BERWICK BANK WIND FARM
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Volume 2, Chapter 19: Water Quality

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19. WATER QUALITY

19.1. INTRODUCTION

1. This chapter of the Offshore Environmental Impact Assessment (EIA) Report presents the assessment of the likely significant effects (as per the "EIA Regulations") on the environment of the Berwick Bank Wind Farm offshore infrastructure which is the subject of this application (hereafter referred to as "the Proposed Development") on water quality. Specifically, this chapter considers the potential impacts of the Proposed Development seaward of Mean High Water Springs (MHWS) during the construction, operation and maintenance, and decommissioning phases.

2. "Likely significant effect is a term used in both the "EIA Regulations" and the Habitat Regulations. Reference to likely significant effect in this Offshore EIA Report refers to "likely significant effect" as used by the "EIA Regulations". This Offshore EIA Report is accompanied by a Report to Inform Appropriate Assessment (RIAA) (SSER, 2022c) which uses the term as defined by the Habitats Regulations Appraisal (HRA) Regulations.

3. The assessment presented is informed by the following technical chapters:

   - volume 2, chapter 7: Physical Processes;
   - volume 2, chapter 8: Benthic Subtidal and Intertidal Ecology; and
   - volume 2, chapter 9: Fish and Shellfish Ecology.

19.2. PURPOSE OF THIS CHAPTER

4. The primary purpose of the Offshore EIA Report is outlined in volume 1, chapter 1. It is intended that the Offshore EIA Report will provide the Scottish Ministers, statutory and non-statutory stakeholders, with sufficient information to determine the likely significant effects of the Proposed Development on the receiving environment.

5. In particular, this Water Quality Offshore EIA Report chapter:

   - presents the existing environmental baseline established from desk studies;
   - identifies any assumptions and limitations encountered in compiling the environmental information;
   - presents the likely significant environmental impacts on water quality arising from the Proposed Development and reaches a conclusion on the likely significant effects on water quality, based on the information gathered and the analysis and assessments undertaken; and
   - highlights any necessary monitoring and/or mitigation measures which are recommended to prevent, minimise, reduce or offset the likely significant adverse environmental effects of the Proposed Development on water quality.

19.3. STUDY AREA

6. The Offshore EIA Report water quality study area includes the intertidal area. This intertidal area overlaps with the onshore topic of Geology, Hydrology, Soils and Flood Risk (landward of MLWS) and Ecology and Ornithology (landward of MHWS) (Figure 19.1).

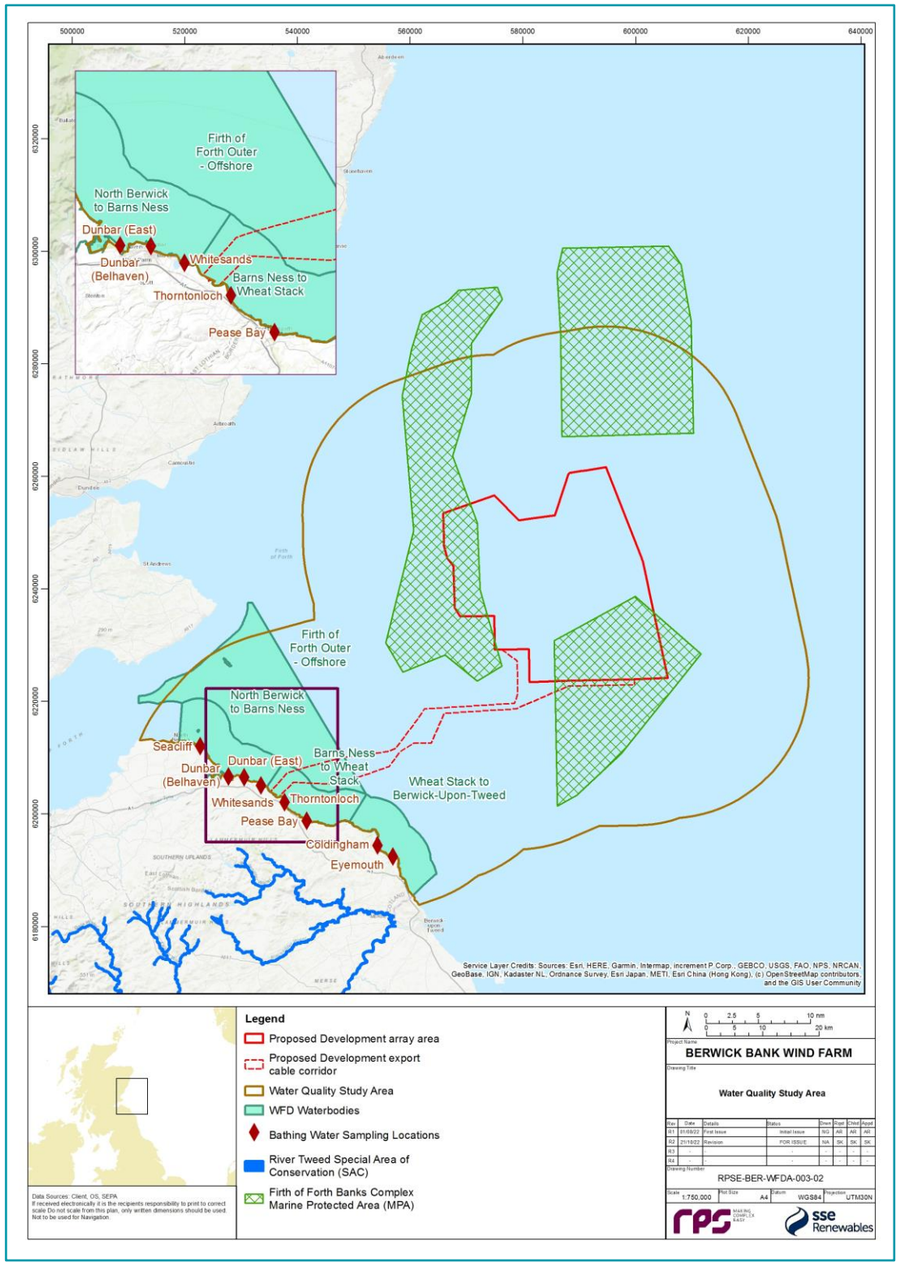

Figure 19.1: Water Quality Study Area

19.4. POLICY AND LEGISLATIVE CONTEXT

7. Policy and legislation on renewable energy infrastructure is presented in volume 1, chapter 2 of the Offshore EIA Report. Policy and legislation specifically in relation to water quality, is contained in the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), Marine Strategy Regulations 2010, the Bathing Waters (Scotland) Regulations 2008, the Water Environment and Water Services (Scotland) Act 2003, the Conservation (Natural Habitats, &c.) Regulations 1994, the Sectoral Marine Plan for Offshore Wind Energy (SMP) 2020, the Scottish National Marine Plan (NMP) 2015, and the United Kingdom (UK) Marine Policy Statement (MPS) 2011. A summary of the legislative provisions relevant to water quality are provided in Table 19.1 to Table 19.5, with other relevant policy provisions set out in Table 19.6 to

8. Table 19.8. These are summarised here with further detail presented in volume 3, appendix 19.

9. All the policy and legislation provided in Table 19.1 to

10. Table 19.8 is also relevant to the intertidal area.

Table 19.1 Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as Amended)

Summary of Relevant Legislation	How and Where Considered in the Offshore EIA Report
General	
Introduced under the WEWS 2003 Act to specify the control regimes for discharges to, abstractions from and impoundments and engineering activities affecting the water environment (i.e. rivers, lochs, transitional waters (estuaries), coastal waters groundwater, and groundwater dependant wetlands).	The means by which water quality and Good status of WFD water bodies is achieved and maintained via this legislation is discussed in section 19.7.2.

Table 19.2: Summary of Marine Strategy Regulations 2010 Relevant to Water Quality

Summary of Relevant Legislation	How and Where Considered in the Offshore EIA Report
General	
The Marine Strategy Regulations 2010, which transpose the requirements of the European Union's (EU) Marine Strategy Framework Directive into domestic law requires the UK to put in place measures to achieve or maintain good environmental status in the marine environment by 2020.	The statutory obligations of the EU Marine Strategy Framework Directive, transposed to Scottish law by the Marine Strategy Regulations, are considered in the baseline environment assessment (section 19.7), and considered as a water quality receptor throughout the Assessment of Significance (section 19.11) and Cumulative Effects Assessment (CEA) (section 19.12).

Table 19.3: Summary of Bathing Waters (Scotland) Regulations 2008 Relevant to Water Quality

Summary of Relevant Legislation	How and Where Considered in the Offshore EIA Report
General	
Transposes Directive 2006/7/EC into Scottish law, establishing mechanisms to improve protection of bathers' health, via raising of water quality standards, and via the provision of information to allow bathers to make informed choices on whether to bathe or not.	All relevant bathing water sampling locations are listed in Table 19.12 and are considered in the baseline environment assessment (section 19.7), and considered as a water quality receptor throughout the Assessment of Significance (section 19.11) and Cumulative Effects Assessment (section 19.12).
Designation and monitoring	
Determines how Bathing Waters will be designated and creates provision to establish the length of the bathing season relating to each Bathing Water. Obliges public authorities to meet requirements of the Regulations, and landowners adjacent to designated Bathing Waters to inform public authorities of pollution incidents. Establishes the frequency and parameters for monitoring of water quality, classifying status based upon two microbial parameters, replacing the 19 parameters of the previous Regulations.	As above.

Table 19.4: Summary of Water Environment and Water Services (Scotland) Act 2003 Relevant to Water Quality

Summary of Relevant Legislation	How and Where Considered in the Offshore EIA Report
General	
Transposes the EU Water Framework Directive into Scottish Law, defines the water environment and sets out the purpose of its protection, and the duties of public authorities. Establishes River Basin Districts (RBDs) requiring preparation of RBD management plans, creates RBD advisory groups to allow preparation of sub-basin plans, and describes procedures for preparation, approval and review of RBD plans.	The statutory obligations of the EU Water Framework Directive (WFD), transposed to Scottish law by the Water Environment and Water Services (Scotland) Act 2003 are considered in the baseline environment assessment (section 19.7), and considered as a water quality receptor throughout the Assessment of Significance (section 19.11) and Cumulative Effects Assessment (section 19.12). Full consideration of the WFD obligations are presented as a WFD assessment for the Proposed Development in volume 3, appendix 19.
Monitoring and protection	
Sets out environmental objectives for each water body in an RBD, requires status monitoring to be carried out, and enables regulating of activities to protect the water environment, and for remedial or restoration measures to achieve environmental objectives.	As above.

Table 19.5: Summary of Conservation (Natural Habitats, &c.) Regulations 1994 Relevant to Water Quality

Summary of Relevant Legislation	How and Where Considered in the Offshore EIA Report
Before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which is likely to have a significant effect on a European site (either alone or in combination with other plans or projects) and is not directly connected with or necessary to the management of the site, a competent authority must make an appropriate assessment of the implications for the site in view of that site's conservation objectives.	All relevant designated sites are listed in Table 19.12, along with their proximity to the Proposed Development and effects on these are considered in section 19.11. Section 19.12 also considers impacts on designated sites from other plans and projects cumulatively with the Proposed Development. European sites are further assessed in line accordance with the Habitats Regulations in the RIAA.

Table 19.6: Summary of Sectoral Marine Plan for Offshore Wind Energy (SMP) 2020 Relevant to Water Quality

Summary of Relevant Policy Framework	How and Where Considered in the Offshore EIA Report
The effect of proposed offshore wind energy developments is cited as a specific potential adverse effect, requiring further consideration at the project level.	Significance of impacts assessed for the Proposed Development in section 19.11, and cumulative effects with other offshore projects is considered in section 19.12. A WFD assessment is reported in volume 3, appendix 19.

Table 19.7: Summary of Scottish National Marine Plan (NMP) 2015 Relevant to Water Quality

Summary of Relevant Policy Framework	How and Where Considered in the Offshore EIA Report
By contributing to the management of human induced pressures on water quality, marine planning will provide one delivery mechanism for River Basin Management Plans.	Impacts to water bodies designated via EU Directives (as transposed into Scottish Law, including those retained/amended following UK exit from EU) are considered in a WFD assessment presented in volume 3, appendix 19.
Developments and activities should not result in a deterioration of the quality of waters to which the WFD, Marine Strategy Framework Directive or other related Directives apply.	
Finfish and shellfish cultivation depends on farms being sited at locations where the water quality is good, and the filter feeding nature of shellfish makes them particularly vulnerable to bacterial or chemical contamination deriving from human activities	No cultivation of finfish or shellfish has been identified in the vicinity of the Proposed Development.
Decision makers should seek to mitigate impacts on the quality of shellfish waters, designated bathing waters and areas particularly important for immersion sports from any proposed development.	Impacts on quality of designated bathing waters is considered in sections 19.11 and 19.12. No designated shellfish waters, or areas of particular importance for immersion sports, are located in the vicinity of the Proposed Development.

Table 19.8: Summary of UK Marine Policy Statement (MPS) 2011 Relevant to Water Quality

Summary of Relevant Policy Framework	How and Where Considered in the Offshore EIA Report
Developments at the coast and at sea can have adverse effects on transitional, coastal, and marine waters. During the construction, operation and decommissioning phases of developments, there can be increased demand for water, discharges to water and adverse ecological effects resulting from physical modifications to the water environment. There may also be an increased risk of spills and leaks of pollutants into the water environment and the likelihood of transmission of invasive non-native species, and their impacts on ecological water quality need to be considered. The marine plan authority should satisfy itself where relevant that any development will not cause a deterioration in status of any water to which the WFD applies. Decision makers should also take into account impacts on the quality of designated bathing waters and shellfish waters from any proposed development.	Section 19.11 discusses the impacts and significance of the introduction and spread of Invasive Non-Native Species (INNS), the accidental release of lubricants, chemicals or similar, operational painting and cleaning of marine growth, and the deterioration of bathing water quality and WFD water bodies. Section 19.12 considers these same impacts alongside existing, in-progress, and proposed projects that may have a cumulative impact to quality. A WFD assessment for the coastal WFD water bodies (up to 1 nm offshore) in the water quality study area is also presented in volume 3, appendix 19.

19.5. CONSULTATION

11. A summary of the key issues raised during consultation activities undertaken to date specific to water quality is presented in Table 19.9, together with how these issues have been considered in the production of this Water Quality Offshore EIA Report chapter. Further detail is presented within volume1, chapter 5 where appropriate.

Table 19.9: Summary of Key Consultation of Relevance to Water Quality

Date	Consultee and Type of Consultation	Issue(s) Raised	Response to Issue Raised and/or where Considered in this Chapter
February 2022	Marine Scotland – Licensing Operations Team (MS-LOT) Scoping Opinion	Developer does not clearly identify potential impacts to water quality resulting from proposed development in Scoping Report and does not propose assessment in relation to water quality.	Potential impacts from Proposed Development relating to water quality are presented in this chapter, and a WFD assessment conducted, and reported in volume 3, appendix 19).
		No information provided in consideration of the WFD.	WFD report included as technical appendix (volume 3, appendix 19).
		Risk of INNS settlement and distribution, risks to water environment from operational cleaning, and from paints and painting operations, the risk of inputs of any lubricant, chemicals or similar, and the risk to water quality from cable landfall works should be assessed.	The risk of such events is managed by the implementation of measures set out in standard post consent plans, which include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. These issues are considered in paragraphs 53 to 86 (INNS), paragraphs 87 to 109 (release of lubricants, chemicals, or similar), paragraphs 110 to 119 (operational cleaning) and paragraphs 120 to 134 (deterioration of water quality).

19.6. METHODOLOGY TO INFORM BASELINE

19.6.2. DESKTOP STUDY

12. Information on water quality within the water quality study area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 19.10.

Table 19.10: Summary of Key Desktop Reports

Title	Source	Year	Author
The Marine Scotland National Marine Plan Interactive (NMPi) maps	Marine Scotland Science (MSS)	2019	MSS for the Scottish Government
SeaSearch Marine Surveys in Scotland	National Biodiversity Network (NBN) Atlas	2017	SeaSearch
Outer Firth of Forth and St Andrews Bay Complex Proposed Special Protection Area (pSPA) Reference No: UK9020316. SPA Site Selection Document: Summary of the scientific case for site selection	Joint Nature Conservation Committee (JNCC)	2016	JNCC
The River Basin Management Plan for Scotland 2021 - 2027	https://www.sepa.org.uk/media/594088/211222-final-rbmp3-scotland.pdf	2021	SEPA for the Scottish Government
Scottish Bathing Waters 2016	Scottish Environment Protection Agency (SEPA)	2016	SEPA for the Scottish Government
Bathing Waters profiles: Eyemouth, Coldingham, Pease Bay, Thorntonloch, Whitesands, Dunbar (East), Dunbar (Bellhaven), Seacliff	https://www2.sepa.org.uk/bathingwaters/Profiles.aspx (accessed 22/07/2022)	2022	SEPA for the Scottish Government
North Berwick to Barns Ness Water Body 200467 information sheet	https://www.sepa.org.uk/data-visualisation/water-classification-hub (accessed 21/07/2022)	2022	SEPA for the Scottish Government
Barns Ness to Wheat Stack Water Body 200038 information sheet	https://www.sepa.org.uk/data-visualisation/water-classification-hub (accessed 21/07/2022)	2022	SEPA for the Scottish Government
Wheat Stack to Berwick-upon-Tweed Water Body 200031 information sheet	https://www.sepa.org.uk/data-visualisation/water-classification-hub (accessed 21/07/2022)	2022	SEPA for the Scottish Government

19.6.3. IDENTIFICATION OF DESIGNATED SITES

13. All designated sites within the water quality study area, and qualifying interest features that could be affected by the construction, operation and maintenance, and decommissioning phases of the Proposed Development were identified using the three-step process described below:

- step 1: All designated sites of international, national and local importance within the water quality study area were identified using a number of sources. For SACs and SPAs, these sources included the JNCC Marine Protected Area (MPA) mapper and the Marine Scotland NMPi maps, and for WFD water dependent protected areas, including bathing water sites, the SEPA water classification hub, SEPA water bodies data sheets and SEPA bathing waters pages;
- step 2: Information was compiled on the relevant WFD water bodies and bathing water sites for each of these sites; and
- step 3: Using the above information and expert judgement, sites were included for further consideration if:
  - a designated site directly overlaps with the Proposed Development array area and the Proposed Development export cable corridor; and/or
  - sites and associated features were located within the potential Zone of Influence (ZoI) for impacts associated with the Proposed Development.

14. The ZoI for water quality was defined through physical processes modelling undertaken in volume 3, appendix 7.1. and followed that identified in volume 2, chapter 8. The ZoI identified designated sites within one tidal excursion (12 km) of the Proposed Development array area and Proposed Development export cable corridor and are therefore at the maximum range of the impacts of the Proposed Development. However, a precautionary approach has been taken, based on the largest ZoI estimated for receptors in the supporting chapters (see paragraph 3). The greatest of these is the ZoI for fish and shellfish ecology (volume 2, chapter 9) which is 25 km, or approximately two tidal excursions.

19.6.4. SITE-SPECIFIC SURVEY DATA

15. Table 19.11 summarises data used to inform the water quality assessment. Sampling of bathing water quality is undertaken by SEPA, and is conducted 18 times between 1 June and 15 September, in fulfilment

of WFD obligations as set out in Table 19.2, and sampling of sediment contamination was conducted as part of the benthic ecology assessment.

Table 19.11: Summary of Site-Specific Survey Data

Title	Extent of Survey	Overview of Survey	Survey Contractor	Date	Reference to Further Information
Sampling of water quality	WFD water bodies	Water sampling undertaken to assess status under WFD obligations. Sampling of water bodies here follows same programmes as for all water bodies.	SEPA	2020	https://www.sepa.org.uk/data-visualisation/water-classification-hub/
Sampling of bathing water	Designated Bathing Waters in area of Proposed Development export cable corridor	Water sampling to determine water quality at all (8) designated Bathing Waters that lie within the three WFD Water Bodies overlapping the Proposed Development export cable corridor	SEPA	2019-2020	https://www2.sepa.org.uk/bathingwaters/Locations.aspx
Benthic subtidal survey	Across the Proposed Development array area and Proposed Development export cable corridor	Grab samples, DDV sampling and epibenthic trawls, including analysis of sediment chemistry for contaminants.	Ocean Ecology Ltd.	2020	Section 3.4 of the Benthic Subtidal and Intertidal Ecology Technical Report (volume 3, appendix 8.1)

19.7. BASELINE ENVIRONMENT

19.7.2. OVERVIEW OF BASELINE ENVIRONMENT

Water Framework Water Bodies

16. The WFD establishes a legislative framework for the protection of surface waters (including rivers, lakes, transitional waters and coastal waters) and groundwater throughout the EU. Under the WFD, coastal waters, estuaries, rivers, man-made docks and canals are divided into a series of water bodies. Within each water body, the WFD sets ecological and chemical objectives. The aim of the WFD is for all water bodies identified in the WFD to achieve "good status" by 2015. This aim was not achieved in Scotland by 2015, but by 2021 87% of water bodies had achieved good status (Scottish Environment Protection Agency (SEPA), 2021). SEPA is aiming to maintain this, and to achieve, or return to, good status in 94% of waters by 2027 (SEPA, 2015). Under all conditions, it requires that there should be no deterioration in status of any water bodies.

17. The Proposed Development export cable corridor overlaps with two WFD water bodies (Barns Ness to Wheat Stack (ID: 200038) and Firth of Forth Outer - Offshore (ID: 20055) and lies within 25 km of two WFD water bodies (North Berwick to Barns Ness (ID: 200467) and Wheat Stack to Berwick-upon-Tweed (ID: 200031)). The most recent sampling results and status classifications available for these water bodies is 2020 (SEPA, 2022a), and details are presented in paragraphs 18 to 21. Locations of WFD water bodies and bathing locations with respect to the Proposed Development are illustrated in Figure 19.1.

18. The Barns Ness to Wheat Stack water body covers approximately 98.3 km^2, all of which lies within the water quality ZoI, and 13.5 km^2 of which overlaps with the Proposed Development export cable corridor. This water body had an overall status in 2020 of Good, with a water quality status of Good, an ecological status of Good and a physico-chemical status of High. The status of the water body has deteriorated from an overall High status in 2012 and has an objective of maintaining Good overall status by 2027. There are currently no pressures identified on this water body that would cause long term deterioration from Good status.

19. The Firth of Forth Outer - Offshore water body covers approximately 446.6 km^2, of which 31.0 km^2 overlaps with the Proposed Development export cable corridor, and 408.4 km^2 lies within the water quality ZoI. This water body had an overall status in 2020 of Good, with a water quality status of Good, an ecological status of Good and a physico-chemical status of High. The status of the water body has deteriorated from an overall High status in 2012 and has an objective of maintaining Good overall status by 2027. There are currently no pressures identified on this water body that would cause long-term deterioration from Good status.

20. The North Berwick to Barns Ness water body covers approximately 134.5 km^2, all of which lies within the water quality ZoI, and does not overlap with the Proposed Development export cable corridor. This water body had an overall status in 2020 of Good, which it has maintained since 2007, an ecological status of Good and a physico-chemical status of High. The water body has an objective of maintaining Good overall status by 2027, and there are currently no pressures identified on this water body that would cause a deterioration from Good status.

21. The Wheat Stack to Berwick-Upon-Tweed water body covers approximately 115.2 km^2, all of which lies within the water quality ZoI, and does not overlap with the Proposed Development export cable corridor. This water body had an overall status in 2020 of Good, with a water quality status of Good, an ecological status of Good and a physico-chemical status of High. The water body has an objective of maintaining Good overall status by 2027. There are currently no pressures identified on this water body that would cause long-term deterioration from Good status.

22. Maintaining and improving water quality in WFD water bodies is achieved via measures described in the river basin management plan for Scotland (SEPA, 2021), which include regulating new and existing discharges, abstractions, impoundments and engineering works in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

23. Assessment of the potential impacts of the Proposed Development upon hydromorphological, biological (habitats and fish), water quality, protected sites, and INNS receptors is considered in detail in volume 3, appendix 19.1.

European Commission Bathing Water Sampling Locations

24. The Bathing Water (Scotland) Regulations 2008 transpose Council Directive 2006/7/EC (the Bathing Water Directive) concerning the management of bathing water quality into Scottish law and reporting commenced in 2015.

25. Compliance with the Bathing Water Regulations is measured using two microbiological parameters: *Escherichia coli* (*E. coli*) and intestinal *Enterococci*, and bathing waters are classed as either poor, sufficient, good or excellent. The revised Bathing Water Directive introduces a new classification system with more stringent water quality standards, requiring all bathing waters to be classed as at least 'sufficient'. It also puts an emphasis on providing information to the public.

26. Eight European Commission (EC) bathing water sampling locations lie within 25 km of the Proposed Development export cable corridor. In the 2021 to 2022 sampling season one location (Eyemouth) was classified as Sufficient, two locations (Dunbar (East) and Dunbar (Belhaven)) were classified as Good and five locations (Thorntonloch, Whitesands, Pease Bay, Coldingham and Seacliff) were classified as Excellent (SEPA 2022b). There is no explicit statutory requirement for bathing waters to achieve or maintain a given status, but summary information on water quality status must be available to the public at bathing locations.

Onshore and intertidal

27. The Berwick Bank Wind Farm Onshore EIA (SSER, 2022a) considers the potential for pollution to enter inland watercourses, and the Thorntonloch Bathing Water indirectly, as a consequence of runoff from construction areas, chemical/fuel spills and untreated foul water discharge. This impact was assessed as having a negligible magnitude on a high sensitivity receptor (the WFD water bodies at 'Good' status) and considered to be of minor adverse significance, and the potential cumulative effects are considered in section 19.12.

28. The intertidal area is considered as part of the WFD assessment in volume 2, appendix 19 since WFD water bodies include the area up to MHWS. Direct impacts of the Proposed Development upon receptors in the intertidal area will be avoided due to the use of trenchless techniques resulting in no pathway for impacts to occur within this area. Further assessment will therefore not be required and information on this is presented in section 19.8.3.

19.7.3. DESIGNATED SITES

29. A number of designated sites identified for water quality receptors are located in the vicinity of the Proposed Development, and are described in Table 19.12 below and illustrated in Figure 19.1

Table 19.12: Designated Sites and Relevant Qualifying Interest Features for the Water Quality Chapter

Designated Site	Closest Distance to Proposed Development Array Area (km)	Closest Distance to Proposed Development Export Cable Corridor (km)	Relevant Qualifying Interest Feature(s)
Firth of Forth Banks Complex MPA (including the Berwick Bank, Scalp and Wee Bankie and Montrose Bank)	0	0	Ocean quahog *Arctica islandica* aggregations
Outer Firth of Forth and St Andrew's Bay Complex SPA	0	0	Non-breeding population Red-throated diver, Slavonian grebe and little gull, and breeding populations of Arctic tern and common tern (all Annex I species) present as qualifying feature, with other Annex I species present, though not as qualifying features.
River Tweed Special Area of Conservation (SAC)	48.00	10.50	Atlantic salmon *Salmo salar* present as primary reason for site selection. Sea lamprey and river lamprey present as a qualifying feature, but not a primary reason for site selection.
Firth of Forth Outer – Offshore Water Body (200055)	20.00	Overlap	All WFD water bodies within 25 km of the Proposed Development array area and Proposed Development export cable corridor meets the criteria for classification as Good status and has an objective to maintain Good status by 2027, in line with WFD obligations.
Barns Ness to Wheat Stack Water Body (200038)	20.00	Overlap	
North Berwick to Barns Ness Water Body (200467)	27.00	1.20	
Wheat Stack to Berwick-Upon-Tweed Water Body (200031)	33.00	3.50	
Bathing Water Site/Sampling Locations			**Current Classification**
Thorntonloch [UKS7616059]	44.14	1.60	Excellent
Whitesands [UKS7616062]	44.96	2.50	Excellent
Dunbar (East) [UKS7616018]	47.44	5.67	Good
Pease Bay [UKS7616041]	42.17	6.76	Excellent
Dunbar (Belhaven) [UKS7616017]	49.23	9.96	Good
Coldingham [UKS7616055]	34.96	12.86	Excellent
Seacliff [UKS7616082]	50.88	14.62	Excellent
Eyemouth [UKS7616022]	34.79	15.42	Sufficient

19.7.4. IMPORTANT ECOLOGICAL FEATURES

30. There are no Important Ecological Features (IEFs) appropriate to water quality specifically, within the ZoI. This has been determined in line with CIEEM guidelines which indicate that as the marine environment is sufficiently widespread and a highly dynamic habitat and is expected to remain viable and sustainable throughout the project, detailed assessment is not necessary (CIEEM, 2018). Deterioration of water quality is, however, a potential impact to benthic ecology, fish and shellfish ecology, and offshore and intertidal ornithology receptors. The IEFs appropriate to these topics are addressed fully in volume 2, chapters 8 , 9 and 11 respectively, and a summary of those features potentially affected by changes to water quality are detailed in Table 19.13.

Table 19.13: IEFs within the Water Quality Study Area

IEF	Scientific Name/Representative Species/Biotope	Importance	Justification
Benthic IEFs			
Seapens and burrowing megafauna	Muddy sediments with large burrow and seapens within the Proposed Development export cable corridor. • SS.SMu.CFiMu.SpnMeg.	National	OSPAR habitat, Scottish Priority Marine Feature (PMF), UK Biodiversity Action Plan (BAP) priority habitat
Sabellaria reef outside of an SAC	Low potential *Sabellaria* reef outside of an SAC • SS.SBR.PoR.SspiMx.	National	Representative of Annex I habitat, and Annex I habitat outside of an SAC, UK BAP priority habitat, OSPAR habitat
Ocean quahog	• *Arctica islandica.*	National	OSPAR protected species. Qualifying feature of the Firth of Forth Banks Complex MPA, Scottish PMF

IEF	Scientific Name/Representative Species/Biotope	Importance	Justification
Fish and Shellfish IEFs			
Marine fish species	• *Pleuronectes platessa;* • *Microstomus kitt;* • *Gadus morhua;* • *Melanogrammus aeglefinus;* • *Merlangius merlangus;* • *Pollachius virens;* • *Clupea harengus;* • *Scomber scombrus;* • *Sprattus sprattus;* • *Cetorhinus maximus;* • *Galeorhinus galeus;* • *Squalus acanthias;* and • *Dipturus batis.*	Local, regional and national importance	Nursery and spawning grounds identified throughout Proposed Development. Important prey species for fish, birds and marine mammals, and important commercial species. Some species listed as Vulnerable, Endangered or Critically Endangered on the International Union for the Conservation of Nature (IUCN) Red List
Shellfish species	• *Cancer pagurus;* • *Nephrops norvegicus;* • *Homarus gammarus;* • *Pecten maximus;* • *Necora puber;* and • *Margaritifera margaritifera.*	Local, regional and international importance.	Commercially important species, with spawning and nursery grounds present for some species. Freshwater pearl mussel *Margaritifera margaritifera* listed in Annexes II and V of the EU Habitats and Species Directive and Appendix III of the Bern Convention. Listed as Endangered on the IUCN Red List. Listed as qualifying features of a number of SACs in the vicinity of the Proposed Development.
Diadromous fish species	• *Salmo trutta;* • *Anguilla anguilla;* • *Petromyzon marinus;* • *Alosa fallax;* • *Alosa alosa;* and • *Salmo salar.*	National and international importance	Likely to migrate through the Proposed Development fish and shellfish ecology study area. Listed as OSPAR threatened/declining species. Not a feature of any designated sites in the vicinity of the Proposed Development. Sea lamprey *Petromyzon marinus* and Atlantic salmon *Salmo salar* are Annex II species and listed as qualifying features of a number of SACs in the vicinity of the Proposed Development. European eel *Anguilla anguilla* are listed as Critically Endangered on the IUCN Red List
Ornithology IEFs			
Non-breeding bird species	• Red throated diver *Gavia stellata*; • slavonian grebe *Podiceps auritus*; and • little gull *Hydrocoloeus minutus*.	National importance	Three non-breeding Annex 1 species (red-throated diver and Slavonian grebe) in nationally important numbers during winter. Together, these species contribute to a non-breeding waterfowl assemblage (divers, grebes and ducks) in excess of 30,500 birds, and a non-breeding seabird assemblage of over 100,000.
Breeding bird species	• common tern *Sterna hirundo*; and • arctic tern *Sterna paradisaea*.	National importance	Provides foraging areas for nationally important numbers of two breeding Annex I species. In addition, it supports important populations throughout the year of migratory seabirds, including seven species which breed at colonies within the site.

19.7.5. FUTURE BASELINE SCENARIO

31. The EIA Regulations (The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; The Marine Works (Environmental Impact Assessment) Regulations 2007; and The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017), require that "*a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without development as far as natural changes from the baseline scenario can be assessed with reasonable effort, on the basis of the availability of environmental information and scientific knowledge*" is included within the Offshore EIA Report for the Proposed Development.

32. In the event that the Proposed Development does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

33. The baseline environment for water quality is not static and will exhibit a degree of natural change over time. Such changes will occur with or without the Proposed Development in place due to natural variability and the impact of existing and future anthropogenic pressures (e.g. sewage storm discharge events, accidental release of pollutants into water catchments, coastal and offshore pollution events).

34. Future baseline conditions would also be altered by climate change, resulting in sea level rise and increased storminess, and this may have the effect of altering water quality both offshore at the Proposed Development array area and export cable corridor, and in coastal areas. Recent, current, and long term objectives for water quality indicators at WFD water bodies in the water quality study area are presented in Table 19.14, and these broadly involve the long-term maintenance of the current 'Good' and 'High' classifications across all categories.

Table 19.14: Recent and Current Classifications, and Future Objectives, for WFD Water Bodies

WFD Water Body	Classification Criteria	Assessment Year/Period			
		2014	2021	2027	Long Term
Firth of Forth Outer - Offshore	Overall	Good	Good	Good	Good
	Physical condition	High	High	High	High
	Freedom from INNS	High	High	High	High
	Water quality	Good	Good	Good	Good
Wheat Stack to Berwick-upon-Tweed	Overall	Good	Good	Good	Good
	Physical condition	High	High	High	High
	Freedom from INNS	High	High	High	High
	Water quality	Good	Good	Good	Good
Barns Ness to Wheat Stack	Overall	Good	Good	Good	Good
	Physical condition	High	High	High	High
	Freedom from INNS	High	High	High	High
	Water quality	Good	Good	Good	Good
North Berwick to Barns Ness	Overall	Good	Good	Good	Good
	Physical condition	High	High	High	High
	Freedom from INNS	High	High	High	High
	Water quality	Good	Good	Good	Good

35. The criteria for inclusion of designated sites in the water quality assessment do not entirely coincide with the criteria on which the WFD assessment in volume 2, appendix 19 is based. The designated sites considered for each, and, where appropriate, the justification for their omission are summarised in Table 19.15.

Table 19.15: Differences in designated sites corresponding between water quality assessment and WFD assessment

Designated site	Water quality assessment	WFD assessment	Reason for omission
WFD water bodies			
Firth of Forth Outer – Offshore	Included	**Not included**	WFD assessment considers water bodies within 1 nm of land. This water body lies outside this boundary
Wheat Stack to Berwick-upon-Tweed	Included	Included	n/a
Barns Ness to Wheat Stack	Included	Included	n/a
North Berwick to Barns Ness	Included	Included	n/a
Protected areas			
Firth of Forth Banks Complex MPA	Included	**Not included**	WFD assessment considers protected areas within water bodies 1 nm from land. This MPA lies outside of the water bodies considered in the WFD assessment.

19.7.6. DATA LIMITATIONS AND ASSUMPTIONS

The water quality study area has been the focus of study for both academic and government institutions, and coincides with a number of designated sites, which contain a range of biological, physical and geological qualifying features. In particular for water quality, regular monitoring of WFD water bodies and bathing water sampling locations under the statutory obligations of the WFD and the Bathing Water Directive (as transposed into Scottish law) have ensured a largely continuous water quality dataset since 2007, covering a broad range of physical, chemical and biological parameters. It is therefore considered that the baseline data employed with respect to water quality measures are robust and sufficient for the purposes of the assessment of effects presented.

19.8. KEY PARAMETERS FOR ASSESSMENT

19.8.2. MAXIMUM DESIGN SCENARIO

36. The maximum design scenarios identified in Table 19.16 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in volume 1, chapter 3 of the Offshore EIA Report. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here, be taken forward in the final design scheme.

Table 19.16: Maximum Design Scenario Considered for Each Impact as Part of the Assessment of Likely Significant Effects on Water Quality

Potential Impact	Phase[1]			Maximum Design Scenario	Justification
	C	O	D		
Increased risk of introduction and spread INNS	✓	✓	✓	**Construction Phase** Increased risk of introduction and colonisation by INNS due to: • up to 11,484 vessel round trips during the construction phase; and • maximum duration of the offshore construction phase is up to 96 months. **Operation and Maintenance Phase** Long term creation of potential INNS habitat of up to 10,198,971 m^2 due to: • presence of up to 307 wind turbines and 10 Offshore Substation Platforms (OSPs)/Offshore convertor station platforms on jacket foundations; • presence of scour protection associated with wind turbines and OSPs/Offshore convertor station platforms; • presence of cable protection associated with up to 1,225 km of inter-array cables, up to 94 km of interconnector cables and up to 872 km of offshore export cables. Assumes up to 15% of inter-array, OSP/Offshore convertor station platform interconnector and offshore export cables may require cable protection; • up to 2,324 vessel round trips per year; and • operation and maintenance phase of up to 35 years. **Decommissioning Phase** Increased risk of INNS due to: • as above for vessel round trips during the construction phase; and • habitat creation of up to 7,493,186 m2 due to presence of scour protection and cable protection, including cable protection for cable crossings, which may be left *in situ*.	**Construction and Operation and Maintenance Phases** The greatest risk of introduction of INNS as a result of the Proposed Development will be as a result of: • maximum number of wind turbines and OSP/Offshore convertor station platforms foundations and associated scour protection, maximum length of offshore export cables and cable protection resulting in greatest surface area for colonisation; and • maximum number of vessel movements during construction, operation and maintenance and decommissioning phases. The estimate of habitat creation from the presence of foundations has been calculated as if the foundations were a solid structure. This is, therefore, a conservative estimate of habitat creation on the basis that the jacket foundations will have a lattice design rather than a solid surface, as has been assumed. **Decommissioning Phase** Maximum design scenario assumes removal of foundations, offshore export cables, scour protection and cable protection, where it is possible to do so. This will be confirmed at the time of decommissioning following the most up to date and best available guidance. If any additional infrastructure is decommissioned, this will result in a reduced area of habitat, and lower risk of INNS. Greatest amount of cable and scour protection resulting in the largest area of infrastructure, assumed to be left *in situ* after decommissioning.
Accidental release of lubricants, chemicals or similar	✓	✓	✓	**Construction Phase** Synthetic compound, heavy metal and hydrocarbon contamination resulting from accidental release or spills of construction, operation or maintenance materials or chemicals. Construction of up to 179 wind turbines, and eight OSPs/Offshore convertor station platforms will entail up to 11,484 vessel round trips during the construction phase, and require transfer and storage of a total[2] of: • 1,162,400 litres of diesel fuel; • 180,790 litres of grease; • 2,456,775 litres of synthetic oil; • 217,485 litres of hydraulic oil; • 429,600 litres of gear oil; • 14,499,000 litres liquid nitrogen; • 4,027,500 litres water/glycerol • 384,000 litres transformer coolant oil;	Maximum number of vessel movements during construction, operation and maintenance and decommissioning phases. **Construction Phase** Quantities of chemicals and lubricants are given for the scenario in which the greater volumes would be required (see volume 1, chapter 3). In every case, quantities are greater for the 179 wind turbine scenario. Volumes and masses of chemicals, lubricants or similar are indicative values and are subject to revision, dependent upon wind turbine design. All compounds will be contained within the wind turbines and unlikely to be discharged into the marine environment as any leak will be contained within the nacelle. **Operation and Maintenance Phase** The risk of accidental release of lubricants, chemicals or similar is managed by the implementation of measures set out in standard post consent plans (Code of Construction Practice (CoCP), Environmental Management Plan (EMP), including Marine Pollution

[1] C = Construction, O = Operation and maintenance, D = Decommissioning

[2] Volumes and masses of chemicals, lubricants or similar are indicative values only and are subject to revision, dependent upon wind turbine design. All compounds will be contained within the wind turbines and unlikely to be discharged into the marine environment as any leak will be contained within the nacelle.

Potential Impact	Phase[1] C	O	D	Maximum Design Scenario	Justification
				• 724,950 litres glycol/coolants; • 1,432 kg of SF6 (value for wind turbine: OSP/Offshore convertor station platforms value not available); • UPS batteries; • fire suppression systems; • High Voltage Alternating Current (HVAC) coolant; and • maximum duration of the offshore construction phase is up to 96 months **Operation and Maintenance Phase** As for construction phase, contamination resulting from the accidental leakage of chemicals and lubricants listed above. Accidental pollution may also result from up to 2,324 round trips by operation and maintenance vessels (including crew supply vessels and jack-up vessels) per year. • operation and maintenance phase of up to 35 years. **Decommissioning Phase** Accidental pollution may result from the use of jack-up vessels during foundation decommissioning, with up to one jack-up event per wind turbine and one jack-up event per OSP/Offshore convertor station platform, and during the removal of inter-array, OSP/Offshore convertor station platform interconnector and offshore export cables.	Contingency Plan (MPCP) and Pollution Prevention Plan, and are presented in volume 3, appendix 6.2). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), International Maritime Organisation (IMO) and International Convention for the Prevention of Pollution from Ships (MARPOL) guidelines for preventing pollution at sea. **Decommissioning Phase** Maximum design scenario for accidental pollution events assumes decommissioning will involve removal of all foundations and array, OSP/Offshore convertor station platform interconnector and offshore export cables, requiring maximum number of decommissioning vessel trips.
Operational painting, and cleaning of marine growth	×	✓	×	**Operation and Maintenance Phase** Cleaning operations will occur during maintenance visits and would comprise: • ad-hoc pressure-washing of marine growth and guano from the foundations, transition pieces and associated secondary steelwork; • visit frequency likely to be no more than twice per year; and • likely to be concentrated on boat landing fenders. Painting operations will require access by a small team and is likely to require: • application of paint or other coatings to protect the foundations from corrosion (internal/external), including surface preparation; and • to be carried out during other works, likely 10% of foundations (both wind turbines and OSPs/Offshore convertor station platforms) a year. Operation and maintenance phase of up to 35 years.	**Operation and Maintenance Phase** The maximum design scenario assumes that cleaning and painting works will be required for the full duration of the operation and maintenance phase, and that the risk of pollution events from cleaning and painting works is managed by the implementation of measures set out in standard post consent plans (CoCP, EMP, including MPCP and Pollution Prevention Plan). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), IMO and MARPOL guidelines for preventing pollution at sea.
Deterioration of water quality from cable and landfall works	✓	×	✓	**Construction Phase** Landfall works: The offshore export cables will make landfall at Skateraw, comprising: • installation of offshore export cables at the landfall via trenchless burial techniques; • up to 8 exit punches out, each 20 x 5 m, for up to 8 cable ducts due to trenchless cable installation in the intertidal; and • exit punches out located between 488 m and 1,500 m from MHWS.	**Construction Phase** Offshore export cables trenching modelling assumes sediment release along the Proposed Development export cable corridor to the nearshore point at which a continuous rock outcrop is encountered. The maximum design scenario assumes that cable installation in the intertidal area will involve trenchless techniques only. It is assumed that the footprint of the trenchless technique (e.g. Horizontal Directional Drilling (HDD)) exit punches out within the subtidal area are within the width of disturbance assumed for offshore export cables installation. The maximum design scenario for exit punch out is based on 8 HVAC circuits (8 cables).

Potential Impact	Phase[1] C	O	D	Maximum Design Scenario	Justification
				Offshore export cables landfall installation works have potential for impacting hydrodynamics, sediment transport and beach morphology in the vicinity of designated bathing sites, Total duration of two non-concurrent schemes of landfall works is estimated to be 15 months. Seabed preparation: • boulder and sandwave clearance; • sandwaves may be cleared to a width of 25 m, average height 5 m and clearance along circa 20% of the Proposed Development export cable corridor length (174.4 km) and 30% of the Proposed Development inter-array and interconnector cable lengths (295 km); and • modelling and assessment assumed a dredge and disposal technique is used to redistribute material within the Proposed Development application boundary. Cable installation: • offshore export cables length up to 872 km; • inter-array cables length up to 1,225 km; • interconnector cables length up to 94 km; • installation using jet trenching which mobilises material from a depth of up to 3 m deep in a trench of up to 2 m wide; • Maximum 120 m seabed width affected by installation (15 m per cable); and modelling assumes that the Proposed Development array area and Proposed Development export cable corridor extend over areas of sand suitable for jetting (i.e. which mobilises the greatest volume of sediment throughout the water column). **Decommissioning Phase** As for construction phase, decommissioning activities have the potential to impact on the bathing water quality at the nearshore via modification of: • hydrodynamics; • sediment transport; and • beach morphology.	*Seabed preparation* Site clearance activities may be undertaken using a range of techniques, the suction hopper dredging has the potential to cause the greatest increase in suspended sediment and largest plume extent as material is released near the water surface and has therefore been considered as the maximum design scenario. *Cable installation* Cable routes include a variety of seabed material and in some areas 3 m depth may not be achieved or may be of a coarser nature which settles in the vicinity of the offshore cable route therefore the assessment provides the upper bound in terms of suspended sediment and dispersion potential. Ploughing (and to a certain extent jetting) moves material rather than bringing it fully into suspension therefore the assumption that the seabed is fluidised presents the maximum design scenario. The inter-array modelling was carried out for a section of an indicative offshore cable route which would have the widest impact (i.e. where the tidal currents are strongest and material brought into suspension will be carried the furthest). Interconnector cable trenching characteristics are the same as those for inter-array cable trenching therefore magnitude of impacts are quantified within the indicative section of trenching modelled. Offshore export cables trenching modelling assumes sediment release along the Proposed Development export cable corridor to the nearshore point at which a continuous rock outcrop is encountered. **Decommissioning Phase** Maximum design scenario assumes complete removal of all infrastructure. If any infrastructure is left *in situ* this will reduce the severity of bathing water quality deterioration during decommissioning.

19.8.3. IMPACTS SCOPED OUT OF THE ASSESSMENT

37. On the basis of the baseline environment (see section 19.7), and the project description outlined in volume 1, chapter 3 of the Offshore EIA Report, a number of impacts have been scoped out of the assessment for water quality. These impacts are outlined, together with a justification for scoping them out, in Table 19.17. Discussions with consultees about the scoping of these impacts that took place after the publication of the Berwick Bank Wind Farm Scoping Opinion (MS-LOT, 2022) are included in the Audit Document for Post-Scoping Discussions (volume 3, appendix 5.1).

Table 19.17: Impacts Scoped Out of the Assessment for Water Quality (tick confirms the impact is scoped out)

Potential Impact	Phase[3]			Justification
	C	O	D	
Impacts from the release of sediment bound contaminants	✓	✓	✓	Seabed disturbance associated with construction, maintenance and decommissioning activities (e.g. foundation and cable installation) could lead to the remobilisation of sediment-bound contaminants that may result in harmful and adverse effects on benthic communities. Due to the limited historic oil and gas activities in the regional benthic subtidal and intertidal ecology study area, the nature of the sediments present (i.e. low levels of fines) and the large distance from shore which suggests a limited input from terrestrial sources, the risk of sediment bound contaminants being present in concentrations likely to be harmful to benthic receptors is considered to be low. Site-specific sediment chemistry sampling has been undertaken across the Proposed Development array area and Proposed Development export corridor during subtidal sampling. No contaminants were found to exceed AL1/AL2 or the Canadian PEL with only arsenic at five sample stations within the north of the Proposed Development array area exceeding Canadian TEL. As discussed, with the Statutory Nature Conservation Bodies (SNCBs) via the Road Map process, on this basis, this impact has been scoped out of further consideration within the water quality Offshore EIA Report chapter.
Impacts on intertidal areas	✓	✓	✓	Due to minimal works associated with the Proposed Development boundary in intertidal areas (i.e. all offshore export cables will be installed via trenchless technology, avoiding direct impacts on the intertidal) which may be utilised by fish and shellfish IEFs, and the relatively low importance of this area for the fish and shellfish IEFs, impacts on intertidal habitats have been scoped out and will not be assessed further.

[3] C = Construction, O = Operation and maintenance, D = Decommissioning

19.9. METHODOLOGY FOR ASSESSMENT OF EFFECTS

19.9.2. OVERVIEW

38. The water quality assessment of effects has followed the methodology set out in volume 1, chapter 6 of the Offshore EIA Report. Specific to the water quality assessment, the following guidance documents have also been considered:

- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2018);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008); and
- Clearing the Waters For All: Guidance on WFD assessment: estuarine and coastal waters (Environment Agency, 2017).

39. In addition, the water quality assessment of effects has considered the legislative framework as defined by:

- Marine Strategy Regulations 2010;
- Bathing Waters (Scotland) Regulations 2008;
- Water Environment and Water Services (Scotland) Act 2003; and
- Conservation (Natural Habitats, &c.) Regulations 1994.

19.9.3. CRITERIA FOR ASSESSMENT OF EFFECTS

40. The process for determining the significance of effects is a two-stage process that involves defining the magnitude of the potential impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in volume 1, chapter 6 of the Offshore EIA Report.

41. The criteria for defining magnitude in this chapter are outlined in Table 19.18. When defining the magnitude of an impact, factors such as the duration, frequency, spatial extent and reversibility of the impact have been taken into account.

42. The criteria for defining magnitude in this chapter are outlined in Table 19.18. In determining magnitude within this chapter, each assessment considered the spatial extent, duration, frequency and reversibility of impact and these are outlined within the magnitude section of each assessment of effect (e.g. a duration of hours or days would be considered for most receptors to be of short term duration, which is likely to result in a low magnitude of impact).

Table 19.18: Definition of Terms Relating to the Magnitude of an Impact

Magnitude of Impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse)
	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial)
Medium	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements (Adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial)
Low	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements (Adverse)
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of adverse impact occurring (Beneficial)
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse)
	Very minor benefit to, or beneficial addition of one or more characteristics, features or elements (Beneficial)

43. The criteria for defining sensitivity in this chapter are outlined in Table 19.19.

Table 19.19: Definition of Terms Relating to the Sensitivity of the Receptor

Value (Sensitivity of the Receptor)	Description
Very High	Nationally and internationally important receptors with high vulnerability and low to no recoverability.
High	Regionally important receptors with high vulnerability and no ability to recover.
Medium	Nationally and internationally important receptors with medium vulnerability and medium recoverability. Regionally important receptors with medium to high vulnerability and low recoverability. Locally important receptors with high vulnerability and no ability to recover.
Low	Nationally and internationally important receptors with low vulnerability and high recoverability. Regionally important receptors with low vulnerability and medium to high recoverability. Locally important receptors with medium to high vulnerability and low recoverability.
Negligible	Locally important receptors with low vulnerability and medium to high recoverability.
	Receptor is not vulnerable to impacts regardless of value/importance.

44. The significance of the effect upon water quality is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 19.20.

45. In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e. the range is given as minor to moderate). In such cases the final significance conclusion is based upon the author's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case. Where professional judgement is applied to quantify final significance from a range, the assessment will set out the factors that result in the final assessment of significance. These factors may include the likelihood that an effect will occur, data certainty and relevant information about the wider environmental context.

46. For the purposes of this assessment:

- a level of residual effect of moderate or more will be considered a 'significant' effect in terms of the EIA Regulations; and
- a level of residual effect of minor or less will be considered 'not significant' in terms of the EIA Regulations.

47. Effects of moderate significance or above are therefore considered important in the decision-making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process.

Table 19.20: Matrix Used for the Assessment of the Significance of The Effect

Sensitivity of Receptor	Magnitude of Impact: Negligible	Low	Medium	High
Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor
Low	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate
Medium	Negligible to Minor	Minor	Moderate	Moderate to Major
High	Minor	Minor to Moderate	Moderate to Major	Major
Very High	Minor	Moderate to Major	Major	Major

19.9.4. DESIGNATED SITES

48. Where Natura 2000 sites (i.e. nature conservation sites in Europe designated under the Habitats or Birds Directives[4]) or sites in the UK that comprise the National Site Network (collectively termed 'European sites')

[4] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

are considered, this chapter makes an assessment of the likely significant effects in EIA terms on the qualifying interest feature(s) of these sites as described within section 19.7.3 of this chapter. The assessment of the potential impacts on the site is deferred to the RIAA (SSER,2022c) for the Proposed Development). A summary of the outcomes reported in the RIAA is provided in section 19.15 of this chapter.

49. With respect to locally designated sites and national designations (other than European sites), where these sites fall within the boundaries of a European site and where qualifying interest features are the same, only the features of the European site have been taken forward for assessment. This is because potential impacts on the integrity and conservation status of the locally or nationally designated site are assumed to be inherent within the assessment of the features of the European site (i.e. a separate assessment for the local or national site is not undertaken). However, where a local or nationally designated site falls outside the boundaries of a European site, but within the water quality study area, an assessment of the likely significant effects on the overall site is made in this chapter using the EIA methodology.

50. No European sites have been designated with water quality as a qualifying feature, but where European sites within 25 km of the Proposed Development array area and Proposed Development export cable corridor have been designated on the basis of relevant qualifying features for which changes to water quality may have a direct effect (i.e. fish and shellfish ecology and benthic ecology), these sites, and their relevant qualifying features, are included in Table 19.13.

19.10. MEASURES ADOPTED AS PART OF THE PROPOSED DEVELOPMENT

51. As part of the project design process, a number of measures have been proposed to reduce the potential for impacts on water quality (see Table 19.21). As there is a commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development and have therefore been considered in the assessment presented in section 19.11 (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 19.21: Designed In Measures Adopted as Part of the Proposed Development

Designed In Measures Adopted as Part of the Proposed Development	Justification
An EMP will be prepared and implemented during the construction, operation and maintenance and decommissioning phases of the Proposed Development. The EMP will include Proposed Development mitigation/monitoring measures and commitments and a MPCP which will include key emergency contact details (e.g. SEPA).	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and maintenance and decommissioning plant is minimised. These will likely include: designated areas for refuelling where spillages can be easily contained, storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, double skinning of pipes and tanks containing hazardous substances, and storage of these substances in impenetrable bunds.
CoCP	These measures have been identified during the design of the onshore and intertidal elements of the Proposed Development as part of the EIA process. They include strategies, control measures and monitoring procedures for managing the potential environmental impacts of constructing the Proposed Development and limiting disturbance from construction activities as far as reasonably practicable.
Decommissioning Plan	The aim of this plan is to adhere to the existing Scottish and international legislation and guidance, with decommissioning industry practice applied. Overall, this will ensure the legacy of the Proposed Development will reduce the amount of long-term disturbance to the environment so far as reasonably practicable.
An INNS Management Plan will be implemented and is included in the EMP (see volume 4, appendix 22, annex B). The plan outlines measures to ensure vessels comply with the IMO ballast water management guidelines (IMO, 2004), it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded.	To manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable.
MPCP	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and decommissioning plant is minimised. These will likely include: designated areas for refuelling where spillages can be easily contained; only using chemicals included on the approved Centre for Environment Fisheries and Aquaculture Science (Cefas) list under the Offshore Chemical Regulations 2002; storage of these in secure designated areas in line with appropriate regulations and guidelines; double skinning of pipes and tanks containing hazardous substances; and storage of these substances in impenetrable bunds. In this manner, the potential for release of contaminants from rigs and supply/service vessels will be strictly controlled, thus providing protection for marine life across all phases of the offshore wind farm development.
Suitable implementation and monitoring of cable protection (via burial, or external protection where, adequate burial depth as identified via risk assessment is not feasible)	The mobile nature of sedimentary environments found in the Proposed Development benthic subtidal and intertidal ecology study area could result in the exposure of previously buried infrastructure such as array, OSP/Offshore convertor station platform interconnector and offshore export cables. Monitoring these features ensures that repair and reburial are done efficiently so that no more than the declared amount of new hard substrate habitat is created, and this infrastructure doesn't cause unnecessary damage to the environment.
Only drilling fluids that are on the Poses Little or No Risk to the environment (PLONOR) list (), the list is controlled and maintained by Cefas, will be used.	Due to the direction of the trenchless cable landfall being constructed from onshore to offshore there will be a potential interface between the sea and the drill fluids during physical punch out of the exit punches out associated with the selected trenchless technique (e.g. HDD). Small quantities of drill fluids may be released. To limit potential environmental damage only PLONOR listed drilling fluid will be used.

19.11. ASSESSMENT OF SIGNIFICANCE

52. The potential impacts arising from the construction, operation and maintenance and decommissioning phases of the Proposed Development are listed in Table 19.16, along with the maximum design scenario against which each impact has been assessed.

53. An assessment of the likely significance of the effects of the Proposed Development on water quality receptors as a result of the identified impacts is given below.

54. The impacts of increased suspended sediment concentration (SSC) and hydrodynamics are assessed in the physical processes chapter (volume 2, chapter 7), and the impact of release of seabed contamination is considered in the benthic ecology chapter (volume 2, chapter 8).

INCREASED RISK OF INTRODUCTION AND SPREAD OF INVASIVE AND NON-NATIVE SPECIES

55. The risk of introduction and spread of INNS during the construction, operation and maintenance and decommissioning phases has been considered in this assessment.

56. INNS within the Proposed Development area may increase during the construction, operation and maintenance, and decommissioning phases as detailed in Table 19.16.

57. Introduction of INNS can result from activities involving any vessel, including installation, survey, crew transfer, and cable repair vessels, entering the Proposed Development area.

58. Colonisation by INNS can result during and after installation of hard substrates that may create suitable habitat, including foundation and scouring protection for wind turbines and OSPs/Offshore convertor station platforms, and cable protection.

Construction Phase

Magnitude of Impact

59. The installation of hard substrates and the presence of construction vessels may lead to an increased risk of introduction and spread of INNS. The maximum design scenario is represented by up to 11,484 vessel round trips during the construction phase, which will occur over a maximum duration of up to 96 months (Table 19.16).

60. There are a number of existing vessel movements occurring within the Proposed Development area area, including cargo vessels, tankers, fishing vessels, recreational vessels and service vessels (volume 3, appendix 13.1). The baseline identified in volume 3, appendix 13.1 identified an average of 14 unique vessel movements per day over a 14-day survey period in August 2022 within a 10 nm buffer around the Proposed Development array area (hereinafter, the Proposed Development shipping and navigation study area). Cargo vessels, tankers and commercial fishing vessels were the most common vessel type. The vessel traffic survey of August 2022 showed an average of three to four vessels intersecting the Proposed Development array area per day, over summer. Throughout the 14-day period, a maximum of 25 vessels were recorded within the Proposed Development array shipping and navigation study area over one day. Provided the INNS provisions of the EMP are implemented, the additional vessels associated with the Proposed Development are unlikely to significantly add to the risk of introduction and spread of INNS.

61. As presented in Table 19.16, the risk of introduction and spread of INNS will be increased due to the creation of 10,198,971 m^2 of hard substrate from the installation of jacket foundations, associated scour protection and any cable protection. There are already natural hard substrates within the vicinity of the Proposed Development array area and offshore Proposed Development export cable corridor (e.g. moderate energy subtidal rock, cobble/stony reefs, and rocky reefs in the nearshore section of the Proposed Development export cable corridor). Furthermore, there are pre-existing wind turbine foundations from Seagreen as well as the Neart na Gaoithe and Inch Cape projects currently under construction.

62. There are multiple marine INNS that are now widespread and well established in Scotland. Some of which have been reported in the Firth of Forth as well as the surrounding area (based on NBN Atlas data) and therefore have the potential to colonise the Proposed Development infrastructure and surrounding area. These include Japanese skeleton shrimp *Caprella mutica* (MSS, 2020), carpet sea-squirt *Didemnum vexillum*, green sea fingers *Codium fragile subsp. fragile*, wakame *Undaria pinnatifida* and wire weed *Sargassum muticum* (NatureScot, 2021).

63. There are several other marine INNS which are of only patchy distribution or are currently only known from the rest of the UK. These include American lobster *Homarus americanus*, Pacific oyster *Crassostrea gigas,* Chinese mitten crab *Eriocheir sinensis,* and slipper limpet *Crepidula fornicata* (NatureScot, 2021).

64. The vessels used for construction will largely be local therefore the introduction of species from outside the region is unlikely. Some of the species already in the region however are known to spread as fouling on ships hulls which could introduce then to the Proposed Development array area and Proposed Development export cable corridor, including wakame, green sea fingers and carpet sea-squirt (Beveridge *et al*., 2011; CABI, 2019).

65. As set out in Table 19.21, an INNS Management Plan and EMP (see volume 4, appendix 22), which will include measures such as ensuring any new infrastructure coming from another marine environment are cleaned and checked prior to installation and that vessels comply with the IMO ballast water management guidelines will be developed and adhered to for the Proposed Development. This will ensure that the risk of potential introduction and spread of INNS will be minimised.

66. The latest post-construction monitoring data from the Beatrice Offshore Wind Farm (APEM, 2021) found no evidence for the presence of INNS on turbine foundations following the presence of installation vessels from international ports, which is evidence to suggest that the introduction of structure such as offshore wind turbine foundation into the benthic environment doesn't necessarily lead to the spread of INNS in Scottish waters.

67. There is no evidence to suggest that INNS are likely to cause a detrimental effect upon water quality, and in some cases have been found to improve water quality, for example by increasing water clarity and decreasing *E. coli* densities of sewage-enriched water (Neves *et al*., 2020).

68. The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible.

Sensitivity of the Receptor

69. All WFD water bodies within 25 km of the Proposed Development are currently classified by SEPA as High for freedom from INNS, and in the long term all water bodies have the objective to maintain this classification. INNS are already widespread within the Firth of Forth, and these objectives have been established in this context, and in the context of the existing offshore wind farm project detailed in Table 19.23. Maintaining a High classification for freedom for INNS for all WFD waterbodies will be contingent upon successful implementation by construction vessels of the INNS provisions contained within the EMP.

70. The risk of introduction and spread of INNS is unlikely to be an impact on bathing water sampling locations as INNS are not a criterion on which bathing water status is classified.

71. Areas of water in the water quality study area which are not classified as WFD water bodies or as a bathing site (i.e. the remainder of the water quality study area), are expected to be of comparable sensitivity. This is especially true where the water quality study area coincides with the Firth of Forth Banks Complex MPA.

72. These water quality receptors have been considered individually and are all deemed to be of negligible vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore considered to be low.

Significance of the Effect

73. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the water quality receptors is considered to be low. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

74. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Operation and Maintenance Phase

Magnitude of Impact

75. Following the construction phase when hard substrates required for colonisation by INNS are present, the movement of operation and maintenance vessels may lead to an increased risk of introduction and spread of INNS. The maximum design scenario is represented by up to 2,324 vessels round trips per year during the operation and maintenance phase (Table 19.16) which is a reduction from the construction phase. Furthermore, the long term creation of 10,198,971 m^2 hard substrate, in the form of jacket foundations, associated scour protection and cable protection, has the potential to contribute to the introduction and spread of INNS. The estimate for habitat creation is considered to be conservative as the lattice nature of jacket foundations will result in a smaller area of habitat created than has been assumed for a foundation with solid sides.

76. The removal of encrusted growth may also occur during the operation and maintenance phase; however, no quantitative assessment can be made as the volume of encrusting is not known. Removal of marine growth has the potential to release invasive species if these have colonised hard structures of the Proposed Development, or if the materials and equipment used in the process have not been properly cleaned after use at a previous location that may have had invasive species present. To control this however, an invasive species management plan has been introduced to reduce the transmission of species through actions involved in the various phases of the Proposed Development (Table 19.21).

77. Details of INNS of concern in this region of Scotland are as outlined previously in paragraphs 62 and 63.

78. As set out in Table 19.21, an INNS Management Plan and EMP (see volume 4, appendix 22), which will include measures such as ensuring any new infrastructure coming from another marine environment are cleaned and checked prior to installation and that vessels comply with the IMO ballast water management guidelines will be developed and adhered to for the Proposed Development. This will ensure that the risk of potential introduction and spread of INNS will be minimised.

79. The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore considered to be negligible.

Sensitivity of the Receptor

80. The water quality receptors described in paragraphs 69 to 71 have been assessed individually and are considered to be of similar sensitivity. Taking into account successful implementation by maintenance vessels of the INNS provisions contained within the EMP, and based upon the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents) in reducing the likelihood of INNS colonisation, and professional judgement, all the receptors are deemed to be of medium vulnerability, low recoverability and high value. The sensitivity of the receptors is therefore, considered to be low.

Significance of the Effect

81. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptors is considered to be low. The effect for all receptors will, therefore, be of **negligible to minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

82. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Decommissioning Phase

Magnitude of Impact

83. The presence of decommissioning vessels may lead to an increased risk of introduction and spread of INNS. The maximum design scenario for the decommissioning phase contains the same activities as the construction phase (Table 19.16). It may be decided closer to the time that removal of cables, cable protection and scour protection may result in greater environmental impacts, however the maximum design scenario assumes that the cables, cable protection and scour protection will be removed following completion of the operation and maintenance phase representing a reduced potential habitat for INNS.

84. As set out in Table 19.21, an INNS Management Plan and EMP (see volume 4, appendix 22), which will include measures such as ensuring any new infrastructure coming from another marine environment are cleaned and checked prior to installation and that vessels comply with the IMO ballast water management guidelines will be developed and adhered to for the Proposed Development. This will ensure that the risk of potential introduction and spread of INNS will be minimised.

85. The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore considered to be negligible.

Sensitivity of the Receptor

86. The water quality receptors described in paragraphs 69 to 71 have been assessed individually and are considered to be of similar sensitivity. Taking into account successful implementation by decommissioning vessels of the INNS provisions contained within the EMP, and based upon the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents) in reducing the likelihood of INNS colonisation, and professional judgement, the receptors are deemed to be of negligible vulnerability, high recoverability and high value. The sensitivity of the receptors is therefore, considered to be low.

Significance of the Effect

87. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptors is low. The effect for all receptors will, therefore, be of **negligible to minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

88. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

ACCIDENTAL RELEASE OF LUBRICANTS, CHEMICALS OR SIMILAR

89. The accidental release of lubricants, chemicals or similar during the construction, operation and maintenance and decommissioning phases has been considered in this assessment.

90. Accidental release of lubricants, chemicals or similar within the water quality study area may increase during the construction, operation and maintenance, and decommissioning phase (Table 19.16).

91. Accidental release of lubricants, chemicals or similar can result from activities involving any vessel, including survey, installation, crew transfer, maintenance, and cable repair vessels, entering the Proposed Development area.

92. Accidental release of lubricants, chemicals or similar can result during and after installation of wind turbines and OSPs/Offshore convertor station platforms that require lubricants, chemicals or similar as part of normal operating conditions, and from scheduled and unscheduled maintenance operations.

Construction Phase

Magnitude of Impact

93. The installation of wind turbines, inter-array cables, offshore export cables and OSPs/Offshore convertor station platforms may lead to an increased risk of accidental release of lubricants, chemicals or similar. The maximum design scenario is represented by up to 10,484 vessel round trips per year during the construction phase, which will occur over a maximum of 96 months (Table 19.4).

94. There are a number of existing vessel movements occurring within the Proposed Development array area, including cargo vessels, tankers, fishing vessels, recreational vessels, and service vessels (volume 3, appendix 13.1). The baseline identified in volume 3, appendix 13.1 recognised 14 unique vessel movements per day over the summer survey period and 16 per day in the winter period in the Proposed Development array area: cargo vessels, tankers and commercial fishing vessels were the most common vessel type. 24 unique vessel movements per day were identified over the survey period in the Proposed Development export cable corridor shipping and navigation study area for the summer period, and 18 per day in the winter period. Therefore, the additional vessels associated with the construction phase of the Proposed Development (i.e. 29 per day) are unlikely to increase the risk of accidental release of lubricants, chemicals or similar.

95. As set out in Table 19.21, an MPCP and EMP will be implemented, which will include measures to reduce the risk of accidental release resulting from transfer of lubricants, chemicals or similar to wind turbines and OSPs/Offshore convertor station platforms, and in the event of accidental release ensure their containment and avoid discharge to the marine environment. Control measures are included in the draft MPCP (volume 4, appendix 22) which will be finalised during consultation with MS-LOT.

96. The impact is predicted to be of local spatial extent, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of the Receptor

97. The water quality receptors described in paragraphs 69 to 71 have been assessed individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore considered to be medium.

Significance of the Effect

98. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

99. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Operation and Maintenance Phase

Magnitude of Impact

100. The presence of operation and maintenance vessels may lead to an increased risk of accidental release of lubricants, chemicals or similar. The maximum design scenario is represented by up to 2,324 vessels round trips per year during the operation and maintenance phase (Table 19.16) which is a reduction from the construction phase.

101. As set out in Table 19.21, an MPCP and EMP will be implemented, which will include measures to reduce the risk of accidental release of lubricants, chemicals or similar from wind turbines and OSPs/Offshore convertor station platforms to the marine environment. To avoid discharge or spillage of oils, it is anticipated that transformers would be filled for their operational life and would likely not need interim oil changes, and that closed systems will be employed to avoid the requirement for operational fluids to be topped up or renewed during the operation phase.

102. The impact is predicted to be of local spatial extent, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of the Receptor

103. The water quality receptors described in paragraphs 69 to 71 have been assessed individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of

accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore considered to be medium.

Significance of the Effect

104. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

105. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Decommissioning Phase

Magnitude of Impact

106. The presence of decommissioning vessels may lead to an increased risk of accidental release of lubricants, chemicals or similar. The maximum design scenario for the decommissioning phase contains the same activities as the construction phase (Table 19.16). However, it might be decided closer to the time that removal of cable protection and scour protection may result in greater environmental impacts. The maximum design scenario therefore assumes that the scour protection and cable protection will be removed where possible and appropriate to do so, noting that this will depend on the type of scour protection used and condition of said protection at the time of removal. This approach will be reviewed at the time of decommissioning following the most up to date and best available guidance.

107. As set out in Table 19.21, an MPCP and EMP will be implemented, which will include measures to reduce the risk of accidental release of lubricants, chemicals or similar to the marine environment, during decommissioning of wind turbines and OSPs/Offshore convertor station platforms.

108. The impact is predicted to be of local spatial extent, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of the Receptor

109. The water quality receptors described in paragraphs 69 to 71 have been assessed individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore considered to be medium.

Significance of the effect

110. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

111. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

OPERATIONAL PAINTING, AND CLEANING OF MARINE GROWTH

112. Operational painting and cleaning of marine growth during the operation and maintenance phase has been considered during this assessment.

113. The operational life of the Proposed Development is anticipated to be 35 years, and wind turbines and OSPs/Offshore convertor station platforms are expected to require regular inspection and maintenance of their exterior surfaces to address and prevent instances of corrosion and marine growth.

114. Operational painting and cleaning of marine growth within the Proposed Development area will increase during the operation and maintenance phase (Table 19.16).

Operation and Maintenance Phase

Magnitude of Impact

115. The marine environment is expected to cause corrosion to the surfaces of wind turbine foundations and to the foundations and topside surfaces of OSPs/Offshore convertor station platforms, where coatings that were applied during the manufacturing process may have become weakened. Application of paint or other coatings, as well as surface preparation, is likely to be required to protect surfaces from corrosion.

116. The foundations of wind turbines and OSPs/Offshore convertor station platforms provide a hard substrate which offers potential habitat for encrusting organisms to colonise, and for guano to accumulate. Removal by pressure washing of encrusted growth and guano will occur *ad hoc* during the operation and maintenance phase, however, no quantitative assessment can be made as the volume is not possible to predict, and is therefore not known at the point of application. Dislodged material may be rapidly consumed by organisms or relocated by wind and tidal currents, and further monitoring may be required to clarify whether biological material accumulates over time (section 19.15).

117. Operational painting is anticipated to be conducted once every ten years, and cleaning of marine growth and guano is anticipated to be carried out twice on every wind turbine and OSP/Offshore convertor station platform over the lifetime of the Proposed Development. Operational painting and cleaning of marine growth will occur during scheduled maintenance visits, as detailed in volume 1, chapter 3.

118. Due to the infrequency of operational cleaning, scheduling alongside routine maintenance activities and implementation of the mitigation measures contained in the EMP and MPCP (Table 19.21), the impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. It is proposed that the marine grade paints will be used at the Proposed Development. The magnitude is therefore considered to be negligible.

Sensitivity of the Receptor

119. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account the infrequency with which operational painting is expected to be required, and the ecologically benign means of cleaning naturally occurring accumulations of marine growth and guano, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore considered to be medium.

Significance of the Effect

120. Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

121. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

DETERIORATION OF WATER QUALITY FROM CABLE AND LANDFALL WORKS

122. Deterioration of water quality from offshore export cables landfall works, seabed preparation and cable installation in WFD water bodies, at bathing waters (including at bathing water sampling locations) along the export cable corridor and within the array area has been considered during this assessment and may increase (i.e. water quality may decrease) during the construction and decommissioning phases of the Proposed Development (Table 19.13), with the potential for the ecological and chemical status of coastal water bodies to deteriorate.

123. Deterioration of water quality and ecological and chemical status can result from activities arising during installation and decommissioning of offshore export cables, landfall works, inter-array cables and interconnector cables with the potential for impacting hydrodynamics, sediment transport and beach morphology in the vicinity of designated sites.

124. The objectives of the WFD require that the Proposed Development should not result in a risk to the deterioration in the status of a water body, or prevent a water body from achieving its environmental objectives (see paragraph 16).

125. A WFD assessment has been undertaken to describe the current baseline conditions of WFD water bodies within 2 km of the Proposed Development and quantifies the potential changes due to the installation and presence of the Proposed Development. This assessment is presented in volume 2, appendix 19.

Construction Phase

Magnitude of Impact

126. The installation of export cables in the export cable corridor, and inter-array cables and interconnector cables in the array area, may lead to the mobilisation of sediment as a result of seabed preparation works and cable burial operations. Sandwave clearance via suction hopper dredging and disposal of material, and cable installation via ploughing and jet trenching, may increase SSC. The associated deposition of sediment and potential effect upon hydrodynamics has been considered as a component of the physical processes assessment in volume 2, chapter 7 following numerical modelling detailed in volume 2, appendix 7.1.

127. The increased SSC arising from cable installation works is expected to return to baseline levels within a couple of tidal cycles, and the deposition of sediment would not be of sufficient magnitude to alter the hydrodynamic regime or offshore bank or beach morphology, and has been assessed as being of negligible adverse significance.

128. The installation of cable export landfall works may lead to an increased risk of deterioration of water quality at bathing water sampling locations and within WFD water bodies. The maximum design scenario is represented by installation of up to eight HDD exit punch outs located between 488 m and 1,500 m from MHWS (Table 19.16).

129. Four WFD water bodies and eight designated bathing water sampling locations are located within the 25 km ZoI of the offshore export cable corridor and array area (Table 19.12), which have the potential to be impacted by altered hydrodynamics, sediment transport and beach morphology. Modelling of offshore export cables trenching assumes sediment release along the Proposed Development export cable corridor to the nearshore point at which a continuous rock outcrop is encountered and within the Proposed Development array area. The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of the Receptor

130. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), modelling of sediment transport processes and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore, considered to be medium.

Significance of the Effect

131. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

132. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Decommissioning Phase

Magnitude of Impact

133. Decommissioning of offshore export cables, inter-array cables and interconnector cables and landfall works may involve complete removal of all infrastructure, but some infrastructure may be left *in situ*.

Removal of all infrastructure may lead to an increased risk of deterioration of water quality in WFD water bodies and at bathing waters (including at bathing water sampling locations) as a result of altered hydrodynamics, sediment transport and beach morphology.

134. Eight designated bathing sites are located within the 25 km ZoI of the offshore export cables landfall works (Table 19.12), which have the potential to be impacted by decommissioning of offshore export cables landfall works. If any infrastructure is left *in situ* this is expected to reduce the severity of water quality deterioration during decommissioning.

135. The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of the Receptor

136. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), modelling of sediment transport processes and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore, considered to be medium.

Significance of the Effect

137. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Secondary Mitigation and Residual Effect

138. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

19.11.3. PROPOSED MONITORING

139. This section outlines the monitoring proposed for water quality proposed monitoring measures are outlined in Table 19.22.

140. No generic water quality monitoring is considered necessary. This has been concluded because there is sufficient confidence in the assessment, of the negligible or minor long-term effects identified, and because regular water sampling is already undertaken as a statutory obligation to maintain high quality bathing water at designated sites, under the Bathing Waters (Scotland) Regulations 2008. In addition to this, SEPA will carry out the WFD monitoring on an annual basis, which will monitor any potential impacts on water quality arising from the Proposed Development. As such no additional water quality monitoring is proposed.

141. The Applicant is however committed to engaging with the SNCBs to identify suitable strategic benthic monitoring or research studies that the Project could contribute to, to improve the knowledge base for long term impacts associated with offshore wind farms. Proposed monitoring measures are outlined in Table 19.22.

Table 19.22: Monitoring Commitments for Water Quality

Potential Environmental Effect	Monitoring Commitment	Means of Implementation
Introduction and colonisation of INNS upon hard structures	Commitment to engaging with MSS, MS-LOT, NatureScot and other relevant key stakeholders to identify and deliver measures for contributing to strategic monitoring to understand the impact of hard structure colonisations and change in community structure and local species diversity.	Monitoring Commitments will be recorded in the Enhancement, Mitigation and Monitoring Commitments (volume 3, appendix 6.3). Detailed monitoring commitments will be agreed post-consent and included in the Project Environmental Monitoring Programme.

19.12. CUMULATIVE EFFECTS ASSESSMENT

19.12.2. METHODOLOGY

142. The CEA assesses the impact associated with the Proposed Development together with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development with the effects from a number of different projects, on the same receptor or resource. Please see volume 1, chapter 6 for detail on CEA methodology.

143. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see volume 3, appendix 6.4 of the Offshore EIA Report). Volume 3, appendix 6.4 further provides information regarding how information pertaining to other plans and projects is gained and applied to the assessment. Each project or plan has been considered on a case by case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

144. In undertaking the CEA for the Proposed Development, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside the Proposed Development. Therefore, a tiered approach has be adopted. This provides a framework for placing relative weight upon the potential for each project/plan to be included in the CEA to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the projects' parameters. The tiered approach which will be utilised within the Proposed Development CEA employs the following tiers:

- tier 1 assessment – Proposed Development (Berwick Bank Wind Farm offshore) with Berwick Bank Wind Farm onshore;
- tier 2 assessment – All plans/projects assessed under Tier 1, plus projects which are operational since baseline characterisation, those under construction and those with consent and submitted but not yet determined;
- tier 3 assessment – All plans/projects assessed under Tier 2, plus those projects with a Scoping Report; and
- tier 4 assessment – All plans/projects assessed under Tier 3, which are reasonably foreseeable, plus those projects likely to come forward where an Agreement for Lease (AfL) has been granted.

145. The specific projects scoped into the CEA for water quality, are outlined in Table 19.23.

146. As described in volume 1, chapter 3, the Applicant is developing an additional export cable grid connection to Blyth, Northumberland (the Cambois Connection). Applications for necessary consents (including marine licenses) will be applied for separately. The CEA for the Cambois Connection is based on

information presented in the Cambois Connection Scoping Report (SSER, 2022e), submitted in October 2022. The Cambois Connection has been scoped into the CEA for water quality on the basis that the Cambois Connection will overlap spatially and temporally with the Proposed Development and the project will engage in activities such as cable burial and installation of cable protection which will impact water quality receptors.

147. The range of potential cumulative impacts that are identified and included in Table 19.24, is a subset of those considered for the Proposed Development alone. This is because some of the potential impacts identified and assessed for the Proposed Development alone, are localised and temporary in nature. It is considered therefore, that these potential impacts have limited or no potential to interact with similar changes associated with other plans or projects. These have therefore not taken forward for detailed assessment.

148. Similarly, some of the potential impacts considered within the Proposed Development alone assessment are specific to a particular phase of development (e.g. construction, operation and maintenance or decommissioning). Where the potential for cumulative effects with other plans or projects only have potential to occur where there is spatial or temporal overlap with the Proposed Development during certain phases of development, impacts associated with a certain phase may be omitted from further consideration where no plans or projects have been identified that have the potential for cumulative effects during this period.

149. For the purposes of this Offshore EIA Report, this cumulative impact has been assessed within a representative 25 km buffer of the Proposed Development (Figure 19.2). This buffer, which is based on the fish and shellfish ZoI, is considered appropriate as the majority of impacts considered in section 19.11 will be localised in extent. This encompasses all offshore wind farm projects within the regional benthic subtidal and intertidal and fish and shellfish study areas, and is the greatest ZoI for all supporting chapters (see paragraph 3).

Table 19.23: List of Other Developments Considered Within the CEA for Water Quality

Development	Status [i.e. Application, Consented, Under Construction, Operational]	Distance from Proposed Development Array Area (km)	Distance from Offshore Export Cable Routes (km)	Description of Development	Dates of Construction (If Applicable)	Dates of Operation (If Applicable)	Overlap with the Proposed Development [e.g. Project Construction Phase Overlaps with Proposed Development Construction Phase]
Tier 1							
Offshore Wind Projects and Associated Cables							
Berwick Bank Wind Farm (onshore aspects)	Proposed	45	0	Landward route of offshore export cables, between landfall and connection to existing power infrastructure	Q1 2025 Q1 2033 (18 months within this period)	2031 onwards	Tier 1 project concerns the Proposed Development, and as such will overlap during all phases.
Tier 2							
Offshore Wind Projects and Associated Cables							
Inch Cape Offshore Wind Farm – 15680	Consented	19	39	Up 72 wind turbines)	2023-2025	2026 onwards	The construction and operational phase of the Inch Cape offshore wind farm overlap with the construction and operation and maintenance phase of the Proposed Development
Neart na Gaoithe Offshore Wind Farm – 66600019	Under construction	16	15	Up to 75 wind turbines	2022-2023	2024 onwards	The operational phase of the Neart na Gaoithe offshore wind farm overlap with the construction and operation and maintenance phase of the Proposed Development
Seagreen 1	Under construction	5	35	Up to 114 wind turbines	2022-2023	2024 onwards	The operational phase of the Seagreen 1 overlap with the construction and operation and maintenance phase of the Proposed Development
Seagreen 1A Project	Consented	5	36	Up to 36 wind turbines	2023-2025	2026 onwards	The construction and operational phase of the Seagreen 1A Project overlap with the construction and operation and maintenance phase of the Proposed Development
Seagreen 1A Export Cable Corridor	Consented	6	28	A 100 km offshore export cables from Seagreen to the landfall at Cockenzie	April 2023 – June 2024	July 2024 onwards	The operational phase of the Seagreen 1A Export Cable Corridor overlaps with the construction and operation and maintenance phase of the Proposed Development
Oil and Gas Activities							
No Oil and Gas Projects identified within a 20 km buffer of the Proposed Development.							
Aggregate Extraction							
No Aggregate Extraction Projects identified within a 20 km buffer of the Proposed Development.							
Disposal Sites							
Eyemouth – FO0080	Operational	35	17	Dredged material disposal site	N/A	Ongoing	Project operational phase overlaps with Proposed Development construction and operation and maintenance phases
Coastal Protection							
No Coastal Protection Projects identified within a 20 km buffer of the Proposed Development.							
Subsea Cables (Telecommunications and Interlinks)							
Eastern Link 1	Planning application submitted	28	2	Scotland England Green Link 1 - interconnector between Torness in Scotland and County Durham in England	2025 - 2027	2027 onwards	The construction and operational phase of the Eastern Link 1 overlaps with the construction and operation and maintenance phases of the Proposed Development

Development	Status [i.e. Application, Consented, Under Construction, Operational]	Distance from Proposed Development Array Area (km)	Distance from Offshore Export Cable Routes (km)	Description of Development	Dates of Construction (If Applicable)	Dates of Operation (If Applicable)	Overlap with the Proposed Development [e.g. Project Construction Phase Overlaps with Proposed Development Construction Phase]
Eastern Link 2	Planning application submitted	14	21	Scotland England Green Link 2 - interconnector between Peterhead in Scotland and North Yorkshire in England	2025 - 2029	2029 onwards	The construction and operational phase of the Eastern Link 2 overlaps with the construction and operation and maintenance phases of the Proposed Development
Ministry of Defence sites							
No Ministry of Defence projects identified within a 20 km buffer of the Proposed Development.							
Tier 3							
Subsea Cables (Telecommunications and Interlinks) and Pipelines							
Cambois Connection	Pre-planning Application	n/a	n/a	Alternative offshore export cables	Q1 2028 – Q4 2031	Q4 2031	The construction and operation and maintenance phases of the Cambois connection overlap with the construction and operation and maintenance phase of the Proposed Development.
Shipping and Navigation							
Eyemouth - Pontoon	Application	34.1	15	Floating Pontoon to serve Neart na Gaoithe maintenance facility	2022	2022 onwards	Project operational phase overlaps with Proposed Development construction and operation and maintenance phases.
Tier 4							
No Tier 4 projects identified within the water quality CEA study area.							

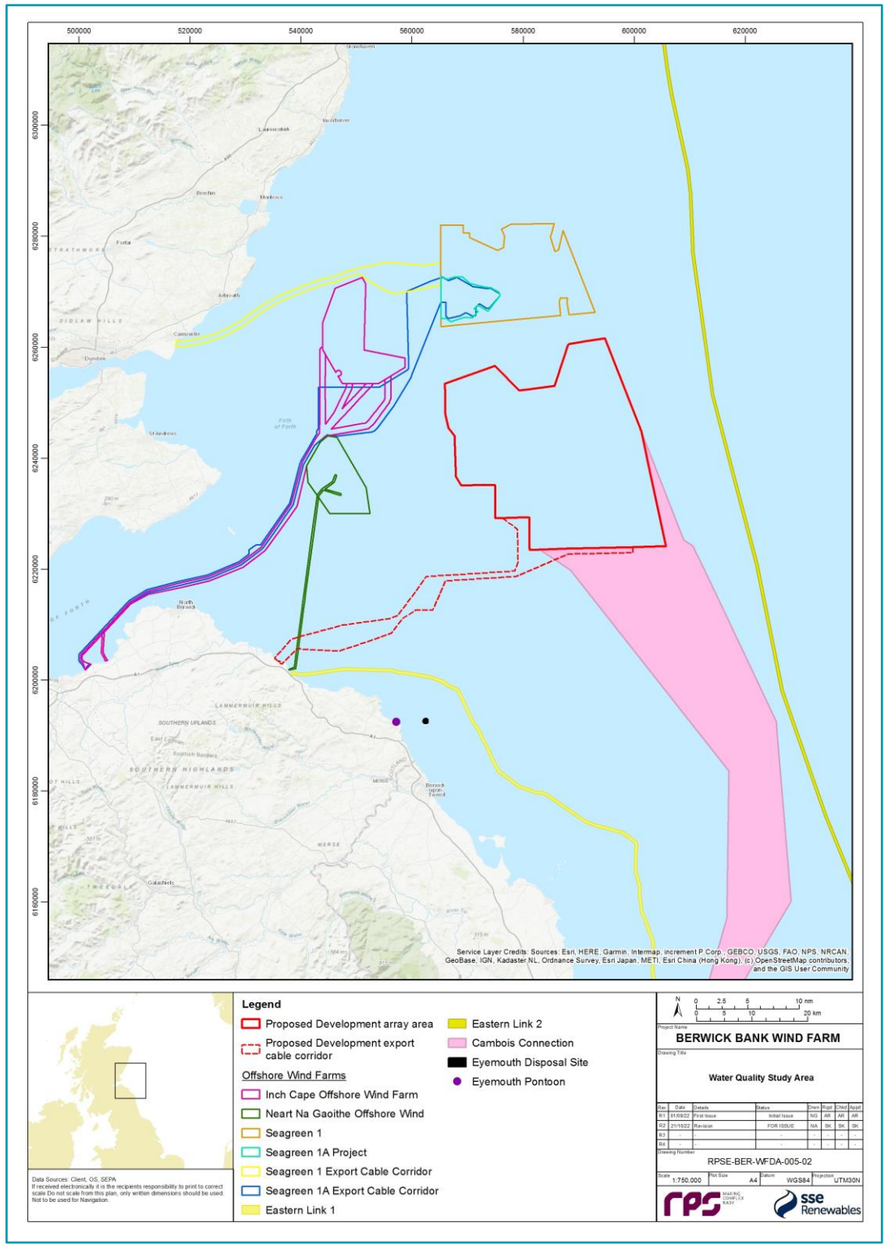

Figure 19.2 Other Developments Screened into the Cumulative Effects Assessment for Water Quality

19.12.3. MAXIMUM DESIGN SCENARIO

150. The maximum design scenarios identified in Table 19.24 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the details provided in volume 1, chapter 3 of the Offshore EIA Report as well as the information available on other projects and plans (see volume 3, appendix 6.4), to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different wind turbine layout), to that assessed here, be taken forward in the final design scheme.

Table 19.24: Maximum Design Scenario Considered for Each Impact as part of the Assessment of Likely Significant Cumulative Effects on Water Quality

Potential Cumulative Impact	Phase[5] C	Phase[5] O	Phase[5] D	Tier	Maximum Design Scenario
Increased risk of introduction and spread of invasive and non-native species (INNS)	✓	✓	✓	2	**Construction Phase** Maximum design scenario as described for the construction phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • construction and operation and maintenance of the Inch Cape Offshore Wind Farm; • construction and operation and maintenance of the Seagreen; • construction and operation and maintenance of Eastern Link 1; • construction and operation and maintenance of Eastern Link 2; • operation and maintenance of the Neart na Gaoithe Offshore Wind Farm; and • operation and maintenance of the Seagreen 1A Export Cable Corridor. **Operation and Maintenance Phase** Maximum design scenario as described for the operation and maintenance phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • operation and maintenance, and decommissioning of the Inch Cape Offshore Wind Farm; • operation and maintenance, and decommissioning of the Neart na Gaoithe Offshore Wind Farm; • operation and maintenance, and decommissioning of the Seagreen; and • operation and maintenance of the Seagreen 1A Export Cable Corridor. **Decommissioning Phase** Maximum design scenario as described for construction phase assessed cumulatively with the operation and maintenance of the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • Inch Cape Offshore Wind Farm residual structures; • Neart na Gaoithe Offshore Wind residual structures; and • Seagreen Offshore Wind residual structures.
	✓	✓	✓	3	**Construction Phase** Maximum design scenario as described for construction phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • tier 2 projects; and • construction and operation and maintenance of Cambois connection. **Operation and Maintenance Phase** Maximum design scenario as described for operation and maintenance phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • tier 2 projects; • operation and maintenance of Eastern Link 1;

[5] C = Construction, O = Operation and maintenance, D = Decommissioning

Potential Cumulative Impact	Phase[5] C	Phase[5] O	Phase[5] D	Tier	Maximum Design Scenario
					• operation and maintenance of Eastern Link 2; and • operation and maintenance of Cambois connection. **Decommissioning Phase** There are currently no known projects which will result in a cumulative effect during the decommissioning phase of the Proposed Development.
Accidental release of lubricants, chemicals or similar	✓	✓	✓	**2**	**Construction Phase** Maximum design scenario as described for the construction phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • construction and operation and maintenance of the Inch Cape Offshore Wind Farm; • construction and operation and maintenance of Eastern Link 1; • construction and operation and maintenance of Eastern Link 2; • construction and operation and maintenance of the Seagreen; • operation and maintenance of the Neart na Gaoithe Offshore Wind Farm; • operation and maintenance of Seagreen1A Export Cable Corridor; and • operation of the Eyemouth disposal site. **Operation and Maintenance Phase** Maximum design scenario as described for the operation and maintenance phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • operation and maintenance, and decommissioning of the Inch Cape Offshore Wind Farm; • operation and maintenance, and decommissioning of the Neart na Gaoithe Offshore Wind Farm; • operation and maintenance, and decommissioning of the Seagreen; • operation and maintenance of the Seagreen 1A Export Cable Corridor; • operation and maintenance of Eastern Link 1; • operation and maintenance of Eastern Link 2; and • operation of the Eyemouth disposal site. **Decommissioning Phase** There are currently no known projects which will result in a cumulative effect during the decommissioning phase of the Proposed Development.
	✓	✓	✓	**3**	**Construction Phase** Maximum design scenario as described for construction phase assessed cumulatively with the full development of the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • tier 2 projects; and • construction of Cambois connection. **Operation and Maintenance Phase** Maximum design scenario as described for operation and maintenance phase assessed cumulatively with the full development of the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • tier 2 projects; and • operation and maintenance of Cambois connection.

Potential Cumulative Impact	Phase[5] C	O	D	Tier	Maximum Design Scenario
					Decommissioning Phase There are currently no known projects which will result in a cumulative effect during the decommissioning phase of the Proposed Development.
Operational painting, and cleaning of marine growth	×	✓	×	2	**Operation and Maintenance Phase** Maximum design scenario as described for the operation and maintenance phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • operation and maintenance of the Inch Cape Offshore Wind Farm; • operation and maintenance of the Neart na Gaoithe Offshore Wind Farm; • operation and maintenance of Eastern Link 1; • operation and maintenance of Eastern Link 2; and • operation and maintenance of the Seagreen.
	×	✓	×	3	**Operation and Maintenance Phase** Maximum design scenario as described for the operation and maintenance phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • tier 2 projects; and • operation and maintenance of Eyemouth Pontoon.
Deterioration of water quality from cable and landfall works	✓	×	✓	2	**Construction Phase** Maximum design scenario as described for the construction phase assessed cumulatively with the following marine projects within a 25 km buffer (i.e. 2 tidal excursions) of the Proposed Development boundary: • construction and operation and maintenance of Inch Cape Offshore Wind Farm; • construction and operation and maintenance of Eastern Link 1; • construction and operation and maintenance of Eastern Link 2; and • operation and maintenance of the Seagreen Project 1A. **Decommissioning Phase** There are currently no known projects which will result in a cumulative effect during the decommissioning phase of the Proposed Development.
	✓	×	✓	3	**Construction Phase** There are currently no known projects which will result in a cumulative effect during the construction phase of the Proposed Development. **Decommissioning Phase** There are currently no known projects which will result in a cumulative effect during the decommissioning phase of the Proposed Development.

19.12.4. CUMULATIVE EFFECTS ASSESSMENT

151. An assessment of the likely significance of the cumulative effects of the Proposed Development upon water quality receptors arising from each identified impact is given below.

INCREASED RISK OF INTRODUCTION AND SPREAD OF INVASIVE AND NON-NATIVE SPECIES (INNS)

Tier 2

152. The risk of introduction and spread of INNS during the construction, operation and maintenance, and decommissioning phases of the cumulative Tier 2 projects has been considered in this assessment. Magnitude has been considered for all three phases combined as the increased risk of introduction and spread of INNS is as a result of all phases combined.

Magnitude of impact

153. The construction and operation and maintenance of the projects/plans/activities shown in Table 19.24 may lead to cumulative introduction and spread of INNS within the water quality CEA study area as a result of vessel movements during the Proposed Development construction phase. The introduction of hard substrate into areas of predominantly soft sediments has the potential to alter community composition and biodiversity and to facilitate the introduction and spread of INNS. The latter may be particularly important with regards to cumulative effects as several offshore structures in relatively close proximity could enable the spread of INNS.

154. Table 19.24 lists all projects/plans/activities considered in the Tier 2 assessment which are Inch Cape Offshore Wind Farm, Neart na Gaoithe Offshore Wind Farm, Seagreen, Seagreen 1A Export Cable Corridor, Eastern Link 1 subsea cable and Eastern Link 2 subsea cable. There is small overlap between the construction phase for the Proposed Development and that of the Inch Cape Offshore Wind Farm and Seagreen 1A Project, as well as the operation and maintenance phase for Seagreen and Neart na Gaoithe Offshore Wind Farm once construction of the Proposed Development has been completed. The remaining projects will be in their operation and maintenance phase during the Proposed Development's construction phase.

155. Inch Cape Offshore Wind Farm has the potential to introduce INNS in the construction phase through the movement of vessels associated with the installation of the wind turbines, offshore substation platforms, inter-array and offshore export cables, and the associated works (Inch Cape Offshore Limited, 2018). In the operation and maintenance phase of the Inch Cape project INNS introduction can result from the introduction of new substrate installed in the construction phase, the amount of hard substrate introduced is equivalent to the long term habitat loss which is described in volume 2, chapter 8.

156. Neart na Gaoithe Offshore Wind Farm has the potential to introduce INNS in the construction and operation and maintenance phase as a result of the introduction of hard substrate, the area of the projects which is considered to be equal to the area of long term habitat loss (Mainstream Renewable Power, 2019). This involves the introduction of wind turbines, offshore substation platforms, meteorological masts, and inter-array and offshore export cables protection. The details of which are in volume 2, chapter 8 (Mainstream Renewable Power, 2019). Vessel movements may also contribute to INNS however no quantification of this is provided in the Offshore EIA Report.

157. Seagreen did not consider the risk of INNS to be "*Capable of Affect, other than insignificantly*" (Seagreen Wind Energy, 2021 p. 36); however, INNS can result from introduction of foundations for 150 wind turbines, five offshore substation platforms, two meteorological masts, and inter-array and offshore export cables protection. Additionally, during operation and maintenance there is the potential for a maximum of 52,800 vessel trips by maintenance vessels over the maximum 30 year lifespan of the wind farm.

158. There are no values provided for Seagreen 1A Export Cable Corridor however up to 20% of the 110 km cable may require cable protection up to 6 m wide (Seagreen Wind Energy Ltd., 2021).

159. Assessment for the Eastern Link subsea cables concluded that the introduction and spread of INNS would be unlikely, and that any associated effects would be minor and not significant (AECOM, 2022).

160. The introduction and spread of INNS during the decommissioning phase in each project is expected to be the same as the construction phase as similar activities will occur.

161. The total cumulative area of hard structures available for colonisation is expected to be up to 15,132,896 m^2. Additionally, there will be 221,318 cumulative vessel trips, not including those for NNG.

162. The cumulative effect is predicted to be of regional spatial extent, long term duration, continuous and low reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

163. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account successful implementation by maintenance vessels of the INNS provisions contained within the EMP, and based upon the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents) in reducing the likelihood of INNS colonisation, and professional judgement, the receptors are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptors is therefore considered to be low.

Significance of effect

164. Overall, taking into account the proposed mitigation of the INNS management plan, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

165. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Tier 3

166. One Tier 3 project with the potential to result in cumulative increased risk of introduction and spread of INNS with the Proposed Development has been identified in the CEA: the Cambois connection.

Magnitude of impact

167. The Cambois connection has the potential to create 306,000 m^2 of new hard substrate habitat via installation of rock/mattress cable protection, potentially covering up to 15% of the total length of the four offshore export cables. It is therefore likely that only a proportion of the cable protection will occupy the water quality CEA study area. The cable protection represents a potential introduction of hard substrate, the effects of which are described in paragraphs 58 to 61, however as the cable protection does not extend into the water column the opportunity for colonisation by some species is reduced. The presence of the Tier 2 and Tier 3 projects has the potential to lead to cumulative impacts arising from the colonisation of up to 15,619,071 m^2 of hard structures.

168. Taking into account successful implementation by maintenance vessels of the INNS provisions contained within the EMP, and based upon the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents) in reducing the likelihood of INNS colonisation, and professional judgement, the

cumulative impact is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be low.

Sensitivity of receptor

169. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account successful implementation by maintenance vessels of the INNS provisions contained within the EMP, and based upon the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents) in reducing the likelihood of INNS colonisation, and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be low

Significance of the effect

170. Overall, taking into account the proposed mitigation of the INNS management plan, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

171. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

ACCIDENTAL RELEASE OF LUBRICANTS, CHEMICALS OR SIMILAR

Tier 2

172. The accidental release of lubricants, chemicals or similar during the construction, operation and maintenance and decommissioning phases of the cumulative Tier 2 projects has been considered in this assessment.

173. Cumulative accidental release of lubricants, chemicals or similar within the water quality study area may increase during the construction, operation and maintenance, and decommissioning phase of Tier 2 projects in the vicinity of the Proposed Development (Table 19.16).

174. Accidental release of lubricants, chemicals or similar can result from activities involving any vessel, including survey, installation, crew transfer, maintenance, and cable repair vessels, entering the Proposed Development area, during the construction, operation and maintenance and decommissioning phases of the project.

175. Accidental release of lubricants, chemicals or similar can result during and after installation of wind turbines and OSPs/Offshore convertor station platforms that require lubricants, chemicals or similar as part of normal operating conditions, from scheduled and unscheduled maintenance operations and during the decommissioning phase of the Proposed Development.

Construction phase

176. The installation of wind turbines, inter-array cables, offshore export cables and OSPs/Offshore convertor station platforms may lead to an increased risk of accidental release of lubricants, chemicals or similar from vessels, or from transfer of lubricants, chemicals or similar to wind turbines before the commencement of the operation and maintenance phase.

Magnitude of impact

177. As set out in Table 19.20, an MPCP and EMP are standard operational procedures for vessels involved in offshore construction, which will include measures to reduce the risk of accidental release of lubricants, chemicals or similar from cable and cable armour installation vessels to the marine environment. Specific information on the quantities used in the relevant Tier 2 projects is not currently available, but estimates are made based upon the quantities required for the Proposed Development, scaled to the size of the other projects. Quantities of lubricants, chemicals or similar required by these projects are presented in Table 19.25.

Table 19.25: Volumes of Lubricants, Chemicals or Similar Required by Offshore Wind Developments Being Considered in CEA

Development	Volume of All Lubricants, Chemicals or Similar (litres)[2]	Distance from Proposed Development Array Area (km)	Distance from Proposed Development Export Cable Corridor (km)
Inch Cape	9,568,000	15	39
Seagreen 1	15,241,000	4	42
Seagreen 1A Project	4,734,000	4	42
Neart na Gaoithe	9,962,500	14	15
Total	**39,505,500**	N/A	N/A

[2] Volumes of chemicals, lubricants or similar are indicative values. All compounds will be contained within the wind turbines and unlikely to be discharged into the marine environment as any leak will be contained within the nacelle.

178. All Tier 2 projects contributing to the cumulative impacts of accidental releases of lubricants, chemicals or similar to water quality receptors (i.e. those listed in Table 19.25) state within their respective assessments that containment measures have been designed into these projects to prevent the release of fluid to the marine environment.

179. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

180. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

181. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will for all receptors, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

182. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Operation and maintenance phase

183. Under normal operational conditions designed-in mitigation measures are intended to contain any spillage of lubricants, chemicals or similar within the structure or substructure of wind turbines and OSPs/Offshore convertor station platforms, and to prevent release into the marine environment.

184. Closed systems preclude the need for many operational fluids to be replenished. Where consumable fluids (e.g. diesel fuel) are required, designated locations for replenishing these, alongside auxiliary containers or bunds of greater capacity than the volume of operational fluids, are able to contain leaks, and double-lined piping where practicable, prevents fluids from leaving the system.

Magnitude of impact

185. The volume of lubricants, chemicals or similar required during the operation and maintenance phase of the Proposed Development is similar to that estimated in Table 19.25, as well as the volume of fluids carried by maintenance vessels. As such the magnitude of the impact of accidental release is comparable to that during the construction phase.

186. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

187. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

188. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will for all receptors, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

189. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Decommissioning phase

190. The risk of accidental release of lubricants, chemicals or similar during the decommissioning phase originates from the leaking of operational fluids from within closed systems or storage equipment, while wind turbines and OSPs/Offshore convertor station platforms are dismantled.

Magnitude of impact

191. The volume of lubricants, chemicals or similar required during the operation and maintenance phase of the Proposed Development is the same as that estimated in Table 19.25, as well as the volume of fluids carried by decommissioning vessels. As such the magnitude of the impact of accidental release is comparable to that during the construction and operation and maintenance phases.

192. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

193. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

194. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will for all receptors, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

195. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Tier 3

Construction phase

196. Accidental release of lubricants, chemicals or similar can result from activities involving any vessel, including survey and cable installation and armouring vessels entering the Proposed Development area, during the construction phase of the project, as outlined in Table 19.24.

Magnitude of impact

197. As set out in Table 19.21, an MPCP and EMP are standard operational procedures for vessels involved in offshore construction, which will include measures to reduce the risk of accidental release of lubricants, chemicals or similar from cable and cable armour installation vessels to the marine environment. As such, the cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

198. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to

be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

199. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

200. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Operation and maintenance phase

201. Accidental release of lubricants, chemicals or similar can result from activities involving any vessel, including cable repair and maintenance vessels entering the Proposed Development area, during the operation and maintenance phase of the project, as outlined in Table 19.24.

Magnitude of impact

202. Vessel traffic to maintain and repair export and inter-array cable is expected to be infrequent, and as such the magnitude of impact presented is low.

Sensitivity of receptor

203. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account designed-in measures for the containment of accidental release of lubricants, chemicals or similar from within the operational structures of the Proposed Development, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

204. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect will for all receptors, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

205. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Decommissioning phase

206. There are currently no known Tier 3 projects which will result in a cumulative effect during the decommissioning phase of the Proposed Development.

OPERATIONAL PAINTING, AND CLEANING OF MARINE GROWTH

Tier 2

207. Operational painting, and cleaning of marine growth during the operation and maintenance phase of the cumulative Tier 2 projects has been considered in this assessment.

208. Cumulative painting, and cleaning of marine growth within the water quality study area will increase during the operation and maintenance phase of Tier 2 projects in the vicinity of the Proposed Development (Table 19.16).

Operation and maintenance phase

209. Wind turbines and OSPs/Offshore convertor station platforms require regular painting and cleaning of marine growth during the operation and maintenance phase to avoid the development of corrosion associated with being situated in the marine environment.

Magnitude of impact

210. Details of project-specific operational painting and cleaning of marine growth for the Tier 2 projects is not available, but based upon the number of structures in each Tier 2 project, and the expected frequency of visits for the Proposed Development, estimates of the magnitude of maintenance vessel trips are given in Table 19.26.

Table 19.26: Estimated Visits to Tier 2 Developments for Operational Painting and Cleaning of Marine Growth, through Full Lifespan of Projects

Tier 2 Development	Operational Painting Visits	Marine Growth Cleaning visits	Total Visits
Inch Cape	222	5,180	5,402
Seagreen 1	357	8,330	8,687
Seagreen 1A Project	108	2,520	2,628
Neart na Gaoithe	231	5,390	5,621
All projects	**918**	**21,420**	**22,338**

211. Operational painting and cleaning of marine growth will be timed to coincide with regular maintenance vessel trips, so the figures given in Table 19.26 are not additional trips, but instead represent the frequency of these particular maintenance activities. The cumulative effect is therefore predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

212. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account the infrequency with which operational painting is expected to be required, and the ecologically benign means of cleaning naturally occurring accumulations of marine growth and guano, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and of high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

213. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

214. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Tier 3

Operation and maintenance phase

215. Tier 3 offshore export cables projects will not require operational painting and cleaning of marine growth, but the Floating Pontoon to serve Neart na Gaoithe maintenance facility is likely to require some degree of painting and cleaning of marine growth.

216. The Neart na Gaoithe floating pontoon is located within the existing harbour at Eyemouth, East Lothian and measures approximately 70 m in length, with berthing for up to three CVT boats, and at this time the frequency and nature of painting and cleaning operations is unavailable.

Magnitude of impact

217. The cumulative effect is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. Given the size of the Neart na Gaoithe pontoon and its distance from the Proposed Development array area (approximately 34 km), where operational painting will be undertaken for the Proposed Development, the magnitude is considered to be low.

Sensitivity of receptor

218. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account the infrequency with which operational painting is expected to be required, and the ecologically benign means of cleaning naturally occurring accumulations of marine growth and guano, and based upon the dispersive ability of the extensive and dynamic nature of the marine environment (i.e. wind, tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and of high value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

219. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

220. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

DETERIORATION OF WATER QUALITY FROM CABLE AND LANDFALL WORKS

Tier 2

221. Cumulative installation of cables and landfall works associated with Tier 2 projects Seagreen Project 1A, Inch Cape Offshore Wind farm, Eastern Link 1 and Eastern Link 2, within the water quality study area, has the potential to cumulatively affect water quality in the vicinity of the Proposed Development.

Operation and maintenance phase

Magnitude of impact

222. As landfall works for the Proposed Development and CEA projects are above MHWS, there are no predicted impacts on water bodies or water quality. In addition, the offshore export cables for the CEA projects are expected to achieve landfall through trenchless technologies (Inch Cape Offshore Wind Farm yet undecided), therefore there will be no potential adverse effects on water quality from these works. Details of project-specific cable installation methodologies for Tier 2 projects is not available, however it is assumed that similar methods as the Proposed Development will be used.

223. It is therefore not expected that water quality will be affected more than that predicted for the Proposed Development alone. The cumulative effect is therefore predicted to be of regional spatial extent, short term duration, intermittent and high reversibility for the lifetime of the Proposed Development. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

224. The water quality receptors described in paragraphs 69 to 71 have been considered individually and are considered to be of similar sensitivity. Taking into account the dynamic nature of the marine environment (i.e. wind , tidal processes, currents), and professional judgement, the receptor is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore considered to be medium

Significance of effect

225. Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The effect for all receptors will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Further mitigation and residual effect

226. No water quality mitigation is considered necessary because the likely effect in the absence of further mitigation (beyond the designed in measures outlined in section 19.10) is not significant in EIA terms.

Tier 3

227. There are no known Tier 3 projects which will result in cumulative effects on deterioration of water quality from cables and landfall works.

19.12.5. PROPOSED MONITORING

228. As per section 19.11.3.

19.13. TRANSBOUNDARY EFFECTS

229. A screening of transboundary impacts has been carried out and has identified that potential impacts on water quality receptors will largely be focused within the footprint of the Proposed Development and therefore no potential for transboundary impacts are predicted (see volume 3, appendix 6.6). Potential impacts as a result of INNS, accidental release of lubricants, chemicals or similar, operational painting and removal of marine growth, and sediments suspended during offshore export cables landfall works are likely to re-settle in close proximity to the Proposed Development.

230. Therefore, considering both the location of the Proposed Development and an initial assessment of baseline characterisation, and as the predicted impacts to water quality receptors will largely be focused within the footprint of the Proposed Development, there are no likely significant transboundary effects with regard to water quality from the Proposed Development upon the interests of European Economic Area (EEA) States.

19.14. INTER-RELATED EFFECTS (AND ECOSYSTEM ASSESSMENT)

231. For water quality, the following potential impacts have been considered within the inter-related effects assessment:

- increased risk of introduction and spread of INNS;
- accidental release of lubricants, chemicals or similar;
- operational painting and cleaning of marine growth; and
- deterioration of bathing water quality from offshore export cables landfall works.

232. Table 19.27 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, operation and maintenance phase, and decommissioning of the Proposed Development and also the inter-related effects (receptor-led effects) that are predicted to arise for water quality receptors.

233. As noted above, effects on water quality also have the potential to have secondary effects on other receptors and these effects are fully considered in the topic-specific chapters. These receptors and effects are:

- benthic, subtidal and intertidal ecology:
  - the potential temporary (construction phase), long term (operation and maintenance phase) and permanent (decommissioning (and post-decommissioning) phase) change in community composition from the introduction and spread of INNS resulting in direct effects on benthic, subtidal and intertidal ecology of minor adverse significance (volume 2, chapter 8);
  - the accidental release of lubricants, chemicals or similar (construction, operation and maintenance and decommissioning phases), resulting in direct effects on benthic, subtidal and intertidal ecology of minor adverse significance;
  - operational painting and cleaning of marine growth (operation and maintenance phase) may have similar impact as accidental release of lubricants, chemicals or similar, resulting in direct effects on benthic, subtidal and intertidal ecology of minor adverse significance; and
  - effects of the offshore export cables crossing the intertidal area have been scoped out as this will be achieved via trenchless techniques, and has therefore not been taken forward for assessment.
- fish and shellfish ecology.
  - the accidental release of lubricants, chemicals or similar (construction, operation and maintenance and decommissioning phases), resulting in direct effects on fish and shellfish ecology of minor adverse significance (volume 2, chapter 9); and
  - operational painting and cleaning of marine growth (operation and maintenance phase) may have similar impact as accidental release of lubricants, chemicals or similar, resulting in direct effects on fish and shellfish ecology of minor adverse significance.
- socio-economics and tourism.
  - water sports including diving, windsurfing, sailing and paddleboarding are popular in the area. Within the water study area, North Berwick and Tantallon are popular for kayaking, and Belhaven for surfing. Recreational fishing takes place at Dunbar and North Berwick, which lie within the water quality study area, and from which recreational fishing trips are commonplace; and
  - assessment of the potential effects of the Proposed Development upon socio-economics and tourism (volume 2, chapter 18) concluded a negligible to low adverse significance upon recreational water users.

Table 19.27: Summary of Likely Significant Inter-Related Effects on the Environment from Individual Effects Occurring Across the Construction, Operation and Maintenance and Decommissioning Phases of the Proposed Development and from Multiple Effects Interacting Across All Phases (Receptor-led Effects)

Description of Impact	Phase			Likely Significant Inter-Related Effects
	C	O	D	
Increased risk of introduction and spread of invasive and non-native species	✓	✓	✓	Although the operation of construction and decommissioning vessels in the area (potentially from countries of origin other than the UK) may facilitate the spread of INNS across all phases, this effect will predominantly arise during the operation and maintenance phase as INNS will require the hard substrate to be in place to provide substrate on which to settle. However, the designed-in measures include the implementation of an INNS Management Plan, which will be included in the EMP (see Table 19.20). This will ensure that the risk of potential introduction and spread of INNS will be minimised across all phases. As a result, any additional inter-related effect is judged to be of no greater significance than those assessed for each individual phase, which in this case is a **minor** adverse effect which is not significant in EIA terms.
Accidental release of lubricants, chemicals or similar	✓	✓	✓	The operation of construction and decommissioning vessels in the area may facilitate the accidental release of lubricants, chemicals or similar, the risk will predominantly arise during the operation and maintenance phase as this is the period when these substances are present, or delivered to replenish consumed stocks. However, the designed in measures include the implementation of an MPCP and EMP (see Table 19.20), which will ensure that the risk of potential release of synthetic compounds to the environment will be minimised across all phases. As a result, any additional inter-related effect is judged to be of no greater significance than those assessed for each individual phase, which in this case is a **minor** adverse effect which is not significant in EIA terms.
Operational painting and cleaning of marine growth	×	✓	×	This effect will only arise during the operation and maintenance phase and as such there will be no interaction effects across the Proposed Development phases. A **minor** adverse significance was concluded for this impact which is not significant in EIA terms.
Deterioration of water quality from cable and landfall works	✓	×	✓	The construction and decommissioning phases are anticipated to be 35 years apart. As a result, any additional inter-related effect is judged to be of no greater significance than those assessed for each individual phase, which in this case is a **minor** adverse effect which is not significant in EIA terms.

Description of Impact	Phase			Likely Significant Inter-Related Effects
	C	O	D	
Receptor Led Effects				
There is potential for interactions to exist between the effects arising from the introduction of synthetic compounds into the marine environment ("accidental release of lubricants, chemicals or similar" and "operational painting and cleaning of marine growth") and the increased risk of introduction and spread of INNS. Aquatic pollution may increase the success of INNS in the event that preceding pollution events have weakened the ability of native species to resist colonisation by non-native species. These individual impacts were assigned a significance of negligible to minor as standalone impacts and although potential combined impacts may arise (i.e. invasion of INNS following accidental release of synthetic compounds), it is predicted that this will not be any more significant than the individual impacts in isolation.				

19.15. SUMMARY OF IMPACTS, MITIGATION MEASURES, LIKELY SIGNIFICANT EFFECTS AND MONITORING

234. Information on water quality within the water quality study area was collected through desktop review and statutory site surveys (routinely conducted by SEPA) and presented in full in section 19.7.2. The baseline characterisation was used to inform the assessment of the WFD water bodies and bathing water sampling locations within the vicinity of the water quality study area, and full details of this assessment are provided in volume 3, appendix 19. Proposed monitoring programmes for marine pollution prevention and contingency planning and INNS are set out in annexes A and B, respectively, of the EMP (volume 4, appendix 8).

235. As noted in section 19.9.4 an assessment of the likely significant effects in EIA terms on the relevant features of sites that comprise part of the UK National Site Network or Natura 2000 network (i.e. European Sites) has been made in this chapter (in sections 19.11 and 19.12.4). The assessment of the potential impacts on the qualifying features of the designated site are deferred to the RIAA (SSER, 2022c) for the Proposed Development. The RIAA concluded that no adverse effect on integrity was predicted to occur on any of the sites considered in this chapter and designated for Annex I habitats below MHWS or Annex II species, specifically:

- Berwickshire and North Northumberland Coast SAC; and
- River Tweed SAC.

236. Table 19.28 presents a summary of the potential impacts, mitigation measures and the conclusion of likely significant effects in EIA terms in respect to water quality. The impacts assessed include: increased risk of introduction and spread of INNS, accidental release of lubricants, chemicals or similar, operational painting and cleaning of marine growth, and deterioration of water quality from cable and landfall works. Overall, it is concluded that there will be no likely significant effects arising from the Proposed Development during the construction, operation and maintenance or decommissioning phases.

237. Table 19.29 presents a summary of the potential cumulative impacts, mitigation measures and the conclusion of likely significant effects on water quality in EIA terms. The cumulative effects assessed include: increased risk of introduction and spread of INNS, accidental release of lubricants, chemicals or similar, operational painting and cleaning of marine growth, and deterioration of water quality from offshore export cables works. Overall, it is concluded that there will be no likely significant cumulative effects from the Proposed Development alongside other projects/plans.

238. No likely significant transboundary effects have been identified regarding effects of the Proposed Development.

Table 19.28: Summary of Likely Significant Environmental Effects, Mitigation and Monitoring

Description of Impact	Phase			Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Additional Measures	Significance of Residual Effect	Proposed Monitoring
	C	O	D						
Increased risk of introduction and spread of INNS	✓	✓	✓	Negligible	Low	Negligible to minor adverse	No additional measures required	Not significant	As presented in the EMP (volume 4, appendix 22), commitment to engaging with MSS, MS-LOT, NatureScot and other relevant key stakeholders to identify and deliver measures for contributing to strategic monitoring to understand the impact of hard structure colonisations and change in community structure and local species diversity.
Accidental release of lubricants, chemicals or similar	✓	✓	✓	Low	Medium	Minor adverse	No additional measures required	Not significant	N/A
Operational painting and cleaning of marine growth		✓		Low	Medium	Minor adverse	No additional measures required	Not significant	N/A
Deterioration of water quality from cable and landfall works	✓		✓	Low	Medium	Minor adverse	No additional measures required	Not significant	N/A

Table 19.29: Summary of Likely Significant Cumulative Environment Effects, Mitigation and Monitoring

Description of Impact	Phase			Cumulative Effects Assessment Tier	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Additional Measures	Significance of Residual Effect	Proposed Monitoring
	C	O	D							
Increased risk of introduction and spread of INNS	✓	✓	✓	Tier 2	Low	Low	Minor adverse	No additional measures required	Not significant	As presented in the EMP (volume 4, appendix 22,), commitment to engaging with MSS, MS-LOT, NatureScot and other relevant key stakeholders to identify and deliver measures for contributing to strategic monitoring to understand the impact of hard structure colonisations and change in community structure and local species diversity.
	✓	✓	✓	Tier 3	Not available	Not available	Not available	No additional measures required	Not significant	
Accidental release of lubricants, chemicals or similar	✓	✓	✓	Tier 2	Low	Medium	Minor adverse	No additional measures required	Not significant	N/A
	✓	✓	✓	Tier 3	Low	Medium	Minor adverse	No additional measures required	Not significant	N/A
Operational painting and cleaning of marine growth		✓		Tier 2	Low	Medium	Minor adverse	No additional measures required	Not significant	N/A
		✓		Tier 3	Low	Medium	Minor adverse	No additional measures required	Not significant	N/A
Deterioration of water quality from cable and landfall works	✓		✓	Tier 2	Not available	Not available	Not available	No additional measures required	Not significant	N/A
	✓		✓	Tier 3	Not available	Not available	Not available	No additional measures required	Not significant	N/A

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