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| Project Title | Seagreen Section 36 Variation Screening Report |
| Document Reference Number | LF000012-CST-OF-LIC-REP-0001 |

# Seagreen Section 36 Variation Screening Report

October 2024

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| Rev | Date | Reason for Issue | Originator | Checker | Approver |
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| 01 | 03/10/2024 | Draft For client review | Jack Walker, Maizie Edwards | James Memory | Huw Powell |
| 02 | 04/10/2024 | Final | Jack Walker, Maizie Edwards | James Memory | Huw Powell |

## Key Terms & Definitions

| Term | Definition |
|---|---|
| 2012 ES | When referring to the original 2012 ES produced for the Seagreen Project with reference 2012 ES. |
| 2014 Consents | Seagreen Alpha S36 Consent, Seagreen Alpha Marine Licence, Seagreen Bravo S36 Consent, Seagreen Bravo Marine Licence and Offshore Transmission Asset Marine Licence (all as varied). |
| the Variation | The project activities outlined in the project description in this screening report include a shift in project installation window |
| Seagreen 1A (SG1A) | 36 turbines associated infrastructure consented but not constructed under Seagreen Alpha and Seagreen Bravo |
| Seagreen Alpha | Seagreen Alpha Offshore Wind Farm (OWF) within the phase 1 development area of the Firth of Forth round 3 offshore wind zone. |
| Seagreen Alpha Marine Licence | The marine licence dated December 2019 with reference: Marine Licence - 04676/19/0. |
| Seagreen Alpha S36 Consent | The Section 36 consent dated August 2018 with reference Seagreen Alpha S36 Consent. |
| Seagreen Bravo | Seagreen Bravo OWF within the phase 1 development area of the Firth of Forth round 3 offshore wind zone. |
| Seagreen Bravo Marine Licence | The marine licence dated December 2019 with reference Marine Licence - 04677/19/0. |
| Seagreen Bravo S36 Consent | The Section 36 consent dated August 2018 with reference Seagreen Bravo S36 Consent. |
| Seagreen Alpha and Bravo Transmission Asset Marine Licence | Seagreen Transmission Asset connecting from Seagreen Alpha and Bravo to grid connection point, Marine Licence dated March 2019 with reference Marine Licence - 04678/19/0. |
| Seagreen Project | The total project as currently consented, comprising the Seagreen Alpha, Seagreen Bravo consents and Offshore Transmission Asset to Carnoustie. |
| Seagreen Project Area | Area of the Seagreen Alpha and Seagreen Bravo OWF (red line boundary) within the phase 1 development area of the Firth of Forth round 3 offshore wind zone. |

## References to Historical Key Documents

| Reference | Summary | Location* |
|---|---|---|
| Optimised Design Application Appropriate Assessment | 2018 Appropriate Assessment (AA) to accompany the 2018 Optimised Design Application (ODA). | Optimised Design Application AA |
| Optimised Design Application Scoping Report | Pre-application scoping report submitted to MS-LOT in 2017 to inform the ODA EIA. | Optimised Design Application Scoping Report |
| Optimised Design Application Environmental Impact Assessment | 2018 ODA Environmental Impact Assessment (EIA), submitted to vary the 2014 consent for Alpha and Bravo, application undetermined. | Optimised Design Application EIA |
| Optimised Design Application Scoping Opinion | Pre-application scoping opinion provided by MS-LOT to SSE in 2017 to inform the ODA EIA in response to the ODA Scoping report. | Optimised Design Application Scoping Opinion |
| 2012 Environmental Statement | Original 2012 Seagreen Alpha and Bravo Environmental Statement (ES) to accompany the marine Licence and Section 36 applications. | 2012 ES |
| 2012 ES Scoping Opinion | Pre-application scoping opinion provided by MS-LOT to SSE in 2010 to inform the 2012 ES in response to the 2012 ES Scoping report. | 2012 ES Scoping Opinion |
| 2014 Marine Protected Area Assessment | MS-LOT Marine Protected Area (MPA) Assessment associated with the 2012 ES. | 2014 MPA Assessment |
| 2014 Appropriate Assessment | 2014 AA to accompany the 2012 ES. | 2014 AA |
| 2020 Piling Strategy | The overall aims and objectives of the OWF Piling Strategy are to provide detailed information on the piling activities for installation of the WTG foundations, including setting out the anticipated timing, location, duration and maximum hammer energy to be used. | 2020 Piling Strategy |
| Seagreen Bravo Marine Licence 2014 | Marine Licence granted to Seagreen Bravo Wind Energy Limited (SBWEL) following submission of Application in 2012. | Seagreen Bravo Marine Licence 2014 |
| Seagreen Alpha Marine Licence 2014 | Marine Licence granted to Seagreen Bravo Wind Energy Limited (SBWEL) following submission of Application in 2012. | Seagreen Alpha Marine Licence 2014 |
| Seagreen Transmission Asset Marine Licence 2014 | Marine Licence granted to Seagreen Alpha Wind Energy Limited (SAWEL) and Seagreen Bravo Wind Energy Limited (SBWEL). | Seagreen Transmission Asset Marine Licence 2014 |

| Reference | Summary | Location* |
|---|---|---|
| 2018 Seascape, Landscape and Visual Impact Assessment (SLVIA) | Seascape, Landscape and Visual Impact Assessment Chapter in the 2018 ODA. | 2018 Seascape, Landscape and Visual Impact Assessment (SLVIA) |
| 2012 Navigational Risk Assessment (NRA) | NRA Technical Appendices to accompany the 2012 ES. | 2012 Navigational Risk Assessment (NRA) |
| 2018 Navigational Risk Assessment | Navigational Risk Assessment (NRA) Technical Appendices to accompany the 2018 ODA. | 2018 Navigational Risk Assessment |
| 2021 Design Statement | This design statement is designed to identify final OWF designs, and sets out changes in the design and layout, set out key criteria that have informed final designs, indicate how seascape, landscape and visual impacts have been addressed and mitigated, illustrate through a set of agreed representative viewpoint locations the final OWF and OTA design and layout. | 2021 Design Statement |
| 2020 Development Specification and Layout Plan | The aims and objectives of the Development Specification and Layout Plan are to provide details of the proposed specification and layout in so far as it relates to the 150 WTGs, spare locations and their associated foundations, across the Site and Inter-array Cables | 2020 Development Specification and Layout Plan |
| 2020 Construction Programme | The overall aim of the Construction Programme is to set out the intended construction programme for the Seagreen Project. | 2020 Construction Programme |
| Marine Pollution Contingency Plan | The overall aims and objectives of the MPCP are to provide detailed information to those involved in the construction of the Seagreen Project on the actions and reporting requirements in the event of a pollution incident originating from offshore operations relating to the Seagreen Project. | Marine Pollution Contingency Plan |
| Construction Environmental Management Plan | The overall aims and objectives of the Offshore CEMP are to detail to those involved in the construction of the Seagreen Project, the series of measures and requirements to manage environmental aspects based on commitments made by Seagreen and the requirements of the consents conditions. | Construction Environmental Management Plan |

*It was agreed with Marine DirectorateLicencing Operations Team in pre-application discussions that the above documents could be referenced in the report text and a hyperlink provided to their website where a copy of the document is located.

| Acronym / Abbreviation | Full Text |
|---|---|
| AA | Appropriate Assessment |
| CEMP | Construction Environmental Management Plan |
| EIA | Environmental Impact Assessment |
| ERM | Environmental Resource Management |
| ES | Environmental Statement |
| HRA | Habitats Regulations Appraisal |
| km | Kilometres |
| Ltd | Limited |
| m | Metre |
| MMMP | Marine Mammal Mitigation Plan |
| MPA | Marine Protected Area |
| MD-LOT | Marine Directorate – Licensing Operations Team |
| MW | Mega Watt |
| NM | Nautical Mile |
| OSP | Offshore Substation Platform |
| OWF | Offshore Wind Farm |
| PAD | Protocol for Archaeological Discovery |
| RSA | Regional Study Area |
| SAC | Special Area of Conservation |
| SAWEL | Seagreen Alpha Wind Energy Limited |
| SBWEL | Seagreen Bravo Wind Energy Limited |
| SEMP | Site Environmental Management Plan |
| SG1A | Seagreen 1A |
| SWEL | Seagreen Wind Energy Limited |
| UK | United Kingdom |
| WTG | Wind Turbine Generator |

**Table of Contents**

# 1. Introduction

## 1.1 Background

Seagreen Wind Energy Ltd (SWEL) is a joint venture between SSE Renewables (49%) and Total Energies (51%). SWEL was awarded exclusive development rights in the Firth of Forth Round 3 Offshore Wind Zone (the "Firth of Forth Zone") by The Crown Estate in 2010. The Firth of Forth Zone is located in the North Sea, beyond the 12 nautical miles (NM) Scottish territorial waters limit. SWEL currently has the benefit of the following consents for the Seagreen Project:

1. Seagreen Alpha Marine Licence[1] and Seagreen Alpha S36 Consent[2] for Seagreen Alpha;
2. Seagreen Bravo Marine Licence[3] and Seagreen Bravo S36 Consent[4] for Seagreen Bravo; and
3. Seagreen Offshore Transmission Asset Marine Licence[5].

(all as varied in 2018 and 2022, and together referred to as the "**2014 Consents**")

The Seagreen Project is located in the North Sea, in the outer Firth of Forth and Firth of Tay region. It comprises the Offshore Wind Farm (OWFs) (which includes the Wind Turbine Generators (WTGs), their foundations and associated array cabling), together with associated infrastructure of the Offshore Transmission Asset (OTA) (which includes the Offshore Substation Platforms (OSPs) and their foundations and the offshore export cable which will make landfall at Carnoustie and connect to the Tealing substation). The consents described above give permission for the installation and operation of up to 150 WTGs, 5 OSPs and associated electrical infrastructure to export to Carnoustie. As described in the 2023 Construction Programme[6], 114 of the 150 WTGs have been constructed (ending construction works in April 2023) and have a grid connection into Tealing, Angus. Construction works for the inter-array cables are expected to finish in October 2024.

To maximise energy generation and facilitate full export capacity for the Seagreen Project, Seagreen 1A (SG1A) Limited obtained a marine licence for an additional export cable (approximately 108km) from the consented Seagreen Project Area to an identified landfall location at Cockenzie. This will include one high voltage export cable to mean high water springs (MHWS), cable landfall and connection to the onshore infrastructure. This connection is planned to support the connection of additional export capacity to accommodate the remaining 36 consented but not constructed WTGs under the 2014 Consents.

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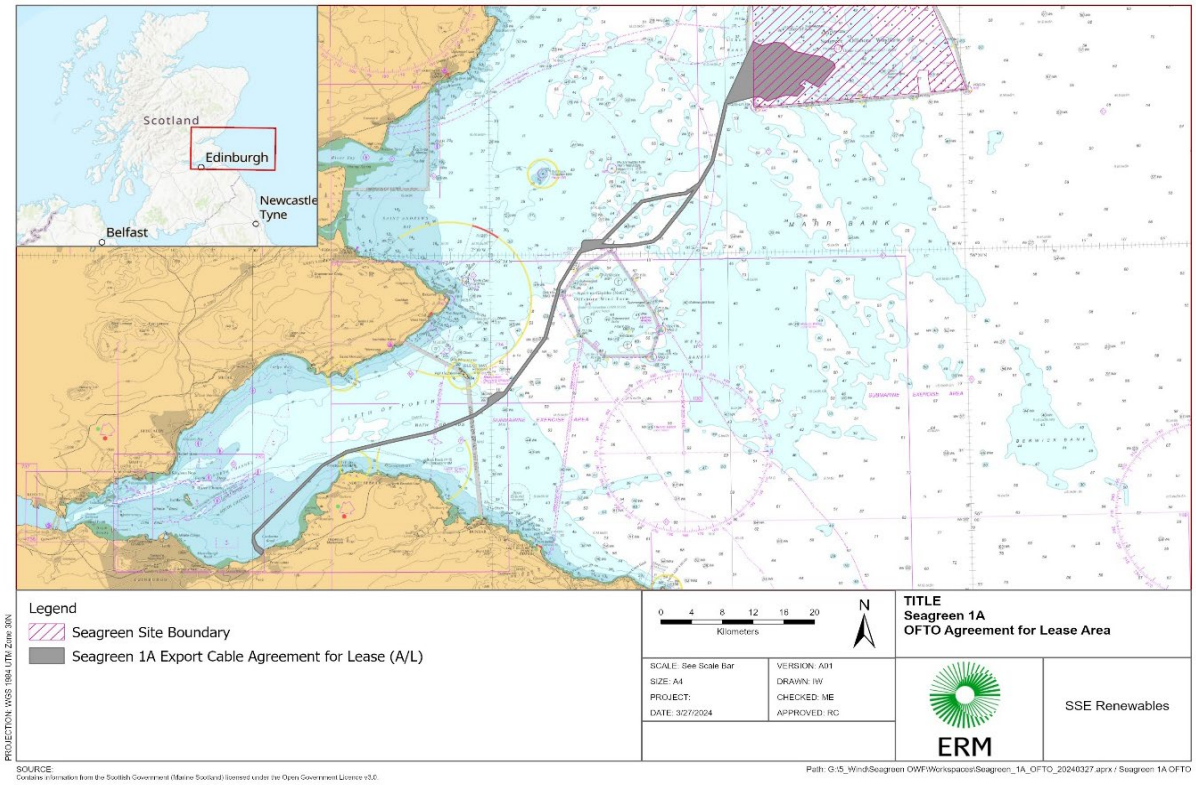
[1] Seagreen Alpha Marine Licence
[2] Seagreen Alpha S.36 Consent
[3] Seagreen Bravo Marine Licence
[4] Seagreen Bravo S.36 Consent
[5] Seagreen Transmission Asset Marine Licence

[6] 2023 Construction Programme

**Figure 1.1 Project Location Overview and Components**




## 1.2 Proposed Seagreen Project Variation

### 1.2.1 Section 36 Variation

The proposed Section 36 Variation is driven through the need to extend the installation window for the final 36 turbines and associated infrastructure consented as part of Seagreen Alpha and Bravo, but not yet constructed (Seagreen 1A). The following text highlights the specific condition which makes the development and construction of Seagreen 1A currently unfeasible by stipulating that construction of Seagreen 1A should take place no later than 3 years after commissioning the first WTG. This condition requires the commencement of Seagreen 1A construction by August 2025. This section outlines relevant conditions and reasoning to extend the installation window, as well proposed rewording of the conditions and the consenting approach.

Condition 2 of the Seagreen Alpha and Bravo Section 36 consents currently reads as follows:

> *The Commencement of the Development must be a date no later than 5 years from the date the consent is granted, or such later date from the date of the granting of this consent as the Scottish Ministers may hereafter direct in writing. The Commencement of Phase 1A of the Development must be a date no later than 3 years from the Commissioning of the First WTG, or such later date*

*from the date of the Commissioning of the First WTG as the Scottish Ministers may hereafter direct in writing.*

*Reason: To ensure the Commencement of the Development is undertaken within a reasonable timescale after consent is granted.*

Due to uncertainties in the OWF industry and challenges specifically facing the development of Seagreen 1A, SWEL are proposing a shift of commencement for constructing the Seagreen 1A infrastructure within a construction window to between January 2029 and December 2032 (where the window for installation is currently expected to expire in August 2025). Construction of the offshore elements of Seagreen 1A would be continuous once commenced, and will remain within the construction schedule assessed within Seagreen 2012. Based on this updated construction programme of Seagreen 1A, SWEL are requesting Condition 2 of the Seagreen Alpha and Bravo Section 36 consents are amended as follows:

*The Commencement of the Development must be a date no later than 5 years from the date the consent is granted, or such later date from the date of the granting of this consent as the Scottish Ministers may hereafter direct in writing. The Commencement of Phase 1A of the Development must be a date no later than **9 years 8 months** from the Commissioning of the First WTG, or such later date from the date of the Commissioning of the First WTG as the Scottish Ministers may hereafter direct in writing.*

*Reason: To ensure the Commencement of the Development is undertaken within a reasonable timescale after consent is granted.*

It should be noted that SWEL intend on continuing with the installation of the works that fall under the Marine Licence (Licence Number: 04678/14/0) relating specifically to the works beneath MHWS for the transmission assets to Cockenzie, which do not fall under the Section 36.

### 1.2.2 Construction Timelines

Construction timelines to be requested within the Section 36 Variation are presented in Table 1-1 below. To account for supply chain and programme uncertainty, it is requested these timelines are permitted to occur within a (4 year) window, and between January 2029 to December 2032 (the Variation). It should be noted that once construction of the offshore works commences, works will be continuous and remain within the 576 days quoted in Table 1-1, as is consented.

**Table 1-1 Summary of Key Milestone dates for Seagreen 1A**

| Project Element | Duration (days) | Start | Finish |
|---|---|---|---|
| **Seagreen 1A – Landfall works** | **200** | **21/05/2030** | **23/11/2031** |
| Landfall Works – TJB Construction | 39 | 21/05/2030 | 29/06/2030 |

| Project Element | Duration (days) | Start | Finish |
|---|---|---|---|
| Landfall Works – Electrical | 161 | 15/06/2031 | 23/11/2031 |
| **Seagreen 1A – Offshore works** | **576** | **01/01/2030** | **31/07/2031** |
| Export Cable – Offshore Works | 305 | 01/03/2030 | 31/12/2030 |
| OSP Installation | 180 | 01/09/2030 | 28/02/2031 |
| Foundation, auxiliary infrastructure and inter array cabling installation | 180 | 01/01/2030 | 31/06/2030 |
| WTG Installation | 180 | 01/02/2031 | 31/07/2031 |

### 1.3 Report Purpose

This Screening Report has been prepared by Environmental Resource Management Limited (ERM) on behalf of SWEL to support a request for a Screening Opinion for the  Variation from the Scottish Ministers via the Marine Directorate Licensing Operations Team (MD-LOT). The document describes the Variation in further detail, explains the proposed consenting approach, and provides justification and supporting information to evidence the conclusion that the Variation does not require an Environmental Impact Assessment (EIA) in support of the Section 36 Variation application.

### 1.4 Report Structure

The structure of the rest of this Screening Report is as follows:

- Section 2: Consenting Background and Approach;
- Section 3: Screening Summary
- Section 4: Review of Environmental Statement
- Section 5: Technical Appraisal
- Section 6: Mitigation
- Section 7: Screening Outcome

# 2. Consents

## 2.1 Consents Background

In 2010, SWEL was awarded exclusive development rights to the Firth of Forth Zone by the Crown Estate, under its third round of offshore wind licensing arrangements.

In 2012, SWEL submitted a suite of applications for development consent, under Section 36 of the Electricity Act 1989 and associated Marine Licences, under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, to construct and operate the Seagreen Project.

Consents and licences for the Seagreen Project were awarded by Scottish Ministers in October 2014. In 2018, the Seagreen Project's OWF licences were varied to remove the consented OWF capacity limits to allow the installation of higher rated WTGs. In 2019, the OTA to Carnoustie licence was varied to accommodate an alternative landfall installation method.

In December 2021, SWEL was awarded consent for a new Marine Licence to construct offshore infrastructure required to facilitate the export of power from the Seagreen to landfall at Cockenzie. The onshore export cable from landfall at Cockenzie to a new substation was subject to a separate planning permission in principle application under the Town and Country Planning (EIA) (Scotland) Regulations 2017 and was granted by East Lothian Council in August 2021.

In 2022, SWEL submitted a Section 36 Variation[7] to MD-LOT to increase several turbine parameters associated with the 36 consented but not constructed turbines including turbine height and increased steel deposits. This was approved by MD-LOT the same year.

Table 2.1 below presents a high-level overview of the existing consents and timeline in relation to the Seagreen Project.

**Table 2.1 High Level Overview of Existing Consents**

| Asset | Consent | Status | Notes |
|---|---|---|---|
| Seagreen Alpha Generating Asset | Seagreen Alpha S36 Consent (as varied in 2018 to remove capacity cap, and varied in 2022 to increase turbine parameters) | Under Construction | Consent for the installation and operation of:<br>- Up to 75 WTGs, including foundations, substructures, fixtures, fittings, fixings and protections.<br>- Associated infrastructure including; inter array cables and cables up to and onto the OSPs; up to 3 metrological masts; up to 3 wave buoys; and transition pieces |

[7] 2022 Section 36C

| Asset | Consent | Status | Notes |
|---|---|---|---|
| | Seagreen Alpha Marine Licence (as varied in 2018 to remove capacity cap, and varied in 2022 to increase turbine parameters) | | including ladders, fences and landing platforms.<br>- WTG and metrological mast foundation options include:<br>o A four leg steel jacket with driven piles;<br>o A four leg steel jacket with suction piles; and<br>o Gravity base structure. |
| Seagreen Bravo Generating Asset | Seagreen Bravo S36 Consent (as varied in 2018 to remove capacity cap, and varied in 2022 to increase turbine parameters)<br><br>Seagreen Bravo Marine Licence (as varied in 2018 to remove capacity cap, and varied in 2022 to increase turbine parameters) | Under Construction | Consent for the installation and operation of:<br>- Up to 75 WTGs, including foundations, substructures, fixtures, fittings, fixings and protections.<br>- Associated infrastructure including; inter array cables and cables up to and onto the OSPs; up to 3 metrological masts; up to 3 wave buoys; and transition pieces including ladders, fences and landing platforms.<br>- WTG and metrological mast foundation options include:<br>o A four leg steel jacket with driven piles;<br>o A four leg steel jacket with suction piles; and<br>o Gravity base structure. |
| OTA to Carnoustie | 2014 Consent – Marine Licence | Under Construction | Consent for the installation and operation of offshore transmission infrastructure including:<br>- Up to 5 OSPs. Substructure and foundation design for the OSPs will be either tubular pile, suction pile or gravity base foundations.<br>- A network of subsea power cables providing inter connections between OSPs. |

| Asset | Consent | Status | Notes |
|---|---|---|---|
| | | | - Up to 6 export cable trenches between the Seagreen Project Area and landfall at Carnoustie, with a maximum length of 530 km. A maximum of 5% (26.2 km) requiring rock armour or concrete mattress protection. |
| | 2019 Consent – Marine Licence Variation | | Variation to amend landfall installation method from horizontal directional drilling to open cut trenching. |
| Transmission Asset to Cockenzie | 2021 Consent – Marine Licence (as varied in 2023 to accommodate additional landfall installation method) | Marine Licence Awarded | Export cable to Cockenzie and associated cable protection. |

## 2.2 Proposed Consenting Approach

SWEL intends to request a Variation to the Seagreen Alpha S36 Consent and the Seagreen Bravo S36 Consent for the Seagreen Project under Section 36C of the Electricity Act 1989. SWEL also intends to request that should the Variation of the Section 36 consent be granted, any relevant timeline constraints within the associated Seagreen Alpha Marine Licence and the Seagreen Bravo Marine Licence are also varied by the Scottish Ministers under section 72 of the Marine and Coastal Access Act 2009 and section 30 of the Marine (Scotland) Act 2010.

Within this Screening Report, SWEL have considered the effects of the Variation and whether these changes could result in impacts of significance (in EIA terms) which are new or materially different to those of the consented Seagreen Project (which were identified in the 2012 ES and which were considered acceptable and resulted in the 2014 Consents).

### 2.2.1 Appropriateness of a Variation application

SWEL will request a Variation to existing consents based on MS-LOT's latest guidance note: *Application for Variation of section 36 consents* (MS-LOT, 2019). The guidance note describes a range of possible design changes that may be appropriate to determine under the Section 36C procedures. Additionally following engagement with MD-LOT (Wednesday 21st August) it was recommended that changes proposed in Section 1.2 would be most appropriately received through a Section 36 Variation application.

### 2.2.2 Consideration of the need of EIA

SWEL proposes that Variation of existing consents is screened out of the relevant EIA Regulations, in line with the Environmental Impact Assessment (EIA) Regulations (the Electricity Works (EIA) (Scotland) Regulations 2017 (**Electricity Works EIA Regulations**) and the Marine Works (EIA) (Scotland) Regulations 2017) (**Marine Works EIA Regulations**).

Under the Electricity Works EIA Regulations in the case of a S36 Variation application "EIA development" means a proposed variation which is either—

(i) Schedule 1 development; or

(ii) Schedule 2 development likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

The Variation does not fall under any of the Schedule 1 activities.

Paragraph 2 of Schedule 2 to the Electricity Works EIA Regulations includes: "*Any change to or extension (including a change in the manner or period of operation) of development of a description listed in schedule 1 or in paragraph 1 of [schedule 2 – which includes generating stations] where that development is already authorised, executed, or in the process of being executed, and the change or extension may have significant adverse effects on the environment.*" As a change to an already authorised generating station, the Variation would be Schedule 2 development requiring an EIA if the changes proposed are likely to have significant effects on the environment. As clarified by paragraph 2 of the Policy Note (SSI 2017/451) amending the Electricity Works EIA Regulations "*only variation applications where the changes proposed by the variation may cause significant adverse environmental effects will require an EIA is carried out*".

In making a determination as to whether or not the Variation will require an EIA to support the S36 Variation application, the relevant criteria set out in Schedule 3 must be considered together with the results of any relevant assessment. These criteria cover the characteristics of the works, the location of the works and the characteristics of the potential impact. The position is similar under the Marine Works EIA Regulations. Each of these are addressed in turn within the following sections.

#### 2.2.2.1 Characteristics of the Variation

Schedule 3 of the Electricity Works EIA Regulations specify that the following characteristics must be considered:

- The size and design of the works;
- Cumulation with other existing works and/or approved works;
- The use of natural resources, in particular land, soil, water and biodiversity;
- The production of waste;
- Pollution and nuisances;

- The risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge; and
- The risks to human health (for example due to water contamination or air pollution).

Size and design of the Seagreen Project: the Variation is not seeking to change the size and design of the project, only the installation schedule and so this has not been included in any further assessment.

Cumulation with other existing works: the Seagreen Project lies in the vicinity of other projects which have the potential to affect receptors in a cumulative fashion, namely Inch Cape OWF, Neart Na Gaoithe OWF and Berwick Bank. Potential cumulative impacts associated with the Variation have been assessed within relevant technical chapters of this Screening Report which has been developed to review in more depth where potential impacts may arise.

Use of natural resources: the change to the installation schedule will have no pathway to alter the use of natural resources compared with the previous assessment. Thus, no likely significant effects on the environment through the use of natural resources are anticipated.

Production of waste and pollution and nuisances: all wastes will be managed in line with the Offshore Construction Environmental Management Plan (CEMP)[8] which will be updated as required for the Variation. The EMP includes waste management measures to minimise, reuse, recycle and disposal of waste streams in compliance with relevant waste legislation. Marine pollution prevention and contingency planning measures are also set out in a Marine Pollution Contingency Plan (MPCP)[9] which will be updated as required for the Variation. The MPCP measures adopted will ensure that the potential for release of pollutants is minimised. In this manner, accidental release of contaminants from rigs and supply/service vessels will be strictly controlled. Due to the measures in place to control and/or manage waste and pollution, likely significant effects on the environment are not predicted.

Major accidents and/or disasters: including those caused by climate change, SWEL will require all contractors and subcontractors to complete adequate risk assessments for all aspects of the installation activities and these requirements will be captured within a Construction Method Statement which will be prepared for the Variation. The Seagreen Project will be a notifiable project for the purposes of the Construction (Design and Management) Regulations 2015 (CDM Regulations), and SWEL will require compliance with the CDM Regulations in the design of the Seagreen Project and through the completion of the installation process through conditions of contract. Management standards in line with ISO 9001, 14001 and OHSAS 18001 will be applied for the overall Seagreen Project management system, and the management systems of all contractors will be required to

[8] Offshore Construction Environmental Management Plan

[9] Marine Pollution Contingency Plan

concur with the same principles. Due to these measures in place in respect of the Seagreen Project, likely significant effects on the environment are not predicted.

Risks to human health: SWEL will require compliance with the Control of Substances Hazardous to Health Regulations 2002 (COSHH Regulations) through conditions of contract in ensuring that the risk to health from workplace exposure to hazardous substances is appropriately assessed and that exposure is prevented. Where this is not reasonably practicable, adequate controls would be implemented and exposure monitored and managed to within acceptable levels, in line with relevant regulations. Health and Safety regulations will be adhered to at all times and relevant HSE Management tools implemented, to ensure the safety of the workforce and the general public.

When considering these factors, the Variation does not have significant adverse effects and is not likely to have significant effects on the environment. Therefore, it is appropriate to screen the Variation out of the requirement for EIA when considering these factors.

#### 2.2.2.2 Location of the Variation

Schedule 3 of the Electricity Works EIA Regulations specify that the environmental sensitivity of geographical areas likely to be affected by the Variation must be considered having regard to the following:

- The existing and approved land use;
- The relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and underground;
- The absorption capacity of the natural environment, paying particular attention to the following areas:
  - wetlands, riparian areas, river mouths;
  - coastal zones and the marine environment;
  - mountain and forest areas;
  - nature reserves and parks;
  - European sites and other areas classified or protected under national legislation;
  - areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the Project, or in which it is considered that there is such a failure;
  - densely populated areas; and
  - landscapes and sites of historical, cultural or archaeological significance.

The Variation is located offshore, within outer Firth of Forth and Firth of Tay region. SWEL is not seeking to change the scale or location of the consented development with the total number of WTGs and OSPs remaining as originally consented (and varied in 2022) and all offshore development associated with the Variation being maintained within the consented offshore Seagreen Project Area

'red line' boundary. It is concluded for each topic that the Variation will not give rise to likely significant effects.

The Seagreen Project lies within the vicinity of a number of protected sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs) and Marine Protected Areas (MPAs). As such, SWEL have considered the environmental sensitivity of the Seagreen Project Area in relation to protected sites in the vicinity of the Variation (refer to the Habitat and Regulations Assessment (HRA) (Appendix A). This includes consideration of the existing and approved use, the relative abundance, availability, quality and regenerative capacity of natural resources in the area, and the absorption capacity of the natural environment (with reference to coastal zones and European and nationally designated sites).

When considering these factors, the Variation does not have significant adverse effects and is not likely to have significant effects on the environment. Therefore, it is appropriate to screen the Variation out of the requirement for EIA when considering these factors.

#### 2.2.2.3 Characteristics of Potential Impacts

Schedule 3 Electricity Works EIA Regulations specifies that the potential impacts and likely significant effects of the Variation on the environment must be considered taking into account the following:

- The magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
- The nature of the impact;
- The transboundary nature of the impact;
- The intensity and complexity of the impact;
- The probability of the impact;
- The expected onset, duration, frequency and reversibility of the impact;
- The cumulation of the impact with the impact of other existing and/or approved works; and
- The possibility of effectively reducing the impact.

This Screening Report assesses the environmental effects of the changes proposed by the Variation compared to the effects of the consented Seagreen Project assessed in the 2012 ES. Where relevant, post-consent assessments completed to discharge existing consent conditions are referenced.

Section 4 and 5 (and supporting documents) of this report demonstrates that the Variation does not have significant adverse effects and is not likely to have significant effects on the environment. Therefore, it is appropriate to screen the Variation out of the requirement for EIA when considering these factors.

### 2.2.3 Stakeholder Engagement

#### 2.2.3.1 Engagement to date

To support the development of this Screening Report, engagement has been undertaken with MD-LOT, where it was confirmed that they understand our approach to screening out EIA and welcomed that we have undertaken technical assessments to quantify the environmental impacts and to support justification to screen out EIA.

#### 2.2.3.2 Future Engagement

Once a screening opinion is received from Marine Directorate SWEL intends to follow up with any statutory and non-statutory stakeholders based on the feedback received, if required. If consultation is required, SWEL will present a consultation record in the Environmental Appraisal submitted with the Section 36 Variation application.

## 3. Screening Process

This screening report has considered if the Variation has the potential to change the impacts previously assessed within the original ES (Seagreen 2012) alone and cumulatively with other projects. As a first step, a high-level screening of the potential impacts of the Variation compared to the original ES are provided in Section 4, as grouped by technical topic presented in Seagreen 2012. Technical topics that cannot be initially screened out due to the potential for increased impact from the Variation compared to the original ES are assessed further in Section 5.

Cumulative impacts consider all projects with the potential to influence impacts generated by the Variation. Due to its proximity, Berwick Bank Offshore Wind Farm is of primary consideration, being located within 10km south of Seagreen 1A. Berwick Bank's offshore construction schedule is currently uncertain, but is likely to be between 2027 and 2032. Where relevant to topics assessed in Section 5, Berwick Bank's construction programme has been assumed to run in parallel within Seagreen 1A as a worst-case scenario.

## 4. Review of Environmental Statement

Table 4-1 summarises the conclusions of each chapter of the ES which supported SWEL's original application (Seagreen, 2012), and highlights which topics require further consideration within this document due potential impacts of the Variation.

**Table 4-1: Summary of Seagreen (2012) ES and topics requiring further consideration.**

| Chapter | Summary | Further Consideration |
|---|---|---|
| **Physical Environment** | Potential changes that the OWF and export cables would have on local waves, currents, sediment distribution, sediment transport regime and features of the seabed, were investigated through survey data. Seagreen and associated Seagreen 1A are predicted to have some localised effect in the immediate vicinity, but no significant effects in the areas further away from the site. Mitigation measures suggested are predicted to reduce all effects to not significant. No cumulative effects are anticipated with other projects.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | Not affected by revised construction programme and no further assessment required |
| **Water and Sediment Quality** | Potential changes that the OWF and export cables would have on water quality, seabed substrate and sediment quality were investigated through a combination of survey data and desk-based reviews. During construction phases, Seagreen and associated Seagreen 1A are predicted to have no significant effects. The greatest impacts on water quality were identified to arise from the | Not affected by revised construction programme and no further |

| Chapter | Summary | Further Consideration |
|---|---|---|
| | introduction of non-native marine species from vessel and construction activities, but mitigation measures are predicted to reduce the effects to non-significant. No cumulative effects are anticipated with other projects.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | assessment required |
| **Nature Conservation** | Potential changes that the OWF and export cables would have on nature conservation were investigated in combination with other associated chapters throughout the ES. Designated sites at international, national, regional and local levels were assessed, alongside features designated under EC Directives and international agreements. A specific HRA data interpretation report was submitted to support an Appropriate Assessment.<br><br>A review of the ES chapter has concluded that there is potential for further impacts as a result of the revised construction programme. | Potentially affected by revised construction programme. Further assessment provided in Section 5.4 and Appendix A. |
| **Ornithology** | Potential changes that the OWF and export cables would have on ornithology through physical disturbances, habitat loss and noise, were investigated through a combination of boat surveys and aerial surveys. During construction phases based on worst-case scenarios, potential construction noise is predicted to have a significant impact on four species of bird: black-legged kittiwake, guillemot, razorbill and puffin. During the operational phase, collision risk is predicted to be of major significance for the great black-backed gull. Cumulative assessments with other neighbouring OWFs are predicted to produce significant collision and displacement impacts to black-legged kittiwake, gannet, guillemot, razorbill, puffin, herring gull, lesser black-backed gull and great black-backed gull.<br><br>A review of the ES chapter has concluded that there is potential for further impacts as a result of revised construction programme. | Potentially affected by revised construction programme. Further assessment provided in Section 5.1. |
| **Benthic Ecology and Intertidal Ecology** | Potential changes that the OWF and export cables would have on benthic and intertidal taxa through physical disturbances, habitat loss and suspended sediments, were investigated through a combination of survey data and desk-based studies. During construction phases, Seagreen and associated Seagreen 1A are predicted to have effects of | Not affected by revised construction programme and no further |

| Chapter | Summary | Further Consideration |
|---|---|---|
| | short-term duration and of no significance. Following construction, scoured areas are expecting to be readily colonised by species from adjacent areas, causing a localised increase in biodiversity. No cumulative effects are anticipated with other projects.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | assessment required |
| **Natural Fish and Shellfish Resource** | Potential changes that the OWF and export cables would have on individual species through noise effects, seabed habitat disturbance, loss of habitat, suspended solids, and remobilisation of contaminants, were investigated through a combination of survey data and desk-based studies. During construction phases, Seagreen and associated Seagreen 1A are predicted to have effects on sound-sensitive species of short-term duration due to noise and are likely to have a significant effect on the overlapping herring spawning ground. No significant impacts are associated with electromagnetic fields on fish communities in the area. Significant cumulative impacts on herring are predicted but impacts on all other fish and shellfish species are predicted to be not significant, due to the potential impacts on herring this document includes a reassessment.<br><br>A review of the ES chapter has concluded that there is potential for further impacts as a result of the revised construction programme. | Potentially affected by revised construction programme. Further assessment provided in Section 5.3. |
| **Marine Mammals** | Potential changes that the OWF and export cables would have on individual species through underwater noise effects, vessel collision risk, changes to water quality, and changes to prey resource, were investigated through a combination of survey data and desk-based studies. During construction phases, Seagreen and associated Seagreen 1A are predicted to have effects on identified receptor species of short-term duration due to noise and are likely to have a significant effect on harbour seal. No significant impacts are associated with vessel collision risk, changes to water quality or changes to prey resource. Significant cumulative impacts on harbour seal are predicted but impacts on all other marine mammal species were predicted to be not significant.<br><br>A review of the ES chapter has concluded that there is potential for further impacts as a result of the revised construction programme. | Potentially affected by revised construction programme. Further assessment provided in Section 5.2. |

| Chapter | Summary | Further Consideration |
|---|---|---|
| **Commercial Fisheries** | Potential changes that the OWF and export cables would have on commercial fisheries through vessel displacement, navigational conflict with vessels, and effects to fishing activity, were investigated. During both construction and operational phases, fishing activity is expected to be excluded or limited from certain areas, impacts on squid and scallop fisheries are predicted to be not significant; similarly, fisheries using mobile gear for scallop, squid and *Nephrops* are not significant. But, impacts on crab and lobster fisheries, that use static gear, are predicted to be significant. Cumulative impacts with surrounding OWFs are predicted to have significant impact on scallop, squid, *Nephrops*, crabs and lobster fisheries during construction, and on squid and scallop fisheries during operation. Significant cumulative impacts were also determined, regarding safety, displacement, and interference with vessels.<br><br>A review of the ES chapter has concluded that there is potential for further impacts as a result of the revised construction programme. | Potentially affected by revised construction programme. Further assessment provided in Section 5.5. |
| **Shipping and Navigation** | Potential changes that the OWF and export cables would have on commercial vessels, fishing vessels, and recreational vessels, were investigated through a combination of survey data and desk-based studies. During construction phases, Seagreen and associated Seagreen 1A are predicted to have no significance due to temporary closures and exclusion zones. Following construction, some significant risks were predicted during the operational phase, but mitigation of vessel tracking, warning notices and publication of locational data on charts, reduces the project to no significance during residual risks. No cumulative effects are anticipated with other projects.<br><br>A review of the ES chapter has concluded that there is potential for further impacts as a result of revised construction programme. | Potentially affected by revised construction programme. Further assessment provided in Section 5.6. |
| **Seascape, Landscape and Visual Amenity** | Potential changes that the OWF and export cables would have on landscape character, seascape character, and visual amenity, were investigated through a combination of survey data and desk-based studies. During construction phases, Seagreen and associated Seagreen 1A are predicted to have no significance. Following construction, some significant risks were predicted during the operational phase regarding seascape character and visual amenity. Several cumulative effects are anticipated, and a number of them are | Not affected by revised construction programme and no further assessment required |

| Chapter | Summary | Further Consideration |
|---|---|---|
| | predicted to be non-significant, whilst a handful of seascape character units and viewpoints are assessed to be significant.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | |
| **Archaeology and Cultural Heritage** | Potential changes that the OWF and export cables would have on submerged artefacts, wrecks, and coastal remains, were investigated through a combination of survey data and desk-based studies. During construction phases, Seagreen and associated Seagreen 1A are predicted to have no significance. Similarly, following construction, no significant risks were identified. No cumulative impacts are anticipated with other projects.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | Not affected by revised construction programme and no further assessment required |
| **Military and Civil Aviation** | Potential changes that the OWF and export cables would have on terminal radar, en-route radar, MOD air defence radar, MOD low flying and danger area operations, helicopter main routes, and the civil aviation authority, were investigated through desk-based studies. During construction and operational phases, Seagreen and associated Seagreen 1A are predicted to have a potential impact, but appropriate technical measures and mitigation will ensure impacts are acceptable and not significant. Similarly, potential cumulative impacts are anticipated, but should be mitigated by appropriate technical measures.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | Not affected by revised construction programme and no further assessment required |
| **Socioeconomics, Tourism and Recreation** | Potential changes that the OWF and export cables would have on socioeconomics, tourism and recreation were investigated through desk-based studies. During construction and operational phases, Seagreen and associated Seagreen 1A are predicted to have a significant beneficial impact during construction, specifically upon employment, and into the operational phase, through port facilities and operators to support maintenance and related activities. Overall, | Not affected by revised construction programme and no further assessment required |

| Chapter | Summary | Further Consideration |
|---|---|---|
| | no adverse impacts were assessed to be significant, and no cumulative adverse impacts were anticipated.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | |
| **Other Marine Users and Activities** | Potential changes that the OWF and export cables would have on military practice and exercise areas (PEXAs), marine disposal sites, oil and gas operations and ancillary structures, subsea structures, unexploded ordnance, aggregate extraction, capital and maintenance dredging, and other relevant marine activities, were investigated through desk-based studies. During construction and operational phases, Seagreen and associated Seagreen 1A are predicted to have no significant impact to other users and activities, and no cumulative impacts are anticipated.<br><br>A review of the ES chapter has concluded that there will be no material change in impacts previously assessed as a result of the revised construction programme. | Not affected by revised construction programme and no further assessment required |

# 5. Technical Appraisal

## 5.1 Ornithology

### 5.1.1 Baseline

The 2012 ES reported that both Project Alpha and Project Bravo lie within the foraging range of many species designated within 12 Special Protection Areas (SPAs), hosting seabird breeding colonies (Seagreen, 2012). In order of proximity, the sites are Fowlsheugh SPA (27.5 km), Outer Firth of Forth and St Andrews Bay Complex SPA (32 km), Forth Islands SPA (48.7 km), St Abbs Head to Fast Castle SPA (65.7 km), Ythan Estuary, Sands of Forvie and Meikle Loch SPA (69.8 km), Buchan Ness to Collieston Coast SPA (71.6 km), Northumbria Coast SPA (84.5 km), Northumberland Marine SPA (84.9 km), Lindisfarne SPA (86.7 km), Imperial Dock Loch, Leith SPA (96.5 km), Farne Islands SPA (97.3 km), and Moray Firth SPA (100 km). The Wider Firth of Forth lies within the Aberdeen-Tees area, which is one of the most important areas for seabirds in the North Sea (Skov *et al*., 1995). More specifically, the Outer Forth/Wee Bankie/Marr Bank area is of international importance for multiple seabird species (HiDef Aerial Surveying Ltd, 2022).

An overview of breeding seabirds within SPAs that are at risk of 'likely significant effect' is presented in Table 5-1.

**Table 5-1 Breeding seabirds and the SPAs in which they are designated at risk of 'likely significant effect' within the HRA process (Seagreen, 2012)**

| Species | SPA |
|---|---|
| Northern Fulmar | Buchan Ness to Collieston Coast, Fowlsheugh, Forth Islands |
| Northern Gannet | Forth Islands |
| Black-legged Kittiwake | Buchan Ness to Collieston Coast, Fowlsheugh, Forth Islands, St Abbs Head to Fast Castle |
| Lesser Black-backed Gull | Forth Islands |
| European Herring Gull | Buchan Ness to Collieston Coast, Forth Islands, Fowlsheugh, St Abbs Head to Fast Castle |
| Common Guillemot | Buchan Ness to Collieston Coast, Forth Islands, Fowlsheugh, St Abbs Head to Fast Castle |
| Razorbill | Fowlsheugh, Forth Islands, St Abbs Head to Fast Castle |

| Species | SPA |
|---|---|
| Atlantic Puffin | Forth Islands |

A total of 91,737 birds from 26 identified species (and 15 unidentified taxa) were observed in aerial surveys of the Firth of Forth, undertaken three times during summer 2009 and four times during winter 2009/2010. Auks were the dominant group, representing 59% of the total observations. Gulls represented 21.2% of the total observations, with black-legged kittiwake contributing 74% of the gulls recorded. Gannet was the most frequently identified species. An overview of relevant ornithology survey data from aerial surveys is provided in Table 5-2 below.

A total of 24,206 individual birds of 39 identified species (and 10 unidentified taxa) were recorded by boat-based surveys, undertaken between December 2009 and November 2011, within the Project Alpha development boundary. guillemot (28.1%), black-legged kittiwake (24.8%) and gannet (16.1%) were the most numerous species recorded. Auks in general dominated the assemblage throughout the year.

The boat-based surveys also recorded 20,436 birds from 37 species (and seven unidentified taxa) in Project Bravo in the 23 surveys during the study period. Similar to Project Alpha, guillemot (29.3%), black-legged kittiwake (21.6%) and gannet (16.6%) were the dominant species in numerical terms. As in Project Alpha, auks dominated the assemblage throughout the two-year study period.

**Table 5-2 Density and population estimates from the summer and winter periods derived from aerial surveys of the Firth of Forth**

| Species/Group | Period | Density (individuals/km$^2$) | Population |
|---|---|---|---|
| Auks | Summer | 25.980 | 149,502 |
| | Winter | 13.516 | 94,708 |
| Northern Gannet | Summer | 4.728 | 27,207 |
| | Winter | 0.366 | 2,106 |
| Black-legged Kittiwake | Summer | 4.629 | 26,638 |
| | Winter | 2.726 | 15,687 |
| | Summer | 0.732 | 4,212 |

| Species/Group | Period | Density (individuals/km$^2$) | Population |
|---|---|---|---|
| Gulls (excluding Kittiwake) | Winter | 1.161 | 6,681 |

#### 5.1.1.1 Sensitive Receptors

***Black-legged Kittiwake***

Black-legged kittiwake *Rissa tridactyla* are moderately sized seabirds, with a length of 38-40 cm, a wingspan of 95-110 cm, and a weight of 300-500 g (RSPB, 2024a). The UK breeding population is 380,000 pairs (RSPB, 2024a). Kober *et al*. (2010) identified that the maximum foraging range of black-legged kittiwake is 83 km, and they have the largest and most numerous colonies along the North Sea coasts of Britain, around Orkney and Shetland, and off north-west Scotland (JNCC, 2021). There is seasonal variation in predicted densities of black-legged kittiwake, with greater densities close to shore in July compared with January (Kober *et al*., 2010; Waggitt *et al*., 2019). Black-legged kittiwake observations were recorded during the Seabird 2000 census, with 2926 breeding individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). Fowlsheugh SPA supports 28,386 individuals (2009) within their foraging range from the Project. Other important colonies include The Forth Islands SPA with 5370 individuals, Buchan Ness to Collieston SPA with 28,266 individuals (2007) and St Abb's Head to Fast Castle SPA with 18,136 individuals (2011) (Seagreen, 2012).

During the June 2011 survey, regionally important numbers were recorded in Project Alpha (1883 individuals) and Project Bravo (2763 individuals) (Seagreen, 2012). During the breeding season, 94% of 1122 individuals were adults in Project Alpha and 96% of 1118 individuals were adults in Project Bravo.

***Northern Gannet***

Northern gannet *Morus bassanus* are large seabirds, with an overall length of 87-100 cm, a wingspan of 165-180 cm, and a weight of 2,400-3,600 g (RSPB, 2024b). The UK breeding population is around 220,000 (RSPB, 2024b). Kober *et al.* (2010) identified that northern gannet distribution at sea is generally widespread, with higher density surrounding St Kilda, Shetland, and southwest Ireland colonies outside of the breeding season, and concentrations around St Kilda, Ailsa Craig, Grassholm, Bass Rock, and the southwest of Ireland during the breeding season. The foraging range for northern gannets is also variable, dependent on their individual colony, with a maximum foraging range recorded for Bass Rock individuals at 540 km (Hamer *et al*., 2000). However, the mean foraging range is around 232 km from the colony at Bass Rock (Hamer *et al.*, 2007), and 229 km for northern gannets generally (Woodward *et al*., 2019). The area of high northern gannet density identified by Kober *et al*. (2010), of most relevance to the Project, is Bass Rock, with an estimated 44,110 breeding

individuals between 1998 and 2000 (Mitchell *et al.,* 2004). There are colonies within the northern gannet foraging range surrounding the Project area, represented by the Forth Islands SPA.

With the relative proximity of Bass Rock to Project Alpha and Project Bravo, gannets were present in both development areas throughout the study period. The regional threshold of 1530 individuals during the breeding season exceeded on three occasions in Project Alpha: May and June in 2010 and May in 2011 (Seagreen, 2012). In Project Alpha, 97% of 2299 individuals were adults and in Project Bravo, 98% of 1895 individuals were adults.

***Common Guillemot***

Common guillemot *Uria aalge* are a moderate size seabird with a length of 38-45 cm, a wingspan of 64-73 cm, and a weight of 850-1,130g (RSPB, 2024c). The UK breeding population is 950,000 pairs (RSPB, 2024c). Kober *et al*. (2010) identified a wide distribution of common guillemot that exhibited seasonal fluctuation; however, the highest densities of individuals were consistent year-round at the Firth of Forth, Moray Firth, and Orkney (Kober *et al.*, 2010; Waggitt *et al.*, 2019). During the winter, the distribution of common guillemot increases into the North Sea, where the species exploits foraging grounds such as Dogger Bank (Royal HaskoningDHV, 2014). Common guillemot observations were recorded during the Seabird 2000 census, with 1002 individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). Both Project Alpha and Project Bravo are within the foraging range of four SPA colonies: Fowlsheugh SPA, Forth Islands SPA, St Abbs Head to Fast Castle SPA, and Buchan Ness to Collieston Coast SPA (Seagreen, 2012). Fowlsheugh SPA has the largest colony with 50,556 individuals in 2000, while the Forth Islands SPA supported 23,798 individuals in 2011.

Guillemot were recorded in all surveys of Project Alpha and Project Bravo across the two-year study period. A similar abundance was recorded at both projects, with 85% of 300 individuals recorded as adults at Alpha and 72% of 160 individuals recorded as adults at Bravo (Seagreen, 2012).

***Razorbill***

Razorbill *Alca torda* are a moderately sized seabird, with a length of 37-39 cm, a wingspan of 63-67 cm, and a weight of 590-730 g (RSPB, 2024d). The UK breeding population is 130,000 pairs (RSPB, 2024d). Kober *et al.* (2010) determined that razorbill have a similar distribution of high-density areas as common guillemot, however the general Atlantic razorbill distribution at sea is slightly more restricted. Waggitt *et al.* (2019) identified a greater seasonal difference in distribution of razorbill than Kober *et al.* (2010), with populations retreating to core colonies along north and western coasts of Scotland and the Outer Hebrides. Razorbill observations were recorded during the Seabird 2000 census, with 562 individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). The Fowlsheugh SPA supported 4632 individuals in 2009, while the Forth Islands SPA supported 734 individuals in 2011 (Seagreen, 2012).

Razorbill were recorded in all surveys of Project Alpha and Project Bravo. During the breeding season, the proportion of adults was relatively low at 58% of 148 at Project Alpha and 64% of 66 at Project Bravo (Seagreen, 2012).

***Atlantic Puffin***

Atlantic puffin *Fratercula arctica* are small seabirds with a length of 26-29 cm, a wingspan of 4763 cm, and a weight of 320-480 g (RSPB, 2024e). The UK breeding population is 580,000 pairs (RSPB, 2024e). Kober *et al.* (2010) determined that Atlantic puffin have a relatively wide distribution in the northeast of England, east and northwest coasts of Scotland, and the Isles of Scilly. The density of individuals is concentrated in the waters off Moray Firth, and the Inner and Outer Hebrides (Kober *et al.*, 2010; Waggitt *et al.*, 2019). Atlantic puffin observations were recorded during the Seabird 2000 census, with 190 breeding individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). The Forth Islands SPA is one of the largest UK colonies, with 124,398 individuals in 2010.

The peak population estimates for Project Alpha and Project Bravo were recorded in the June 2011 survey with 2666 and 5583 individuals respectively (Seagreen, 2012). These were the only estimates to exceed the regional breeding population threshold of 2328 puffins. During the breeding season, adults comprised 72% of 114 individuals in Project Alpha and 64% of 113 individuals in Project Bravo.

***Herring Gull***

Herring gull *Larus argentatus* are large seabirds, with a length of 54-60 cm, a wingspan of 130-150 cm, and a weight of 640-1,440 g (RSPB, 2024f). The UK breeding population is around 140,000 pairs, with a wintering population of 740,000 individuals (RSPB, 2024f). Kober *et al*. (2010) identified that European herring gull are widely distributed around the UK coastlines, with areas of high density between the Rhins of Galloway and the Isle of Arran on the west coast of Scotland, and areas of medium density around the Inner Hebrides and the south coast of Wales. Herring gull observations were recorded during the Seabird 2000 census, with 1060 breeding individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). The Forth Islands SPA was the third largest colony in Britain and Ireland in Seabird 2000 with 4814 pairs.

Herring gulls were recorded in all but three surveys of Project Alpha but were absent in seven surveys of Project Bravo (Seagreen, 2012). The peak breeding season estimates of 121 individuals in Alpha (June 2010) and 163 individuals in Bravo (June 2011) were well below the 1% threshold of 472 individuals.

***Great Black-backed Gull***

Great Black-backed gull *Larus marinus* are large seabirds, with a length of 64-78 cm, a wingspan of 150-165 cm, and a weight of 1,000-2,000 g (RSPB, 2024g). The UK breeding population is 17,000 pairs, with a wintering population of 76,000 individuals (RSPB, 2024g). Great Black-backed gull observations were recorded during the Seabird 2000 census, with only 8 breeding individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). During the winter months there is an influx of Great Black-backed gulls to the UK, with up to 2000 recorded on the Isle of May in the Firth of Forth (Forrester *et al.,* 2007).

There are 32 colonies of Great Black-backed gulls within foraging range from both projects, which contain 288 breeding individuals (Seagreen, 2012). 55% of the small sample of 20 birds during the breeding season were adults and assumed to be breeding.

***Lesser Black-backed Gull***

Lesser black-backed gull *Larus fuscus* are large seabirds, with a length of 52-64 cm, a wingspan of 135-150 cm, and a weight of 620-1,000 g (RSPB, 2024h). The UK breeding population is 110,000 pairs, with a wintering population of 130,000 individuals (RSPB, 2024h). Lesser black-backed gull resemble small European herring gull in appearance, but not in abundance, with concern over future population decline (RSPB, 2024h) despite an overall rise in population during the 20$^{th}$ century (Kober *et al*., 2010). Kober *et al*. (2010) identified that lesser black-backed gulls have an uneven distribution in the Irish and Celtic Seas, and the Southwest Approaches, with the highest densities located in the Celtic Sea off the coast of Cornwall and Pembrokeshire, although they are also widespread in Scotland. Lesser Black-backed gull observations were recorded during the Seabird 2000 census, with only 7 breeding individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004). There were 6914 individuals recorded in the Forth Islands SPA (Seagreen, 2012).

Peak numbers were recorded in June 2010, with an estimated 98 individuals in Project Alpha and 135 in Project Bravo (Seagreen, 2012). During the breeding season, 90% of birds at Project Alpha and 69% at Project Bravo were adults out of a small sample of 34 individuals.

***Arctic Tern***

Arctic tern S*terna paradisaea* are small seabirds, with a length of 33-35 cm, a wingspan of 75-85 cm, and a weight of 95-120 g (RSPB, 2024i). The UK breeding population is 53,000 pairs, with a wintering population of 500,000-900,000 individuals (RSPB, 2024i). Kober *et al*. (2010) identified that the UK distribution of Arctic tern is patchy, but wider than common tern, with the highest density of individuals modelled around Orkney, Shetland, and discrete locations along the east coast of England. Arctic tern observations were recorded during the Seabird 2000 census, with 82 breeding individuals recorded between 1998 and 2002 in Angus, near the array area of the Project (Mitchell *et al.,* 2004).

At both Project sites, peak numbers of Arctic tern were recorded during the autumn passage period (August and September), with peak estimates of 227 and 800 individuals within Project Alpha and Project Bravo respectively (Seagreen, 2012). The Firth of Forth is known to be a key feeding area for passage Arctic terns, where they may stay for 1-2 weeks before continuing their southwards migration to Antarctica.

### 5.1.2 Potential Project Impacts

The 2012 ES concluded a total of four potential impacts on ornithology receptors for both Project Alpha and Project Bravo, which are listed in Table 5-3 and Table 5-4. The assessment of indirect effects on seabird prey during construction of the Project resulted in moderate and significant effects on Guillemot, Razorbill and Puffin for both projects. Additionally, the assessment of mortality through collision with turbine blades during the operational phase of Project Alpha resulted in moderate and significant effects on Gannet at national and regional levels, black-legged Kittiwake at regional levels,

Herring gull at regional levels, and major and significant effects on Great Black-backed gull at regional levels. Similarly for Project Bravo, the assessment of mortality through collision with turbine blades resulted in moderate and significant effects on Gannet at national and regional levels, and black-legged Kittiwake at regional levels.

**Table 5-3 Summary of impacts resulting from Project Alpha (Seagreen 2012)**

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| Displacement through disturbance due to increased boat traffic | Gannet<br>Black-legged Kittiwake<br>Lesser Black-backed Gull<br>Herring Gull<br>Guillemot<br>Razorbill<br>Puffin<br>Great Black-backed Gull<br>Arctic Tern | N/A | All effects Negligible or Minor and Not Significant | Good practice guidelines in relation to ornithology | No change in impact |
| Indirect effects of construction on prey | Black-legged Kittiwake<br>Guillemot<br>Razorbill<br>Puffin<br>Arctic Tern | N/A | Effects Moderate and Significant for Guillemot, Razorbill, and Puffin. Effects Minor and Not Significant for Black-legged Kittiwake and Arctic Tern | Good practice guidelines in relation to potential impacts upon sensitive fish (e.g. soft start) | No change in impact |
| **Operation Phase** | | | | | |
| Mortality through collision with turbine blades | Gannet<br><br>Black-legged Kittiwake | National<br>Regional<br>National<br>Regional | All effects Minor and Not Significant except Moderate and Significant for Gannet, Black-legged Kittiwake at | Compliance with all best practice measures and guidance with regards turbine | Reduces the overall impact from mortality |

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| | Lesser Black-backed Gull<br><br>Herring Gull<br><br>Great Black-backed Gull | National<br>Regional<br>National<br>Regional<br>National<br>Regional | Regional levels, Herring Gull at Regional levels, and Major and Significant for Great Black-backed Gull at Regional levels | colouring and placement where possible. | from collision with turbines. |
| Displacement* | Black-legged Kittiwake<br><br>Guillemot<br><br>Razorbill<br><br>Puffin | National<br>Regional<br>National<br>Regional<br>National<br>Regional<br>National<br>Regional | All effects Minor and Not Significant | Placement of turbines at locations suggested as 'least' important based on habitat studies | Placement of turbines has the potential to have no residual impact** |
| Barrier effects* | Gannet<br>Black-legged Kittiwake<br>Guillemot<br>Razorbill<br>Puffin | N/A | All effects Minor and Not Significant | Placement of turbines to allow flight corridors to key foraging sites | N/A |

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | | |
| **Decommissioning Phase** | | | | | |
| Displacement through disturbance due to increased boat traffic | Gannet<br>Black-legged Kittiwake<br>Lesser Black-backed Gull<br>Herring Gull<br>Guillemot<br>Razorbill<br>Puffin<br>Great Black-backed Gull<br>Arctic Tern | N/A | All effects Negligible or Minor and Not Significant | Good practice guidelines in relation to ornithology | No change in impact |
| Indirect effects of decommissioning on prey | Gannet<br>Black-legged Kittiwake<br>Guillemot<br>Razorbill<br>Puffin<br>Arctic Tern | N/A | All effects Negligible and Not Significant | N/A | N/A |

*Nature Scot assess Displacement and Barrier effects in the operational phase together as they both relate to how the presence of the wind farm affects behaviour and movement patterns, therefore making them difficult to distinguish (Nature Scot, 2023).

**An example of a residual impact is the avoidance of any areas of foraging habitat that may conceivably be used by the sensitive receptors, which could result in displacement.

**Table 5-4 Summary of impacts resulting from Project Bravo (Seagreen 2012)**

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| Displacement through disturbance due to increased boat traffic | Gannet<br>Black-legged Kittiwake<br>Lesser Black-backed Gull<br>Herring Gull<br>Guillemot<br>Razorbill<br>Puffin<br>Great Black-backed Gull<br>Arctic Tern | N/A | All effects Negligible or Minor and Not Significant | Good practice guidelines in relation to ornithology | No change in impact |
| Indirect effects of construction on prey | Black-legged Kittiwake<br>Guillemot<br>Razorbill<br>Puffin | N/A | All effects Moderate and Significant, except Minor and Not Significant for Black-legged Kittiwake and Arctic Tern | Good practice guidelines in relation to potential impacts upon sensitive fish (e.g. soft start) | No change in impact |

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| | Arctic Tern | | | | |
| **Operation Phase** | | | | | |
| Mortality through collision with turbine blades | Gannet<br><br>Black-legged Kittiwake<br><br>Lesser Black-backed Gull<br><br>Herring Gull<br><br>Great Black-backed Gull | National<br>Regional<br>National<br>Regional<br>National<br>Regional<br>National<br>Regional<br>National<br>Regional | All effects Minor and Not Significant except Moderate and Significant for Gannet at National and Regional levels and Black-legged Kittiwake at Regional levels | Compliance with all best practice measures and guidance with regards turbine colouring and placement where possible. | Reduces the overall impact from mortality from collision with turbines |
| Displacement* | Black-legged Kittiwake<br><br>Guillemot | National<br>Regional<br>National | All effects Minor and Not Significant | Placement of turbines at locations suggested as 'least' important based on habitat studies | Placement of turbines has the potential to have no residual impact** |

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| | Razorbill<br><br>Puffin | Regional<br>National<br>Regional<br>National<br>Regional | | | |
| Barrier effects* | Gannet<br>Black-legged Kittiwake<br>Guillemot<br>Razorbill<br>Puffin | N/A | All effects Minor and Not Significant | Placement of turbines to allow flight corridors to key foraging sites | N/A |
| **Decommissioning Phase** | | | | | |
| Displacement through disturbance due to increased boat traffic | Gannet<br>Black-legged Kittiwake<br>Lesser Black-backed Gull<br>Herring Gull | N/A | All effects Negligible or Minor and Not Significant | Good practice guidelines in relation to ornithology | No change in impact |

| Description of Effect | Sensitive Receptor | Scale | Effect | Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|
| | Guillemot<br>Razorbill<br>Puffin<br>Great Black-backed Gull<br>Arctic Tern | | | | |
| Indirect effects of decommissioning on prey | Gannet<br>Black-legged Kittiwake<br>Guillemot<br>Razorbill<br>Puffin<br>Arctic Tern | N/A | All effects Negligible and Not Significant | N/A | N/A |

*NatureScot assess Displacement and Barrier effects in the operational phase together as they both relate to how the presence of the wind farm affects behaviour and movement patterns, therefore making them difficult to distinguish (Nature Scot, 2023).

**An example of a residual impact is the avoidance of any areas of foraging habitat that may conceivably be used by the sensitive receptors, which could result in displacement.

The changes of the refined project design of 2020 were considered to have no material increase, and in most cases significantly lower impacts, on seabirds when compared to the assessment made in the 2012 ES (Seagreen, 2022).

Disturbance during construction and operation, as well as displacement and barrier effects, were not considered to be impacted by the proposed changes as the seabed deposits will not cause a material increase in construction activity or vessel movements (that would result in an increased impact to bird disturbance or displacement), as the construction duration remains unchanged and the number of vessels remains as previously assessed. Similarly, the impact from barrier effects and barrier displacements will not exceed those previously assessed in 2012 (Seagreen, 2022).

Table 5-5 addresses potential implications associated with the Variation. The Variation is considered to have no material change and no likely significant effect on identified ornithology receptors compared to the assessment made in the 2012 ES.

**Table 5-5 Implications of Proposed Construction Programme Change on Ornithology**

| Proposed Construction Programme Change | Implications on Effect Significance |
|---|---|
| A shiftto the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES). | Key impacts on ornithology as previously assessed in 2012 and 2022 were indirect effects on prey during construction and operation and mortality through collision with turbine blades.<br><br>A shiftto the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES) will have no material change to disturbance during construction and operation as a result of the shift, thus there is no increased impact on ornithology receptors expected. Similarly, no increased displacement and barrier effects is expected to occur as a result of the shift.<br><br>No material change in impacts previously assessed, no likely significant effect and no significant adverse effects on the environment as a result of the change proposed by the Variation.<br><br>There is the potential for increased cumulative impacts, which are discussed and assessed in Section 5.1.3. |

### 5.1.3 Further Assessment

In light of the proposed alteration to project timelines, the cumulative impact assessments in relation to other projects in the area has been reevaluated. The main cumulative impacts on ornithology of Seagreen 1A with other projects in the area are likely to be:

- Displacement through disturbance due to increased boat traffic during construction, operation and maintenance, and decommissioning;
- Indirect effects on prey during construction and decommissioning;
- Effects of distributional responses (including both displacement and barrier effects) of sensitive receptors (Black-legged Kittiwake, Guillemot, Razorbill, and Puffin); and
- Mortality through collision with turbine blades.

The 2012 ES (Seagreen, 2012) considered other operational projects in the vicinity of Seagreen 1A, including other OWFs in the planning stages, and onshore developments where these could affect the same receptor populations. Further searches based on the foraging ranges of the sensitive receptors were also undertaken.

To update the previous cumulative assessment to account for the proposed Variation in construction programme, the initial project list developed in 2012 was reviewed, with new projects likely to temporally overlap with the shift of the Seagreen 1A Project added to the revised assessment.

As part of the assessment, impacts associated with Seagreen 1A were reviewed. Changing the construction period will not result in any additional impact above that associated with the already consented parameters to offshore ornithology. There will be no material change in the Project Design Envelope (PDE), with the currently consented project representing the worst case scenario.

Seagreen 1A lies in the vicinity of several other projects which have the potential for cumulative impacts, such as Inch Cape OWF, Neart Na Gaoithe OWF and Berwick Bank (Table 5-7). It is important to recognise that a change in construction programme will have no material effect on impacts associated with the operation and maintenance phase. Therefore, the cumulative assessment made for the 2012 ES (Seagreen, 2012) and the 2020 Variation in turbine parameters (Seagreen, 2022) remain valid. Additionally, with no change in predicted impacts during operation, the cumulative assessments made for all other projects since 2012 and 2020 also remain valid and consider the full potential impact of Seagreen 1A.

Therefore, potential impacts where construction timelines of other projects overlap with the new proposed construction dates for Seagreen 1A have been taken into consideration. Cumulative effects to ornithology will be present throughout the construction phase of the project.

Therefore, the key consideration with the change in the Seagreen 1A construction programme is temporal overlap with the construction of the remaining turbines at Seagreen 1A and the construction phase of the Berwick Bank.

The key receptors scoped in for assessment, based on Seagreen (2012), as outlined in Section 5.1.1, are black-legged kittiwake, Northern gannet, guillemot, razorbill, Atlantic puffin, herring gull, great and lesser black-backed gulls, and Arctic tern. The majority of these species have low sensitivity to vessel-related disturbance effects (Garthe and Hüppop, 2004; Furness *et al.*, 2013; Fliessbach *et al.*, 2019). An

overview of sensitivity ratings is presented in Table 5-6. The ratings from each study have been indexed to a 1-5 scale, where a score of 1 is negligible and 5 is high sensitivity, to enable comparison between the different scorings used across the studies. The sensitivity rating is based on the highest (worst-case) score.

Razorbill is considered to be the most sensitive to disturbance effects, which is largely based on the proportion of birds observed 'escaping' from approaching vessels and the species European threat and conservation status (Fliessbach *et al.*, 2019). When looking at OWF ship and helicopter traffic specifically (Furness *et al.*, 2013), razorbill sensitivity is considered to be low, in line with that of guillemot and puffin.

**Table 5-6 Key offshore ornithology receptor sensitivities to vessel-related disturbance**

| Species | Sensitivity Score (Indexed 1-5) | | | Sensitivity |
|---|---|---|---|---|
| | Garthe and Hüppop (2004) | Furness *et al.* (2013) | Fliessbach *et al.* (2019) | |
| Black-legged Kittiwake | 1.7 | 1.8 | 1.5 | Negligible |
| Gannet | 2.5 | 1.4 | 1.8 | Low |
| Guillemot | 2.1 | 2.8 | 2.0 | Low |
| Razorbill | 2.4 | 2.8 | 3.6 | Medium |
| Puffin | 2.4 | 2.3 | N/A | Low |
| Herring Gull | 2.0 | 1.4 | 1.3 | Low |
| Great Black-backed Gull | 2.7 | 1.8 | 1.6 | Low |
| Lesser Black-backed Gull | 2.3 | 1.4 | 1.3 | Low |
| Arctic Tern | 2.2 | 2.3 | 1.2 | Low |

The 2012 ES for the Seagreen Project concluded that vessel-related disturbance during the construction phase would result in negligible impact to guillemot and razorbill, and all other key offshore ornithology receptors (Seagreen, 2012). For the Seagreen Project alone, a change in construction programme is not expected to result in greater effect on any seabirds due to disturbance, therefore, this conclusion remains applicable.

However, the proposed change to the construction programme (but not the construction duration) means that construction of the remaining turbines for Seagreen 1A may overlap with construction of the Berwick Bank. Therefore, the combined effects of these two developments are assessed.

The Berwick Bank ES included both guillemot and razorbill in the assessment of vessel-related disturbance, with all other species scoped out due to low sensitivity or small potential for interaction (Pelagica and Cork Ecology, 2022). The assessment determined that impacts to these species were likely to be small, as vessels will only be present in a small portion of the site at any given time. Impacts were, therefore, found to be negligible to minor.

The cumulative assessment for Berwick Bank considered that the Seagreen 1A construction phase may overlap with the Berwick Bank construction phase. Due to the small effect predicted at both projects, the assessment determined that cumulative effects were unlikely to be significant (Pelagica and Cork Ecology, 2022). The same determination is appropriate here, with cumulative vessel-related disturbance impacts to key offshore ornithology receptors during the construction phase expected to be minimal, representing a minor impact at a worst-case.

Additionally, there is potential for cumulative habitat loss associated with the temporal overlap between the Seagreen Project and the Berwick Bank construction phases. Habitat loss during construction is considered to be short-term, with impacts largely arising from seabed disturbance during installation of infrastructure and burial of cables. Habitat loss associated with the Seagreen Project alone will not increase above that already consented, thus, the project alone assessment conclusions as presented in the 2012 ES (Seagreen, 2012) remain applicable.

The Berwick Bank assessment determined that habitat loss during construction would be small in comparison to the habitat available to seabirds in the region. Impacts were found to be minimal, with a minor significance determined as a worst-case scenario (Pelagica and Cork Ecology, 2022).

Cumulatively, overall short-term habitat loss may increase. However, the total extent is not considered to represent a notable proportion of available habitat. In the cumulative assessment for the Berwick Bank, it was considered that the Seagreen 1A construction phase may overlap with the Berwick Bank construction phase. The assessment concluded that impacts at each project were likely to be limited to the immediate vicinity of the respective projects and considered of small magnitude (Pelagica and Cork Ecology, 2022). Therefore, cumulative effects of the Seagreen Project and Berwick Bank are considered to be minor at a worst-case, with no material effect on seabird populations expected.

**Table 5-7 Ornithology Cumulative Effects Assessment Short List**

| Development | Type | Project Stage | Reasons for inclusion |
|---|---|---|---|
| Berwick Bank Offshore Wind Farm | Offshore Wind Farm | Consent application submitted | This development was included as it is scheduled to be operational from 2032 so construction and operational phases will overlap, and it is within approximately ~6 km of the Seagreen Project. |
| Inch Cape Offshore Wind Farm | Offshore Wind Farm | Consented | This development was included as it is scheduled to be operational in 2027 and it is within approximately ~17 km of the Seagreen Project. |
| Neart Na Gaoithe Offshore Wind Farm | Offshore Wind Farm | Construction | This development was included as it is scheduled to be operational in 2025 and is within approximately ~30 km of the Seagreen Project. |
| Marr Bank Offshore Wind Farm | Offshore Wind Farm | Pre-planning | This development was included as it is within approximately ~1 km of the Seagreen Project. |
| Morven Offshore Wind Farm | Offshore Wind Farm | Pre-planning | This development was included as it is within approximately ~30 km of the Seagreen Project. |
| Ossian Offshore Wind Farm | Floating Offshore Wind Farm | Scoping Submitted | This development was included as it is within approximately ~62 km of the Seagreen Project. |
| Bowdun Offshore Wind Farm | Offshore Wind Farm | Pre-planning | This development was included as it is within approximately ~30 km of the Seagreen Project. |
| Kincardine Offshore Wind Farm | Floating Offshore Wind Farm | Operational | This development was included as it is operational and is within approximately ~35 km of the Seagreen Project. |

| Development | Type | Project Stage | Reasons for inclusion |
|---|---|---|---|
| Aberdeen Offshore Wind Farm | Offshore Wind Farm | Operational | This development was included as it is within approximately ~60 km of the Seagreen Project. |
| Bellrock Offshore Wind Farm | Offshore Wind Farm | Pre-planning | This development was included as it is within approximately ~90 km of the Seagreen Project. |
| Campion Offshore Wind Farm | Floating Offshore Wind Farm | Pre-planning | This development was included as it is within approximately ~115 km of the Seagreen Project. |
| Muir Mhor Offshore Wind Farm | Floating Offshore Wind Farm | Scoping Submitted | This development was included as it is within approximately ~100 km of the Seagreen Project. |
| Hywind Scotland Pilot Park | Floating Offshore Wind Farm | Operational | This development was included as it has been operational since 2017 and it is within approximately ~90 km of the Seagreen Project. |
| Beatrice Offshore Wind Farm | Offshore Wind Farm | Operational | This development was included as it is operational and within approximately ~180 km of the Seagreen Project. |
| Moray East Offshore Wind Farm | Offshore Wind Farm | Operational | This development was included as it is operational and within approximately ~170 km of the Seagreen Project. |
| Moray West Offshore Wind Farm | Offshore Wind Farm | Construction | This development was included as it under construction and scheduled to be operational by 2025 and is within approximately ~165 km of the Seagreen Project. |

| Development | Type | Project Stage | Reasons for inclusion |
|---|---|---|---|
| Salamander Offshore Wind Farm | Offshore Wind Farm | Pre-planning | This development was included as it is within approximately ~95 km of the Seagreen Project. |
| Pentland Floating Offshore Wind Farm | Floating Offshore Wind Farm | Consented | This development was included as it is within approximately ~245 km of the Seagreen Project. |
| Green Volt Offshore Wind Farm | Floating Offshore Wind Farm | Scoping Submitted | This development was included as it is scheduled to be operational by 2030 and it is within approximately ~140 km of the Seagreen Project. |
| MarramWind Offshore Wind Farm | Floating Offshore Wind Farm | Scoping Submitted | This development was included as it is within approximately ~160 km of the Seagreen Project. |
| Caledonia Offshore Wind Farm | Floating Offshore Wind Farm | Scoping Submitted | This development was included as it is within approximately ~160 km of the Seagreen Project. |
| Cenos Offshore Wind Farm | Offshore Wind Farm | Scoping Submitted | This development was included as it is within approximately ~199 km of the Seagreen Project. |

### 5.1.4 Conclusion

The change in construction dates will not result in any change to collision estimates and the existing assessment and conclusions remain valid. Similarly, changes to the construction programme are expected to have no material effect on distributional response during operation.

There is limited potential for construction activities to result in adverse impacts to ornithology. The shift of the overall construction window (noting the duration period remains unchanged) proposed includes construction within the window of January 2029 to December 2032, with offshore construction starting in 2029 at the earliest. The installation window has been assumed to overlap with the construction of Berwick Bank Offshore Wind Farm, which is currently uncertain and a worst-case assumption.

This is likely to lead to cumulative vessel related disturbance for ornithology receptors, as the construction and vessels operating at Berwick Bank and Seagreen Projects may be on site at the same time. Project alone impacts were found to be small for both Seagreen 1A (Seagreen, 2012) and the Berwick Bank alone (Pelagica and Cork Ecology, 2022). Due to the spatial segregation between the two projects and that vessels will only be present in a small area within the respective project sites at any given time, cumulative impacts are expected to be minimal and unlikely to exceed minor adverse effect.

Cumulative habitat loss during the construction phase is also considered, with temporal overlap with Berwick Bank resulting in an overall increase in the spatial extent of short-term habitat loss. However, habitat loss at any given time will be confined to within the development area of the respective projects and is likely to be small in comparison to the regional habitat availability. The Berwick Bank cumulative assessment noted potential temporal overlap between construction phases and concluded impacts would be of small magnitude (Pelagica and Cork Ecology, 2022). This assessment determined that cumulative habitat loss is expected to be small and unlikely to exceed minor adverse effect.

Seagreen 1A also lies in the vicinity of several other projects which have the potential for cumulative impacts, such as Inch Cape OWF and Neart na Gaoithe OWF. However, a cumulative assessment concluded that a change in the construction programme will have no material effect on impacts associated with the operation and maintenance phase. Therefore, the cumulative assessment made for the 2012 ES, the 2020 Variation in turbine parameters and for all other projects since 2012 and 2020 remain valid.

The majority of the key receptors scoped in for assessment have low sensitivity to vessel-related disturbance effects, with razorbill considered as the most sensitive to disturbance effects. However, when considering OWF ship and helicopter traffic, razorbill sensitivity is in line with guillemot and puffin (Furness *et al*., 2013). The 2012 ES concluded that vessel-related disturbance during the construction phase would result in negligible impacts to all key offshore ornithology receptors (Seagreen, 2012), therefore the change in construction programme for the Seagreen Project alone is not expected to result in a greater effect on any seabirds due to disturbance. Therefore, this conclusion remains applicable.

Therefore, all impacts to key offshore ornithology receptors associated with the proposed Variation in construction programme are unlikely to result in material change to the assessments conducted previously. As a worst case, impacts are expected to be **Minor**, which is **Not Significant** in EIA terms.

## 5.2 Marine Mammals

### 5.2.1 Baseline

The 2012 ES reported common seal *Phoca vitulina* and grey seal *Halichoerus grypus* as being of particular relevance within the Regional Study Area (RSA) due to key breeding and haul-out sites in the vicinity of the project (Seagreen, 2012; Seagreen, 2021). Of those two pinnipedian species, grey seal was the species more frequently sighted during site-specific boat-based and aerial surveys (Sparling, 2011; Sparling, 2012). The latest SCOS report (SCOS, 2022) confirms the presence and trend in the East Scotland Seal Monitoring Unit (SMU), within which the offshore Seagreen 1A Project is located.

Four cetacean species were found to frequently or seasonally visit the waters off the east coast of Scotland that have been recorded in the vicinity of the offshore Seagreen 1A Project: harbour porpoise *Phocoena phocoena*, common bottlenose dolphin *Tursiops truncatus*, white-beaked dolphin *Lagenorhynchus albirostris*, and minke whale *Balaenoptera acutorostrata* (Seagreen, 2012; Seagreen, 2021). Of those four cetacean species, harbour porpoise was the cetacean species most frequently sighted during site-specific boat-based and aerial surveys, followed by white-beaked dolphin and minke whale. Common bottlenose dolphin was not identified during boat-based surveys but during aerial surveys (Sparling, 2011; Sparling, 2012). The latest SCANS surveys (SCANS IV), conducted in 2022, confirm presence of harbour porpoise, white-beaked dolphin, and minke whale within their survey block NS-D, within which the offshore Seagreen 1A Project is located. In addition, fin whale *Balaenoptera physalus* were recorded to be present within this block (Gilles *et al*., 2023).

An overview of relevant marine mammal survey data from individual surveys is provided in Table 5-8 below.

**Table 5-8 Marine Mammal Species Recorded in the Vicinity of the Offshore Seagreen 1A Project**

| Species | Boat-based Site-specific Surveys (total individuals recorded)[1] | Site-specific Aerial Surveys (total individuals / 100km)[2] | Block NS-D of the SCANS IV Surveys (individuals/km$^2$ (density) \| number (abundance))[3] | East Scotland SMU of the SCOS Report 2022 (Latest August counts in 2021)[4] |
|---|---|---|---|---|
| **Pinnipedia** | | | | |
| Grey seal | 992 | 0.08 | NA | 2,712 |
| Harbour seal | 24 | 0.02 | NA | 262 |
| Unidentified seal sp. | 97 | 2.08 | NA | - |

| Species | Boat-based Site-specific Surveys (total individuals recorded)[1] | Site-specific Aerial Surveys (total individuals / 100km)[2] | Block NS-D of the SCANS IV Surveys (individuals/km$^2$ (density) \| number (abundance))[3] | East Scotland SMU of the SCOS Report 2022 (Latest August counts in 2021)[4] |
|---|---|---|---|---|
| **Cetacea** | | | | |
| Harbour porpoise | 174 | 1.65 | 0.599 \| 38,577 | NA |
| Common bottlenose dolphin | - | 0.02 | 0.001 \| 57 | NA |
| White-beaked dolphin | 221 | 0.83 | 0.08 \| 5,149 | NA |
| Unidentified dolphin sp. | 56 | 0.31 | - | NA |
| Minke whale | 62 | 0.05 | 0.042 \| 2,702 | NA |
| Fin whale | - | - | 0.001 \| 57 | NA |

[1] Sparling, 2012; [2] Sparling, 2011; [3] Gilles et al., 2023; [4] SCOS, 2022

It should be noted that common bottlenose dolphin were recorded in considerable numbers (density estimate = 0.03 animals/km$^2$; abundance = 1,924 individuals) for Block R of the SCANS III surveys, where the offshore Seagreen 1A Project was located for that survey. It is also noteworthy that no fin whale were recorded during SCANS III surveys for Block R (Hammond *et al*., 2017).

On review of previous baseline assessments and with a view on additional data mentioned above, the identified marine mammal receptor species within the 2012 ES are considered appropriate and sufficient. These are harbour seal, grey seal, harbour porpoise, common bottlenose dolphin, white-beaked dolphin, and minke whale.

### 5.2.2 Potential Project Impacts

#### 5.2.2.1 Predicted Effects and Mitigation

The 2012 ES concluded a total of 18 potential impacts on marine mammal receptors, which are listed in Table 5-9. The assessment of underwater noise from piling activities on harbour seal during constructions resulted in moderate adverse and significant impacts. The results of the 2020 Piling Strategy Underwater Noise Assessment, assessing the significance of impacts for the refined project design of the 150 WTGs, were the same or less than assessed in the 2012 ES for both Permanent Threshold Shift (PTS) and behavioural disturbance, for all marine mammals.

**Table 5-9 Effects Summary Table from Chapter 13 of the 2012 ES for the entire Seagreen Project Area (From: Seagreen, 2012)**

| Effect | Description of Effect | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| **Construction** | | | |
| Underwater Noise (Pile Driving) | Death, injury or behavioural disturbance | Marine Mammal Observer (MMO) / Passive Acoustic Monitoring (PAM) or<br>Acoustic Deterrent Devices (ADDs) (if appropriate in a particular case for particular species).<br>500 m mitigation zone around noise source. | Moderate adverse and significant in harbour seal<br>Minor adverse and not significant in all other species except negligible and not significant in white-beaked dolphin |
| Underwater Noise | Death, injury or behavioural disturbance | Marine Mammal Mitigation Plans (MMMP) | Negligible and not significant (all species) |
| Collision risk (ship hull impact) | Injury or death | MMMP | Negligible and not significant (all species) |
| Changes to water quality (accidental release of contaminants) | Illness, injury or<br>Death | Site Environmental Management Plan (SEMP) | Negligible and not significant (all species) |

| Effect | Description of Effect | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| Changes to water quality (suspended sediment) | Illness, reduced foraging ability | SEMP | Negligible and not significant in all cetaceans,<br>Minor adverse and not significant in seals |
| Changes to prey resource | Individual fitness effect from reduced prey availability or increased foraging costs | Hearing sensitive fish species will be moderately impacted through pile driving noise, mitigation methods applied to the reduction of noise at source are the same as those applied for marine mammals (soft start and ramp up) | Minor adverse and not significant in harbour seal<br>Negligible and not significant (all other species) |
| **Operation and Maintenance** | | | |
| Underwater noise (WTGs) | Death, injury or behavioural disturbance | NA | Negligible and not significant (all species) |
| Underwater noise (vessel noise) | Death, injury or behavioural disturbance | NA | Negligible and not significant (all species) |
| Barrier effects | Prevent movement or migration | NA | Negligible and not significant (all species) |
| Collision risk (ship hull impact) | Injury or death | MMMP | Negligible and not significant (all species) |
| Changes to water quality (accidental release of contaminants) | Illness, injury or death | SEMP | Negligible and not significant (all species) |

| Effect | Description of Effect | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| Electromagnetic fields | Behavioural changes | NA | Negligible and not significant (all species) |
| **Decommissioning** | | | |
| Underwater noise (cutting) | Death, injury or behavioural disturbance | NA | Minor adverse and not significant all species |
| Underwater noise (vessels) | Death, injury or behavioural disturbance | NA | Negligible and not significant (all species) |
| Collision risk (ship hull impact) | Injury or death | MMMP | Negligible and not significant (all species) |
| Changes to water quality (accidental release of contaminants) | Illness, injury or death | SEMP | Negligible and not significant (all species) |
| Changes to water quality (suspended sediment) | Illness, reduced foraging ability | SEMP | Minor adverse and not significant in seals,<br>Negligible and not significant in all cetacean species |
| Changes to prey resource | Individual fitness effect from reduced prey availability or increased foraging costs | NA | Alpha only – Minor adverse and not significant in harbour seal<br>Negligible and not significant (all other species) |

The refined project design of 2020 were considered to have no material change and no likely significant effect on the marine mammals compared to the assessment made in the 2012 ES (Seagreen, 2022).

#### 5.2.2.2 Implications of Project Construction Programme Changes

Table 5-10 addresses potential implications associated with the proposed changes of the offshore Seagreen 1A Project on marine mammals. The changes are considered to have no material change, and no likely significant effect is identified on marine mammal receptors compared to the assessment made in the 2012 ES.

**Table 5-10 Implications of Proposed Construction Programme Changes on Marine Mammals**

| Proposed Construction Programme Change | Implications on Effect Significance |
|---|---|
| A shift to the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES). | Key impacts on marine mammals as previously assessed in 2012 and 2022 were underwater noise, impacts due to prey displacement and increased turbidity. A shift to the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), will have no material change to underwater noise produced during construction, operation or decommissioning, thus there is no increased impact on marine mammals expected. Similarly, no increased disturbance to prey or seabed sediment is expected to occur as a result of the shift.<br><br>No material change in impacts previously assessed is expected. No likely significant effects and no significant adverse effects on the environment is expected as a result of the shift proposed.<br><br>There is the potential for increased cumulative impacts, which are discussed and assessed in Section 5.2.3. |

### 5.2.3 Further Assessment

In light of the proposed construction programme shift, the cumulative impacts in relation to other schemes need to be reassessed. As per the 2012 ES, the main cumulative impacts of the Seagreen Project with other projects in the RSA on marine mammals are likely to be:

- disturbance from underwater noise;
- vessel collision; and
- indirect impacts through loss of prey.

Impacts from vessel collision risk have been assessed as part of the 2012 ES of the Seagreen 1A Project and reassessed in 2022. The impacts were assessed as being of **Negligible** significance (which is **Not Significant** with respect to the EIA Regulations) throughout each of the construction, operations & maintenance, and decommissioning phases of the Seagreen 1A Project. As such, the significance of this impact is not anticipated to increase beyond those already assessed.

Impacts and changes to marine mammal prey species have been assessed as part of each of the construction, operations & maintenance, and decommissioning phases of the Seagreen 1A Project. The impacts were assessed as being of **Minor** significance during construction and **Negligible** significance during decommissioning (which is **Not Significant** with respect to the EIA Regulations). As such, the significance of this impact is not anticipated to increase beyond those already assessed.

#### 5.2.3.1 Cumulative Effects Assessment (CEA) Disturbance from Underwater Noise

The RSA considers the connectivity of marine mammal receptors with relevant Special Areas of Conservation (SACs), i.e. the Isle of May SAC and the Berwickshire and North Northumberland Coast SAC for grey seal, the Firth of Tay and Eden Estuary SAC for harbour seal, and the Moray Firth SAC for common bottlenose dolphin. With a view on current practices of using marine mammal management units to determine which other projects to include, the approach in the 2012 ES is sensible. Therefore, the North Sea Management Unit (NS MU) (IAMMWG, 2023) was applied to determine relevant projects to consider in the cumulative effects for cetaceans, and the East Scotland SMU (SCOS, 2022) to determine which projects to include for pinniped species.

Table 5-11 lists the projects relevant to the marine mammal cumulative effects assessment. Potential impacts where construction timelines of other projects overlap with the new proposed construction dates for the Seagreen 1A Project are taken into consideration with respect to cumulative underwater noise.

**Table 5-11 Marine Mammal Cumulative Effects Assessment Short List.**

| Project | Type | EIAR | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | HP | BND | WBD | MW | GS | HS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seagreen 1A* | OWF | Y | | | | | | | y | y | Y | y | y | y |
| Ossian | OWF | Y | | | | | | | y | y | y | y | y | n |
| Salamander | FOWF | Y | | | | | | | y | y | Y | y | y | y |
| Green Volt | FOWF | Y | | | | | | | y | y | y | y | y | y |
| Pentland | FOWF | Y | | | | | | | y | y | y | y | n | n |
| Moray West | OWF | Y | | | | | | | y | y | y | y | n | n |
| Berwick Bank | OWF | Y | | | | | | | y | y | y | y | y | y |
| Inch Cape | OWF | Y | | | | | | | y | y | y | y | y | y |
| Neart Na Gaoithe | OWF | Y | | | | | | | y | y | y | y | y | y |
| East Anglia ONE N | OWF | Y | | | | | | | y | y | y | y | n | n |
| East Anglia Three | OWF | Y | | | | | | | y | y | y | y | n | n |
| East Anglia Two | OWF | Y | | | | | | | y | y | y | y | n | n |
| Hornsea Four | OWF | Y | | | | | | | y | y | y | y | n | n |
| Hornsea Three | OWF | Y | | | | | | | y | y | y | y | n | n |
| Norfolk Vanguard E | OWF | Y | | | | | | | y | y | y | y | n | n |
| Norfolk Vanguard W | OWF | Y | | | | | | | y | y | y | y | n | n |
| Rampion 2 | OWF | Y | | | | | | | y | n | y | y | n | n |
| Dogger Bank C | OWF | Y | | | | | | | y | y | y | y | n | n |

| Project | Type | EIAR | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | HP | BND | WBD | MW | GS | HS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dudgeon Extension | OWF | Y | | | | | | | y | y | y | y | n | n |
| Sheringham Extension | OWF | Y | | | | | | | y | y | y | y | n | n |
| Sofia | OWF | Y | | | | | | | y | y | y | y | n | n |

Key (and for all similar tables for species considered in this assessment): OWF = fixed foundation, FOWF = floating, Environmental Impact Assessment Report Y/N denotes whether a quantitative impact assessment for piling is available, red cells denote years in which piling activities are expected / could occur, orange cells denote years in which seismic surveys are expected. Projects screened into/out of species-specific assessments are denoted by y/n for HP (harbour porpoise), BND (common bottlenose dolphin), WBD (white-beaked dolphin), MW (minke whale), GS (grey seal) and HS (harbour seal)

* It is key to understand that the project is applying to extend the installation window, not the total installation time period.

This Cumulative Effects Assessment (CEA) uses behavioural disturbance values for the worst-case piling scenarios for offshore wind farm developments where a quantitative impact assessment was available in Environmental Impact Assessment Report (EIAR). However, as the methodology for assessing disturbance differs among project quantitative impact assessments, it should be noted that the total number of disturbed animals is not directly comparable and should be regarded here with caution. Nonetheless, they are considered the most suitable for comparison in this CEA, as they are the values presented by the project during the consenting process.

***Precaution in the Cumulative Effects Assessment***

The estimated effects presented in this CEA should be regarded as highly precautionary, as a result of the following considerations:

- Piling impacts are summed across projects, which assumes no spatial overlap in impact footprints and is likely to be overly precautionary considering the proximity of many of the included OWF developments;
- Timing of the construction activities is unknown, therefore the assessment assumes that piling could occur at any point within any given year or across years throughout the construction window. This results in piling for a single project being considered across multiple years in combination with all other projects. In reality the impacts will be limited to the construction period, which could occur within the first year of the construction window, thereby not overlapping with projects in subsequent years;
- Piling activities are not likely to require a full year to complete, therefore there is likely to be significantly less overlap even within presented years;
- Hammer energies and project design envelopes are likely to differ among developments, with alternative piles (e.g. pin piles, rather than monopiles) requiring less energy and having a lesser disturbance effect;
- Disturbance reactions by marine mammals are assumed in the CEA to be constant throughout the construction window, however it is likely that response levels will decrease with continued exposure.

#### 5.2.3.2 Cumulative Effects Assessment Underwater Noise Disturbance: Harbour Seal

Projects that lie within the harbour seal East Scotland SMU have been screened in for assessment in the CEA. This has resulted in fewer projects included when compared to the CEA for cetacean species. The population estimate for the East Scotland SMU (364; for 2016-2021) is based on the most recent August counts of harbour seals at haul-out sites, scaled by the proportion of the population estimate to be hauled out during the survey window (SCOS, 2022).

Table 5-12 outlines the number of harbour seal predicted to be exposed to behavioural disturbance from a single piling event under the worst-case scenario for each project in a given year. The disturbance value is obtained from the original 2012 ES, with harbour seal values calculated using overlays of $dB_{ht}$ contours and spatially explicit density data to assess impact levels, under the worst-case/GM1 scenario (Seagreen, 2012). It is important to note that while the total number for

behavioural disturbance may appear across concurrent years, this does not represent an additive impact. As the construction may occur wholly within a single year, and may occur at any point over the span of several years, the disturbance value is repeated as it represents the worst case scenario within that particular year.

**Table 5-12 Harbour seal Cumulative Effects Assessment: potential disturbance from underwater noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 51 | 51 | 51 | 51 |
| Salamander | FOWF | | 3 | | | | |
| Berwick Bank | OWF | 3 | 3 | 3 | 3 | 3 | |
| ***TOTAL*** | | 3 | 6 | 54 | 54 | 54 | 51 |
| ***% MU (364)*** | | 0.8% | 1.6% | 14.8% | 14.8% | 14.8% | 14.0% |
| ***Seagreen 1A contribution to total*** | | 0% | 0.0% | 94.4% | 94.4% | 94.4% | 100% |

The sensitivity of harbour seal to disturbance from piling activities has been assessed as **Medium**, and the magnitude of the cumulative impact has been assessed as **High**. Therefore, the cumulative effect of disturbance from underwater noise is considered to be of **Major** significance, which is **Significant** with respect to the EIA Regulations.

This assessment assumes all construction activities are happening at the same time (as a worst-case scenario). Further mitigation is therefore proposed here to reduce the cumulative impact of construction activities to non-significant levels (in EIA terms). Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. This proposed mitigation will minimise cumulative effects from disturbance from underwater noise on sensitive marine mammal species within the region.

If this proposed mitigation is implemented, the magnitude of effect is considered to be reduced to **Low**, which (together with a **Medium** sensitivity) would result in **Minor** significance of the impact, which is **Not Significant** in EIA terms.

#### 5.2.3.3 Cumulative Effects Assessment Underwater Noise Disturbance: Grey Seal

The Seagreen 1A Project falls within the East Scotland SMU for grey seal (SCOS, 2022), therefore only those projects within this SMU have been screened in, resulting in significantly fewer projects included compared to cetacean species. The SMU population estimate for grey seals is based on a combination of trends in pup production estimates by region and August haul-out counts, with the most recent

haul-out count having occurred in 2021. The most resent population size estimate for the East Scotland SMU is 10,783 individuals (SCOS, 2022).

Table 5-13 outlines the number of grey seals predicted to experience behavioural disturbance at each project under a worst-case scenario for a single piling event, grouped by year. The disturbance value has been obtained from the original 2012 ES, with grey seal values calculated using overlays of $dB_{ht}$ contours and spatially explicit density data to assess impact levels, under the worst-case/GM1 scenario (Seagreen, 2012).

**Table 5-13 Grey Seal Cumulative Effects Assessment: potential disturbance from underwater noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 398 | 398 | 398 | 398 |
| Ossian | OWF | | | | 436 | 436 | 436 |
| Green Volt | FOWF | 336 | 336 | 336 | | | |
| Salamander | FOWF | | 1395 | | | | |
| Berwick Bank | OWF | 1358 | 1358 | 1358 | 1358 | 1358 | 1358 |
| ***TOTAL*** | | 1694 | 3089 | 2092 | 2192 | 2192 | 2192 |
| ***% MU (10,783)*** | | 15.7% | 28.6% | 19.4% | 20.3% | 20.3% | 20.3% |
| ***Seagreen 1A contribution to total*** | | 0.0% | 0.0% | 19.0% | 18.2% | 18.2% | 18.2% |

The sensitivity of grey seal to disturbance from piling activities has been assessed as **Low**, and the magnitude of the cumulative impact has been assessed as **High**. Therefore, the cumulative effect of disturbance from underwater noise is considered to be of **Moderate** significance, which is **Significant** with respect to the EIA Regulations.

Further mitigation is proposed here to reduce the cumulative impact of construction activities to non-significant levels (in EIA terms). Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. This proposed mitigation will minimise cumulative effects from disturbance from underwater noise on sensitive marine mammal species within the region. If this proposed mitigation is implemented, the magnitude of effect is considered to be reduced to **Low**, which (together with a **Low** sensitivity) would result in **Negligible** significance of the impact and **Not Significant** with respect to EIA Regulations.

#### 5.2.3.4 Cumulative Effects Assessment Underwater Noise Disturbance: Harbour Porpoise

Table 5-14 outlines the number of harbour porpoise predicted to be disturbed by each project (where disturbance is expected) in a single worst-case piling event, grouped by year. The CEA only includes

projects with a quantitative impact assessment, as there is considerably more certainty in the number of animals predicted to be disturbed for these types of assessments. For cetacean species, the values for behavioural disturbance from the Seagreen 1A Project have been calculated by overlaying impact contours from the noise propagation modelling with average densities from the SCANS II data for survey Block V (Seagreen, 2012).

Construction of offshore wind farms is predicted to increase significantly in the years leading up to 2030 in order to achieve installed capacity targets. As a result, disturbance impacts are expected to be considerably higher in the second half of the decade compared to 2024 or 2025.

**Table 5-14 Harbour Porpoise Cumulative Effects Assessment: Underwater Noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 1501 | 1501 | 1501 | 1501 |
| Ossian | OWF | | | | 8309 | 8309 | 8309 |
| Green Volt | FOWF | 5208 | 5208 | 5208 | | | |
| Salamander | FOWF | | 11958 | | | | |
| Berwick Bank | OWF | 2822 | 2822 | 2822 | 2822 | 2822 | 2822 |
| East Anglia ONE N | OWF | 1289 | 1289 | | | | |
| East Anglia Two | OWF | | 1551 | 1551 | | | |
| Hornsea Four | OWF | 6417 | 6417 | 6417 | | | |
| Hornsea Three | OWF | 7330 | 7330 | 7330 | 7330 | | |
| Norfolk Vanguard E | OWF | | 2676 | 2676 | | | |
| Norfolk Vanguard W | OWF | | | 1678 | | | |
| Rampion 2 | OWF | 630 | 630 | | | | |
| Dudgeon Extension | OWF | 5161 | 5161 | | | | |
| Sheringham Extension | OWF | 1338 | 1338 | | | | |
| ***TOTAL*** | | 30195 | 46380 | 29183 | 19962 | 12632 | 12632 |
| ***% MU (346,601)*** | | 8.7% | 13.4% | 8.4% | 5.8% | 3.6% | 3.6% |
| ***% UK MU (159,632)*** | | 18.9% | 29.1% | 18.3% | 12.5% | 7.9% | 7.9% |
| ***Seagreen 1A contribution to total*** | | 0.0% | 0.0% | 5.1% | 7.5% | 11.9% | 11.9% |

The sensitivity of harbour porpoise to disturbance from piling activities has been assessed as **Medium**, and the worst-case magnitude of the cumulative impact has been assessed as **High** (for 2029).

Therefore, the cumulative effect of disturbance from underwater noise is considered to be of **Major** significance, which is **Significant** with respect to the EIA Regulations.

Further mitigation is proposed here to reduce the cumulative impact of construction activities to non-significant levels (in EIA terms). Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. This proposed mitigation will minimise cumulative effects from disturbance from underwater noise on sensitive marine mammal species within the region. If this proposed mitigation is implemented, the magnitude of effect is considered to be reduced to **Low**, which (together with a **Medium** sensitivity) would result in **Minor** significance of the impact and **Not Significant** with respect to EIA Regulations.

#### 5.2.3.5 Cumulative Effects Assessment Underwater Noise: Common Bottlenose Dolphin

Table 5-15 and Table 5-16 outline the number of common bottlenose dolphin predicted to be disturbed at each project in each year. Projects that predicted no impact to common bottlenose dolphin (e.g., East Anglia One North, East Anglia Three, East Anglia Two, Hornsea Three, Norfolk Vanguard East, Norfolk Vanguard West, Sofia, Dogger Bank C, Dudgeon Extension and Sheringham Shoal Extension) have been scoped out of assessment in this CEA. Due to the presence of a coastal MU (Coastal East Scotland) for common bottlenose dolphin in the vicinity of the Seagreen 1A Project, this CEA considers disturbance effects for both the Coastal East Scotland MU on its own, and the Coastal East Scotland MU in combination with the Greater North Sea MU.

**Table 5-15 Common bottlenose dolphin Cumulative Effects Assessment: projects that included potential disturbance to the Coastal East Scotland Management Unit alone from underwater noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 2 | 2 | 2 | 2 |
| Ossian | OWF | | | | 5 | 5 | 5 |
| Salamander | FOWF | | 25 | | | | |
| Berwick Bank | OWF | 5 | 5 | 5 | 5 | 5 | 5 |
| ***TOTAL*** | | 5 | 30 | 7 | 12 | 12 | 12 |
| ***% MU (224)*** | | 2.2% | 13.4% | 3.1% | 5.4% | 5.4% | 5.4% |
| ***Seagreen 1A contribution to total*** | | 0.0% | 0.0% | 28.6% | 16.7% | 16.7% | 16.7% |

**Table 5-16 Common bottlenose dolphin Cumulative Effects Assessment: projects that included potential disturbance to the combined Coastal East Scotland and Greater North Sea Management Units from underwater noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 2 | 2 | 2 | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Green Volt | FOWF | 204 | 204 | 204 | | | |
| Salamander | FOWF | | 84 | | | | |
| Berwick Bank | OWF | 107 | 107 | 107 | 107 | 107 | 107 |
| Hornsea Four | OWF | 14 | 14 | 14 | | | |
| ***TOTAL*** | | 325 | 409 | 327 | 109 | 109 | 109 |
| ***% MU (2,246)*** | | 14.5% | 18.2% | 14.6% | 4.9% | 4.9% | 4.9% |
| ***% UK MU (2,109)*** | | 15.4% | 19.4% | 15.5% | 5.2% | 5.2% | 5.2% |
| ***Seagreen 1A contribution to total*** | | 0.0% | 0.0% | 0.6% | 1.8% | 1.8% | 1.8% |

The sensitivity of common bottlenose dolphin to disturbance from piling activities has been assessed as **Low**, and the worst-case magnitude of the cumulative impact has been assessed as **Medium** (for 2030-2032) for the CES MU and **High** (2029) for the CES MU and GNS MU combined. Therefore, the worst-case cumulative effect of disturbance from underwater noise is considered to be of **Minor** significance for the CES MU and **Moderate** for the CES and GNS MUs combined, which is **Not Significant** for the CES MU and **Significant** for the combined MUs with respect to the EIA Regulations.

However, it is important to note that the contribution of the Seagreen 1A Project to the total impacted individuals for the CES and GNS MUs combined is <2%, with the vast majority of impacts derived from Berwick Bank development. Additionally, further mitigation is proposed here to reduce the cumulative impact of construction activities to non-significant levels (in EIA terms). Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. This proposed mitigation will minimise cumulative effects from disturbance from underwater noise on sensitive marine mammal species within the region. If this proposed mitigation is implemented, the magnitude of effect is considered to be reduced to **Low**, which (together with a **Low** sensitivity) would result in **Negligible** significance of the impact and **Not Significant** with respect to EIA Regulations.

#### 5.2.3.6 Cumulative Effects Assessment Underwater Noise: White-beaked Dolphin

Table 5-17 outlines the number of white-beaked dolphin predicted to be disturbed at each project in each year. Projects that were identified for inclusion in this CEA, but where no impact to white-beaked dolphin was identified, have been scoped out of assessment here. It is noted that for white-beaked dolphin, a single MU comprising all UK waters and extending to the seaward boundary used by the European Commission for Habitats Directive reporting is used, compared to the GNS MU used for the previous cetacean species.

**Table 5-17 White-beaked Dolphin Cumulative Effects Assessment: potential disturbance from underwater noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 161 | 161 | 161 | 161 |
| Ossian | OWF | | | | 1531 | 1531 | 1531 |
| Green Volt | FOWF | 1665 | 1665 | 1665 | | | |
| Salamander | FOWF | | 5697 | | | | |
| Berwick Bank | OWF | 830 | 830 | 830 | 830 | 830 | 830 |
| Hornsea Four | OWF | 85 | 85 | 85 | | | |
| Hornsea Three | OWF | 12 | 12 | 12 | 12 | | |
| ***TOTAL*** | | 2592 | 8289 | 2753 | 2534 | 2522 | 2522 |
| ***% MU*** | | 5.9% | 18.9% | 6.3% | 5.8% | 5.7% | 5.7% |
| ***% UK MU*** | | 7.6% | 24.4% | 8.1% | 7.4% | 7.4% | 7.4% |
| ***Seagreen 1A contribution to total*** | | 0.0% | 0.0% | 5.8% | 6.4% | 6.4% | 6.4% |

The sensitivity of white-beaked dolphin to disturbance from piling activities has been assessed as **Medium**, and the magnitude of the cumulative impact has been assessed as **Medium**. Therefore, the cumulative effect of disturbance from underwater noise is considered to be of **Moderate** significance and **Significant** with respect to EIA Regulations. Further mitigation is proposed here to reduce the cumulative impact of construction activities to non-significant levels (in EIA terms). Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. This proposed mitigation will minimise cumulative effects from disturbance from underwater noise on sensitive marine mammal species within the region. If this proposed mitigation is implemented, the magnitude of effect is considered to be reduced to **Low**, which (together with a **Medium** sensitivity) would result in **Negligible** significance of the impact and **Not Significant** with respect to EIA Regulations.

#### 5.2.3.7 Cumulative Effects Assessment Underwater Noise Disturbance: Minke Whale

Table 5-18 outlines the number of minke whale predicted to be disturbed at each project in each year. Projects that were identified for inclusion in this CEA, but where no impact to minke whale was identified, have been scoped out of assessment here. The MU for minke whale (and white-beaked dolphin) is a single MU comprising all UK waters and extending to the seaward boundary used by the European Commission for Habitats Directive reporting, compared to the GNS MU used for the previous cetacean species.

Notably, minke whale distribution in the North Sea is seasonal, with disturbance levels representative of the worst-case impacts characteristic of the summer months, when the species is more abundant. In

the winter months, when abundance is comparatively low, the impacts are predicted to be significantly less.

**Table 5-18 Minke whale Cumulative Effects Assessment: potential disturbance from underwater noise**

| Project | Type | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Seagreen 1A | OWF | | | 275 | 275 | 275 | 275 |
| Ossian | OWF | | | | 362 | 362 | 362 |
| Green Volt | FOWF | 265 | 265 | 265 | | | |
| Salamander | FOWF | | 603 | | | | |
| Berwick Bank | OWF | 132 | 132 | 132 | 132 | 132 | 132 |
| Hornsea Four | OWF | 46 | 46 | 46 | | | |
| Hornsea Three | OWF | 51 | 51 | 51 | 51 | | |
| Rampion 2 | OWF | 6 | 6 | | | | |
| ***TOTAL*** | | 500 | 1103 | 769 | 820 | 769 | 769 |
| ***% MU (20,118)*** | | 2.5% | 5.5% | 3.8% | 4.1% | 3.8% | 3.8% |
| ***% UK MU (10,288)*** | | 4.9% | 10.7% | 7.5% | 8.0% | 7.5% | 7.5% |
| ***Seagreen 1A contribution to total*** | | 0.0% | 0.0% | 35.8% | 33.5% | 35.8% | 35.8% |

The sensitivity of minke whale to disturbance from piling activities has been assessed as **Medium**, and the magnitude of the cumulative impact has been assessed as **Low**. Therefore, the cumulative effect of disturbance from underwater noise is considered to be of **Minor** significance, which is **Not Significant** with respect to the EIA Regulations.

### 5.2.4 Conclusion

This section has assessed the potential effects on marine mammal receptors arising from the shift to the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), for the offshore development of the Seagreen 1A Project. The baseline assessment of the original ES from 2012 is deemed accurate and sufficient.

Key impacts of the project itself on marine mammals as previously assessed in 2012 and 2022 were underwater noise, impacts due to prey displacement and increased turbidity. A shift to the

construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), is assessed as having no material change to underwater noise produced during construction, operation or decommissioning as a result of the shift, thus there is no increased impact on marine mammals expected. It can be concluded that there is no material change in impacts previously assessed, no likely significant effects and no significant adverse effects on the environment expected as a result of the shift proposed.

Cumulative behavioural disturbance from underwater noise generated across projects in the vicinity of the Seagreen 1A Project is assessed as **Significant** in EIA terms for harbour seal, grey seal, harbour porpoise, and common bottlenose dolphin (within the CES and GNS Mus combined MU). Effects that are **Not Significant** in EIA terms are predicted for common bottlenose dolphin (within the CES MU), white-beaked dolphin, and minke whale.

It is important to note that these species assessments are not consistent across years, with the greatest impacts predicted at the start of the construction window, where there is greater overlap with other projects. In 2032 for example, the cumulative impacts from underwater noise are predicted to have a lower magnitude, as construction for the other developments will have been completed. However, further mitigation is also proposed to reduce the cumulative impact of construction activities to non-significant levels (in EIA terms). Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. This proposed mitigation will minimise cumulative effects from disturbance from underwater noise on sensitive marine mammal species within the region. With these commitments in place, the magnitude of the cumulative impact is expected to be reduced to Not Significant.

In conclusion, whilst the Variation will not lead to any material changes to impacts on marine mammals within the Seagreen 1A Project itself, the severity of the cumulative impacts due to multiple OWFs under construction requires the application of the mitigation measure proposed above.

## 5.3 Natural Fish and Shellfish Resource

### 5.3.1 Baseline

The 2012 ES (Seagreen, 2012) split the study area for Fish and Shellfish Ecology into three parts:

- The Immediate Study Area (ISA), to include Project Alpha, Project Bravo and the Transmission Asset Project areas;
- The Regional Study Area (RSA), to encompass the ISA and the surrounding area defined by ICES rectangles 42E7, 41E7, 41E8 and 42E8; and
- The Wide Study Area (WSA), to encompass the RSA and ICES rectangles 43E8, 43E9, 42E9, 41E9, 40E7, 40E8, and 40E9.

The 2012 ES reported a number of species of commercial importance that use all or part of the WSA as spawning and/or nursery grounds (Seagreen, 2012, Coull *et al.,* 1998). Those which overlap or are in close proximity to any of the study areas include cod, lemon sole, herring, mackerel, nephrops, plaice, sandeel, saithe, sprat, spotted ray, spurdog, tope, and whiting. Table 5-19 identifies the main periods of spawning activity for the important species in the WSA, while Table 5-20 identifies species that have spawning and/or nursery grounds within the RSA.

**Table 5-19 Main periods of spawning activity for key fish species in the WSA (spawning periods are highlighted in yellow, peak spawning periods are highlighted in orange) (source: Seagreen, 2012)**

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Herring | | | | | | | | | | | | |
| Cod | | | | | | | | | | | | |
| Sandeel | | | | | | | | | | | | |
| Sprat | | | | | | | | | | | | |
| Whiting | | | | | | | | | | | | |
| Mackerel | | | | | | | | | | | | |
| Plaice | | | | | | | | | | | | |
| Saithe | | | | | | | | | | | | |
| Lemon sole | | | | | | | | | | | | |

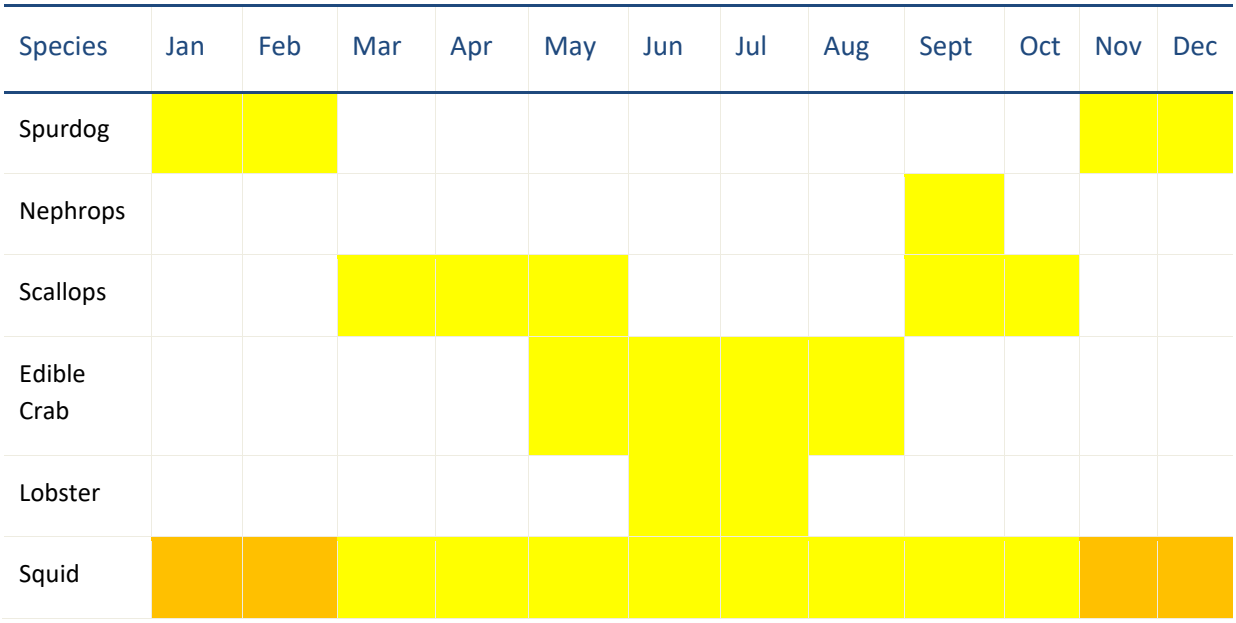



**Table 5-20 Fish species with spawning and nursery grounds (Coull *et al.,* 1998; Ellis *et al.,* 2012) near the Fish and Shellfish Ecology Regional Study Area, and whether their spawning and/or nursery ground lie within the study area**

| Species | Spawning Grounds within the Fish and Shellfish Ecology Regional Study Area | Nursery Grounds within the Fish and Shellfish Ecology Regional Study Area |
|---|---|---|
| Spurdog | N/A | ✓ |
| Common skate | N/A | ✓ |
| Spotted ray | N/A | ✓ |
| Tope shark | N/A | ✓ |
| Cod | ✓ | ✓ |
| Anglerfish | ✕ | ✓ |
| Whiting | ✓ | ✓ |
| Blue whiting | ✕ | ✓ |
| Plaice | ✓ | ✓ |

| Species | Spawning Grounds within the Fish and Shellfish Ecology Regional Study Area | Nursery Grounds within the Fish and Shellfish Ecology Regional Study Area |
|---|---|---|
| Sandeel | ✓ | ✓ |
| European hake | ✗ | ✓ |
| Ling | ✗ | ✓ |
| Haddock | ✗ | ✓ |
| Mackerel | ✗ | ✓ |
| Herring | ✓ | ✓ |
| Saithe | ✗ | ✓ |
| Lemon sole | ✓ | ✓ |
| Sprat | ✓ | ✓ |
| Nephrops | ✓ | ✓ |

Key: N/A = Insufficient data on the occurrence of spawning grounds

#### 5.3.1.1 Fish and Shellfish Ecology Receptor Groups

The key fish and shellfish species identified in the study areas can be grouped into five receptor groups:

- Elasmobranchs (sharks, skates, and rays);
- Demersal fish;
- Pelagic fish;
- Shellfish; and
- Migratory fish.

Due to the specific nature of the impact pathways associated with underwater noise, this impact is evaluated using alternative receptor groups, as outlined in Popper *et al.,* (2014):

- Fish with a swim bladder used in hearing;
- Fish with a swim bladder not used in hearing;
- Fish without a swim bladder; and
- Fish eggs and larvae.

These receptor groups are arranged in order of decreasing sensitivity to underwater noise. Species with a swim bladder used in hearing, such as Atlantic herring (hereafter herring), represent the most sensitive group. Due to widely available data on herring distributions and sensitivities, and their known presence within the region, herring is used to assess the worst-case scenario for underwater noise impacts.

Guidelines for behavioural responses in fish are not clearly established (Popper and Hawkins, 2019) and various strategies have been suggested. However, Popper *et al*. (2014) concluded that establishing sound exposure criteria for every possible sound source, type of response, and fish species was not feasible. To address this, a method was developed that categorises fish species based on the morphology of their auditory systems and provides threshold values for major potential effects from common sound sources. While this interim approach is not definitive, it aims to offer science-based criteria for assessing the effects of anthropogenic sound on fish. This methodology is applied in this chapter for the assessment of injury.

Table 5-21 presents key indicative thresholds for mortality and mortal injury, recoverable injury, and temporary threshold shifts (TTS) in relation to underwater noise exposure for fish and shellfish receptors.

**Table 5-21 Key underwater noise thresholds pertaining to Fish and Shellfish Ecology ($SEL_{cum}$ = Cumulative Sound Exposure Level (SEL) dB re 1 $\mu$ $Pa^2s$.; $SPL_{peak}$ = Peak Sound Pressure Level (SPL) dB re 1 $\mu$ Pa; RMS = Route Mean Square dB re 1 $\mu$ Pa) (From: Popper *et al.*, 2014)**

| Underwater Noise: Fish and Shellfish Receptor Group | Noise Source | Mortality and Potential Mortal Injury | Recoverable Injury | Temporary Threshold Shift |
|---|---|---|---|---|
| Fish with a swim bladder used in hearing | Continuous noise sources | N/A | 170dB RMS for 48 hrs | 158dB RMS for 12 hrs |
| | Pile driving | 207dB $SEL_{cum}$ > 207dB $SPL_{peak}$ | 203dB $SEL_{cum}$ > 207dB $SPL_{peak}$ | 186dB $SEL_{cum}$ |
| | Explosions | 229 – 234dB $SPL_{peak}$ | N/A | N/A |
| Fish with a swim bladder not used in hearing | Pile driving | 210dB $SEL_{cum}$ > 207dB $SPL_{peak}$ | 203dB $SEL_{cum}$ > 207dB peak | > 186dB $SEL_{cum}$ |
| | Explosions | 229 – 234dB peak | N/A | N/A |
| Fish without a swim bladder | Pile driving | > 219dB $SEL_{cum}$ > 213 dB peak | > 216dB $SEL_{cum}$ > 213dB peak | >> 186dB $SEL_{cum}$ |
| | Explosions | 229 – 234dB peak | N/A | N/A |

| Underwater Noise: Fish and Shellfish Receptor Group | Noise Source | Mortality and Potential Mortal Injury | Recoverable Injury | Temporary Threshold Shift |
|---|---|---|---|---|
| Fish eggs and larvae | Pile driving | 210dB $SEL_{cum}$ > 207dB peak | Moderate impact nearfield (tens of metres), low impact beyond | Moderate impact nearfield (tens of metres), low impact beyond |
| | Explosions | > 13 mm s-1 peak velocity | N/A | N/A |

***Elasmobranchs***

The key elasmobranch species of relevance to the study areas include:

- Spotted ray (*Raja montagui*);
- Spurdog/spiny dogfish (*Squalus acanthias*); and
- Tope shark (*Galeorhinus galeus*).

A summary of the elasmobranch species present in the study areas are presented in Table 5-22 and includes information on seasonality, distribution, and hearing group. There are no elasmobranch species listed as designated features of any Marine Protected Areas (MPAs) within the region surrounding the Fish and Shellfish Ecology study areas.

**Table 5-22 Ecology of elasmobranch species identified as having potential for presence within the Fish and Shellfish Ecology Study Area**

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| **Spotted ray** ***Raja montagui*** | Limited information on the reproductive biology of this species | Majority of population found in waters 100-500 m deep. Prefers soft, sandy substrates in coastal seas and on continental shelves | Mostly non-migratory, though females migrate to shallow waters from April-July to spawn | Adults feed on large crustaceans, teleost fish, polychaetes and molluscs, juveniles on small crustaceans | Fish with no swim bladder |
| **Spurdog** ***Squalus acanthias*** | Timing of reproduction varies by location, though it broadly occurs between January and August | Found in inshore waters to continental shelf, most commonly 10-200 m but recorded up to 900 m. Is epibenthic but also occurs in water column, with no preference for habitat | Highly migratory, dependent on age and sex. Young females migrate to shallow waters to give birth | Diet consists of mostly teleost fish (herring, whiting, Norway pout, cod, and Atlantic mackerel), with crustaceans often taken by smaller individuals | Fish with no swim bladder |
| **Tope shark** ***Galeorhinus galeus*** | Mating and parturition occurs during the spring | Found inshore through to 550 m depth, mostly near the seabed | Females give birth in shallow waters | Feeds mostly on a wide variety of teleost fish, in addition to some invertebrates | Fish with no swim bladder |

***Demersal Fish***

The key demersal fish species of relevance to the study areas include:

- Atlantic cod (*Gadus morhua*);
- European plaice (*Pleuronectes platessa*);
- Lemon sole (*Microstomus kitt*);
- Saithe (*Pollachius virens*);
- Sandeel (*Ammodytes marinus*); and
- Whiting (*Merlangius merlangus*).

A summary of the demersal fish species present in the study areas are presented in Table 5-23 and includes information on seasonality, distribution, and hearing group. There are no demersal fish species listed as designated features of any MPAs within the region surrounding the Fish and Shellfish Ecology study areas.

**Table 5-23 Ecology of demersal fish species identified as having potential for presence within the Fish and Shellfish Ecology Study Area**

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| **Atlantic cod** ***Gadus morhua*** | Spawning occurs in winter and beginning of spring | Juveniles prefer shallower waters (10-30 m) with complex habitats than adults (up to 600 m) | Migrate between spawning, feeding and overwintering areas, journeys of <200 km | Omnivorous, feeding on mostly fish and invertebrates | Fish with a swim bladder involved in hearing |
| **European plaice** ***Pleuronectes platessa*** | Spawn mostly between January-March in well-defined spawning grounds | Occurs on mud and sandy bottoms, from intertidal to about 100 m depth (increase in water depth with age) | Migrate for spawning activity | Feed mainly on thin-shelled molluscs and polychaetes. Active at night | Fish with no swim bladder |
| **Lemon sole** ***Microstomus kitt*** | The timing of spawning is related to a temperature threshold | Found on stony bottoms at depths 20-200 m | None reported | Feeds on invertebrates, primarily polychaetes | Fish with no swim bladder |
| **Saithe** ***Pollachius virens*** | Unknown | Occurs up to 350 m | Enters coastal waters in spring and returns to deeper waters in winter | Adults feed on other fish, whereas small fish feed primarily on crustaceans | Fish with a swim bladder involved in hearing |

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| **Sandeel** ***Ammodytes marinus*** | Spawning recorded in December and January | Occurs up to 150 m over sandy bottoms, both inshore and offshore | Bury in bottom during night and winter, migrate in water column during strong tidal currents | Feed on plankton | Fish with no swim bladder |
| **Whiting** ***Merlangius merlangus*** | Spawning occurs January-September | Depth range 10-200 m, most commonly 30-100 m, over mud and gravel bottoms mostly, but also on sand and rock | Individuals migrate to open sea after first year | Feed on a range of benthic prey | Fish with a swim bladder involved in hearing |

***Pelagic Fish***

The key pelagic fish species of relevance to the study areas include:

- Atlantic herring (*Clupea harengus*);
- Atlantic mackerel (*Scomber scombrus*); and
- European sprat (*Sprattus sprattus*).

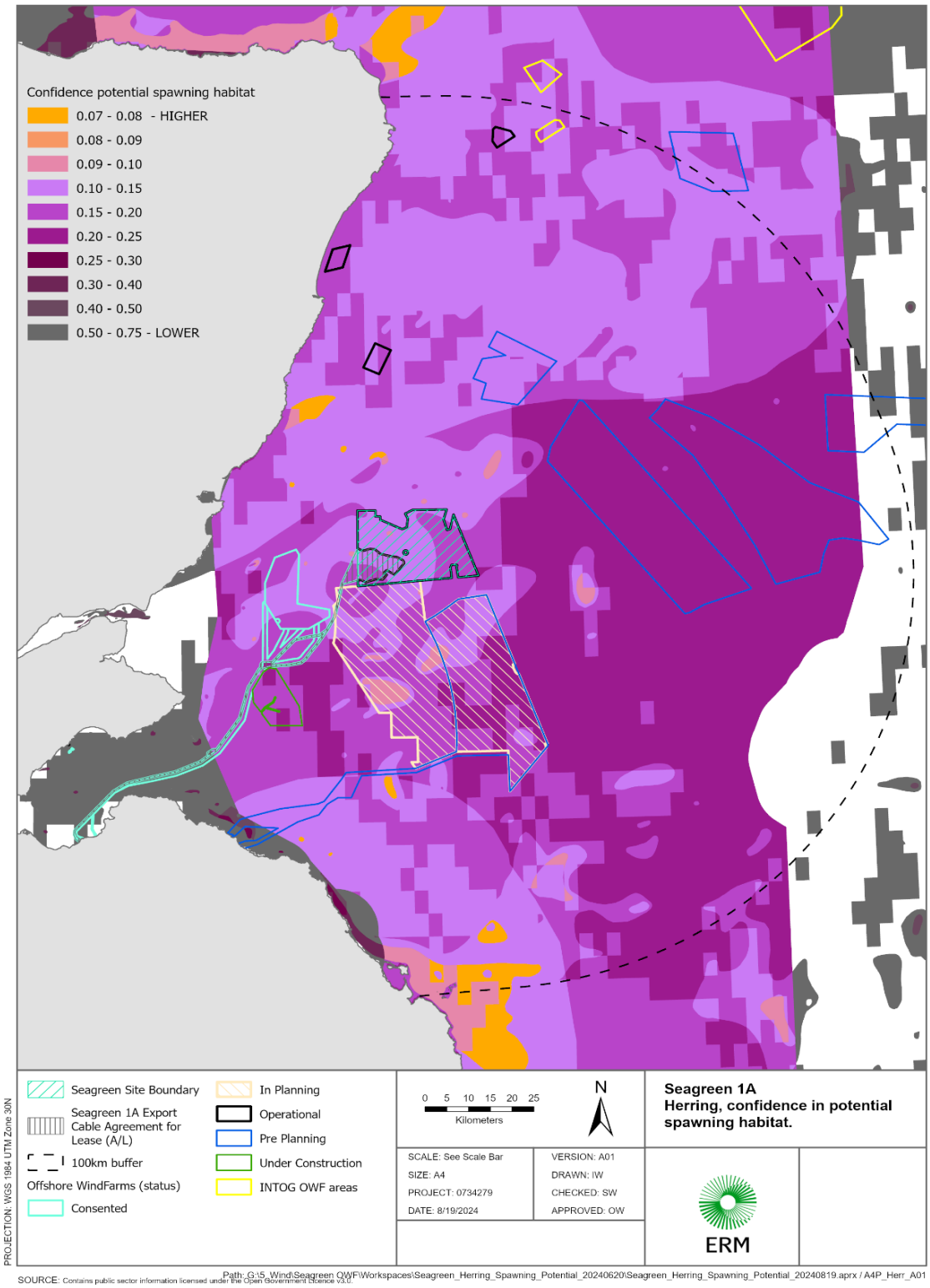
A summary of the pelagic fish species present in the study areas are presented in Table 5-24 and includes information on seasonality, distribution, and hearing group. There are no pelagic fish species listed as designated features of any MPAs within the region surrounding the Fish and Shellfish Ecology study areas.

Particular attention is given to the spawning and nursery grounds of Atlantic herring (hereafter referred to as herring) throughout this assessment, as they represent the most sensitive hearing group and are used to assess the worst-case scenario for underwater noise impacts. The potential spawning habitat for herring within 100 km of the Seagreen 1A OWF is presented in Figure 5-1, following the Kyle-Henney *et al.* (2024) methodology. The area within the site boundary is classed as having medium potential for herring spawning, with an isolated patch of high spawning potential in the west half of the site boundary and patches surrounding the perimeter.

**Table 5-24 Ecology of pelagic fish species identified as having potential for presence within the Fish and Shellfish Ecology Study Area**

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| **Herring** ***Clupea harengus*** | Comes to coastal areas to spawn. Both autumn and winter-spawning stock present | Occupy the water column from surface to 200m depth | Comes to coastal areas to spawn | Feed mostly on small shrimps and copepods, with occasional filter-feeding | Fish with a swim bladder involved in hearing |
| **Atlantic mackerel** ***Scomber scombrus*** | Spawning occurs during summer | Widely distributed on coastal shelves up to 200 m depth | Migrate in winter and early spring to spawning areas (inshore); spawn in summer; migration to post-spawning feeding grounds and overwinter areas | Filter-feeders on zooplankton, such as small fish and prawns | Fish without a swim bladder involved in hearing |
| **European sprat** ***Sprattus sprattus*** | Spawn throughout the year, though primarily in spring and summer | Occurs in the water column at depths of 10-150 m | Shows strong migrations between winter feeding and summer spawning grounds. Diurnal migrations through the water column | Feeds on planktonic crustaceans | Fish with a swim bladder involved in hearing |

**Figure 5-1 Potential spawning habitat for Atlantic herring *Clupea harengus* within 100 km of the Seagreen Offshore Wind Farm**



***Shellfish***

The key shellfish species of relevance to the study areas include:

- Brown crab (*Cancer pagurus*);
- Common whelk (*Buccinium undatum*);
- European Lobster (*Homarus gammarus*);
- King scallop (*Pecten maximus*) and Queen scallop (*Aequipecten opercularis*);
- Norway lobster (*Nephrops norvegicus*);
- Veined/long-finned Squid (*Loligo forbesii*); and
- Velvet swimming crab (*Necora puber*).

A summary of the shellfish species present in the study areas are presented in Table 5-25 and includes information on seasonality and distribution. There are no shellfish species listed as designated features of any MPAs within the region surrounding the Fish and Shellfish Ecology study areas.

**Table 5-25 Ecology of shellfish species identified as having potential for presence within the Fish and Shellfish Ecology Study Area**

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships |
|---|---|---|---|---|
| **Brown crab** ***Cancer pagurus*** | Females are buried for 6-9 months, during which they remain in pits dug into the sediment or under rocks, not feeding. Larvae are released in late spring/early summer | Usually at depths between 6 m-40 m, but can be found offshore at depths of up to 100 m. Found on a range of substrates such as sand, gravel and rocky seabed | Juveniles may remain in intertidal areas for approximately 3 years before moving to subtidal areas | Crustaceans including smaller brown crabs as well as bivalve molluscs |
| **Common whelk** ***Buccinum undatum*** | Whelk have a low fecundity and entirely benthic reproductive strategy. Whelk spawn between November and January, laying distinctive egg masses which are then attached to suitable substrate | Muddy sand, gravel and rock | Common whelk has low growth rates and restricted adult movements | Carnivorous predator and active scavenger |
| **European Lobster** ***Homarus gammarus*** | Mating takes place in the summer and is annual or bi-annual. Eggs carried for 10-11 months | Rocky and stony substrata, usually not deeper than 50 m | Do not undertake migrations; will only move a few miles along the shore | Preys on crabs, molluscs, sea urchins, polychaete worms and starfish |
| **King scallop** ***Pecten maximus*** | Scallops spawn in spring or summer and probably require dense concentrations to achieve | Coarse gravel with some erect epifauna and shell is known to be suitable for successful | Not considered migratory | Filter feeder |

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships |
|---|---|---|---|---|
| | the successful production of larvae | settlement and recruitment of larvae to the stock | | |
| **Queen scallop** ***Aequipecten opercularis*** | Scallops spawn in spring or summer and probably require dense concentrations to achieve the successful production of larvae | Coarse gravel with some erect epifauna and shell is known to be suitable for successful settlement and recruitment of larvae to the stock | Not considered migratory | Filter feeder |
| **Norway lobster** ***Nephrops norvegicus*** | Spawn in summer and autumn | Inhabits muddy bottoms, in waters 20-800 m deep, though usually 200-600 m | Not considered migratory | Nocturnally feeds on detritus, crustaceans, and worms |
| **Veined/long-finned Squid** ***Loligo forbesii*** | Spawning occurs from December to May, with a peak between December and February | Found over sandy and muddy bottoms, in waters 10-400 m deep. During the day they aggregate near the bottom and at night they disperse in the water column | Migrate to shallow areas for spawning | Preys on fish, crustaceans and cephalopods |
| **Velvet swimming crab** ***Necora puber*** | Spawning occurs throughout the year but peaks in summer. Spawning grounds are assumed | Predominantly an intertidal species, found on stony and rocky habitats. Is known to | | Scavengers that will consume almost any organic matter. |

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships |
|---|---|---|---|---|
| | to have the same spatial extent as the species distribution. | inhabit shallow reef areas on moderately sheltered shorelines. | | |

***Migratory Fish***

The key migratory fish species of relevance to the study areas include:

- Allis and Twaite Shad (*Alosa alosa* and *Alosa fallax*);
- Atlantic salmon (*Salmo salar*);
- Brown/sea trout (*Salmo trutta*);
- European eel (*Anguilla anguilla*);
- European smelt (*Osmerus eperlanus*);
- River lamprey (*Lampetra fluviatilis*); and
- Sea lamprey (*Petromyzon marinus*).

A summary of the migratory fish species present in the study areas are presented in Table 5-26 includes information on seasonality, distribution, and hearing group. There are no demersal fish species listed as designated features of any MPAs within the region surrounding the Fish and Shellfish Ecology study areas.

**Table 5-26 Ecology of migratory fish species identified as having potential for presence within the Fish and Shellfish Ecology Study Area**

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| **Allis shad *Alosa alosa* and Twaite shad *Alosa fallax*** | Shad remain in the freshwater environment for a short period, usually a few months. Juveniles migrate downstream in April-May. | A suitable estuarine habitat is likely to be very important for shad, both for passage of adults and as a nursery ground for juveniles. | Shad spend 3-4 years in marine environments, specifically in estuarine areas. They return to freshwater in April-May to spawn. | Shad species feed primarily on plankton as juveniles, and small crustaceans and fish in later life stages. | Fish with a swim bladder involved in hearing |
| **Atlantic salmon** ***Salmo salar*** | Spawning usually takes place between November and February. Eggs hatch in spring and with juveniles remaining in a freshwater environment for 1-4 years before entering the marine environment between April and May as smolts. They then remaining at sea for 1-4 years. In the first year at sea Atlantic salmon are known as grilse, becoming multi sea | Atlantic salmon spawn in rivers, before migrating to the marine environment as smolt. UK populations are known to migrate north to feed. Post-smolts are thought to remain close to the surface, but they may migrate to deep-sea feeding areas, within the Norwegian Sea and Greenland. | Adults return to the freshwater environment after 1-4 years in the marine environment. During migration adults tend to remain at water depths of between 13 m and 118 m, averaging 64 m. Prior to upriver migration salmon spend time in brackish waters. Following the transition to freshwater adult salmon largely stop feeding, | It has been hypothesised that deep dives to up to 280 m are related to feeding or predator avoidance. | Fish with a swim bladder not involved in hearing |

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| | winter (MSW) salmon in subsequent years. | | instead relying on fat reserves. | | |
| **Brown/sea trout** ***Salmo trutta*** | Trout spend 1-3 years in the freshwater environment. They migrate downstream in spring/early summer (both as post-smolts and as adults). | Brown trout that migrate to and are present in the marine environment can be either post-smolts, when they are in the marine environment for the first time, or post-spawned returning adults. | Trout usually spend 1 or 2 years at sea, in coastal areas. They migrate to freshwater environments in April-June. | Whilst in the marine environment sea trout spend most of their time in the upper 5 m, though dives of up to 30 m are also recorded, though to be associated with feeding or predator avoidance. | Fish with a swim bladder not involved in hearing |
| **European eel** ***Anguilla anguilla*** | European eels spend most of their life cycle in the freshwater environment. Downstream migration is from August to December (as silver eels) | Both juvenile and adult eels are found throughout the water column. Depth selected can vary with time of day; tagged adult eels swim in shallow warm waters at night and then make a deep dive to 1,000 m where they remain for the day before ascending again. The | European eel spawn in the Sargasso Sea with larvae drifting to Europe on the Gulf Stream. Following this they morph into glass eels and enter rivers from January-June. After between an average of 5-20 years of freshwater living, they travel back to | European eel diet comprises primarily fish, mollusc and crustaceans whilst in the marine environment. Adults do not feed on migration. | Fish with a swim bladder involved in hearing |

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| | | purpose of the dive may be for predator avoidance. | the Sargasso Sea to spawn and die. | | |
| **European smelt** ***Osmerus eperlanus*** | Widely distributed around the east and southeast coasts of England and the central southern North Sea. Spawns in rivers and lakes in February-May. | European smelt is an anadromous midwater species that is rarely found far from the shore. | Congregate near river mouths in winter and ascend the river between February and April. They return to sea shortly after spawning occurs. | Feeds on small crustaceans, with large adults occasionally taking small fish. | Fish without a swim bladder involved in hearing |
| **River lamprey** ***Lampetra fluviatilis*** | River lamprey remain in freshwater for 5 years or more, where they remain in burrows in river silt beds until adults. They transit to feed in estuaries and coastal waters in July-September. | After metamorphosis (July–September) at three to five years of age, the young adults migrate downstream during darkness to estuaries and coastal waters. | River lamprey spend up to 2 years in the marine environment whilst they reach maturity. In the autumn they stop feeding in preparation for their migration into freshwater, which occurs between October and December. Their upstream migration to spawning grounds occurs in winter and spring, when temperature | The distribution of river lamprey whilst in the marine environment is dependent on the distribution of the prey species to which they are attached. | Fish with no swim bladder |

| Species | Seasonality | Habitat Association | Migration | Predator-prey relationships | Hearing Group |
|---|---|---|---|---|---|
| | | | is low. They undertake these movements at night. | | |
| **Sea lamprey**<br>***Petromyzon marinus*** | Sea lamprey spend 3-4 years in freshwater environment. Following this, they transit to the open sea, primarily in July-September. | Metamorphosis to the adult form takes place between July and September. The time of the main migration downstream seems to vary from river to river. | Sea lamprey spend 18-24 months in marine waters. Following this, they migrate into freshwater in April-May spawning in May-June. | After metamorphosis and the downstream migration to the sea, the adults feed on fish there. They seem to feed on a wide variety of marine and anadromous fishes, including herring, salmon, cod and haddock. | Fish with no swim bladder |

### 5.3.2 Potential Project Impacts

#### 5.3.2.1 Predicted Effects and Mitigation

The 2012 ES concluded a total of 11 potential impacts on Fish and Shellfish receptors, which are listed in Table 5-27. The assessment of underwater noise from piling activities on herring during construction resulted in moderate adverse and significant impacts. The results of the 2020 Piling Strategy Underwater Noise Assessment, assessing the significance of impacts for the refined project design of the 150 WTGs, were less than or equal to the assessment undertaken in the 2012 ES for both mortality, auditory injury/impairment and behavioural effects, for all fish and shellfish species (Seagreen, 2022).

**Table 5-27 Effects Summary Table from Chapter 12 of the 2012 ES for the entire Seagreen Project Area (From: Seagreen, 2012)**

| Description of Effect | Impact | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| **Construction** | | | |
| Underwater Noise – death or injury | Minor adverse | Use of non-piled substructures/foundations would significantly reduce noise impacts.<br><br>Energy needed to drive piles should be minimised to reduce peak noise impacts.<br><br>Soft start piling (in which the energy used to drive the piles into the sediment is slowly ramped up) creates an increasing level of noise from low levels and will allow noise sensitive species such as herring and sprat to vacate the area and can reduce the risk to injury. This is an industry standard mitigation.<br><br>Physical mitigation methods may lead to a modest reduction in source level although this is untested in deeper water or tidal conditions. Investigation will continue regarding other technical mitigation solutions to reduce noise impacts. | If non-piled foundations are used then impact would be negligible.<br><br>The use of the mitigation methods suggested for piling may reduce the impact on high sensitivity species such as herring however at this stage it is not possible to determine what this reduction may be. Therefore, on a precautionary basis the impact remains minor adverse and not significant. |
| Underwater Noise - behaviour | Moderate adverse (herring) | Use of non-piled substructures/foundations would significantly reduce noise impacts. | If non-piled foundations are used then impact would be negligible. |

| Description of Effect | Impact | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| | | Energy needed to drive piles should be minimised to reduce peak noise impacts.<br><br>Soft start piling (in which the energy used to drive the piles into the sediment is slowly ramped up) creates an increasing level of noise from low levels and will allow noise sensitive species such as herring and sprat to vacate the area and can reduce the risk to injury. This is an industry standard mitigation.<br><br>Physical mitigation methods may lead to a modest reduction in source level although this is untested in deeper water or tidal conditions. Investigation will continue regarding other technical mitigation solutions to reduce noise impacts. | The use of the mitigation methods suggested for piling may reduce the impact on high sensitivity species such as herring however at this stage it is not possible to determine what this reduction may be. Therefore, on a precautionary basis the impact remains moderate adverse and significant. |
| Seabed habitat disturbance | Negligible | No mitigation methods advised for this impact. | Not significant. |
| Permanent loss of habitat | Negligible | Use of piled jacket structures would reduce the overall footprint and the consequent habitat loss. | If prime sandeel habitats are avoided or use of them minimised, and jacket substructure/foundations used, then the impact could be reduced but given the high sensitivity of the receptor the impact will remain Negligible and not significant. |

| Description of Effect | Impact | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| Increase of suspended sediments and remobilisation of contaminants | Negligible | No mitigation methods advised for this impact. | Not significant. |
| **Operation and Maintenance** | | | |
| Disturbance effects of Electromagnetic Fields (EMF) | Minor adverse | The effects of EMF are poorly understood, and mitigation measures are difficult to recommend. However burial depths of 0.5 m to 2.1 m are estimated and the arrangement of the array cable layout will be considered with respect to mitigating the effect of EMF. | With appropriate burial depth and intelligent array cable layouts it may be possible to reduce the impacts of EMF, however given the uncertainties around this impact from a precautionary standpoint this will remain minor adverse for the most sensitive species and not significant. |
| Operational noise | Negligible | No mitigation methods advised for this impact. | Not significant. |
| Disturbance of seabed habitats | Negligible | No mitigation methods advised for this impact. | Not significant. |

| Description of Effect | Impact | Potential Mitigation Measures | Residual Effects |
|---|---|---|---|
| Creation of new habitats – fish aggregation | Negligible/beneficial | No mitigation methods advised for this impact. | Not significant. |
| Increase of suspended sediments and remobilisation of contaminants | Minor adverse | No mitigation methods advised for this impact. | Not significant. |
| **Decommissioning** | | | |
| Seabed habitat disturbance and loss | Negligible | No mitigation methods advised for this impact. | Not significant. |

The changes of the refined project design of 2020 are considered to have no material change and no likely significant effect on the fish and shellfish species compared to the assessment made in the 2012 ES (Seagreen, 2022).

#### 5.3.2.2 Implications of Project Construction Programme Changes

Table 5-28 addresses potential implications associated with the proposed changes of the offshore Seagreen 1A Project on fish and shellfish. The changes are considered to have no material change, and no likely significant effect is identified on fish and shellfish receptors compared to the assessment made in the 2012 ES.

**Table 5-28 Implications of Proposed Construction Programme Changes on Fish and Shellfish**

| Proposed Construction Programme Change | Implications on Effect Significance |
|---|---|
| A shiftto the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES). | Key impacts on fish and shellfish as previously assessed in 2012 and 2022 were underwater noise, habitat disturbance, increased turbidity, and impacts due to Electromagnetic Fields (EMF). A shiftto the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), will have no material change to underwater noise produced during construction, operation or decommissioning, thus there is no increased impact on fish and shellfish expected. Similarly, no increased disturbance to habitat, seabed sediment or EMF is expected to occur as a result of the shift.<br><br>No material change in impacts previously assessed is expected. No likely significant effects and no significant adverse effects on the environment are expected as a result of the shift proposed.<br><br>There is the potential for increased cumulative impacts, which are discussed and assessed in Section 5.3.3. |

### 5.3.3 Further Assessment

In light of the proposed construction programme shift, the cumulative impacts in relation to other schemes need to be reassessed. As per the 2012 ES, the main cumulative impacts of the Seagreen Project with other projects in the RSA on fish and shellfish are likely to be:

- Disturbance from underwater noise;
- Seabed habitat disturbance and loss; and
- EMF effects.

Impacts from seabed habitat disturbance and loss have been assessed as part of the 2012 ES of the Seagreen Project and reassessed in 2022. The impacts were assessed as being of **Negligible** significance (which is **Not Significant** with respect to the EIA Regulations) throughout each of the construction, operations and maintenance, and decommissioning phases of the Seagreen Project. As such, the significance of this impact is not anticipated to increase beyond those already assessed.

Impacts from the creation of EMF to fish and shellfish have been assessed as part of the operations and maintenance phase of the Seagreen Project. The impacts were assessed as being **Minor adverse** (which is **Not Significant** with respect to the EIA Regulations). As such, the significance of this impact is not anticipated to increase beyond those already assessed.

#### 5.3.3.1 Cumulative Effects Assessment (CEA) Disturbance from Underwater Noise

The RSA considers the connectivity of fish and shellfish receptors with the ISA, including the Project and the Export Cable Route (ECR), and the surrounding area defined by the ICES rectangles 42E7, 41E7, 41E8 and 42E8. With a view on current practices of using fish with a swim bladder used in hearing as the most sensitive receptor, herring is used to represent the most vulnerable case in the underwater noise assessment. Therefore, the hearing capability of herring was applied to determine relevant projects to consider in the CEA.

Table 5-29 lists the projects relevant to the fish and shellfish CEA. Potential impacts where construction timelines of other projects overlap with the new proposed construction dates for the Seagreen 1A Project are taken into consideration with respect to cumulative underwater noise.

**Table 5-29 Fish and Shellfish Cumulative Effects Assessment Short List**

| Project | Type | EIAR | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Salamander | FOWF | Y | | | | | | | | | |
| Green Volt | FOWF | Y | | | | | | | | | |
| Pentland | FOWF | Y | | | | | | | | | |
| Seagreen 1A | OWF | Y | | | | | | | | | |
| Moray West | OWF | Y | | | | | | | | | |
| Berwick Bank | OWF | Y | | | | | | | | | |
| Inch Cape | OWF | Y | | | | | | | | | |
| Neart Na Gaoithe | OWF | Y | | | | | | | | | |
| East Anglia ONE N | OWF | Y | | | | | | | | | |
| East Anglia Three | OWF | Y | | | | | | | | | |
| East Anglia Two | OWF | Y | | | | | | | | | |
| Hornsea Four | OWF | Y | | | | | | | | | |
| Hornsea Three | OWF | Y | | | | | | | | | |
| Norfolk Vanguard E | OWF | Y | | | | | | | | | |
| Norfolk Vanguard W | OWF | Y | | | | | | | | | |
| Rampion 2 | OWF | Y | | | | | | | | | |
| Dogger Bank C | OWF | Y | | | | | | | | | |
| Dudgeon Extension | OWF | Y | | | | | | | | | |
| Sheringham Extension | OWF | Y | | | | | | | | | |
| Sofia | OWF | Y | | | | | | | | | |

| Project | Type | EIAR | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Muir Mhòr | FOWF | N | | | | | | | | | |
| MarramWind | FOWF | N | | | | | | | | | |
| Caledonia | OWF | N | | | | | | | | | |
| Cenos | SS | N | | | | | | | | | |

Key (and for all similar tables for species considered in this assessment): OWF = fixed foundation, FOWF = floating, Environmental Impact Assessment Report Y/N denotes whether a quantitative impact assessment for piling is available, red cells denote years in which piling activities are expected / could occur, orange cells denote years in which seismic surveys are expected.

Recent projects that incorporate underwater noise assessments use the Popper *et al.* (2014) methodology, which categorises fish species based on the morphology of their auditory systems and provides threshold values for major potential effects from common sound sources, as seen in Table 5-21. The guidelines proposed include thresholds for pile driving, explosions, and continuous noise sources such as shipping. The defined category 'Fishes in which hearing involves a swim bladder or other gas volume' includes species that are susceptible to barotrauma and can detect sound pressure as well as particle motion. Species in this group include cod and herring and are the most susceptible to mortality and potential mortal injury, with the lowest threshold value for piling of 207 dB re 1 $\mu Pa^2s$ $SEL_{cum}$ or >207 dB re 1 µPa $SPL_{peak}$. The extent of injury increases as sound levels, exposure time, and number of pile driving strikes increase.

The 2012 ES used a different underwater noise assessment methodology, which was undertaken by Subacoustech Environmental Ltd in 2012 (Nedwell *et al.,* 2012). This underwater noise assessment used the weighted species specific 130 $dB_{ht}$ perceived level as an indicator of traumatic hearing damage (Table 5-30). The $dB_{ht}$(Species) scale is designed to incorporate the concept of 'loudness' as perceived by a particular species. This is achieved by referencing the sound to the species' hearing threshold, effectively evaluating the level of sound that the species can perceive. Since different species have varying hearing sensitivities, the same underwater sound will be perceived differently depending on the species in question. The perceived noise levels are usually lower than the un-weighted levels recorded; the reduction accounts for the frequencies that the species cannot hear and the general insensitivity of many marine species to certain sounds. The $dB_{ht}$ model estimates the proportion of a population that will react to underwater noise, rather than trying to estimate the likelihood of an individual reaction.

**Table 5-30 Assessment criteria used to assess the potential impact of underwater noise on marine species (from Nedwell *et al.*, 2012)**

| Level in $dB_{ht}$(Species) | Effect |
|---|---|
| 0-50 | Low likelihood of disturbance |
| 50-75 | Avoidance is unlikely |
| 75 and above | Significant avoidance reaction by the majority of individuals but habituation or context may limit effect |
| 90 and above | Strong avoidance reaction by virtually all individuals |

| Level in $dB_{ht}$(Species) | Effect |
|---|---|
| Above 130 | Possibility of traumatic hearing damage from single event |

The threshold of 130 $dB_{ht}$ is a conservative value compared to the values used by Popper *et al.* (2014). Noise levels between 75 $dB_{ht}$ and 130 $dB_{ht}$ are likely to lead to avoidance reactions in fish, whereas noise levels above 130 $dB_{ht}$ are likely to lead to mortality.

Berwick Bank, located approximately 6 km from the Seagreen 1A Project, undertook an underwater noise assessment using the Popper *et al.* (2014) guidelines as described in Section 5.3.1 (SSE Renewables, 2022). However, it was noted that these criteria for disturbance are qualitative rather than quantitative, therefore the criteria presented in the Washington State Department of Transport Biological Assessment Preparation for Transport Projects Advanced Training Manual (WSDOT, 2011) were also used in the assessment for predicting the extent of behavioural effects due to impulsive piling. An unweighted sound pressure level of 150 dB re 1 µPa RMS was suggested as the criterion for onset behavioural effects, so any levels above this would be expected to cause temporary behavioural changes.

Piling activities at Berwick Bank are anticipated to overlap with piling activities at Seagreen 1A scheduled between 2029 and 2032. It is important to clarify that piling will not happen continuously throughout the entire four-year installation window. Instead, piling could occur at any time within this window, so the four-year span is considered a worst-case scenario for planning and impact assessment purposes.

#### 5.3.3.2 Cumulative Effects Assessment Underwater Noise Disturbance: Herring

The 2012 ES selected a worst-case scenario for the operations, which includes a single piling operation with an installation time of 55 minutes to install a pile up to 27 m in length. The scenario assumes that only one pile is installed per day over a period of two years, with a maximum of 348 piles installed for Project Alpha and 324 piles for Project Bravo. Using the weighted species-specific threshold of 130 $dB_{ht}$ perceived level as an indicator of traumatic hearing damage, the maximum range at which herring would experience hearing damage is at 0.26 km (Nedwell *et al.,* 2012). However, the peak impact range of 130 $dB_{ht}$ for herring is confined to the ISA.

Note that herring eggs are assumed to be present within the project area during the spawning period. However, as their sensitivity is below that of fish with a swim bladder used in hearing (represented within this assessment by herring) any potential impacts will be determined through the assessment of the most sensitive receptor group.

A level of 90 $dB_{ht}$ was proposed as the level at which there is a strong probability that all individuals would be disturbed and show a strong avoidance reaction, while 75 $dB_{ht}$ was proposed as the level at which 50-85% of individuals would be disturbed. In this case, the maximum range at which herring would experience avoidance reactions is at 28 km and 77 km respectively. The 2012 ES concluded that these impacts would result in 3% of herring spawning grounds in the WSA affected by noise levels of 90 $dB_{ht}$ or higher and 24% affected by noise levels of 75 $dB_{ht}$ or higher. In terms of nursery grounds, 9% in the WSA would be affected by noise levels of 90 $dB_{ht}$ or higher and 40% would be affected by noise levels of 75 $dB_{ht}$ or higher.

The Berwick Bank underwater noise modelling results for fish with a swim bladder used in hearing are shown in Table 5-31 based on cumulative sound exposure level thresholds, and in Table 5-32 based on the peak sound pressure thresholds. When considering the 150 dB re 1 µPa RMS disturbance threshold, the range for a single pile driving to cause disturbance is 17 km.

**Table 5-31 Injury Ranges for Fish With a Swim Bladder Involved in Hearing, Based on the Cumulative SEL Metrics from Impact Pile Driving for the Realistic and Maximum Scenarios for Wind Turbine Jacket Foundations, and OSP/Offshore Convertor Station Platform Jackets at Berwick Bank (SSE Renewables, 2022)**

| Hearing Group | Response | Threshold ($SEL_{cum}$ dB re 1 $\mu Pa^2s$) | Range (m) | | |
|---|---|---|---|---|---|
| | | | Wind turbine Max Energy | Wind turbine Realistic Energy | OSP/Offshore Convertor Station Platform |
| Fish with a swim bladder involved in hearing | Mortality | 207 | 33 | 26 | 33 |
| | Recoverable injury | 203 | 67 | 53 | 67 |
| | TTS | 186 | 4161 | 3183 | 3943 |

**Table 5-32 Summary of Peak Pressure Injury Ranges for Fish With a Swim Bladder Involved in Hearing, Based on the Phase of Impact Piling that Produces the Highest Peak Sound Pressure Levels for Both Wind Turbine Foundations and OSP/Offshore Convertor Station Platform Foundations at Berwick Bank (SSE Renewables, 2022)**

| Hearing Group | Response | Threshold ($SPL_{peak}$ dB re 1 µPa) | Range (m) | |
|---|---|---|---|---|
| | | | Wind turbine Max Energy and OSP/Offshore Convertor Station Platform | Wind turbine Realistic Energy |
| Fish with a swim bladder involved in hearing | Mortality | 207 | 228 | 196 |
| | Recoverable injury | 207 | 228 | 196 |

In the absence of a common underwater noise modelling approach, a direct comparison among OWFs is not possible. However, where piling is concurrent it is expected that disturbance from pile driving across the Seagreen 1A Project and Berwick Bank is likely to occur at a moderate frequency or intensity, affecting a moderate proportion of the regional herring population which has the potential to cause medium-term changes in the population from baseline conditions as a result of disturbance to local spawning grounds, however the project has agreed to no concurrent piling with Berwick Bank. Where piling is concurrent with other developments, the frequency is also considered to be moderate, however intensity is considered as low due to increased distances between developments.

For this reason, the sensitivity of herring at a population level to disturbance from piling activities has been assessed as **Medium**, and the magnitude of the cumulative impact has been assessed as **Medium**, assuming a worst-case scenario. Therefore, the cumulative effect of disturbance from underwater noise is considered to be of **Moderate** significance, which is **Significant** with respect to the EIA Regulations.

However, this assessment assumes all construction activities are happening at the same time as a worst-case scenario, which is assumed at the time of drafting this scenario. Seagreen 1A will coordinate with the Berwick Bank development to ensure that no instances of concurrent piling occur in order to minimise or mitigate the potential for cumulative disturbance or damage to sensitive fish and shellfish species as a result of underwater noise and vibration. With these commitments in place, the magnitude of the cumulative impact is expected to be reduced to **Low**, which (together with a

**Medium** sensitivity) would result in an impact of **Minor** significance, which is **Not Significant** with respect to EIA Regulations. This conclusion aligns with the assessment presented in the 2012 ES and remains valid, provided there is no overlap in piling activities.

### 5.3.4 Conclusion

This section has assessed the potential effects on fish and shellfish receptors arising from the shift to the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), for the Offshore Development of the Seagreen Project. The baseline assessment of the original ES from 2012 is deemed accurate and sufficient.

Key impacts of the project itself on fish and shellfish receptors as previously assessed in 2012 and 2022 were underwater noise, seabed habitat disturbance, permanent loss of habitat, increased suspended sediments, and EMF effects. A shift to the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), is assessed as having no material change to underwater noise produced during construction, operation or decommissioning, thus there is no increased impact on fish and shellfish expected. It can be concluded that there is no material change in impacts previously assessed, no likely significant effects and no significant adverse effects on the environment are expected as a result of the shift proposed.

A direct comparison could not be made in the CEA of underwater noise disturbance due to the lack of common modelling approach used in prior assessments. However, the CEA resulted in a worst-case assumption of a **Significant** effect for herring.

This assessment assumes all construction activities are happening at the same time as a worst-case scenario. Seagreen 1A will coordinate with the Berwick Bank development to ensure that no instances of concurrent piling occur in order to minimise or mitigate the potential for cumulative disturbance or damage to sensitive fish and shellfish species as a result of underwater noise and vibration.

With these commitments in place, the magnitude of the cumulative impact is expected to be reduced to **Low**, which (together with a **Medium** sensitivity) would result in an impact of **Minor** significance, and **Not Significant** with respect to EIA Regulations.

In conclusion, whilst the Variation will not lead to any material changes to impacts on fish and shellfish within Seagreen 1Aitself, the severity of the cumulative impacts due to multiple OWFs under construction requires the application of further mitigation as described above.

## 5.4 Nature Conservation

All relevant seabird and marine mammal species and associated populations that have any exposure to environmental effects resulting from the proposed Variation activities are classified populations of SPAs or Annex II designated populations of SACs. All of these are assessed within the proposed Variation's Habitats Regulations Appraisal (HRA). In addition, Annex I habitats and habitats supporting classified SPA populations are also assessed in the HRA. The HRA is provided in Appendix A, however the summary and conclusions are presented below.

### 5.4.1 HRA Summary and Conclusion

The proposed changes to the Seagreen 1A Project comprises of a shiftto the construction window (noting that the construction duration remains unchanged), where construction of the remaining WTGs and associated cables will take place between January 2029 and December 2032. However it is important to understand this is an installation window, with the actual indicative installation durations (as presented in Section 1.2) remaining the same as previously assessed. With this change in construction timeline, the construction phase of Seagreen 1A will temporally overlap with the construction phase of the Berwick Bank.

The change in construction timeline has no material effect on any other activities or parameters associated with the project, including numbers of vessel movements, areas of habitat loss, or number or sizes of WTGs. Therefore, impacts associated with the Seagreen 1A Project alone were determined to remain as previously assessed, **No Adverse Effect on Site Integrity is determined for all considered sites**.

With temporal overlap between Seagreen 1A and other development construction, there is potential for in combination effects which have not previously been considered. These include loss of habitat, underwater noise and vessel-related disturbance. The potential impacts of these pressures were qualitatively assessed, where it was determined that any impacts would be of small magnitude and highly localised. Therefore with the implementation of relevant mitigation measures, in combination **No Adverse Effect of Site Integrity is determined for all considered sites**.

Operation phase impacts associated with the Seagreen 1A Project were also considered. However, as there is **no change** to project design parameters, the currently consented project is considered to represent the worst-case scenario. Therefore, it is reasonable to determine that all in combination assessments carried out since the publication of the original Seagreen 1A application in 2013 have **fully considered** all effects associated with the operation phase of Seagreen 1A. As such, alone and in combination **No Adverse Effect on Site Integrity is determined for all considered sites**.

## 5.5 Commercial Fisheries

### 5.5.1 Baseline

The following section presents an updated overview of the commercial fisheries baseline in the commercial fisheries study area to that presented in previous assessments.

In terms of landed value, the main commercial fisheries species targeted within the Seagreen 1A Project area are brown crab, lobster, scallops, and haddock, with lobster and brown crab fisheries being the most valuable. Across the six ICES rectangles that make up the commercial fisheries study area, fishing vessels landed on average a value of around £17.6 million (MMO, 2023) annually between 2016-2022 with shellfish landings attributing 99% of the landings total. 95% of these landings were made by Scottish registered vessels.

Seagreen 1A Export Cable Corridor routes diagonally through ICES rectangle 41E7, this area shows the highest value of landings recorded within the commercial fisheries study area at ~£11.5 million landed in 2022 (MMO, 2023). *Nephrops* and lobster are the most valued catch in this area which are fished for using conflicting static and towed gear types.

The Seagreen generation assets are located within ICES rectangle 42E8, recorded landing values around £1 million in 2021 and £336,192 in 2022, this is of moderate to low importance on a national scale, but of moderate importance on a regional scale. The majority of the catch landed during 2022 within ICES rectangle 42E8 was scallops using towed gear types. Landings are notable at nine ports near the Project site. The highest landing value caught from the study area in 2022 was landed into Pittenweem, with just under £5.5 million in total, with £2.3 million landed into Arbroath, £2.2 million landed into Eyemouth and £1.8 million into Dunbar (MMO, 2023).

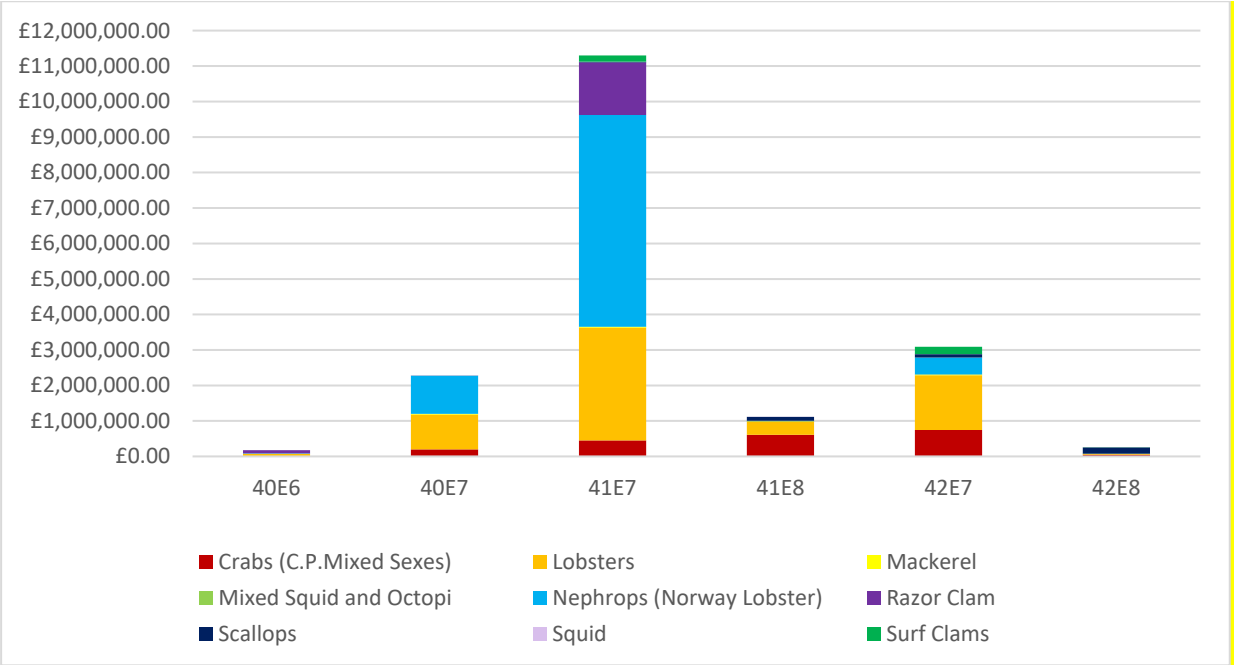



**Figure 5-2 UK landings first sale value for ICES rectangles in the study area, 2022, by species (MMO, 2023)**

Landing values have remained relatively stable across a four-year period from 2016-2022, with reducing landings in 2020 likely to be due to reduced fishing activity associated with the Covid pandemic; 2020-2021 landings increased by 26% (Seagreen, 2023) with 2022 similar to 2021, and landings yet to recover fully to pre-Covid values.

The trends in key species landed across the commercial fisheries study area have stayed consistent with shellfish fisheries in the area producing around 99% of the annual value of landings every year between 2016 and 2022. Shellfish fisheries such as lobster (£6.2 million in average annual first sales value), *Nephrops* (£5.8 million), scallop (£2.3 million) and brown crab (£1.6 million) represent high value fisheries for the area and are targeted by UK vessels deploying creels and traps, trawls and scallop dredge gears. Razor clam and velvet crab catches are also notable (Seagreen, 2023) with razor clams being of high value to export markets. The razor clam fishery is currently restricted to an authorised trial electrofishing area within the Firth of Forth and is subject to a decision on the future approach by the Scottish government (Scottish Gov, 2023).

Crab and lobster are important fisheries within the whole study area they are principally targeted by full time static gear vessels using creels/creels, alongside a small number of part time vessels who set a small number of creels in inshore areas during the summer months. Fishing is year-round, although there is a significant peak in activity in the summer months. *Nephrops* are an important shellfish species in the Forth and Tay area, with the highest recorded landings in rectangles 41E7 and 41E6.

Landings data from 2016-2022 indicates that 50% of the total value landed from the study area is done so by vessels 10m and under in length. Whilst the split is equal in value, there are variations across

target species with lobster, brown crab, razor clam and velvet crab primarily caught by under 10m vessels and *Nephrops* and scallops primarily caught by over 10m vessels (Seagreen, 2023). Landings data by month indicates that shellfish landings occur year-round but peak seasonally depending on target species as follows:

- Lobster: summer months, particularly August;
- *Nephrops:* summer month and late autumn;
- Scallops: spring months;
- Brown crab: throughout the year; and
- Razor clam: throughout the year.

UK vessel landings data 2016-2022 indicate that within the Commercial fisheries study area approximately 48% of landings by value can be attributed to commercial vessels using creels and traps, 30% by demersal otter trawls and 14% by dredge (Seagreen, 2023).

**Limitations of the data**

As described in the UK Sea Fisheries Statistics 2022 Report (MMO, 2023), multiple factors impact fishing activity and landings tend to fluctuate considerably over time. In 2020, the ongoing COVID-19 pandemic (where effects were felt from March 2020) resulted in considerable impacts on commercial fishing. Like all parts of the UK economy, the pandemic had differential impacts on different sectors of the fishing industry. Overall, shellfish fisheries were hit most severely as shellfish species tend to be landed and sold fresh for use in the hospitality sector and demand from this sector in the UK and abroad dropped dramatically as lockdowns were being imposed across the UK and EU. Data for 2020 and 2021 are not considered representative of normal fishing activities due to the effects of the COVID-19 pandemic.

Further limitations of landing data include the spatial size of ICES rectangles which can misrepresent actual activity across small sites within the ICES rectangle. Overall landings from vessels under 10m appear lower than for larger vessels, however it is important to note that data from the under 10m fleet is often not available or patchy due to current regulations not requiring the same level of data records as the over 10m fleet.

**Sensitive receptors**

**Scallop fishery**

Scallop vessels are specific to their targeted catch and generally tow either one or two beams onto which a number of dredges are attached, depending on vessel size, engine power and winch capacity. In Scottish waters a scallop dredge is limited to 8 dredges aside inside the 6NM, 10 dredges within 6-12NM and up to 14 dredges outside the 12NM. The principle type of dredge used is the English 'Springer' type, where the scallops are raked from the seabed using the steel teeth of the dredges, these can penetrate the seabed to a depth of 20cm. The majority of vessels targeting scallops in 2016-2022 within the immediate area of Project Alpha and Project Bravo are over 15 m in length (MMO,

2023). VMS data (2022) indicates that scallop dredging occurs in areas along the north east coast, including the Scalp Bank and in the vicinity of the Seagreen 1A Project.

The most important fishing activity in the immediate Array areas is dredging for scallops. Scallop dredging is undertaken principally in ICES rectangles 42E8 and 42E7 and is a valuable fishery in Scottish waters, however is recorded in rectangles 44E8 and 43E8 as well. Scallops were found to be present within Project Alpha and Project Bravo during the 2011 benthic trawl, video, and grab surveys. Data provided by MSS suggest that the key fishing grounds for scallops overlap with Project Alpha and extend to the north and west (inshore) of the Seagreen 1A Project Area, as well as being present in the majority of Project Bravo.

**Squid fishery**

Squid is reported to be an increasingly important fishery in the Forth and Tay area. Annual landings vary significantly as the fishery is dependent on the arrival of the species to the area. Peak landings occur between June and September and are targeted both inshore and offshore. Squid grounds are often located in inshore areas, but these varies year on year, fishermen will generally move further offshore as the season progresses. The fishery is targeted by vessels with home ports in the regional and wider study area. Consultation with fishermen suggests that grounds are found throughout the Forth and Tay area, including within the Seagreen 1A Project. Squid stock recruitment can fluctuate annually due to variation in factors such as annual cohort size, sea surface temperature and exploitation effort (J.Royer et al.2002).

**Whitefish fishery**

Haddock and Whiting are targeted throughout the year with activity peaking in summer months (May to August). Closer inshore the under 10m fleets monthly catch limit for Haddock and Whiting in the North Sea of 2.5 and 4 tonnes respectively. The majority of the whitefish catch targeted by larger Scottish seine netters and demersal trawlers further offshore within the Seagreen generation asset area. Landings are moderate in the north-eastern areas of the commercial fisheries study area. Unlike other areas of the UK the North Sea fishery has not seen an increase in either Haddock or Whiting quota during 2024 (UK Gov 2024) It is therefore presumed that fishing intensity for this fishery will not increase during the construction phase of this project.

***Nephrops* fishery**

*Nephrops* are an important fishery in the Forth and Tay area with the highest recorded landings in rectangles' 41E7 and 41E6. It is a highly important fishery to Port Seton, totalling £599,165 for the harbour. *Nephrops* inhabit muddy substrates and are principally targeted by demersal otter trawls. Weather conditions, particularly for the smaller category vessels are a significant factor in determining levels of activity in the winter months. There are seasonal fluctuations in landings, with a marked peak period recorded during the summer months (July and August) however vessels target them all year (Seagreen, 2012) (Seagreen, 2023). Consultation with *Nephrops* fishermen identified that a large

proportion of *Nephrops* vessels are operating from local ports and are under 15m, and therefore VMS data for this receptor group is not immediately publicly available.

**Static Gear, Crab and Lobster Fishery**

Crab and lobster are principally targeted by the static gear fishery with a number of part time/hobby fishers who set creels in the summer months. Lobsters are found on rocky, uneven ground and around wreck sites. Crab species can be targeted on a range of substrates. Annual fishing activity is constant, peaking in summer months. Vessels targeting crab and lobster are generally under 15m and are restricted by weather significantly. Creel fishing grounds are predominantly inshore of the Seagreen 1A Project, the grounds off of Arbroath are particularly important. Several creel vessels have been identified operating offshore in deeper waters and within the vicinity of the 1A Project. The fishery has grown over the years with larger vessels entering the sector and undertaking fishing out to 25NM.

**Razor clam fishery**

In 2022, £1.5 million of razor clam were caught from the commercial fisheries study area (Marine Scotland, 2024) all of which was landed into Pittenweem. Caught by under ten-meter fishing vessels pulling electrodes over the seabed divers follow to hand collect the clams. Currently the fishery is operating under a scientific licence, however the trial was extended again end of 2023 and it is likely that it will become a regulated fishery in the future. This fishery has the potential to be impacted by increased vessel traffic from construction works, particularly cumulative impact from multiple site construction being undertaken at the same time, due to large presence of construction vessels and wet storage within the area (Figure 5-3). For safety reasons divers will not be able to hand collect the clams in areas construction related vessels or wet storage are operating. It is not a fishery that can move elsewhere along the coast as only certain grounds are licenced by Marine Scotland as part of the scientific trial. Razor clam fisheries are not considered within this assessment due to the scientific trial expiring on 31st January 2025 (Marine Scotland, 2023).

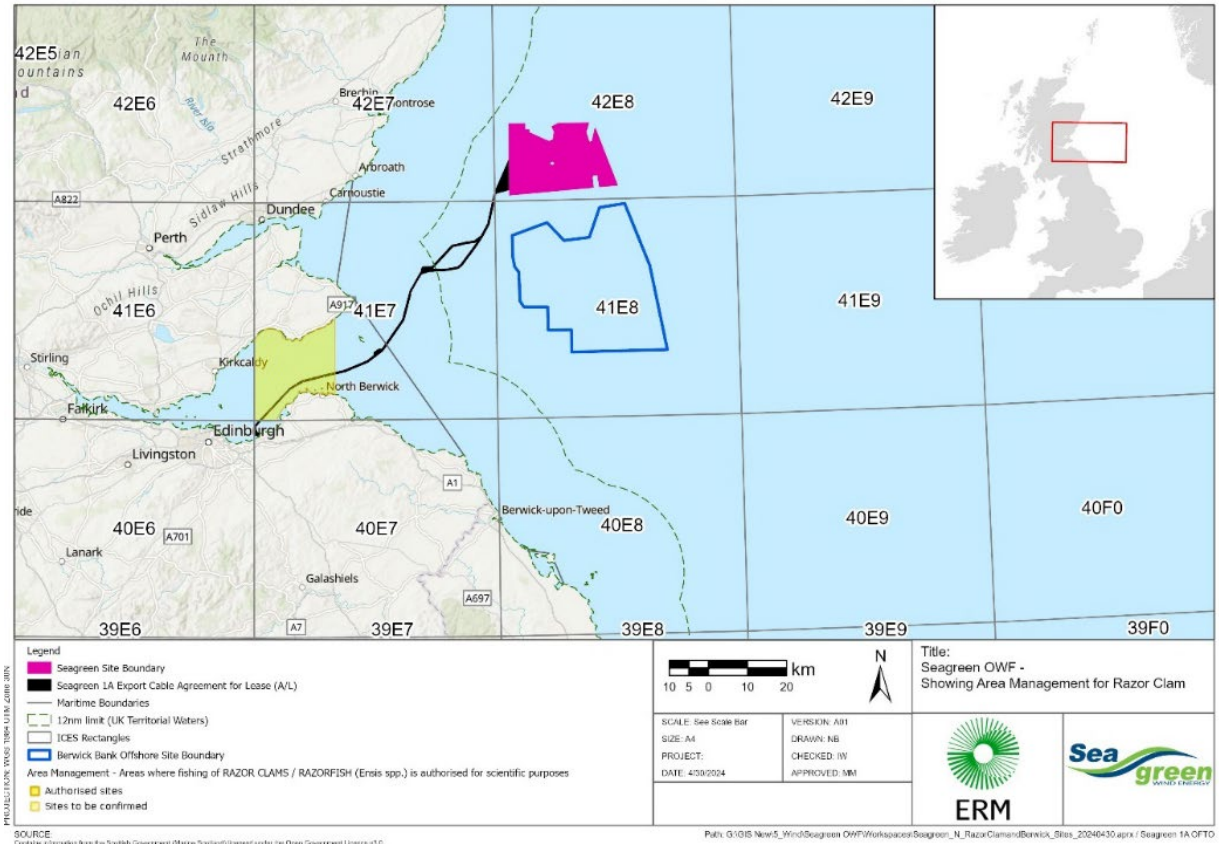



**Figure 5-3 Chart showing razor clam fishery in relation to Seagreen and Berwick bank sites**

### 5.5.2 Potential Project Impacts

#### 5.5.2.1 Predicted Effects and Mitigation

The original ES (Seagreen, 2012) identified and assessed the following potential key project-only impacts during the construction phase:

- Safety issues for fishing vessels;
- Displacement of fishing vessels into other grounds;
- Increase in steaming times;
- Interference to fishing activities;
- Adverse impacts upon commercial and recreational important species; and
- Cumulative impacts,

Each of these potential impacts was assessed with respect to the following 5 key commercial fisheries receptors, identified as being present in the commercial fisheries study area:

- Scallop fishery;
- Squid fishery;
- Whitefish fishery;

- *Nephrops* fishery;
- Crab and lobster fishery.

The original assessment concluded that for the impacts listed above, no more than **moderate adverse** impacts were predicted on these 5 receptor groups.

Based on re-assessment of the revised proposed construction timelines, no additional impacts other than those already detailed within the original ES are predicted and the significance of these impacts on these 5 receptor groups remains the same. The logic applied here is that the same impacts assessed in 2012 (and assumed to arise during the construction phase set-out in the original ES), will still occur during the later construction phases assessed within this document.

The exception to this is a potential change in the nature and significance of cumulative impacts. This is due to a different level of overlapping construction periods for other OWFs in the commercial fisheries study area compared to that originally assessed. For example, Berwick Bank was not assessed in the original (Seagreen, 2012) EIA so requires assessment here.

Table 5-33 details the cumulative impact on selected commercial fisheries receptors as detailed in the original ES, chapter 14: commercial fisheries (Seagreen, 2012). The specific receptors that were the focus of the original cumulative assessment were the scallop fishery (local and nomadic), the squid fishery, the *Nephrops* fishery and the inshore crab/lobster creel fishery.

**Table 5-33 Conclusions of original cumulative assessment on commercial fisheries (taken from Chapter 14 of ES (Seagreen, 2012))**

| Effect | Cumulative Impact | Justification |
|---|---|---|
| Temporary or complete loss / restricted access to fishing grounds | **Moderate adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery receptors (significant in EIA terms). | Moderate adverse (without mitigation) concluded on all fisheries receptor groups due to the potential for overlap between the construction period of Seagreen, Inch Cape and Neart na Gaoithe.<br>The results of the assessment are less or equivalent to those found in the original to the ES, with a moderate adverse impact concluded pre mitigation and minor adverse post mitigation. |
| Safety issues for fishing vessels | **Moderate adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery receptors (significant in EIA terms). | Moderate adverse (without mitigation) concluded on all fisheries receptor groups due to the potential for overlap between the construction period of Seagreen, Inch Cape and Neart na Gaoithe and subsequent safety risks that may arise via unburied cables/high-level of construction vessel activity. |

| Effect | Cumulative Impact | Justification |
|---|---|---|
| Increased steaming times for fishing vessels | **Minor adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery receptors (significant in EIA terms). | Assumed that vessels would only need to steam around temporary safety zones, therefore, no major increase in steaming times envisaged. |
| Displacement of fishing vessels into other areas | **Moderate adverse** for scallop and squid fishery receptors groups (significant in EIA terms). | Moderate adverse (without mitigation) concluded on these 2 receptor groups due to the potential for overlap between the construction period of Seagreen, Inch Cape and Neart na Gaoithe, leading to displacement of fishing vessels from all these areas onto adjacent areas, where fishing may already be being undertaken by other fishing vessels. |

Noting the conclusion of moderate adverse cumulative impacts on many of the commercial fisheries receptor groups, an over-arching mitigation was proposed in the 2012 ES, focused on the establishment of a Regional Fisheries Working Group. The 2012 ES went onto state that this Working Group would need to develop agreed mitigation that could reduce these significant impacts to non-significant (acceptable) levels.

### 5.5.3 Further Assessment

The following section presents an updated assessment of potential cumulative impacts on commercial fisheries from that presented in the original ES (Seagreen, 2012). This is focussed on the construction phase of the Seagreen 1A Project as a change in proposed construction programme is the key change being sought via this Section 36 Variation request. Due to the proposed change in construction periods for Seagreen 1A, scope exists for a greater level of overlap/interaction between the construction period of Seagreen 1A and other OWF projects in the commercial fisheries study areas, compared to what was assessed in the cumulative assessment in the original ES (Seagreen, 2012).

The Seagreen 1A Project lies in the vicinity of a number of other projects which have the potential for creating cumulative impacts on commercial fisheries. The key OWF projects considered within this re-assessment of cumulative impacts are shown below and are those closest to Seagreen 1A, therefore, have the potential to create cumulative impacts.

**Table 5-34 Nearest OWF Relative to Seagreen 1A**

| Project Name | Closest distance from Seagreen 1A | Offshore Construction Start Date | Offshore Construction End Date |
|---|---|---|---|
| **Inch Cape OWF** | Within approximately ~17 km | 2025 | 2026 |
| **Neart na Gaoithe OWF** | Within approximately ~30 km | 2020 | 2024 |
| **Berwick Bank OWF** | Within approximately ~6 km | 2027 | 2032 |

The following windows of installation as part of this reassessment dates are anticipated for the Seagreen 1A Project:

- Foundation installation in main array: January 2029 – December 2032.
- Export cable installation: January 2029 – December 2032.
- WTG installation: January 2029 – December 2032.

In terms of cumulative impacts on commercial fisheries, the key overlap in construction phases will be between Seagreen 1A and Berwick Bank. Implications in terms of cumulative impacts are summarised below in Table 5-35.

**Table 5-35 Original vs updated cumulative assessment on commercial fisheries (taken from Chapter 14 of ES (Seagreen, 2012))**

| Effect | Original Cumulative Impact Assessment (Seagreen, 2012) | Updated Cumulative Impact Assessment | Justification |
|---|---|---|---|
| ***Construction Phase*** | | | |
| Temporary or complete loss / restricted access to | **Moderate adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery receptors | **Minor adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery | A lower significance of impact **(minor adverse)** concluded due to only two construction phases overlapping (Seagreen 1A and Berwick Bank). |

| Effect | Original Cumulative Impact Assessment (Seagreen, 2012) | Updated Cumulative Impact Assessment | Justification |
|---|---|---|---|
| fishing grounds | (significant in EIA terms). | receptors (not significant in EIA terms). | |
| Safety issues for fishing vessels | **Moderate adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery receptors (significant in EIA terms). | **Minor Adverse** for the scallop, squid, Nephrops and lobster/crab creel fishery receptors (not significant in EIA terms). | Reduced significance of impact concluded. Even though there will be likely overlap of the construction phases of Seagreen 1A and Berwick Bank and Inch Cape, offshore wind/commercial fisheries liaison and co-existence strategies have developed significantly since the original assessment in 2012 and with the application of standard procedures (CFLOs; FIRs' NtMs; Safety Zones), any safety issues should be able to be mitigated to acceptable (non-significant) levels. |
| Increased steaming times for fishing vessels | **Minor adverse** for the scallop, squid, *Nephrops* and lobster/crab creel fishery receptors (significant in EIA terms). | **Minor adverse** for the scallop, squid, Nephrops and lobster/crab creel fishery receptors (not significant in EIA terms). | Even though potential exists for a greater number of temporary safety zones, due to the added presence of Berwick Bank, any deviations will still be limited resulting in no major increase in steaming times. |
| Displacement of fishing vessels into other areas | **Moderate adverse** for scallop and squid fishery receptors groups (significant in EIA terms). | **Moderate adverse** for scallop and squid fishery receptors groups (significant in EIA terms). | A significance of impact **(Moderate adverse)** concluded due to two construction phases overlapping (Seagreen 1A and Berwick Bank). |

The mitigation that was suggested within the original ES is still appropriate. The Seagreen 1A Project intends to utilise a range of fisheries liaison and management measures to minimise the loss of access due to exclusion zones. With regards to commitments around the creation of a Regional Fisheries Working Group since the production of the original ES in 2012, a Forth and Tay regional advisory group has been formed, as has a Forth and Tay Commercial Fisheries Working Group (CFWG).

Continuing the use of rolling safety zones during construction to ensure, where possible, the smallest amount of fishery is restricted at any one time will further mitigate cumulative temporary loss of access and displacement of fishing vessels to other areas. Rolling safety zones are currently committed to under the Fisheries Management and Mitigation Strategy, Section 3.3 (Seagreen, 2020).

### 5.5.4 Conclusion

The original assessment of cumulative impacts (construction phase) on commercial fisheries correctly focussed on the scope for temporal overlap between the construction phases of the Seagreen Project and the adjacent Inch Cape and Neart na Gaoithe OWF projects. For some cumulative impacts, moderate adverse impacts were concluded, which are significant in EIA terms. Mitigation was then proposed in the form of establishing a Regional Fisheries Working Group to further develop more specific, appropriate mitigation to reduce these impacts to non-significant (acceptable) levels. This re-assessment has considered potential cumulative impacts on commercial fisheries receptors in the context of new developments in the region alongside those assessed originally.

For the shift in construction schedule proposed in this Variation request, a lower level of temporal overlap is expected between the construction phases of local projects, as it is expected that Inch Cape will have constructed by 2026 and the wider Seagreen site will be operational. Temporal overlap with the construction phase of Berwick Bank will remain however. Use of rolling safety zones as currently committed to under the Fisheries Management and Mitigation Strategy will assist in mitigating cumulative temporary loss of access and displacement of fishing vessels to other areas. Based on the above cumulative assessment it is anticipated that impact significance will not change compared to the outcome of the original 2012 ES.

## 5.6 Shipping and Navigation

This section provides a technical assessment of impacts to shipping and navigation identified within the 2012 ES (Seagreen 2012) in the context of revised construction timeline.

### 5.6.1 Baseline

Various vessel traffic datasets have been collected to characterise the shipping and navigation baseline. This includes vessel traffic surveys undertaken in 2011 to inform the Navigation Risk Assessment (NRA) (Anatec, 2012), and additional Automatic Identification System (AIS) datasets collected during 2017 and 2019. The most recent dataset was used to inform the safety zone application for the Seagreen project (Anatec, 2021), which included a validation exercise to compare the 2019 dataset against the earlier datasets. The assessment concluded that "there was considered to be good overall correlation between the data sets".

The 2019 data comprised two 14-day periods, one collected during July 2019 and one in November 2019. An average of 16 unique vessels per day was recorded during the July period within a 10 nautical mile (nm) study area around the Seagreen site, falling to 12 during the November period. The seasonal variation was observed to be largely due to a significant increase in recreational activity in summer, when compared to the winter period. An average of five unique vessels per day was recorded within the Seagreen site itself, compared to four per day in winter.

Commercial vessels (cargo and tanker) were the most common vessel type recorded during the 28 day survey period, accounting for over half of the total traffic within the study area. Fishing vessels were also recorded at notable levels during the survey period, accounting for 20% of total traffic. A higher count of fishing vessels, passenger vessels and recreational vessels were noted in the summer period, while a higher count of oil and gas vessel activity was noted during the winter period.

It should be considered that these numbers only capture vessels broadcasting on AIS. Smaller non-AIS vessels may also be present in the area (Anatec, 2021).

The 2019 data predates the deployment of construction buoys at both Seagreen and Neart na Gaoithe, and the installation of infrastructure within both of these project sites. Therefore, traffic patterns are likely to have changed in the area. In particular, it is likely that vessel numbers in proximity to Seagreen 1A have decreased given its location within the overarching Seagreen boundary.

### 5.6.2 Potential Project Impacts

Table 5-36 presents a summary of the shipping and navigation impacts assessed within the original ES. This includes rationale for whether the previously assessed significance of risk for the impact within the original ES could be affected by the temporal change of the project. Where the findings could be impacted, additional consideration is provided following the table.

**Table 5-36 Shipping and Navigation Impact Summary**

| Impact | Summary | Further Consideration |
|---|---|---|
| **Vessel Displacement and route deviations** | Increased risk of displacement of vessels from regular routes due to presence of OWF components and infrastructure. | No – not affected by proposed temporal change given routeing is already established around the Seagreen WTGs meaning no change in routeing patterns. |
| **Vessel to vessel collision risk** | Increased risk of collision due to vessel displacement from their main routes. | No – not affected by proposed temporal change given routeing is already established around the Seagreen WTGs meaning no change in routeing patterns and by collision risk. |
| **Vessel to structure allision risk** | Increased risk of vessel to structure allision due to presence of OWF components. | No – not affected by proposed temporal change given impact is associated with the layout and size of structures. |
| **Reduced SAR abilities** | Increased risk of reduced SAR capabilities due to the presence of OWF components. Given that the Seagreen Project may increase need for SAR operations, as well as hindering SAR attempts, this impact was assessed as significant. | Yes – increase in length of construction window (but not period) may mean that increased vessel numbers, crew and personnel are on site for longer periods. |
| **Radar interference** | Increased risk of Radar interference due to the presence of OWF components. | No – not affected by proposed temporal change given impact is associated with the |

| Impact | Summary | Further Consideration |
|---|---|---|
| | | layout and size of structures. |
| **Subsea cable interaction** | Increased risk of gear / anchor due to the presence of subsea cables. | No – not affected by proposed temporal change given impact is associated with laid cables. |

### 5.6.3 Further Assessment

As per Table 5-36, the only shipping and navigation impact identified as requiring further consideration is the potential for reduced SAR abilities. This is on the basis that an extended construction period may mean that vessels and personnel are on site for longer periods of time, meaning the risk of an incident requiring emergency response increases.

SWEL will be required to produce and agree an Emergency Response Cooperation Plan (ERCoP) with the Maritime and Coastguard Agency (MCA) which sets out the procedures in place to ensure cooperation between SWEL and the MCA in the event of an emergency incident. The creation and agreement of the ERCoP is an MCA requirement under Marine Guidance Note (MGN) 654. During the construction phase this will include communication procedures, emergency contacts, and consideration of the available resources associated with the Seagreen 1A Project which may be able to assist in an emergency situation in liaison with the MCA.

In the event of an emergency incident occurring in the local area not associated with the Seagreen 1A Project, the vessels associated with the construction phase may be able to assist in liaison with the MCA, noting such vessels are likely to be well equipped and manned by experienced crew.

On this basis it is considered that the original finding that this impact is not significant is changed by a shift in schedule.

### 5.6.4 Conclusion

The temporal shift of the construction programme will not impact the findings of the original ES for shipping and navigation, and after appropriate mitigation **no significant** residual risks are present.

## 6. Mitigation

The 2012 ES identified mitigation and monitoring approaches (for the 150 WTGs) which have been agreed. Given the Variation has the potential to result in cumulative effects for some receptors the following mitigations are recommended:

- Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank in order to minimise or mitigate the potential for cumulative impacts of underwater noise on key receptors. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects.
- Use of rolling safety zones to ensure, where possible, that the smallest amount of fishery is restricted at any one time, as committed to under the Fisheries Management and Mitigation Strategy, Section 3.3 (Seagreen, 2020).

## 7. Screening Outcome

Following a robust screening process, as described above and summarised in Table 7.1, it is concluded that the Variation does not change the fundamental characteristics of the Seagreen Project and will be completed within the consented 'red line' boundary. Based on the technical assessments completed as part of this screening process it is concluded the Variation will not give rise to any likely significant adverse environmental effects, alone or in combination with other projects, compared to the consented Seagreen Project assessed in the 2012 ES.

Based on paragraph 31 of MS-LOT (2019) "*where the proposed variation is unlikely to have significant environmental effects, no EIA Report or process would be required in respect of the variation application*", SWEL propose the Section 36 Variation application does not require an EIA under the Electricity Works EIA Regulations or the Marine Works EIA Regulations and that the Variation should be screened out of the requirement for EIA.

Therefore, SWEL propose to accompany the Section 36 Variation application with a supporting Environmental Appraisal Report which will:

- Summarise technical information presented in this Screening Report (and tabulated within the Screening Letter);
- Provide any additional information reasonably requested by stakeholders during pre-application consultation; and
- Provide any relevant updates between writing this Screening Request and the submission of the Section 36 Variation application.

**Table 7.1 Screening Summary Table**

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| Archaeology and Cultural Heritage | No significant effects following application of mitigation. | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report the Variation's parameter changes will have **no likely significant effects** on archaeology and cultural heritage above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Benthic & Intertidal Ecology | No significant effects. | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on benthic and intertidal ecology above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Commercial Fisheries | Pre-mitigation significant effects on crab and lobster fishery activities during construction only. | Yes | The re-assessment in the Screening Report, concluded that through the shift in construction schedule proposed in this Variation request, a lower level of temporal overlap is expected between the construction phases of local projects. In instances where there is temporal overlap between the construction phases of the Seagreen project and the adject OWF developments within the area, mitigation including establishment of Regional Fisheries Working Groups and continuing the use of rolling safety zones (as currently committed to under the Fisheries Management and Mitigation Strategy), will assist in mitigating cumulative temporary loss of access and displacement of fishing vessels to other areas.<br>Therefore, the Variation's parameter changes will have **no likely significant effects** on commercial fisheries above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic |
| Fish and Shellfish | Pre-mitigation significant effects from noise on the behaviour of herring. | Yes | The re-assessment in the Screening Report concluded that a shift to the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES), is assessed as having no material change to underwater noise during construction, operation or decommissioning, this there is no increased impact on fish and shellfish. However, the cumulative effects of underwater noise disturbance resulted in a worst-case assumption of a significant effect for herring. In order to mitigate this |

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| | | | effect, Seagreen 1A will coordinate with the Berwick Bank development to ensure that no instances of concurrent piling occur in order to minimise or mitigate the potential for cumulative disturbance or damage to sensitive fish and shellfish species as a result of underwater noise and vibration. With these commitments in place, the magnitude of the cumulative impact is expected to be reduced to a Minor, Not Significant effect.<br>Therefore, the Variation 's parameter changes will have **no likely significant effects** on fish and shellfish above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Landscape, Seascape & Visual | Potentially significant effects on:<br>Regional Character Areas (SA3, SA4)<br>Visual Amenity (VP2, VP5)<br>Settlements within 35 km<br>Sustrans National Cycle Network (NCN) 1<br>Local vantage points and car parks within 35 km<br>Recreational boats and yachts<br>Bell Rock Lighthouse | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation 's parameter changes will have **no likely significant effects** on landscape, seascape and visual, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| | Cumulative on:<br>National Seascape Area 4<br>Regional Character Area (SA3, SA4, SA5, SA6)<br>Visual amenity (VP2, VP5)<br>Settlements within 35 km, especially St Cyrus<br>Sustrans NCN1<br>Local vantage points and car parks<br>Recreational boats and yachts<br>Bell Rock Lighthouse | | |
| Marine Mammals | Moderate adverse and significant in harbour seal from underwater noise (piling). | Yes | The re-assessment in the Screening Report concluded that a shiftto the construction window (noting that the duration of the construction period remains unchanged from that assessed in the original 2012 ES) is assessed as having no material change to underwater noise produced during construction, operation or decommissioning as a result of the shift, thus there is no increased impact on marine mammals expected. However, cumulative behavioural disturbance from underwater noise generated across projects in the vicinity of the Seagreen 1A Project is assessed as **Significant** in EIA terms for harbour seal, grey seal, harbour porpoise, |

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| | | | and common bottlenose dolphin. It should be noted that these species assessments are not consistent across years, with the greatest impacts predicted at the start of the construction window, where there is greater overlap with other projects. Seagreen 1A will commit to avoid piling activity concurrently with that of Berwick Bank. Seagreen will also engage with other relevant developers active in this region to avoid, where reasonably practicable, or minimise potential overlap of piling between projects. With these commitments in place, the magnitude of the cumulative impact is expected to be reduced to Not Significant.<br>Therefore, the Variation's parameter changes will have **no likely significant effects** on marine mammals above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Military & Civil Aviation Activities | None following technical mitigation proposed. | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on military and civil aviation activities, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Nature Conservation and HRA | | Yes | The re-assessment in the Screening Report concluded that a shift of the construction phase is assessed as having no material effect on activities or parameters associated with the project. Therefore, the impacts associated with the Project alone, were determined to remain as previously assessed, as no adverse effect. With temporal overlap between Seagreen 1A and other development construction and operation, there is potential for in combination effects. With the implementation of relevant mitigation measures, the effect of the Site Integrity us determined No Adverse Effect, for all considered sites.<br>Therefore, the Variation's parameter changes will have **no adverse effects** beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| Ornithology | Effects were assessed as not significant for all species during construction, operation and decommissioning.<br>The potential for moderate and significant impacts on auk species: guillemot, razorbill and puffin, as a result of indirect effects on their sandeel prey due to piling during construction were identified.<br>During operation, collision risk had the potential to cause significant effects on regional gannet, kittiwake, herring gull and greater black-backed gull | Yes | The re-assessment in the Screening Report concluded that a shift of the construction phase is assessed as having no material effect on collision estimates and subsequent ornithological impacts associated with the Project alone. The temporal overlap between Seagreen 1A and other development construction, is anticipated to increase the likelihood of cumulative vessel disturbance for ornithology receptors, specifically in regard to Berwick Bank's construction period. However, the spatial segregation between these two project and small occupational areas of construction vessels during this period, cumulative impacts are expected to be minimal and unlikely to exceed minor adverse effect. Cumulative habitat loss during the construction phase is also considered, however, habitat loss at any given time will be confined to within the development area of the respective projects and is likely to be small in comparison to the regional habitat availability. Therefore, assessment determined that cumulative habitat loss is expected to be small and unlikely to exceed minor adverse effect. The 2012 ES concluded that vessel-related disturbance during the construction phase would result in negligible impacts to all key offshore ornithology receptors (Seagreen, 2012), therefore the change in construction programme for the Seagreen Project alone is not expected to result in a greater effect on any seabirds due to disturbance.<br>Therefore, the Variation's parameter changes will have **no likely significant effects** beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| | populations at one or both projects. | | |
| Other Marine Users | No significant effects. | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on other marine users, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Physical Environment | No significant effects. | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on the physical environment, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Shipping & Navigation | No significant effects following mitigation. | Yes | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on shipping and navigation, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |
| Socioeconomic, Tourism and Recreation | Significant beneficial effects on:<br>expenditure in Scotland during construction and operation | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on socioeconomic, tourism and recreation, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |

| Topic | 2012 ES Significant Effects | Critically Assessed in Screening Report | 2024 Screening Report Outcome |
|---|---|---|---|
| | Employment in Scotland during construction and operation | | |
| Water and Sediment Quality | No significant effects. | No | Following a review of the impact summary table that was presented in the 2012 ES and the potential project implications, as set out in the Screening Report, the Variation's parameter changes will have **no likely significant effects** on water and sediment quality, above and beyond those assessed in the 2012 ES.<br>There will be no likely significant effects or significant adverse effects in respect of this topic. |

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## Appendix A: Habitat Regulations Assessment Update

Refer to Attachment.