# Salamander Offshore Wind Farm

## Offshore EIA Report

## Volume ER.A.3, Chapter 22: Inter-related Effects

SALAMANDER

Powered by Ørsted and
Simply Blue Group

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# Glossary

| Term | Definition |
|---|---|
| Applicant | Salamander Wind Project Company Limited (formerly called Simply Blue Energy (Scotland) Limited), a joint venture between Ørsted, Simply Blue Group and Subsea7. |
| Inter-related effects | The likely effects of multiple impacts from the proposed development on one receptor. For example, noise and air quality together could have a greater effect on a residential receptor than each impact considered separately. |
| Project lifetime effects | Project lifetime effects are considered to be effects that occur throughout more than one phase of the Salamander Project (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor, than if just assessed in isolation in the three key project phases (e.g. construction, operation and decommissioning). |
| Receptor led effects | Receptor-led effects involve spatially or temporal interaction of effects, to create inter-related effects on a receptor or receptor group. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects. |
| Salamander Project | The proposed Salamander Offshore Wind Farm. The term covers all elements of both the offshore and onshore aspects of the project. |

# Acronyms

| Term | Definition |
|---|---|
| AEZ | Archaeological Exclusion Zones |
| EBI | Energy Balancing Infrastructure |
| ECC | Export Cable Corridor |
| EIA | Environmental Impact Assessment |
| EIAR | Environmental Impact Assessment Report |
| EMF | Electro-Magnetic Fields |
| INNS | Invasive non-native Species |

| Term | Definition |
|---|---|
| JV | Joint Venture |
| MD-LOT | Marine Directorate – Licensing Operations Team |
| MMMP | Marine Mammals Mitigation Plan |
| OAA | Offshore Array Area |
| O&M | Operation and Maintenance |
| OWF | Offshore Windfarm |
| PVA | Population Viability Analysis |
| SSC | Suspended Sediment Concentration |
| SWPC | Salamander Wind Project Company Limited (formerly called SBES) |
| UXO | Unexploded Ordnance |
| VMP | Vessel Management Plan |
| WFD | Water Framework Directive |
| WTG | Wind Turbine Generator |

# 22 Inter-related Effects

## 22.1 Introduction

22.1.1.1 The Applicant, Salamander Wind Project Company Limited (SWPC), a Joint Venture (JV) partnership between Ørsted, Simply Blue Group and Subsea7, is proposing the development of the Salamander Offshore Wind Farm (hereafter 'Salamander Project'). The Salamander Project will consist of the installation of a floating offshore wind farm (up to 100 megawatts (MW) capacity) approximately 35 kilometres (km) east of Peterhead. It will consist of both offshore and onshore infrastructure, including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network (please see **Volume ER.A.2, Chapter 4: Project Description** for full details on the Project Design).

22.1.1.2 In the evaluation of inter-related effects, the designated Study Area is derived from the Study Areas employed in the topic-specific assessments. Given the diverse spatial impacts experienced by various offshore and onshore receptors, the extent of the Study Area for potential inter-related effects fluctuates based on the specific topic and receptor being considered.

22.1.1.3 This chapter has been authored by Environmental Resources Management (ERM) Ltd. Further competency details of the authors of this chapter are outlined in **Volume ER.A.4, Annex 1.1: Details of the Project Team.**

## 22.2 Purpose

22.2.1.1 The primary purpose of this EIAR is for the application for the Salamander Project satisfying the requirements of Section 36 of the Electricity Act 1989 and associated Marine Licences as required under the Marine and Coastal Access Act 2009 (developments outside of 12 nautical miles (nm)) and the Marine (Scotland) Act 2010 (for developments within 12 nm).

22.2.1.2 The EIAR has been finalised following the completion of the pre-application consultation (**Volume RP.A. 4, Report 1: Pre-Application Consultation (PAC) Report**) and EIA Scoping Report (Simply Blue Energy (Scotland) Ltd., 2023) (and takes account of the relevant advice set out within the Scoping Opinion from Marine Directorate – Licensing Operations Team (MD-LOT, 2023) relevant to the Offshore Development. Comments relating to the Energy Balancing Infrastructure (EBI) will be addressed within the Onshore EIAR. The Offshore EIAR will accompany the application to MD-LOT for Section 36 Consent under the Electricity Act 1989, and Marine Licences under the Marine (Scotland) Act 2010.

22.2.1.3 Chapters within **Volume ER.A.3** of this EIAR assess the effects of the Salamander Project on topic-specific receptors, encompassing offshore elements. These assessments are structured on an impact-centric basis, wherein impacts on receptors are categorised by impact type and assessed within the temporal context of the construction, operation and maintenance (O&M), or decommissioning phase. In contrast, this chapter on inter-related effects centres on the receptor itself; it identifies impacts that may stem from multiple environmental topics or effects that may manifest across multiple Project phases. Essentially, this chapter addresses impacts that may be underestimated elsewhere in the EIAR.

22.2.1.4 This EIAR chapter:

- Outlines the receptor groups evaluated in the EIA process;
- Synthesises the likelihood of effects on these receptor groups, drawing from the outcomes of topic-specific chapters, spanning the construction, O&M, and decommissioning phases; and
- Highlights the potential for interaction and emergence of 'inter-related' effects resulting from multiple impacts on any of the identified receptor groups.

22.2.1.5 The potential inter-related effects have been evaluated by employing realistic worst-case scenarios for the project. The complete Project Design Envelope can be found in **Volume ER.A.2, Chapter 4: Project Description**.

22.2.1.6 This section exclusively evaluates inter-related effects among topic chapters related to offshore receptors. Cumulative effects, which involve impacts stemming from the combined influence of Project Salamander and other plans or projects, are examined within the individual topic chapters of this EIAR**.**

## 22.3 Study Area

22.3.1.1 Each assessment chapter within the offshore EIAR outlines a topic-specific Study Area, relevant to the respective receptor group. The spatial extent of these Study Areas varies between topic chapters and the determinations within these chapters are used to inform this inter-related effects assessment.

## 22.4 Offshore Assessment Methodology and Significance Criteria

### 22.4.1 Desk Study

22.4.1.1 The baseline environments for each of the receptor groups considered in the inter-related effects assessment vary in accordance with the specific topic area. As such, these are defined within the relevant chapters:

- **Volume ER.A.3, Chapter 7: Marine Physical Processes;**
- **Volume ER.A.3, Chapter 8: Water and Sediment Quality;**
- **Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology;**
- **Volume ER.A.3, Chapter 10: Fish and Shellfish Ecology;**
- **Volume ER.A.3, Chapter 11: Marine Mammals;**
- **Volume ER.A.3, Chapter 12: Offshore Ornithology;**
- **Volume ER.A.3, Chapter 13: Commercial Fisheries;**
- **Volume ER.A.3, Chapter 14: Shipping and Navigation;**
- **Volume ER.A.3, Chapter 15: Aviation and Radar;**
- **Volume ER.A.3, Chapter 16: Seascape, Landscape and Visual Impact Assessment;**
- **Volume ER.A.3, Chapter 17: Marine Archaeology and Cultural Heritage;**
- **Volume ER.A.3, Chapter 18: Other Users of the Marine Environment; and**
- **Volume ER.A.3, Chapter 19: Socio-economics, Tourism and Recreation.**

### 22.4.2 Assessment Methodology

22.4.2.1 The approach to assessing inter-related effects within this chapter has followed a four stage process, as summarised in **Table 22-1** and outlined in the following paragraphs.

**Table 22-1 Summary of staged approach to the offshore inter-related effects assessment for the Salamander Project**

| Stage | Description |
|---|---|
| *1* | Assessments undertaken for individual EIA topic areas within **Volume ER.A.3** of this EIAR. |
| *2* | Review of the assessments set out within individual topic chapters to identify any receptor groups that may be affected by more than one topic area. |
| *3* | Identification of potential inter-related (offshore) effects on these receptor groups, including consideration of the extent to which potential inter-related effects are already considered within this EIAR. |
| *4* | Assessment of how individual effects may combine to create inter-related effects on each receptor group for:<br>• 'Project lifetime effects' (i.e. during construction, O&M, and decommissioning phases); and<br>• 'receptor-led effects' (i.e. multiple effects on a single receptor). |

### 22.4.3 Stage 1: Topic-specific assessments

22.4.3.1 The initial phase of evaluating inter-related effects in the offshore context is detailed in each dedicated offshore topic chapter. This stage involves individual assessments of the impacts on receptors throughout the construction, O&M, and decommissioning phases of the offshore components of the Salamander Project.

22.4.3.2 The results of these assessments are outlined in **Volume ER.A.3** of this EIAR.

### 22.4.4 Stage 2: Identification of receptor groups

22.4.4.1 The second stage entails a comprehensive examination of the assessments conducted in the topic-specific chapters to pinpoint 'receptor groups' necessitating evaluation in the inter-related effects assessment. The term 'receptor group' is employed to underscore that the methodology for the inter-related effects assessment does not scrutinise every single receptor appraised during the EIAR stage. Instead, the focus is on potentially sensitive groups of receptors. The assessed receptor groups can be broadly classified as follows:

- Physical environment:
  - Marine Physical Processes;
  - Water and Sediment Quality;
- Biological environment:
  - Benthic and Intertidal Ecology;
  - Fish and Shellfish Ecology;
  - Offshore and Intertidal Ornithology;

- Marine Mammals;
- Human environment:
  - Commercial Fisheries;
  - Shipping and Navigation;
  - Aviation and Radar;
  - Seascape, Landscape and Visual Amenity;
  - Marine Archaeology and Cultural Heritage;
  - Other Users of the Marine Environment; and
  - Socio-economics, Tourism and Recreation.

22.4.4.2 The potential for inter-related effects is considered in further detail at Stage 3.

### 22.4.5 Stage 3: Identification of potential inter-related effects on receptor groups

22.4.5.1 Consideration is given to the potential for inter-related effects to arise for each of the identified receptor groups across the three Project phases (i.e. Project lifetime effects) as well as the interaction of multiple effects on a receptor (i.e. receptor-led effects), as defined in **Table 22-2**.

**Table 22-2 Definitions of Project lifetime and receptor-led inter-related effects**

| Effect Type | Definition |
|---|---|
| *Project Lifetime Effects* | Project lifetime effects are considered to be effects that occur throughout more than one phase of the Salamander Project (construction, operation, and decommissioning), and which interact to potentially create a more significant effect on a receptor, than if just assessed in isolation in the three key Project phases (e.g. construction, operation and maintenance, and decommissioning). For example, seabed disturbance during the O&M phase may occur in areas that have not yet fully recovered from construction phase activities. In this instance, the O&M activities would occur at a site not yet recovered to baseline conditions, and as such impact magnitude would be greater than would otherwise have been expected. |
| *Receptor-led Effects* | Receptor-led effects involve interaction between multiple effects on a specific receptor or receptor group. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects. For example, underwater noise and increased sedimentation may combine to cause a greater effect significance on fish ecology than when either impact was considered in isolation. |

### 22.4.6 Stage 4: Assessment of inter-related effects on each receptor group

22.4.6.1 It is important to emphasise that the inter-related effects assessment solely addresses the impacts stemming from the offshore components of the Salamander Project and not those from other projects, which are covered in the cumulative effects assessment within each topic-specific EIAR chapter**.**

22.4.6.2 The importance of individual effects, as outlined in the topic-specific chapters, is outlined in the assessment tables for each receptor group. All determinations regarding the significance of effects assume the successful implementation of appropriate mitigation measures, meaning only the residual effect has been considered. Subsequently, a comprehensive assessment of the potential for these individual effects to interact and

generate a different or heightened effect has been undertaken. This evaluation incorporates qualitative and, where reasonably feasible, quantitative analyses. The assignment of significance for any such inter-related effect is not carried out; rather, any inter-related effects that might be more consequential than the individual effects acting independently on a given receptor are identified and discussed within this chapter. Assessment of Inter-related effects

### 22.4.7 Offshore Physical Environment

#### Marine Physical Processes

22.4.7.1 Inter-related effects are effects over a project lifetime from a specific pathway, however many marine physical processes are inherently inter-related, such as sediment transport relying on currents and waves, and thus, these interlinked processes are discussed within the assessment as overarching impacts. The identified impacts, such as potential changes in morphology of the coast, may occur throughout more than one phase of the Salamander Project (construction, operation and maintenance, and decommissioning), and can interact to potentially create a more significant effect on a receptor than if just assessed in isolation. **Table 22-3** summarises these for the Marine Physical Processes assessment.

22.4.7.2 There are also, receptor-led inter-related effects for which the marine and coastal processes, as discussed in **Volume ER.A.3, Chapter 7: Marine Physical Processes**, are notably pathways with limited physical receptors, but overlap with a broad range of other topic receptors, which are inherently inter-related. Subsequently, insights from the analysis of changes in marine and coastal processes have informed other EIAR topics, including:

- **Volume ER.A.3, Chapter 8: Water and Sediment Quality;**
- **Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology;**
- **Volume ER.A.3, Chapter 10: Fish and Shellfish Ecology;**
- **Volume ER.A.3, Chapter 12: Offshore and Intertidal Ornithology;**
- **Volume ER.A.3, Chapter 13: Commercial Fisheries;**
- **Volume ER.A.3, Chapter 17: Marine Archaeology and Cultural Heritage; and**
- **Volume ER.A.3, Chapter 18: Other Users of the Marine Environment.**

22.4.7.3 Assessments have been undertaken separately within these individual topic chapters and are not reported here as additional inter-relationships.

**Table 22-3 Summary of the potential Project lifetime inter-related effects for Marine Physical Processes**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Potential increases in SSC and associated changes to seabed substrate. | N/A | N/A | N/A | Offshore Array Area (OAA), Offshore Export Cable Corridor (ECC) | There are no receptors for Marine Processes, however this is considered a pathway for other topics.<br><br>The effects of increased SSC caused by seabed disturbance will primarily occur during the construction and decommissioning phases of the Salamander Project. The spatial extent of significant seabed disturbance and associated increase of SSC and deposition is expected to be localised, only within the near-field and intermediate impact zones of the activity (up to 500 m), limited by the coarser nature of the substrate at the site. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |
| Potential changes to sediment transport system by changes in wave and current climate | N/A | N/A | N/A | OAA, Offshore ECC | There are no receptors for Marine Processes, however this is considered a pathway for other topics.<br><br>The installation of infrastructure has the potential to result in a localised blockage of waves, tides and sediment transport. This blockage will commence when offshore construction begins, increasing incrementally up to the Design Envelope, which is represented by the fully operational Salamander Project. All changes to sediment transport systems due to modification of the wave and current climate will be no greater than that identified for the operational phase. |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| | | | | | Changes in sediment transport extending (up to) 10's of metres from cable protection.<br><br>Localised changes to waves and hydrodynamics immediately within the vicinity of the rock berms within shallow water (<20 m), but associated morphological change limited by the small scale/low profile of the rock protection.<br><br>Wake effects from offshore infrastructure extending (up to) hundreds of metres from substructures and associated mooring/anchor systems and subsea electrical hubs, with changes in sediment transport theoretically possible in this footprint, mainly in the form of local scour.<br><br>Scour around gravity base, suction caisson or drilled pile anchors and subsea electrical hubs, extending (up to) several metres from the structure. |
| Potential changes to the morphology of the seabed (including scour) | Negligible | Negligible | None | OAA, Offshore ECC | The morphology of designated areas of seabed could theoretically be subject to project lifetime inter-related effects, with direct seabed disturbance occurring in the construction and decommissioning phase and indirect disturbance occurring during the operational phase due to hydrodynamic, wave and sediment transport blockage related effects. However, in all cases the extent of change is expected to be negligible and even if combined over the project lifetime, the magnitude of change (and therefore overall significance of effect) would be no greater than if assessed in isolation. |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Potential changes in morphology of the coast | Minor | Minor | None | OAA, Offshore ECC | The morphology of the coast could theoretically be subject to project lifetime inter-related effects, with direct disturbance to intertidal/ shallow subtidal areas occurring in the construction and decommissioning phase and indirect disturbance occurring during the operational phase due to hydrodynamic, wave and sediment transport blockage related effects. However, in all cases the extent of change is expected to be small and highly localised and even if combined over the project lifetime, the magnitude of change (and therefore overall significance of effect) would be no greater than if assessed in isolation. |
| Potential changes to water column processes (mixing and stratification) | None | Negligible | None | OAA, Offshore ECC | Any potential changes to water column processes are only associated with the Salamander Project, whilst in operation. No inter-related effects are determined across the other phases. |
| *Receptor Based Effects* | | | | | |
| The different marine physical processes studied are already inter-related; in particular, sediment transport is dependent on currents and waves and therefore these linked processes have already been considered within the assessment. In turn, this information on changes to physical processes has been used to inform other ES topics such as **Volume ER.A.3, Chapter 8: Water and Sediment Quality** and **Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology**. | | | | | |

### Water and Sediment Quality

22.4.7.4 Effects on Water and Sediment Quality may also lead to secondary effects on other receptors, which are fully considered in the following topic-specific chapters:

- **Volume ER.A.3, Chapter 9: Benthic Ecology and Intertidal Ecology;**
- **Volume ER.A.3, Chapter 10: Fish and Shellfish Ecology;**
- **Volume ER.A.3, Chapter 11: Marine Mammals;** and
- **Volume ER.A.3, Chapter 12: Offshore and Intertidal Ornithology.**

22.4.7.5 Impacts such as increased SSC and resuspension of contaminated sediments (leading to sediment and water quality changes), may affect other receptors, such benthic communities and fish (indirect effects of pathways changes); however, these inter-relationships are considered in the respective topic-specific chapters.

22.4.7.6 In terms of inter-relationships and potential interaction of multiple impacts, creating a more significant effect upon one receptor, the realistic worst-case scenario of interaction between various pathways and coalescence between impacts, has been taken into account during the main assessment. Inter-related effects are mostly temporary and localised in nature over the lifetime of the OWF. A summary of these inter-relationships between impacts is presented in **Table 22-4.**

**Table 22-4 Summary of the potential Project lifetime inter-related effects for Marine Sediment and Water Quality**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br>*18 months* | *O&M*<br>*35 years* | *Decommissioning*<br>*18 months* | | |
| Remobilisation of sediments causing increased suspended solids concentration in the water column leading to deterioration of water quality | Minor | Negligible | Minor | OAA, Offshore ECC | The effects of increased SSC caused by seabed disturbance will primarily occur during the Construction and Decommissioning phases of the Salamander Project. The spatial extent of significant seabed disturbance and associated increase of SSC and deposition is expected to be localised, only within the near-field and intermediate impact zones of the activity (up to 500 m), limited by the coarser nature of the substrate at the site. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |
| Remobilisation of sediments and use of drilling muds causing potential resuspension of contaminated sediments into the water column leading to deterioration of water and sediment quality | Negligible | Negligible | Negligible | OAA, Offshore ECC | The effects of resuspended contaminated sediments caused by seabed disturbance will primarily occur during the Construction and Decommissioning phases of the Salamander Project. The spatial extent of significant seabed disturbance and associated sediment plume and deposition is expected to be localised, only within the near-field and intermediate impact zones of the activity (up to 500 m), limited by the coarser nature of the substrate at the site. Additionally, there is no evidence of significant pollution within the sediment of the Salamander Project near-filed Study Area. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Accidental release of pollutants and sewage waste into the water column from vessels during transit and construction operations | Negligible | Negligible | Negligible | OAA, Offshore ECC | The risk of accidental release of pollutants and sewage waste into the water column from vessels will primarily occur during the Construction and Decommissioning phases of the Salamander Project. Mitigation measures will be in place to reduce the risks and emergency response plans will be implemented in the unlikely event of an accident, further localising the extent of a spill. Furthermore, in the unlikely event of an accident, the high energy nature of the receiving environment and its ability to flush and disperse any substance entering the water column, would minimise the magnitude of the impact. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |
| Accidental release of litter and debris into the water column from vessels during transit and construction operations | Negligible | Negligible | Negligible | OAA, Offshore ECC | The risk of accidental release of litter and debris into the water column from vessels will primarily occur during the Construction and Decommissioning phases of the Salamander Project. Mitigation measures will be in place to reduce the risks and emergency response plans will be implemented in the unlikely event of an accident. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |
| Removal of biofouling from the subsea structures and leeching of antifouling, anticorrosive agents from | Negligible | Negligible | Negligible | OAA, Offshore ECC | The risk of damage associated with release of biofouling debris and the effects of leaching compounds contamination will primarily occur during the Operation and Maintenance phase of the Salamander Project. Removal of biofouling will only occur when necessary and the surface |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| coated infrastructure leading to water and sediment quality deterioration | | | | | area available for colonisation is small, limiting the magnitude of the impact. The effects of leaching of antifouling and anticorrosive agents will be long-term but localised and on a small scale, low-toxicity paints will be selected throughout. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |

*Receptor Based Effects*

There is potential for inter-relation between impacts of seabed sediment disturbance associated with increased SSC and resuspension of potentially contaminated sediment into the water column due to installation of seabed infrastructure. There is a potential for additional impacts caused by vessel traffic in the area, over the lifetime of the project. The sensitivity of the Water and Sediment Quality and WFD receptors is considered as **Low** to **Medium**. The overall significance of the effects is determined as Minor (increased SSC) to Negligible. Although there is potential for effects to be amplified in areas where there is spatial and temporal overlap, it is expected that there will be a degree of spatial and temporal separation and, therefore, the combined effects will not be any more significant than the individual worst-case effects considered in isolation.

### 22.4.8 Biological Environment

#### Benthic and Intertidal Ecology

22.4.8.1 Potential inter-relationships exist between Benthic and Intertidal Ecology receptors and:

- **Volume ER.A.3, Chapter 8: Water Quality:** impacts on water quality may result in impacts on benthic and intertidal ecology;
- **Volume ER.A.3, Chapter 10: Fish and Shellfish Ecology**: impacts to benthic and intertidal ecology may affect the food resource available to fish;
- **Volume ER.A.3, Chapter 12: Offshore and Intertidal Ornithology:** impacts to benthic and intertidal ecology may affect the food resource available to bottom-feeding diving birds, waders, and other wildfowl; and
- **Volume ER.A.3, Chapter 13: Commercial Fisheries**: impacts on benthic communities may impact on catch and effort of commercial fisheries.

22.4.8.2 The worst-case impacts assessed within **Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology** take interactions between Project effects from different phases into account. Therefore, the impact assessments presented therein are considered conservative and robust.

22.4.8.3 The potential for inter-related effects to arise from these pathways is set out in **Table 22-5**. These are divided into Project lifetime effects, where there is interaction during construction, O&M, and/or decommissioning Project phases, and the receptor-led inter-related effects that affect benthic habitats or benthic ecological communities.

**Table 22-5 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Benthic Ecology**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Temporary habitat loss or disturbance | Minor | Minor | Minor | OAA, Offshore ECC | Temporary habitat loss or disturbance to benthic habitats and species will occur across all phases of the Salamander Project (**Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology, Table 9-15**). The total area of inter-related habitat loss or disturbance has been assumed based on the combined area of habitat loss or disturbance from Construction and Operation and Maintenance, totalling 1,220,700 m² (1.2 km²). This is the same area expected to be lost or disturbed during Decommissioning. Given the high level of spatial overlap and the expected degree of recoverability in benthic communities it is expected that Project lifetime effects will not result in combined effects of greater significance than for the Decommissioning phase.<br><br>A total of 1.2 km² cumulative habitat loss throughout the project duration represents a small proportion (0.9%) of the total habitat present within the Far-field Study Area. The habitats and characterising biotopes expected to be impacted are common and widespread throughout the wider region.<br><br>Additionally, each disturbance event occurring at any one location within the Study Area will not be continuous and will be short-term. While the impact will be locally significant and comprise temporary short-term habitat loss or disturbance within the Near-field Study Area, the loss and disturbance will be highly localised.<br><br>As such, although inter-related effects may be marginally greater than effects associated with individual activities, impacts are not expected to be of greater |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| | | | | | magnitude and inter-related habitat loss is not predicted to have a notable effect on benthic and intertidal ecology receptors. |
| Long-term habitat loss (including via project infrastructure) | Negligible | Minor | Minor | OAA, Offshore ECC | Placement of project infrastructure will result in long-term loss to benthic habitats and species. The effects from the presence of project infrastructure will commence when offshore Construction begins and increasing incrementally up to the realistic worst-case scenario, represented by the fully operational project.<br><br>Across the project lifetime, the effects on benthic ecology receptors are not anticipated to be sufficiently different from those of the operational phase, as to result in combined effects of greater significance. |
| Increased suspended sediment and associated deposition | Minor | Negligible | Minor | OAA, Offshore ECC | The effects of increased sediment suspended concentration (SSC) caused by seabed disturbance will primarily occur during the Construction and Decommissioning phases of the Salamander Project. The spatial extent of significant seabed disturbance and associated increase of SSC and deposition is expected to be localised, only within the near-field and intermediate impact zones of the activity (up to 500 m), limited by the coarser nature of the substrate at the site. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |
| Impact to habitats or species as a result of pollution or accidental discharge | Negligible | Negligible | Negligible | OAA, Offshore ECC | The risk of accidental release of pollutants into the water column from vessels will primarily occur during the Construction and Decommissioning phases of the Salamander Project. Mitigation measures will be in place to reduce the risks and emergency response plans will be implemented in the unlikely event of an accident, |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| | | | | | further localising the extent of a spill. Furthermore, in the unlikely event of an accident, the high energy nature of the receiving environment and its ability to flush and disperse any substance entering the water column, would minimise the magnitude of the impact. The cumulative effects of the impact over the Salamander Project lifetime are not expected to result in greater significance than those assessed separately. |
| Increased risk of introduction and spread of invasive non-native species (INNS) | Minor | Minor | Minor | OAA, Offshore ECC | Increased vessel activity during all Salamander Project phases will be associated with a potential increased risk of introduction of INNS into the area, and there is the risk of colonisation by INNS on the installed marine infrastructure that provides suitable artificial habitat for settlement.<br><br>Project embedded mitigation measures include the development of an INNS Plan that will provide a framework for management of biosecurity issues and invasive species for the Project duration, and will include compliance with relevant guidance regarding ballast water; these measures will reduce the overall risk of introduction.<br><br>Within the impact assessment (**Section 9.11** of **Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology**) it is determined that the negligible to low magnitude of the effect, combined with low to high sensitivity of the receptor will result in impact of minor significant for each individual Project phase. Although assessment of Project lifetime effects may lead to a small increase in INNS risk, this is still likely to remain of low magnitude. Given that receptor sensitivity is unchanged over this increased temporal extent, combined effects over the project lifetime will not increase to be of greater significance than the assessments for each individual phase. |

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Effects of electromagnetic field (EMF) emissions from electrical cables | n/a | Minor | n/a | OAA, Offshore ECC | Cable EMFs will only be produced at the time of energy transmission. As such, this will be limited to the Operation and Maintenance phase, and there is no potential for Project lifetime inter-related effects. |

*Receptor Based Effects*

There is potential for interactions between the effects of habitat loss/disturbance/alteration, and effects on benthic habitats from sediment deposition associated with elevated SSC. It is considered that there is greatest risk of inter-related impacts from the combined effects of direct (both temporary and long-term) habitat loss/disturbance (from placement of anchors from vessels and jack-up events, seabed levelling and boulder clearance), indirect habitat disturbance (from cable installation/burial and due to sediment deposition), and indirect effects of changes in physical processes due to the presence of Project infrastructure within the marine environment. Each of these potential impacts was assigned an individual significance of minor. Although there is potential for effects to be amplified in areas where there is spatial and temporal overlap, it is expected that there will be a degree of spatial and temporal separation and, therefore, the combined effects will not be any more significant than the individual worst-case effects considered in isolation. Any disturbance is expected to be limited, and the benthic habitats and species seen within the baseline environment are widespread. Where temporary disturbance occurs, full recovery is predicted. In addition, any effects due to changes in physical processes are likely to be spatially limited and of small magnitude. As such, these interactions are predicted to be no greater than the individual effects assessed in isolation.

### Fish and Shellfish Ecology

22.4.8.4 The potential inter-related effects associated with the Salamander Project exist between fish and shellfish ecology and:

- **Volume ER.A.3, Chapter 7: Marine Physical Processes**: impacts on marine physical processes may result in impacts on fish and shellfish ecology;
- **Volume ER.A.3, Chapter 8: Water Quality**: impacts on water quality may result in impacts on fish and shellfish ecology;
- **Volume ER.A.3, Chapter 9: Benthic and Intertidal Ecology**: impacts to benthic ecology may affect the food resource available to fish and shellfish;
- **Volume ER.A.3, Chapter 11: Marine Mammals**: impacts to fish and shellfish ecology may affect the food resource available to mammal populations; and
- **Volume ER.A.3 Chapter 12: Offshore and Intertidal Ornithology**: impacts to fish and shellfish ecology may affect the food resource available to bird populations;
- **Volume ER.A.3, Chapter 13: Commercial Fisheries**: impacts on fish communities may impact on catch and effort of commercial fisheries.

22.4.8.5 The worst-case impacts assessed within **Volume ER.A.3, Chapter 10: Fish and Shellfish Ecology** account for such interactions and are considered conservative and robust. As such, both Project lifetime and receptor-led inter-related effects are not considered of greater significance than those assessed alone. For clarity, the areas of interaction between impacts are listed in **Table 22-6**.

**Table 22-6 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Fish and Shellfish Ecology**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Damage or disturbance to sensitive species due to underwater noise generated from construction activities<br><br>and<br><br>Disturbance or damage to sensitive species due to underwater noise generated from operation and maintenance activities | Minor | Negligible | Minor | OAA, Offshore ECC | Underwater noise associated with the Offshore Development is short-term and primarily occurs during the Construction Phase. Under the assumption that the Decommissioning Phase will result in equivalent impacts and effects, it is assumed that underwater noise would also have a **Minor** effect. Realistically, no piling activity would be expected during the Decommissioning Phase, and therefore underwater noise will likely be a result of vessel activity and less intrusive noise-producing activities. Therefore, there is highly limited potential for project lifetime inter-related effects associated with underwater noise. |
| Temporary habitat loss or disturbance during the installation of all assets and placement of vessel anchors on the seabed<br><br>and<br><br>Habitat loss due to the presence of infrastructure on the seabed and associated scour protection | Minor | Minor | Minor | OAA, Offshore ECC | Temporary and prolonged habitat loss is likely to occur throughout the Offshore Development's lifetime, as a result of dynamic cable movement, seabed infrastructure, cable protection, and scour protection on the seabed. However, given the small scale of the Offshore Development and limited spatial extent of impact in the context of available habitats, there is limited potential for significant project lifetime inter-related effects associated with habitat loss. |

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|---|---|---|---|---|---|
| Temporary increases in suspended sediment concentrations and potential sedimentation/smothering of fish and shellfish | Minor | N/A | Minor | OAA, Offshore ECC | Temporary increases in suspended sediment are most likely to occur during the Construction Phase, however a similar or lower magnitude of increased SSC is expected during the Decommissioning Phase. The Construction and Decommissioning Phases of the Offshore Development are separated by a period of 35 years, which is sufficient for full recovery of fish and shellfish receptors that may have experienced an effect. Whilst both the Construction and Decommissioning Phases occur during the Offshore Development's lifetime, it is unlikely that the Offshore Development's lifetime inter-related effects exist above those identified for the Construction or Decommissioning Phases alone. |
| Effects of thermal load and EMFs from subsea and dynamic cables on sensitive species | N/A | Negligible | N/A | OAA, Offshore ECC | Cable EMFs will only be produced at the time of energy transmission. As such, this will be limited to the Operation and Maintenance Phase, and there is no potential for the Offshore Development's lifetime inter-related effects associated with EMF. |
| Fish aggregation around the floating substructures and associated infrastructure | N/A | Negligible | N/A | OAA | Fish aggregation is only likely to occur during prolonged infrastructure presence in the water column and on the seabed. As such, this will be limited to the Operation and Maintenance Phase, and there is no potential for the Offshore Development's lifetime inter-related effects associated with fish aggregation. |
| Ghost fishing due to lost fishing gear becoming entangled in installed infrastructure | N/A | Negligible | N/A | OAA | Ghost fishing is only likely to occur during prolonged infrastructure presence in the water column and on the seabed. As such, this will be limited to the Operation and Maintenance Phase, and there is no potential for the Offshore Development's lifetime inter-related effects associated with ghost fishing. |

*Receptor Based Effects*

There is potential for interactions between the effects of habitat loss/disturbance/alteration, and effects on fish and shellfish receptors from sediment deposition associated with elevated SSC. It is considered that there is greatest risk of inter-related effects from the combined effects of direct (both temporary and long-term) habitat loss/disturbance (from placement of anchors from vessels and jack-up events, seabed levelling and boulder clearance), indirect habitat disturbance (from cable installation/burial and due to sediment deposition), and indirect effects of changes in physical processes due to the presence of Offshore Development infrastructure within the marine environment. Receptors at most risk of inter-related effects are spawning populations of Atlantic herring and sandeel populations. Given the limited spatial extent of the Offshore Development, the extent of potential habitat available for both Atlantic herring and sandeel in the

region, and the recoverability of spawning habitats over time, it is unlikely that the Offshore Development would have potential for significant lifetime inter-related effects associated with these receptor groups.

### Marine Mammals

22.4.8.6 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Marine Mammals and vice versa.

22.4.8.7 Potential inter-relationships exist between Marine Mammal receptors and:

- **Volume ER.A.3, Chapter 10: Fish and Shellfish Ecology**: indirect impacts on prey; and
- **Volume ER.A.3, Chapter 13: Commercial Fisheries**: indirect impacts on prey.

22.4.8.8 Inter-related effects are Project lifetime effects from a single pathway that occur throughout more than one phase of the Project (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just assessed in isolation.

22.4.8.9 A description of the likely inter-related effects arising from the Salamander Project on marine mammals is provided below in **Table 22-7.**

**Table 22-7 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Marine Mammals**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br>*18 months* | *O&M*<br>*35 years* | *Decommissioning*<br>*18 months* | | |
| Disturbance from underwater noise | Negligible | Negligible | Negligible | OAA, Offshore ECC | Disturbance to marine mammals from underwater noise shall be present throughout each of the construction, operations and maintenance, and decommissioning phases of the Salamander Project. This results in a potential Project lifetime inter-related effect.<br><br>Disturbance to marine mammals shall primarily be caused by piling activities at Salamander during the construction phase, but shall also be present as a result of:<br><br>• Construction:<br>  • Geophysical surveys;<br>  • Unexploded ordinance (UXO) clearance;<br>  • Vessel activity;<br>  • Construction activities such as dredging, piling and/or drilling;<br>• Operations and maintenance:<br>  • Operational floating WTGs;<br>  • Geophysical surveys<br>  • Vessel activity;<br>• Decommissioning:<br>  • Removal of structure;<br>  • Geophysical surveys; and |

| | | | | | |
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| | | | | | • Vessel activity.<br><br>The implementation of a UXO Marine Mammal Mitigation Protocol (MMMP) for UXO clearances, a piling MMMP for piling activities, and a vessel management plan (VMP), shall ensure that impacts related to disturbance as a result of underwater noise shall remain **Negligible** to **Low** in magnitude, and therefore **Not Significant** across all three phases of the Salamander Project. For each of the potentially noisy activities, across each Project phase, the impacts were assessed as being of **Negligible** significance. It is also noted that while some level of disturbance may occur over the lifetime of the Salamander Project, the magnitude of such disturbance over a longer time period will be far less than during the construction phase.<br><br>The potential impacts of the clearance of UXOs are discussed within this EIAR for completeness. However, as it is not possible at this time to precisely define the number of UXO which may require detonation, a separate Marine Licence application and EPS Licence application (with associated environmental assessments) will be submitted for the detonation of any UXO which may be identified as requiring clearance in pre-construction surveys.<br><br>As such, the significance of the inter-related effects of each Project phase are not anticipated to increase beyond those assessed for Project effects alone. |
| Disturbance from vessel activity in the Offshore Development Area | Negligible | Negligible | Negligible | OAA, Offshore ECC | The risk of marine mammal disturbance as a result of vessels will be present throughout each of the construction, operations and maintenance, and decommissioning phases of the Salamander |

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|---|---|---|---|---|---|
| | | | | | Project. This results in a potential Project lifetime, inter-related effect.<br><br>However, the risk of disturbance from vessels to marine mammals was assessed as being of **Negligible** significance throughout each of the construction, operations and maintenance, and decommissioning phases of the Salamander Project. In addition, the implementation of a VMP shall ensure that impacts related to vessel activity shall remain low in magnitude, and therefore **Not Significant** across all three phases of the Salamander Project.<br><br>As such, the significance of the inter-related effects of each project phase are not anticipated to increase beyond those already assessed, and the inter-related effects associated with vessel disturbance are assessed as **Negligible (Not Significant)**. |
| Changes to marine mammal prey species | Negligible | Negligible | Negligible | OAA, Offshore ECC | 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 Salamander Project. Thus, there is the potential for project lifetime, inter-related effects associated with impacts on marine mammal prey items.<br><br>However, the impacts on marine mammal prey items was 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 Salamander Project.<br><br>As such, the significance of the inter-related effects of each project phase are not anticipated to increase beyond those already |

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| | | | | | assessed, and the inter-related effects associated with indirect impacts on marine mammal prey items are assessed as **Negligible (Not Significant)**. |

*Receptor Based Effects*

Receptor-led effects occur as a result of multiple effects upon a specific receptor acting in combination with one another over the same spatial and temporal scales. Where this occurs, the spatial or temporal interaction of effects from multiple pathways potentially create a more significant effect on a receptor than if just assessed in isolation.

*Combination of Disturbance from Underwater Noise, the Presence of Vessels and Indirect Impacts on Marine Mammal Prey Items*:

When acting in combination with one another, the greatest potential for spatial and temporal interactions arising from the Salamander Project are associated with underwater noise impacts and the presence of vessels. Each of the individual impacts (i.e. disturbance from piling activities and disturbance from vessel activity) were assessed as being of **Negligible** (**Not Significant**) due to the implementation of embedded mitigation measures.

Although piling activities and vessel presence within the Offshore Development Area could occur at the same time, it is noted that in some instances, the presence of vessels prior to piling is likely to disturb some marine mammal species (Benhemma-Le Gall et al., 2023), and thus limit the amount of disturbance and/or displacement some marine mammal species may experience as a result of piling activities. In addition, underwater noise arising from piling activities has the potential to disturb animals to an extent which reduces the potential for vessel interactions.

As such, the significance of the receptor-led effects is not anticipated to increase beyond those already assessed and are assessed as **Negligible (Not Significant).**

### Offshore and Intertidal Ornithology

22.4.8.10 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Salamander Project may potentially further contribute to the impacts assessed on Offshore and Intertidal Ornithology and vice versa.

22.4.8.11 Two impacts have been identified to cause inter-related effects with regards to Offshore and Intertidal Ornithology across the lifetime of the Salamander Project: Project lifetime effects which here constitutes habitat loss and receptor-based effects which involves collision and distributional responses. The main effects of collision and distributional responses were assessed separately following quantitative analysis (collision risk modelling and displacement matrices). Some species are sensitive to only one of the two effects, and thus, are not considered for inter-related effects of distributional responses and collision: great black-backed gull and herring gull are insensitive to distributional responses; and guillemot, razorbill, and puffin are insensitive to collision. For species which are sensitive to both distributional responses and collision (kittiwake and gannet), summing the impacts of both is considered a precautionary approach to inter-related assessment as the same individual cannot be displaced and collide.

22.4.8.12 For all other effects, it is not possible to produce a quantitative assessment alone as the rest of the EIA relies on qualitative assessments, and it is not possible to quantify impacts to populations confidently. Therefore, a qualitative assessment of inter-related effects has also been conducted. Other effects primarily constitute loss of foraging or loafing habitat, including vessel disturbance and all activities which interact with the seabed or water column. As a result, all other effects from the Salamander Project have been assessed in relation to habitat loss.

22.4.8.13 Long-term habitat loss is assessed under operation and maintenance impacts, however, this effect will begin during the construction phase and end during the decommissioning phase, as Salamander Project infrastructure is installed and then removed. Short-term disturbance of supporting habitat, such as through installation, repair, or burial/reburial of cables may result in additional areas of habitat being lost to birds during the period of work and while the habitat is recovering.

22.4.8.14 While the presence of vessels and helicopters will not affect supporting habitat itself, these effects are also considered to represent additional short-term habitat loss, as displaced birds may be temporarily excluded from foraging areas. Effects associated with vessel disturbance will cease almost immediately once a vessel leaves the area, allowing seabirds to return to the foraging habitat.

22.4.8.15 While vessel disturbance, short-term habitat loss, and long-term habitat loss are considered cumulatively, it is important to recognise that there will be spatial and temporal overlap with these effects. For example, cable repair may take place within an area of habitat covered by 'long-term habitat loss', and therefore, the short-term loss (cable repair) and disturbance (vessel presence) will not be in addition to the already assessed long-term loss of habitat.

22.4.8.16 Distributional responses to the presence of operational wind turbine generators (WTGs) in the OAA also constitute habitat loss. Therefore, a two-tier assessment is considered here, and summarised in **Table 22-8**.

22.4.8.17 Firstly, for birds which are not displaced by the WTGs: an assessment has been undertaken of long-term habitat loss, short-term habitat loss, and vessel disturbance from construction, operation and decommissioning across the entire Offshore Development Area (Tier 1 Habitat Loss) assuming no disturbance from the WTGs themselves.

22.4.8.18 Secondly, an assessment accounting for birds which are displaced by WTGs, where it assumed that the entire OAA plus 2.0 km Buffer is classed as habitat loss, in addition to any loss (direct habitat loss and vessel disturbance-related loss) within the Offshore ECC (Tier 2 Habitat Loss).

**Table 22-8 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Marine Ornithology**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br><br>*18 months* | *O&M*<br><br>*35 years* | *Decommissioning*<br><br>*18 months* | | |
| Tier 1 Habitat loss | Negligible | Negligible | Negligible | OAA, Offshore ECC | Habitat loss may occur due to several factors, covering a relatively large spatial extent. To maintain a precautionary approach, the spatial extent of habitat loss and vessel trips are summed, even where there is overlap between effects. The total area of inter-related habitat loss is 17,305,200 m2, or up to 17.3 km2, within the Offshore Development Area, which is comprised of 5,178,350 m2 (5.2 km2) short-term loss in both construction and decommissioning (10,356,700 m2, or 10.4 km2, total) and 6,948,500 m2 (7.0 km2) long-term loss during operation and maintenance. Additionally, there are expected to be up to 8,540 vessel and 4,935 helicopter trips throughout the lifespan of the Salamander Project.<br><br>Up to 17.3 $km^2$ of cumulative habitat loss throughout the Salamander Project lifetime represents a small proportion of the total habitat available to seabirds considering species specific foraging ranges (Woodward *et al.*, 2019; NatureScot, 2023c) and the large extent of accessible alternative habitat in the region (refer to **Volume ER.A.3, Chapter 9 Benthic and Intertidal Ecology** (**Section 9.7.1**, **Figure 9-3**)). Additionally, the duration of habitat loss should also be noted; with short-term loss occurring primarily in the construction and decommissioning phases, and long-term loss during operation and maintenance. Habitat loss will, therefore, not occur concurrently over the full 17.3 $km^2$, with short-term loss associated with construction |

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| | | | | | recovering during the operation phase, and long-term loss ceasing and recovering during decommissioning.<br><br>As such, although inter-related effects may be marginally greater than effects associated with individual activities, impacts are not expected to be of greater magnitude and inter-related habitat loss is not predicted to have a notable effect on seabird populations. |
| Tier 2 Habitat loss | Minor | Minor | Minor | OAA, | For birds which are displaced by WTGs, habitat loss may occur over the entirety of the OAA, with additional loss occurring in the Offshore ECC. Therefore, the total area of habitat loss is 109 $km^2$, comprising of 92.2k $m^2$ in the OAA plus 2.0 km Buffer and 17.3 $km^2$ associated with infrastructure and seabed works. Additionally, there are expected to be up to 8,540 vessel and 4,935 helicopter trips throughout the lifespan of the Salamander Project.<br><br>Displacement from the OAA was determined to be **Minor** effect at worst, with either No Impact or Negligible effect predicted for most species (**Table 12-43**). The greatest significance is expected for guillemot, where Minor effect is predicted. This is due to the high numbers of auks observed during the 24-month DAS, most notably during the post-breeding moult period.<br><br>Additional loss of habitat (17.3 $km^2$) is unlikely to have notable additional effect on seabirds. Additionally, this additional habitat loss will be short-term and only occur during isolated events within the Offshore ECC.<br><br>Therefore, considering birds displaced by operational WTGs, habitat loss is unlikely to result in measurable effect on populations above that predicted for distributional responses. As such, inter-related habitat loss is not predicted to have a notable effect on seabird populations. |

*Receptor Based Effects*

Overall impacts arising from distributional responses and collision are expected to be small for both kittiwake and gannet, with population-level effects resulting in <0.02%-point changes in survival rate (as the inverse of mortality rate).

**Table 22-9** presents the summed effects on the mortality rates of the regional populations of kittiwake and gannet.

Combined impacts on kittiwake (i.e. the sum of displacement and collision impacts) may result in up to 34 additional mortalities in the breeding season and up to two in the non-breeding season, adjusted to account for breeding season birds which remain present in the non-breeding season (details are provided in **Section 12.10.6** of **Volume ER.A.3, Chapter 12: Offshore and Intertidal Ornithology** and **Volume ER.A.4, Annex 12.8 Offshore Ornithology Regional Populations Report**). Such increases, when assessed against the regional populations and baseline mortality, result in mortality rate changes of 0.017%-point. This increase is minimal and below the threshold for PVA. The small magnitude of change is not expected to have a measurable effect on the regional population. Therefore, the inter-related effects of collision and distributional responses on kittiwake are **Minor**.

The change in gannet survival rate is 0.003%-point, with an increase of up to 15 mortalities per year (sum of displacement and collision mortality estimates, adjusted to consider breeding population bird presence in the non-breeding season, details are provided in **Section 12.10.6 Volume ER.A.3, Chapter 12: Offshore and Intertidal Ornithology** and in **Volume ER.A.4, Annex 12.8 Offshore Ornithology Regional Populations Report**) expected to result in no measurable effect on the regional population. As such, it is concluded that inter-related effects of collision and distributional responses on gannet are **Negligible**.

For both species, considering the worst-case rates (i.e. lowest avoidance rate and highest displacement and mortality rates), impacts remain relatively small. Impacts to kittiwake would be no greater than 58 mortalities per year, resulting in a maximum survival rate change of -0.029%. Gannet impacts are smaller, with up to 29 mortalities per year, equating to a 0.007%-point decrease in survival rate.

**Table 22-9 Summed mortalities from collision and displacement assessment, and associated effects on regional populations and baseline mortality rates of black-legged kittiwake (*Rissa tridactyla*) and northern gannet (*Morus bassanus*)**

| Species | Season | Baseline Metrics (indv.) | | | Impact Mortalities (indv.) | | | Mean Total Mortalities (indv.) | Mean Impacted Survival Rate | %-point Change |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Population* | *Survival Rate* | *Mortalities* | *Displacement* | *Collision* | *Total* | | | |
| *Ozsanlav-Harris* et al. *(2014) collision avoidance rates; Applicant Approach mortality and displacement rates (i.e. lower end of SNCB mortality rates)* | | | | | | | | | | |
| Black-legged kittiwake | Breeding | 202,258 | 85.400% | 29,530 | 11 | 23 | 34 | 29,566 | 85.383% | -0.017 |
| | Non-breeding | 627,816 | | 91,661 | 1 | 1 | 2 | | | |
| Northern gannet | Breeding | 423,893 | 91.900% | 34,335 | 3 | 4 | 8 | 34,350 | 91.897% | -0.003 |
| | Non-breeding | 248,385 | | 20,119 | 3 | 2 | 7 | | | |
| *Worst-case rates (kittiwake: 30% displacement, 3% mortality, 98.9% annual avoidance; gannet: 70% displacement, 3% mortality, 98% breeding avoidance, 98.9% non-breeding avoidance)* | | | | | | | | | | |
| Black-legged kittiwake | Breeding | 202,258 | 85.400% | 29,530 | 33 | 23 | 56 | 29,588 | 85.371% | -0.029 |
| | Non-breeding | 627,816 | | 91,661 | 1 | 1 | 2 | | | |
| Northern gannet | Breeding | 423,893 | 91.900% | 34,335 | 9 | 9 | 18 | 34,363 | 91.893% | -0.007 |
| | Non-breeding | 248,385 | | 20,119 | 8 | 3 | 11 | | | |

### 22.4.9 Human Environment

#### Commercial Fisheries

22.4.9.1 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Commercial Fisheries and vice versa.

22.4.9.2 A summary of the assessed risk of inter-related effects arising from the Salamander Project on Commercial Fisheries is provided below in **Table 22-10**.

**Table 22-10 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Commercial Fisheries**

| *Project Lifetime Effects* |
|---|
| It is not anticipated that effects on commercial fishing vessels across all phases of the Salamander Project will interact in such a way to result in combined effects of greater significance than the assessment of each individual phase. Although some effects may be considered to be 'long term', the expected rapid recovery of affected receptors ensures that there is no potential for interphase effect interaction. |
| *Receptor Based Effects* |
| There is potential for an inter-related effect from the combination of the loss or restricted access to fishing grounds and the consequent displacement of fishing activity into other areas. This could result in increased gear conflict and pressure on other fishing grounds. During construction, static gear vessels may be required to relocate pots from areas of activity, which could increase intensity of activity in other areas or cause conflict with mobile gear species (e.g. scallop vessels). However, with successful implementation of the embedded mitigation measures outlined in **Section 13.8.3** of **Volume ER.A.3, Chapter 13: Commercial Fisheries**, and the temporary nature of the works, it is not predicted that there will be any inter-related effect of greater significance than those already assessed in isolation. Considering the measures outlined in **Section 13.8.3** of **Volume ER.A.3, Chapter 13: Commercial Fisheries** it is anticipated that the appropriately mitigated loss of access will reduce displacement and, therefore, any inter-related effect will not be of greater significance than those assessed in isolation (**Negligible** to **Minor**).<br><br>Increased collision and allision risk to commercial fishing vessels has been considered in **Volume ER.A.3; Chapter 14: Shipping and Navigation**. |

### Shipping and Navigation

22.4.9.3 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Shipping and Navigation and vice versa.

22.4.9.4 Potential interactions that may contribute to inter-related effects over the Salamander Project lifetime include:

- vessel-to-vessel collision due to the presence of Salamander Project vessels and displacement of vessels from the OAA;
- vessel-to-structure contact due to the presence of semi-submersible floating platform/WTGs;
- snagging with semi-submersible floating platform/WTG moorings, Inter-array Cables or the Offshore Export Cable; and
- a change in navigable water depth.

22.4.9.5 A summary of the assessed risk of inter-related effects arising from the Salamander Project on Commercial Fisheries is provided below in **Table 22-11**.

**Table 22-11 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Shipping and Navigation**

| *Project Lifetime Effects* |
|---|
| Across the Salamander Project lifetime, the effects on Shipping and Navigation are expected to be short term and are expected to cease immediately following cessation of project activities. As such, they are not anticipated to interact in such a way that will result in combined effects of greater significance than the assessment of each individual phase. |
| *Receptor Based Effects* |
| Regarding receptor-led inter-related effects, an increase in vessel numbers and the displacement of vessels out with the OAA, has potential to have effects on marine mammals and offshore ornithology. However, the contribution of Shipping and Navigation to overall disturbance of these receptors will be minimal and would not be sufficient to increase the level of any individual effect significance. |

### Aviation and Radar

22.4.9.6 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Aviation and Radar and vice versa.

22.4.9.7 A summary of the assessed risk of inter-related effects arising from the Salamander Project on Aviation and Radar is provided below in **Table 22-12**.

**Table 22-12 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Aviation and Radar**

| |
|---|
| *Project Lifetime Effects* |
| Effects on Aviation and Radar receptors are expected to cease immediately following cessation of Project activities. As such, no pathway has been identified for these to interact in such a way that will result in combined effects of greater significance than the assessment of those assessed in isolation. |
| *Receptor Based Effects* |
| The impacts identified **in Volume ER.A.3, Chapter 15: Aviation and Radar** have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. However, the worst-case impacts assessed take potential interactions into account. Therefore, the impact assessments presented therein are considered conservative and robust. It is determined that there are no interactions which may create new or more significant impacts than those assessed in isolation. |

### Seascape, Landscape, and Visual Amenity

22.4.9.8 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Salamander Project may potentially further contribute to the impacts assessed on Seascape, Landscape, and Visual Amenity and vice versa.

22.4.9.9 An assessment of inter-related effects has been undertaken in **Volume ER.A.3, Chapter 16: Seascape, Landscape and Visual Amenit**y, and is summarised in **Table 22-13**, to assess any areas where impact pathways identified for this topic area combine, or inter-relate, to have an effect.

**Table 22-13 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Seascape and Visual Amenity Impacts**

| *Project Lifetime Effects* |
|---|
| Project lifetime effects are no greater than individually assessed impacts. Although impacts are broken down into different receptors based upon physical and perceived characteristics (e.g. coastal character areas) the actual receptor is the same in each case, i.e. the people perceiving the effect on coastal character. Therefore, these people will only perceive the effect one way (visually) at one point in time, and will not experience the Construction, Operation and Maintenance and Decommissioning phases simultaneously, or across multiple pathways. |
| *Receptor Based Effects* |
| In the SLVIA, no significant effects have been assessed as arising from the Offshore Development during Construction, Operation and Maintenance, and Decommissioning.<br><br>The majority of receptors in the SLVIA Study Area will not experience inter-related effects, since they have either no visibility, or very limited / distant visibility, of either the Offshore Development or the Onshore Development, and therefore have limited potential for inter-related effects to occur. Inter-related effects will only occur on those receptors near the onshore substation and landfall, where the construction and operational of the onshore infrastructure will occur in areas that may also be susceptible to changes resulting from views of the Offshore Development.<br><br>Combined visibility of both the Offshore Development and the Onshore Development will be restricted to the coastline and its immediate hinterland within the vicinity of the onshore substation and landfall, however there is notable screening by forestry around the onshore substation, that tends to restrict views of either the Offshore Development or the Onshore Development. While there may be visibility of both Onshore and Offshore Developments, they will generally not be seen together due to the intervening distance (approximately 33 km) and their separate geographic locations relative to each other.<br><br>It is considered that screening by surface elements including dunes, landform and coniferous forestry will restrict visibility of the Offshore Development from much of the area near the onshore substation, including the A90 corridor and smaller settlements along this route. Lunderton Cottages and Lunderton will have no visibility of the Offshore Development, while its visibility from Inverquizie may be severely restricted. Further afield, the Offshore Development will be visible from higher areas further inland such as at St Fergus and Hallmoss which also have visibility of Hywind Scotland. A lack of visibility of the Onshore Development from these areas means that the effects of the Salamander Project at these locations will be the same as for the Offshore Development alone.<br><br>Views in which both the Offshore Development and Onshore Development will be most noticeable are likely to occur in the local geographic area between Craigewen and Kirktown Head, where more of the Onshore Development will be visible at close-range and the Offshore Development will be visible at long range in wider views out to sea. Visibility of the Onshore and Offshore Developments will be consecutive rather than simultaneous, in different sections of the view, with the effects of both remaining similar in magnitude to their effects when considered individually. The combined magnitude of change of both the Offshore Development and the Onshore Development will be slightly higher than for either alone, but not markedly due to the |

distance of the Offshore Development at very long range out to sea. The inter-related effects on these visual receptors in the coastal area between Craigewen and Kirktown Head are assessed as being of no greater effect significance compared to the impacts considered alone for the onshore substation. This reflects the position and scale of the Offshore Development relative to the expansive seascape of the North Sea and the precedents of offshore WTGs (Hywind Scotland) and elements of energy infrastructure on land along the coastline.

Bearhill lies directly inland of the Onshore Substation Site with the OAA directly to the east. This area will have simultaneous visibility of both the Onshore Development and the Offshore Development. The combined magnitude of change of both Onshore and Offshore Developments will be slightly higher than for either alone, but not markedly due to the distance of the Offshore Development at very long range out to sea. The inter-related effects on these visual receptors at Bearhill are assessed as being of no greater effect significance compared to the impacts considered alone for the onshore substation. This reflects the relatively modest scale of both the Onshore Substation and EBI relative to the surrounding landscape and the Offshore Development relative to the expansive seascape of the North Sea and the sea horizon. Both developments will have some visual precedent, including the WTGs of Hywind Scotland; and the elements of energy infrastructure on land.

### Marine Archaeology and Cultural Heritage

22.4.9.10 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Salamander Project may potentially further contribute to the impacts assessed on Marine Archaeology and Cultural Heritage and vice versa.

22.4.9.11 A description of the likely inter-related effects arising from the Salamander Project on Marine Archaeology and Cultural Heritage is provided below in **Table 22-14**.

**Table 22-14 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Marine Archaeology and Cultural Heritage**

| Impacts | Residual Effects | | | Project Aspect | Inter-related Effects |
|---|---|---|---|---|---|
| | *Construction*<br>*18 months* | *O&M*<br>*35 years* | *Decommissioning*<br>*18 months* | | |
| Direct physical impact | Negligible to Minor | Negligible to Minor | Negligible to Minor | OAA, Offshore ECC | Activities associated with each stage across the lifecycle of the Salamander Project may result in additive direct physical impacts, from initial seabed sampling to construction activities, operational repairs and recovery of infrastructure at the end of the Salamander Project (further details in **Section 17.16.2, 17.16.3** and **17.16.4** of **Volume ER.A.3, Chapter 17: Marine Archaeology and Cultural Heritage**). |
| Indirect physical impact | Negligible | Negligible | Negligible | OAA, Offshore ECC | Indirect physical impacts may also occur across the three Project phases. Where the overall installation footprint from the construction phase changes during the O&M phase, for example, through the installation of new scour protection beyond the existing footprint. Scour may also occur around vessel anchors, which, although temporary and resulting in a localised effect, would accumulate across all Project phases (further details in **Section 17.16.2**, **17.16.3** and **17.16.4** of **Volume ER.A.3, Chapter 17: Marine Archaeology and Cultural Heritage**). |
| Settings impacts | N/A | Negligible to Minor | N/A | OAA | Setting impacts are defined as being limited to the Operation and Maintenance Phase and as such there are no Project lifetime effects when considering setting impacts across the three major phases of the Salamander Project (Construction, Operation and Maintenance and Decommissioning) (further details in **Section 17.16.5** of **Volume ER.A.3, Chapter 17: Marine Archaeology and Cultural Heritage**). |
| *Receptor Based Effects* | | | | | |
| Receptor-led effects may be experienced by marine archaeology and cultural heritage receptors, where direct physical impacts and indirect physical impacts overlap. Mitigation measures are | | | | | |

in place to ensure that once a potential receptor is identified (either known through geophysical survey or through an identification during construction, for example), the potential receptor will be reported and protected, as appropriate. Also, indirect physical effects, such as changes in physical processes, may occur. However, these indirect physical effects have been assessed as part of the impact assessment (**Section 17.11** of **Volume ER.A.3, Chapter 17: Marine Archaeology and Cultural Heritage**).

There are no receptor-led effects in settings, since changes are experienced by the same receptor in each case (asset) and in one way (visually) at one point in time. Therefore, effects on views and on perceived character are inter-linked and do not interact to produce a different, or greater, effect on a receptor than when effects are considered in isolation.

### Other Users of the Marine Environment

22.4.9.12 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Other Users of the Marine Environment and vice versa.

22.4.9.13 A summary of the assessed risk of inter-related effects arising from the Salamander Project on Other Users of the Marine Environment is provided below in **Table 22-15**.

**Table 22-15 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Other Users of the Marine Environment**

| *Project Lifetime Effects* |
|---|
| Potential interactions that may contribute to inter-related effects over the Salamander Project lifetime primarily relate to obstruction of vessel activities of other users of the marine environment. Effects from vessel activity are short term and temporary; they cease as soon as the vessel has departed. As such, there is no pathways for temporal interaction and it is determined there is no risk of Project lifetime inter-related effects of greater significance than the assessment of each individual phase. |
| *Receptor Based Effects* |
| Regarding receptor-led inter-related effects, an increase in the presence of safety zones, increase in vessel numbers and the displacement of vessels within the OAA, have potential to marginally increase the effect magnitude on other users of the marine environment. However, this change will be small and not sufficient to increase the overall magnitude of effect or significance level. |

### Socio-economics, Tourism and Recreation

22.4.9.14 The assessment of impacts arising from construction, operation and decommissioning of the Salamander Project indicates that impacts on receptors addressed in different aspects of the Project may potentially further contribute to the impacts assessed on Socio-economics.

22.4.9.15 A summary of the assessed risk of inter-related effects arising from the Salamander Project on Socio-economics is provided below in **Table 22-16.**

**Table 22-16 Summary of the potential Project Lifetime and Receptor Based inter-related effects for Socio-economics, Tourism and Recreation**

| *Project Lifetime Effects* |
|---|
| There are no pathways for temporal interaction, and it is determined there is no risk of Project lifetime inter-related effects of greater significance than the assessment of each individual phase. |
| *Receptor Based Effects* |
| There are no receptor-led effects in the Socio-economics, Tourism and Recreation assessment as the effects considered within the assessment do not interact to produce a different, or greater effect, on a receptor than when effects are considered in isolation. |

## 22.5 Conclusion and Summary

22.5.1.1 The assessment presented within this chapter consider the potential for inter-related effects to arise from offshore elements of the Salamander Project. The content of this chapter has been based on expert judgement and led by assessments of individual effects presented in topic-specific EIAR chapters. No inter-related effects were found to exceed the significance levels determined for Project effects alone, and therefore they are determined to be **Not Significant** in EIA terms.

## 22.6 References

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