Tour operators	Minor significance	Scoped out	The effect of the presence of offshore structures on tour operators was considered to be of minor significance. No change is predicted despite the reduced scale of the Project. It is considered that further assessment should be scoped out of the Project EIA.
Disturbance to the seabed during operation and maintenance activities	Ordnance	n/a	Scoped Out	Effects resulting from unexploded ordnance was not explicitly assessed in the Original ES. Effects resulting from unexploded ordnance would present a major health and safety risk. However, mitigation measures would be implemented to minimise the risk associated with unexploded ordnance. As such, and with the embedded mitigation in place, it is considered that further assessment should be scoped out of the Project EIA.

18.6.1 Scoping of Cumulative Impacts Assessment

Scoping of the CIA for the Original EIA was considered collaboratively through the FTOWDG. The potential for cumulative impacts affecting other marine and coastal users was scoped out at a regional level as detailed in Appendix 6.2: Scottish Offshore Wind Farms – East Coast – Discussion Document – Approach to Cumulative Impacts Assessment (Royal Haskoning, 2010) of the Original ES. It was considered that the distances between the offshore wind farms was such that cumulative effects were unlikely to be an issue requiring any collaborative work and could be addressed at Project level.

It is considered that if the Project is constructed, maintained and operated in accordance with the embedded mitigation set out in Section 18.4 and based on the reduced scale of the Project that any cumulative effects would be no greater and likely less than those considered during the Original Scoping exercise. It is therefore considered that further assessment of cumulative effects be scoped out of the Project EIA.

18.7 Approach to EIA

Based on the evidence summarised from the Original ES and Scoping and considering the reduced scale of the Project by comparison to the Originally Consented Project, it is concluded that all of the potential effects on Other Users (including Ordnance) should be scoped out of the Project EIA. Therefore, it is proposed that no detailed assessment of Other Users would be included within the ES.

18.8 Scoping Questions

- Are you satisfied that the review of baseline data confirms no significant change in the baseline associated with Other Users as detailed in the Original ES?
- Do you agree that, in all cases, the assessment scenario previously applied in conducting the Original EIA represents the worst-case scenario when compared to the Project?
- Do you agree that the embedded mitigation described provides a suitable means for managing and mitigating the potential effects of the Project on the Other Users?
- Do you agree that the assessment of impacts on Other Users can be scoped out of the Project EIA for the forthcoming Application?
- Do you agree that the cumulative effects on Other Users should be scoped out of the Project EIA based on the assumptions detailed in this Scoping Report and the conclusions reached in the CIA for the Originally Consented Project?

19 Socio-economics

19.1 Introduction

This section of the Scoping Report describes the local social and economic context that is of relevance to the Project and considers the potential effects on socioeconomics and tourism that may result from construction, operation and maintenance and decommissioning of the Project. Reference is made to the previously established baseline characterisation that was presented within the Original Application, and to the outcomes of impact assessment presented in the Original ES. Socioeconomic effects upon commercial fishing are identified and considered within the 'Commercial Fisheries' chapter (Chapter 13).

19.2 Baseline Data

This section identifies the baseline data sources that can be used to characterise socioeconomic conditions and tourism within and around the Development Area, initially drawing on the data sources used to inform the Originally Consented Project EIA, but updated where possible through a review of more recent data. Commentary is provided on the sufficiency of this data as a basis for scoping the Project EIA. Since completion of the EIA for the Originally Consented Project, formal guidelines for the completion of socioeconomic assessment of offshore wind farms remain absent, so scoping continues to follow the advice provided within the Scottish Enterprise Economic Appraisal Guidance Note (Scottish Enterprise, 2008) and the Green Book (HM Treasury, 2013).

A variety of data sources were reviewed to inform the Original ES (NnGOWL, 2012). Those datasets considered to be relevant to the Project are listed in Table 19-1 below. The data sources are more fully described in Chapter 23 and Appendix 23.1 of the Original ES (NnGOWL, 2012).

Table 19-1. Baseline data sources Originally Consented Project Socioeconomic assessment

Data Source	Study / Data name	Survey Overview
Population data and predictions for local authorities	General Registrar of Scotland (GROS) (2009)	The GROS provided actual and projected population change for each local authority and Scotland between 1981 and 2033.
Population demographics	Office for National Statistics (ONS) (2011a)	Annual population survey data on the proportion of children, working age and pension age residents that make up the population.
Population working age data	ONS (2011b)	Survey results for the proportion of working age population.
Population demographics	ONS (2011c)	Mid-year population estimates.
Business and employment data	ONS (2011d)	Business register and employment survey.
	ONS (2011e)	Annual business inquiry – employee

Data Source	Study / Data name	Survey Overview
		analysis.
	ONS (2011f)	Business demography 2009 tables.
Economy data	ONS (2005)	UK input-output tables 2005.
	Scottish Government (2010)	Input-output tables 2007.
Employment and labour market data	ONS (2010a)	Annual survey of hours and earnings - resident analysis.
	ONS (2010b)	Annual survey of hours and earnings – workplace analysis.
	ONS (2010c)	Labour productivity measures from the ABI: 1998 to 2007 economic & labour market review | Vol 4 | No 5 |
	ONS (2010d)	Annual business inquiry - employee analysis.
Tourism data	VisitScotland (2010)	Research and statistics providing information and analysis on Scotland's visitors, markets and tourism industry, drawn from VisitScotland's extensive research activities.

Within the Original ES, the study area was defined as the combined local authority regions of Angus, Dundee, Fife, Edinburgh and East Lothian. The potential economic impact on the rest of Scotland in general was also considered. There are a number of ports within the study area that could provide support for the Project.

The Project timeline used for the assessment in the Original ES was from 2008 to 2039 (32 years in total) which covered the consenting phase through to the decommissioning phase (after approximately 25 years of operation).

The socioeconomic benefit assessment was also informed by an economic numerical model which considered the anticipated Project expenditure and industry data in the installation and operational phases.

19.2.1 Data Validity

NnGOWL are of the opinion that the data previously collected as part of the Original ES is sufficient to meet the requirements needed to effectively characterise the current baseline conditions within the Development Area. The following sections demonstrate the adequacy (or otherwise) of the available data in relation to spatial coverage and age.

19.2.1.1 Data Spatial Coverage

The Project covers the same area as the Original Application and has not changed in spatial location or size. Therefore, the study area (comprising of five local authority regions) identified within the Original ES remains applicable and valid to the Project. The options for construction and operations ports remain open with a number of port facilities that could potentially be used to support various aspects and phases of the Project.

19.2.1.2 Age of Data

The socioeconomic data (including population, employment and tourism survey data) used within the Original ES were collected from publicly available survey findings and research undertaken by VisitScotland, ONS and the Scottish Government prior to 2012. This data was used to identify the socioeconomic conditions and existing baseline at that time.

Updates to this information are now available and it is therefore proposed to undertake a review of the more recent available information as a basis for checking the validity of the socio-economic baseline and as a basis for an updated assessment where this is considered necessary.

19.2.2 Review of the Baseline

Chapter 23 and Appendix 23.1 of the Original ES present the full baseline characteristics for socioeconomics across the Development Area and the surrounding economic area.

The socioeconomic baseline was established across the study area of Angus, Dundee, Fife, Edinburgh and East Lothian as well as at the Scotland level and covered Gross Value Added (GVA), population demography, business demography, the economic and labour market and tourism.

The total population of the study area was slightly over one million (ONS, 2011b), representing approximately one fifth of the total population of Scotland. Of this, the greatest number lived in Edinburgh, followed by Fife, Dundee, Angus and East Lothian. Compared to Scotland as a whole, each of the local authority regions had a broadly similar pattern in terms of the proportion of children, working age and pension age residents. However, East Lothian, Angus and Fife had a lower proportion of working age population compared to Scotland. Whilst Scotland's population had remained broadly static between 1981 and 2009, there were dramatic changes within the local authority regions of interest; the population of Dundee decreased by 15% whilst increases occurred in Angus (5%), Fife (6%), Edinburgh (7%) and East Lothian (20%). According to the General Registrar of Scotland's (GROS) latest population projections, these trends were predicted to continue. For example, the population of Dundee was estimated to reduce to approximately 135,000 by 2030 and East Lothian's is forecast to increase to almost 125,000 in the same time period.

For business births and deaths, the net number (births less deaths) was recorded as a net additional 3,000 businesses across the study area between 2004 and 2009, being lowest in Dundee and East Lothian, and highest in Edinburgh.

Employment is worked out in terms of job years rather than individual jobs. One job year is a representation of the length of the job rather than a single job, for example two full time jobs lasting for 6 months each would be equivalent to one job year. An estimate of job years generated in the study area is between 3,000 and 11,600 job years. When considering the benefits to Scotland as a whole the estimated number of job years is between 4,200 and 15,000 job years.

In terms of employment rates within the study area, Dundee has tended to have a lower level of employment compared to the other three local authority areas. Edinburgh saw a large fall in the proportion of the population in employment between 2008/09 and 2009/10.

19.3 Design Envelope

Table 19-2 sets out the worst case scenario defined by the Original ES for Socioeconomics (NnGOWL, 2012) compared to the proposed worst case scenario for the Project. This is provided at a level of detail that is sufficient to draw conclusions in relation to the scoping process. The worst case scenario design envelope for the Original ES has been identified using the information provided in Section 23.7.2 of the Original ES and at a level of detail sufficient to allow a comparison between the design envelopes.

Table 19-2. Worst Case Scenario Definition – Socioeconomics

Potential Impact	Original Project Design Envelope (Mainstream Renewable Power, 2012)	Project Design Envelope	Difference
Construction and Decommissioning			
Construction employment	Up to 125 turbines with GBS or jacket foundation substructures; Up to 140 km of inter-array cable; Up to 2 OSPs; Two 33 km offshore export cables; Two year construction programme (2014 – 2015)	Up to 56 turbines with jacket foundation substructures; Up to 140 km of inter-array cable; Up to 2 OSPs; Two 43 km offshore export cables; Two or three year construction programme (2020 - 2022)	Reduction in installed infrastructure but possible increase in size of turbines and foundations and construction period and increase in length of Offshore Export Cables.
Wider economic impacts	Up to 125 turbines with GBS or jacket foundation substructures; Up to 140 km of inter-array cable; Up to 2 OSPs; Two 33 km offshore export cables; Two year construction programme (2014 –	Up to 56 turbines with jacket foundation substructures; Up to 140 km of inter-array cable; Up to 2 OSPs; Two 43 km offshore export cables; Two or three year construction programme (2020 -	Reduction in installed infrastructure but possible increase in size of turbines and foundations and construction period and increase in length of Offshore Export Cables.

Potential Impact	Original Project Design Envelope (Mainstream Renewable Power, 2012)	Project Design Envelope	Difference
	2015)	2022)	
Tourism and accommodation	Up to 125 turbines with GBS or jacket foundation substructures; Up to 140 km of inter-array cable; Up to 2 OSPs; Two 33 km offshore export cables; Two year construction programme (2014 – 2015)	Up to 56 turbines with jacket foundation substructures; Up to 140 km of inter-array cable; Up to 2 OSPs; Two 43 km offshore export cables; Two or three year construction programme (2020 - 2022)	Reduction in installed infrastructure but possible increase in size of turbines and foundations and construction period and increase in length of Offshore Export Cables.
Operation and Maintenance			
O&M employment	Onshore control room and base for operational life span. Base and vessels for planned and unplanned maintenance. Project lifespan: 25 years	Onshore control room and base for operational life span. Base and vessels for planned and unplanned maintenance. Project lifespan: 50 years	No change to original design envelope but longer Project operational lifespan.
Wider economic impacts	Onshore control room and base for operational life span. Base and vessels for planned and unplanned maintenance. Project lifespan: 25 years	Onshore control room and base for operational life span. Base and vessels for planned and unplanned maintenance. Project lifespan: 50 years	No change to original design envelope but longer Project operational lifespan.
Tourism and accommodation	Onshore control room and base for operational life span.	Onshore control room and base for operational life span.	Reduced number of turbines but greater tip height; longer Project

Potential Impact	Original Project Design Envelope (Mainstream Renewable Power, 2012)	Project Design Envelope	Difference
	Base and vessels for planned and unplanned maintenance. 125 turbines Project lifespan: 25 years	Base and vessels for planned and unplanned maintenance. 56 turbines of greater tip height Project lifespan: 50 years	operational lifespan

19.4 Embedded Mitigation

A number of potential, local opportunities that have the potential to enhance socioeconomic effects were detailed within the Original Scoping Report for the Original Application and could apply equally to the Project where they remain feasible. The opportunities identified in the Original ES and which would be reconsidered in reviewing the socioeconomic assessment for the Project, were as follows:

- The use of locally manufactured content where possible;
- The use of local contractors during construction for onshore infrastructure and potential offshore construction work where possible;
- Possibility of local community facility improvements;
- Employment and training possibilities for local people on the operation and maintenance of a wind farm where feasible; and
- Supporting the community through sponsorship of local groups and teams.

The Originally Consented Project was assessed as having a net positive socioeconomic effect both at the study area level but also across Scotland, in terms of the potential for job creation and overall Project expenditure. No additional mitigation measures were therefore required; however the following additional enhancement measures were identified as having the potential to be beneficial in the Original ES and would be reconsidered in reviewing the socioeconomic assessment for the Project:

- To maximise local employment opportunities, as far as possible, through liaison with public sector bodies (e.g. Scottish Enterprise), and through other activities that raise awareness of the opportunities that the proposed Project provides; and
- To monitor economic benefits for the study area and Scotland. This can be done by keeping a record of all supplies procured, value, location and length of contract. The data could be collated and analysed on a regular basis to provide evidence as to the economic benefits that have accrued to the study area and Scotland.

19.5 Scoping of the Project EIA

Table 19-3 summarises the post-mitigation (residual) significance for all effects considered in the Original ES and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

The embedded mitigation (Section 19.4) was included within the assessment conclusions and therefore only the residual effects have been presented in these tables.

Table 19-3. Summary of Potential Effects – Socioeconomics

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction, Operation, Maintenance and Decommissioning				
Business supply chain	GVA - study area and Scotland	Moderate (positive)	Scoped in	Reduced number of turbines and potential change in the duration of construction. Potential change in the baseline situation. Whilst the Project will likely still produce a positive increase in GVA for the study area and the other areas of analysis, given the reduction in the number of installed turbines and the potential change to the baseline, it is proposed to scope effects on GVA into the Project EIA in order to review the level of significance that should be attributed.
	Employment - study area and Scotland	Moderate (positive)	Scoped in	Reduced number of turbines and potential change in the duration of construction. Potential change in the baseline situation. There will likely be a positive increase in employment in the study area, albeit this will depend upon where contracts are placed and the level of local skills base. The majority of jobs created are expected to be above existing benchmark averages in terms of average earnings per worker, reflecting the skill profile of the expected job opportunities; however, given the reduction in the number of installed turbines and the potential change to the baseline, it is proposed to scope effects on employment into the Project EIA in order to review the level of significance that should be attributed.
Tourism	Tourism economy – study area	Not significant	Scoped out	Reduced number of turbines but increase in tip height and potential change in the duration of construction. However, it is concluded that, given the level of significance previously attributed, the previous assessment remains valid therefore it is proposed that

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
				effects on tourism be scoped out of further assessment in the Project EIA. Potential visual and setting impacts from increased turbine tip height will be captured within the SLVIA technical chapter of the Project ES (See Chapter 17 of this scoping report).

19.5.1 Scoping of Cumulative Impact Assessment

The CIA included within the Original ES considered the proposed Inch Cape and the Seagreen offshore wind farms in conjunction with the Original Application and was based upon a worst case scenario of all three projects being constructed at the same time. The Original ES looked at potential cumulative effects with respect to GVA, employment, economy and tourism.

A review of other plans, projects and activities (selected from the list in Appendix B) indicates that there are no other current plans, projects and activities that need to be considered in this CIA. As the Inch Cape and the Seagreen projects are understood to be broadly at the same stage as the Project (i.e. in or about to be subject to scoping), the CIA is considered to remain valid.

Table 19-4 summarises the post-mitigation (residual) significance for all cumulative effects considered and details whether the potential effect has been scoped out of the Project EIA, with a relevant justification.

Table 19-4. Summary of Potential Effects – Project with Other Plans, Projects and Activities.

Potential Effect	Residual Impact Significance (NnGOWL, 2012)		Scoped in or out of the Project EIA	Justification
Construction and Decommissioning				
Business supply chain	GVA - study area and Scotland	Moderate (positive)	Scoped in	The cumulative projects under consideration remain the same as those considered in the Original ES but with a reduction in the scale of the Project. It is anticipated that there will be a similar reduction in the scale of the other projects. As such it is uncertain whether the reduced scale, combined with any potential changes to the baseline, would be likely to reduce the positive effect on the GVA and employment in the study area. It is therefore proposed that cumulative effects on GVA and Employment be scoped into the Project EIA.
	Employment - study area and Scotland	Moderate (positive)	Scoped in	
Tourism	Tourism economy –	Not significant	Scoped out	Reduced number of turbines for all projects but potential increases in tip height. However, it is

Potential Effect	Residual Impact Significance (NnGOWL, 2012)	Scoped in or out of the Project EIA	Justification
Construction and Decommissioning			
	study area		concluded that, given the level of significance previously attributed, the previous cumulative assessment remains valid therefore it is proposed that cumulative effects on tourism be scoped out of further assessment in the Project EIA. Potential visual and setting impacts from potentially increased turbine tip height will be captured within the SLVIA technical chapter of the Project ES (See Chapter 17 of this scoping report).

19.6 Approach to EIA

Based on the evidence summarised, NnGOWL propose to undertake a review of the baseline data and a re-assessment of the potential impacts on the key socio-economic metrics using the study area previously applied. In the first instance the baseline will be updated making use of the most up to date data sources to ascertain the current level of and recent trends in employment and GVA creation in each impact area. The Business Register and Employment Survey (ONS) and local and National GVA estimates (ONS) will be used to set out a clear baseline for the current level of employment and GVA in the impact areas.

An assessment would then be conducted based on a Project specific economic impact model, developed by determining the estimation of the Project expenditure on construction and operation activities by phase and geography that drive the employment and GVA impacts that the assessment is seeking to measure. Assumptions about local content will be based on an up to date view of current supply chain market conditions.

Due to the uncertainty over the scale of socio-economic impacts, a scenario based analysis will be applied to illustrate the potential scale of benefit associated with offshore wind farms where port locations and supply chain geography are uncertain.

It is anticipated that the scenarios would include:

- A high impact scenario - Contracts identified as deliverable from the local supply chain have been awarded to the local supply chain.
- Medium impact scenario: The local supply chain has been successful in attaining a balance of the contracts
- Low impact scenario: The local supply chain involvement is limited to minimum level.

The scenario based approach is consistent with the guidance set out in the HM Treasury Green Book and broadly follows the approach presented in the Original ES.

The sourcing assumptions will provide an estimated value for the direct construction and O&M expenditure that would be captured in each impact area under each of the scenarios for the 50 year lifespan of the

Project. This information forms the basis of calculations for the direct, indirect and induced employment and GVA impacts. Definitions of each type of impact are set out in Table 19-5.

Table 19-5. Definition of socio-economic effects to be considered in the Project EIA.

Type of Economic Effect	Construction	O&M
Direct Employment and GVA	Relates to the economic effects wholly related to capital spend on construction. The employment and GVA associated with the **first round of capital expenditure** i.e. MORL's spend directly with suppliers in each impact area.	Jobs and wealth creation directly associated with O&M activity. The **employees directly engaged** in activities relating to the management, O&M and monitoring and maintenance of the Offshore Wind Farm.
Indirect GVA and Employment Effects	These impacts take place in the supply chains of companies that directly supply goods and services to the development. Indirect construction impacts related to the jobs and GVA generated in impact areas in the chains of suppliers of goods and services to the direct activities.	Jobs and GVA associated with supply chain spend during the O&M phase. This includes first and second round supply chain impacts.
Induced Economic Effects	This captures the additional employment and wealth associated with expenditure of personal income from the jobs which are supported directly and indirectly. These effects are spread across a wide range of sectors.	

The quantitative estimates of employment and GVA would be driven by the additional output generated in each sector. This would be converted to jobs and GVA using sector based benchmarks (from the ONS Annual Business Survey) appropriate to each impact area. The direct employment and GVA impacts are based on the assumed direct expenditure and employment under each scenario.

Indirect impacts would be estimated using a bespoke economic model which uses the UK and Scottish Input-Output tables (ONS, 2005). The input-output model will be used to model the way in which direct spend with first tier suppliers would lead to indirect employment and GVA effects further down the supply chain. This output would then be converted into employment and GVA using sector benchmarks.

Induced economic impacts will be spread across the UK, Scottish and local economies in a variety of production, manufacturing, construction and traded and non-traded service sectors. Compared to direct and indirect economic impacts, there is typically greater uncertainty about the scale, sectoral distribution and geographical spread of these impacts. Nonetheless, they are a positive benefit that the assessment can refer to qualitatively.

The change in baseline conditions that would occur as a result of socio-economic impacts is the basis for the assessment of magnitude. As direct, indirect and induced impacts occur in a different range of sectors,

the assessment will need to explore the magnitude of impacts against a slightly different baseline for each type of measure.

For both employment and GVA receptors, the absolute scale of direct and indirect (and induced) employment and GVA is the central consideration for the employment receptor. The magnitude of impact associated with direct employment will be assessed in the context of the current level of employment in relevant sectors to offshore wind construction and operation.

For indirect employment and GVA, the magnitude of the impact would need to be assessed in the context of the current level of employment and GVA in the whole economy as these impacts will be spread across a wider range of sectors.

The significance of effects will be assessed based on the sensitivity of each receptor and using a significance matrix consistent with that in use across the EIA. Sensitivity of each receptor would be determined using a qualitative framework such as that provided in the table below.

Table 19-6. Example framework for determining sensitivity of socio-economic receptors.

Sensitivity	Definition	Example Criteria
Very High	Receptor is accorded a very high priority in local and regional development and regeneration policy.	Identification as a highest ranking thematic or spatial priority (as a result of economic potential and/or need). Evidence of severe socio-economic challenges, under-performance or vulnerability e.g. patterns of deprivation, employment and wealth generation, employment forecasts, exposure to socio-economic threats.
High	Receptor is accorded a high priority in local and regional economic development and regeneration policy.	Identification as a key thematic or spatial priority (as a result of economic potential and/or need). Evidence of major socio-economic challenges, under-performance or vulnerability e.g. patterns of deprivation, employment and wealth generation, employment forecasts, exposure to socio-economic threats.
Medium	Receptor is accorded a medium priority in local and regional economic development and regeneration policy.	No identification as a key thematic or spatial priority (as a result of economic potential and/or need) Evidence of significant socio-economic challenges, under-performance or vulnerability.
Low	Receptor is accorded a low priority in local and regional economic development and regeneration policy.	No identification as a key thematic or spatial priority (as a result of economic potential and/or need) Evidence of economic prosperity, buoyancy and resilience e.g. low levels of deprivation, relatively high employment and wealth generation rates, relatively strong employment forecasts.
Negligible	Receptor is accorded no particular priority in local and regional economic development and regeneration policy.	No identification as policy priority (as a result of economic potential and/or need). Evidence of good overall economic performance and long term

Sensitivity	Definition	Example Criteria
		prospects. No particular economic weaknesses or challenges.

The potential visual impacts and sensitivities associated with tourism and tourist viewpoints will be considered in relation to the SLVIA (see Chapter 17 of this scoping report).

19.7 Scoping Questions

- Do you agree that the effect on tourism should be scoped out of the ES on the basis that the baseline remains valid and the scale of the Project is reduced when compared to that assessed in the Original EIA?
- Are you satisfied with the proposed approach to assessing the potential effects on GVA and employment in the Project EIA?

19.8 References – Socio-economics

General Registrar of Scotland (2009). http://www.gro-scotland.gov.uk/files2/stats/projected-population-of-scotland-2008based/projected-population-of-scotland-2008-based-publication/projected-population-of-scotland-2008-based.pdf

HM Treasury (2013). The Green Book. Appraisal and Evaluation in Central Government. Treasury Guidance (Updated 2003 version).

Neart na Gaoithe Offshore Wind Limited (2009). Neart na Gaoithe Proposed Offshore Wind Farm. Scoping Report. November 2009.

Neart na Gaoithe Offshore Wind Limited (2012). Neart na Gaoithe Offshore Wind Farm Environmental Statement. July 2012.

Nomis (2017). Official labour market statistics. Local Authority Profiles. https://www.nomisweb.co.uk/reports/lmp/la/1946157416/report.aspx?town=Edinburgh#tabempunemp. [Accessed April 2017].

ONS (2005). UK Input-Output Tables. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011].

ONS (2010a). Annual Survey of Hours and Earnings - resident analysis. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011].

ONS (2010b). Annual Survey of Hours and Earnings – workplace analysis. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011].

ONS (2010c). Labour productivity measures from the ABI: 1998 to 2007 Economic & Labour Market Review | Vol 4 | No 5 |. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Dec 2011].

ONS (2010d). Annual Business Inquiry - Employee Analysis. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011].

ONS (2011a). Annual Population Survey. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011]

ONS (2011b). Annual Business Inquiry – Employee Analysis. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011].

ONS (2011c). Mid-year Population Estimates. Available online from: http://www.ons.gov.uk/ons/index.html [accessed May 2011].

ONS (2011d). Business Register and Employment Survey. Available online from: http://www.ons.gov.uk/ons/index.html [accessed Jul 2011].

ONS (2017a). Dataset – Business Demography. Births, deaths and survivals of businesses in the UK, by geographical areas and standard industrial classification groups. https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/businessdemographyreferencetable [accessed April 2017].

ONS (2017b). Statistical bulletin: Regional labour market statistics in the UK: Apr 2017. https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/regionallabourmarket/apr2017#summary-of-latest-regional-labour-market-statistics [Accessed April 2017].

Scottish Enterprise (2008). Economic Appraisal Guidance Note. A Summary Guide to Developing the Economic Case for a Project or Programme. Appraisal & Evaluation Team. 1st November 2008.

Scottish Government (2010). Input Output Tables 2007. Available online from: http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output/IOAllFiles2007. [accessed Feb 2012].

VisitScotland (2010). Research and Statistics. Available online from: http://www.visitscotland.org/research_and_statistics.aspx [accessed Feb 2012].

Visit Scotland (2016) http://www.visitscotland.org/pdf/ScotlandRegional%20-%20MarketStats%20Oct2016%20-Final.pdf [Accessed April 2017].

20 Summary of the EIA Scoping

20.1 Topics Scoped into the Project EIA

Table 20-1 summarises the outcomes of the scoping process as set out in Chapters 6 to 19 of this scoping report. It summarises those topics and / or individual impacts or receptors scoped in the Project EIA to be prepared by NnGOWL and presented in the Project ES that will accompany the application for consents.

Table 20-1 Summary of topics and /or impacts scoped into the Project EIA

Technical Assessment	Development Stage	Potential Effect	Scoped In?
Geology and water quality	All	All	No
Physical Processes	All	All	No
Air quality	All	All	No
Ornithology	Operation and Maintenance	Displacement and barrier effects - Gannet, kittiwake, guillemot, razorbill, Puffin	Yes
		Collision mortality - Gannet, Arctic skua, great skua, little gull, black-headed gull, common gull, lesser black-backed gull, herring gull, great black-backed gull & kittiwake	Yes
		All effects combined - Gannet and kittiwake	
	Cumulative – Operation and Maintenance	Displacement and barrier effects - Gannet, kittiwake, guillemot, razorbill, Puffin	Yes
		Collision mortality - Gannet, Arctic skua, great skua, little gull, black-headed gull, common gull, lesser black-backed gull, herring gull, great black-backed gull & kittiwake	Yes
		All effects combined - Gannet and kittiwake	Yes
Marine Mammals	Construction & Decommissioning	Piling noise during installation of foundations – PTS, TTS and disturbance – harbour porpoise, white beaked dolphin, bottlenose dolphin, minke whale, harbour seal, grey seal.	Yes
	Cumulative – Construction & Decommissioning	Piling noise during installation of foundations – PTS, TTS and disturbance – harbour porpoise, white beaked dolphin, bottlenose dolphin, minke whale, harbour seal, grey seal.	Yes
Benthic Ecology	All	All	No
Fish and shellfish ecology	All	All	No
Commercial fisheries	Construction and Decommissioning	Loss or restricted access to fishing grounds due to Offshore Wind Farm construction activities	Yes

Technical Assessment	Development Stage	Potential Effect	Scoped In?
		Loss or restricted access to fishing grounds due to Offshore Export Cable installation activities	Yes
		Increased steaming times as a result of safety zones and construction activities at the Wind Farm Area.	Yes
		Increased steaming times as a result of construction activities at the Offshore Export Cable Corridor.	Yes
		Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Wind Farm.	Yes
		Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Export Cable.	Yes
		Displacement of fishing vessels into other areas due to construction activities at the Wind Farm Area and along the Offshore Export Cable Corridor.	Yes
	Operation and Maintenance	Loss or restricted access to fishing grounds due to turbines and associated Wind Farm infrastructure.	Yes
		Loss or restricted access to fishing grounds due to the Offshore Export Cables.	Yes
		Interference to transiting of fishing vessels as a result of the Offshore Wind Farm	Yes
		Interference to transiting of fishing vessels as a result of the Offshore Export Cable Corridor	Yes
		Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Wind Farm Area	Yes
		Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Offshore Export Cable Corridor	Yes
		Displacement of fishing vessels due to the operational Wind Farm	Yes
		Displacement of fishing vessels due to the operational Offshore Export Cable	Yes
	Cumulative – Construction and Decommissioning	Loss or restricted access to fishing grounds due to Offshore Wind Farm construction activities	Yes
		Loss or restricted access to fishing grounds due to Offshore Export Cable installation activities	Yes
		Increased steaming times as a result of safety zones and construction activities at the Wind Farm Area.	Yes

Technical Assessment	Development Stage	Potential Effect	Scoped In?
		Increased steaming times as a result of construction activities at the Offshore Export Cable Corridor.	Yes
		Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Wind Farm.	Yes
		Fouling of static gear or changes to towing patterns due to construction and installation vessels transiting to the Offshore Export Cable.	Yes
		Displacement of fishing vessels into other areas due to construction activities at the Wind Farm Area	Yes
		Displacement of fishing vessels into other areas due to construction activities along the Offshore Export Cable Corridor	Yes
	Cumulative – Operation and Maintenance	Loss or restricted access to fishing grounds due to turbines and associated Wind Farm infrastructure.	Yes
		Loss or restricted access to fishing grounds due to the Offshore Export Cables.	Yes
		Interference to transiting of fishing vessels as a result of the Offshore Wind Farm	Yes
		Interference to transiting of fishing vessels as a result of the Offshore Export Cable Corridor	Yes
		Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Wind Farm Area	Yes
		Fouling of static gear or changes to towing patterns due to O&M vessels transiting to the Offshore Export Cable Corridor	Yes
		Displacement of fishing vessels due to the operational Wind Farm	Yes
		Displacement of fishing vessels due to the operational Offshore Export Cable	Yes
Shipping and Navigation	Operation and Maintenance	Physical presence of Offshore Wind Farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure)	Yes
	Cumulative - Operation and Maintenance	Physical presence of Offshore Wind Farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Yes
Military and aviation	Operation and Maintenance	Effects on activities carried out in military PEXAs	Yes
		Increase in risk due to clutter resulting from reflected turbine	Yes

Technical Assessment	Development Stage	Potential Effect	Scoped In?
		signals and reduced detectability of aircraft resulting from shadowing behind turbines. RAF Brizlee Wood and RAF Buchan ADR systems; NERL Allanshill and Perwinnes PSR systems; Aberdeen Airport utilization of data from the NERL Allanshill and Perwinnes PSR systems	
		Use of helicopters for operation and maintenance of the Offshore Wind Farm	Yes
	Cumulative Operation and Maintenance -	Increase in risk due to clutter resulting from reflected turbine signals – Leuchars Station PSR	Yes
		Reduced detectability of aircraft resulting from shadowing behind turbines – Leuchars Station PSR	Yes
Maritime Archaeology and Cultural Heritage	Operation and Maintenance	Impacts on the setting of cultural heritage assets	Yes
	Cumulative - Operation and Maintenance	Impacts on the setting of cultural heritage assets	Yes
Seascape, Landscape and Visual Impacts	Construction	Changes to visual amenity arising from intertidal cable laying	Yes
	Operation and Maintenance	Changes to character of regional seascape units	Yes
		Changes to the special qualities of local landscape designations	Yes
		Changes in visual amenity experienced at representative viewpoints	Yes
		Changes in visual amenity experienced along routes	Yes
	Cumulative – Operation and Maintenance	Changes to character of regional seascape units	Yes
		Changes to the special qualities of local landscape designations	Yes
		Changes in visual amenity experienced at representative viewpoints	Yes
		Changes in visual amenity experienced along routes	Yes
Other Users	All	All	No
Socioeconomics	All	Business supply chain – GVA and supply chain effects	Yes
	All - cumulative	Business supply chain – GVA and supply chain effects	Yes

For the avoidance of doubt, it is proposed that the following topics / technical elements of a topic **are scoped out from the Project ES** (unless otherwise specifically listed in Table 20-1 above):

- Geology and water quality – all potential impacts alone and cumulatively;

- Physical processes – all potential impacts alone and cumulatively ;
- Air quality – all potential impacts alone and cumulatively;
- Ornithology – all potential effects except for those specifically set out in Table 20-1 (alone or cumulatively) and for the species named;
- Marine Mammals – all potential effects except TTS, PTS and disturbance displacement / PTS from piling for the species named in Table 20-1;
- Benthic Ecology – all potential impacts alone and cumulatively;
- Fish and Shellfish Ecology – all potential impacts alone and cumulatively;
- Shipping and navigation – all potential effects during construction and for the operational phase with the exception of vessel to vessel and vessel to structure collision risk (alone and cumulatively);
- Military and aviation - all potential effects except for those specifically set out in Table 20-1 (alone or cumulatively);
- Marine archaeology and cultural heritage – all effects during the construction phase and all effects during the operational phase with the exception of impacts on the setting of cultural heritage assets (alone and cumulatively);
- Seascape, Landscape and Visual –all potential effects except for those specifically set out in Table 20-1 (alone or cumulatively);
- Other users – all potential impacts alone and cumulatively; and
- Socioeconomics and Tourism – impacts on tourism (alone and cumulatively).

21 Proposed Structure of the Environmental Statement

In accordance with the requirements of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), the proposed contents and structure of the Project ES, in light of the findings of the scoping process, will be as follows:

- A Non-technical Summary (NTS);
- Volume 1 - The main text of the EIA; and
- Volume 2 – Any supporting Technical Appendices and graphics.

The ES will cover the Project as outlined in Chapter 4 and will be provided in support of the Section 36 and Marine Licence applications.

Volume 1 of the Project ES will be divided into the following main chapters:

- Chapter 1 - Introduction and Background to the Proposal;
- Chapter 2 – Climate Change;
- Chapter 3 – Regulatory Policy Context;
- Chapter 4 – Site Selection;
- Chapter 5 – Project Description;
- Chapter 6 –Consultation and Engagement;
- Chapter 7 – Scoping of the ES and Embedded Mitigation
- Chapter 8 - EIA Methodology;
- Chapter 9 – Marine Mammals;
- Chapter 10 – Ornithology;
- Chapter 11 - Commercial Fisheries;
- Chapter 12 – Shipping and Navigation;
- Chapter 13 – Military and Aviation;
- Chapter 14 – Marine Archaeology and Cultural Heritage;
- Chapter 15 – Seascape and Landscape Visual Impact Assessment;
- Chapter 16 – Socioeconomic assessment;
- Chapter 17 – Summary of the EIA; and
- Chapter 18 – Summary of Mitigation Measures.

The technical assessment chapters will be comprised of the following main sections (unless otherwise required to comply with best practice or relevant guidance):

- Introduction;
- Guidance and legislation;
- Data Sources;
- Relevant consultations;
- Impact Assessment Methodology;
- Baseline Description;
- Impact Assessment (including cumulative impact assessment); and
- Mitigation Measures, Residual Impact and any recommendations for monitoring.

The CIA will be completed as a part of each of the individual topic chapters, where such effects are scoped in to the EIA, and will be presented within each chapter.

For each environmental aspect being assessed, the relevant guidelines will be followed and applied as considered necessary. Unless otherwise set out in the individual topic chapter, each potential impact will be assessed in terms of the sensitivity or value of the receptor in line with relevant guidance and best practice. The magnitude of each impact will then be and a matrix approach will be applied combining the sensitivity magnitude values to provide an overall level of significance (adverse or beneficial) and taking account of any relevant embedded mitigation measures.

For significant impacts, appropriate mitigation measures will be set out where possible and the residual impact (the impact significance taking the mitigation into account) will be defined.