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Volume 7B Proposed Development (Offshore) Appendices

Appendix 3-2 Marine Water Quality Baseline

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OCEAN WINDS

Volume 7B Appendix 3-2 Marine Water Quality Baseline

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Acronyms and Abbreviations

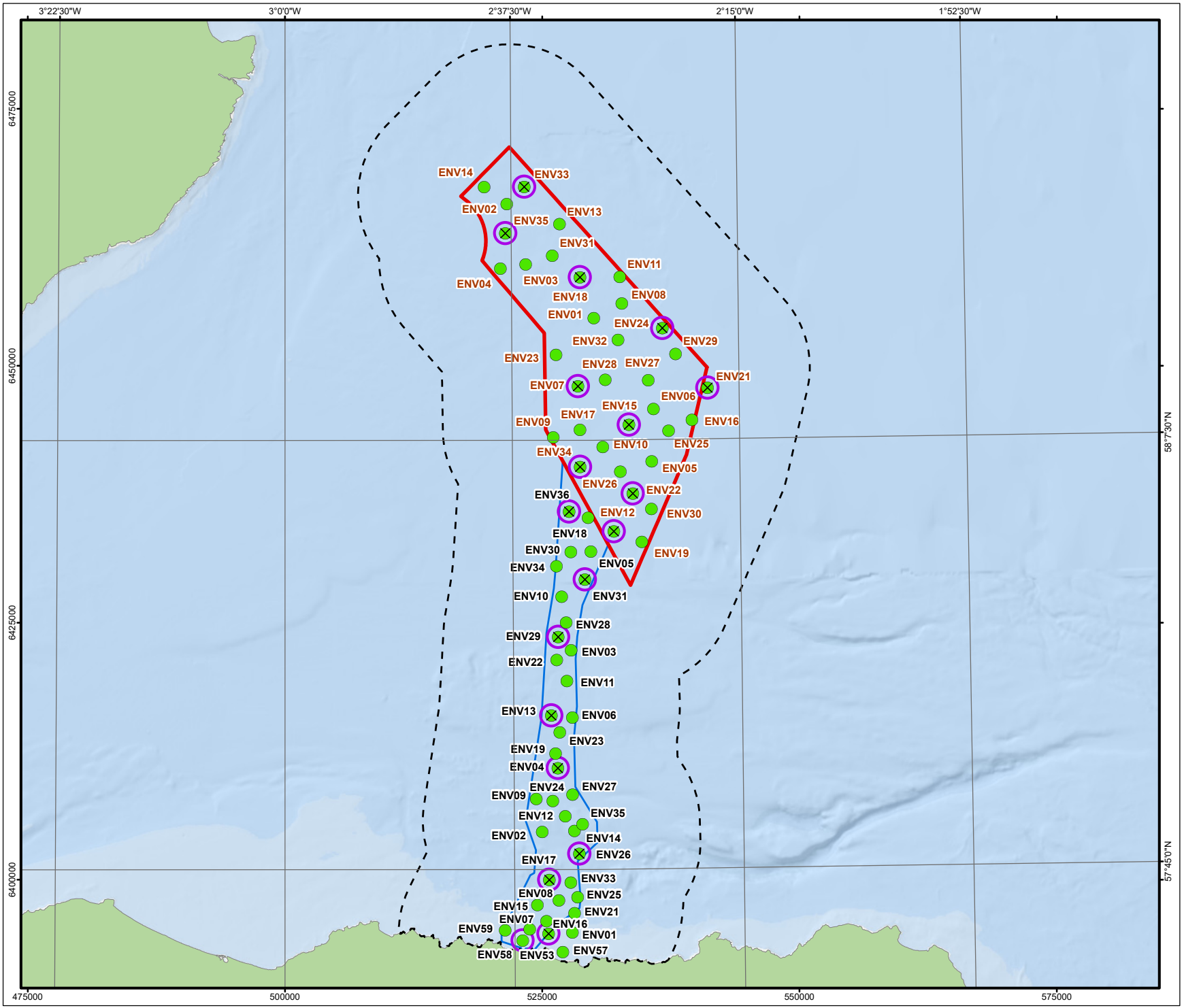
CTD	Conductivity, Temperature and Depth
MW&SQ	Marine Water and Sediment Quality
NMPI	National Marine Plan Interactive
OECC	Offshore Export Cable Corridor
OWF	Offshore Wind Farm
SPM	Suspended Particulate Matter
SSC	Suspended Sediment Concentration

1 Introduction

1.1.1.1 This appendix covers an in-depth analysis of the baseline environment of marine water quality parameters in the Marine Water and Sediment Quality (MW&SQ) Study Area of the Proposed Development (Offshore), such as:

- Temperature and salinity;
- Dissolved oxygen;
- Turbidity; and
- pH.

1.1.1.2 Illustrations of the location of sample stations across the Caledonia Offshore Wind Farm (OWF) (i.e., array area) and the Caledonia Offshore Export Cable Corridor (OECC) are shown in Figure 1-1. The results of this site-specific survey are compared with publicly available regional data, including previous OWF Environmental Impact Assessments (EIAs), to provide a robust characterisation of the entire MW&SQ Study Area.



Caledonia OWF

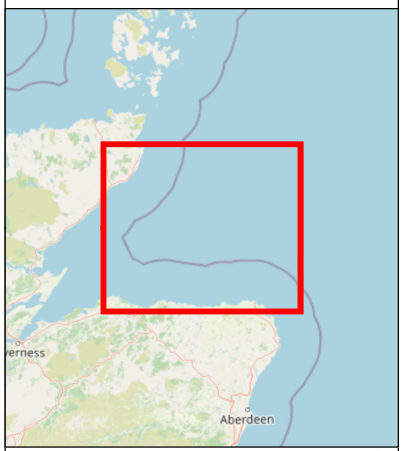
Offshore Export Cable Corridor

10km Zone of Influence

PSA Sample

Chemistry Sample

Water Sample



0 5 10 15 20 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	16/09/2024	Approved	EV	BB	DH

CALEDONIA Offshore Wind Farm

GoBe APEM Group

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_MWS_MAP_0017i

CONTRACTOR REV: 01

GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE

Figure 1-1: Site-Specific Survey Locations in the Caledonia OWF Array Area and Caledonia OECC

STATUS: Approved

SCALE: 1:500,000

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2 Temperature and Salinity

2.1 Overview

2.1.1.1 Using data organised by grid cells as presented on Scotland's National Marine Plan Interactive Map (NMPi), monthly temperature (°C) and salinity (‰) data were extracted from 20 grid cells located within the Caledonia OWF and nine grid cells within the Caledonia OECC (Marine Directorate, 2024[1]). The available data layers represents a 30-year (1971-2000) temperature/salinity climatology for surface regions of the Northwest European shelf seas. From the original data, which are irregularly distributed in space and time, the mean monthly surface temperature and salinity are calculated, as well as the climatic mean annual cycle. These regional data are compared with site-specific survey data to provide a robust characterisation of temperature and salinity across the receiving environment established with high data confidence. This section refers to two measurements of salinity; parts per thousand (‰) and practical salinity units (psu). To convert salinity from parts per thousand to practical salinity units, you can use the relationship: 1‰ = 1psu (e.g., 34.70‰ is equal to 34.70psu).

2.2 Caledonia OWF

2.2.1.1 Salinity data extracted from Scotland's NMPi Map (detailed in Section 2.1.1.1) showed annual mean surface salinity (‰) was reported to remain fully marine at around 34.78‰ with minimal fluctuations throughout the year (ranging from 34.70‰ in April to 34.99‰ in October) (Table 2-1; Figure 2-1).

2.2.1.2 Scotland's NMPi placed Aprils monthly average sea surface salinity within the Caledonia OWF at 34.70‰. A site-specific survey of the Caledonia OWF conducted in April observed a comparable sea surface salinity between 34.10psu and 34.60psu (Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)). In general, sample stations reported stable salinity profiles across the depth of the water column, with the exception of Station ENV12, which showed a halocline (distinct vertical layer in a body of water where there is a sharp change in salinity over a relatively short depth range) between c. 10m to 25m from the surface. The development of a halocline is consistent with the freshwater input from river catchments which flow into the Moray Firth. This is validated by the fact that Station ENV12, situated in the southern part of the array, is located close to potential freshwater sources.

2.2.1.3 Temperature data extracted from Scotland's NMPi for data within the Caledonia OWF displayed a strong seasonal signal with highs of 12.69°C in September and lows of 5.76°C in March. Moreover, during the summer

months (May, June, July, August, and September), a slight temperature variation was observed in the depth of the water column with ranges of up to 1.8°C (in June) between mean surface and bottom temperatures (Figure 2-1). This is in line with anticipated seasonal temperature stratification resulting from solar heating forming a weak thermocline (Sharples et al., 2006[2]; Volume 2, Chapter 2: Marine and Coastal Processes).

2.2.1.4 Scotland's NMPi placed Aprils monthly average sea surface temperature within the Caledonia OWF at 7.21°C. A site-specific survey of Caledonia OWF conducted in April observed a comparable range of sea surface temperatures between 7.8°C and 9.7°C depending on sample location (Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)). The survey output demonstrated a relatively constant sea surface temperature, suggesting a well-mixed upper layer (to approximately 10m). In addition, a clear thermocline (distinct vertical layer within a body of water where there is a rapid change in temperature with depth) was observed with temperatures decreasing rapidly at depths ranging from 5 to 20m in all stations, with the exception of Station ENV18 and ENV34. These two outliers are located on the central seaward side of the Caledonia OWF and showed a well-mixed profile. Beyond the thermocline observed at most sample stations, temperatures were relatively stable.

2.2.1.5 In summary, the values reported for temperature and salinity of the Caledonia OWF are characteristic of an offshore marine environment in the North Sea throughout an annual cycle.

Table 2-1: Mean monthly sea temperature (surface and bottom) and salinity (surface and bottom) across the Caledonia OWF based on climatology data between 1971 and 2000.

Month	Sea Surface Temperature (°C)	Sea Bottom Temperature (°C)	Sea Surface Salinity (‰)	Sea Bottom Salinity (‰)
January	7.44 (± 0.08)	7.71 (± 0.07)	34.70 (± 0.04)	34.76 (± 0.04)
February	6.55 (± 0.10)	6.55 (± 0.07)	34.71 (± 0.04)	34.74 (± 0.03)
March	5.76 (± 0.11)	5.80 (± 0.06)	34.72 (± 0.03)	34.73 (± 0.02)
April	7.21 (± 0.02)	7.01 (± 0.05)	34.70 (± 0.05)	34.79 (± 0.04)
May	8.29 (± 0.02)	7.55 (± 0.05)	34.74 (± 0.04)	34.85 (± 0.04)
June	10.53 (± 0.12)	8.65 (± 0.15)	34.77 (± 0.03)	34.79 (± 0.03)
July	11.35 (± 0.02)	10.06 (± 0.13)	34.83 (± 0.04)	34.93 (± 0.02)
August	12.69 (± 0.10)	11.11 (± 0.15)	34.78 (± 0.02)	34.85 (± 0.03)
September	12.23 (± 0.08)	11.85 (± 0.16)	34.86 (± 0.03)	34.93 (± 0.04)
October	11.80 (± 0.03)	11.71 (± 0.06)	34.93 (± 0.03)	34.99 (± 0.04)
November	9.93 (± 0.07)	9.85 (± 0.08)	34.82 (± 0.03)	34.83 (± 0.05)
December	8.56 (± 0.07)	8.64 (± 0.04)	34.85 (± 0.02)	34.90 (± 0.02)
Annual	9.36	8.87	34.78	34.84

Note, mean (± standard deviation) are shown for each parameter (n = 20).
Source: Marine Directorate (2024[1]).

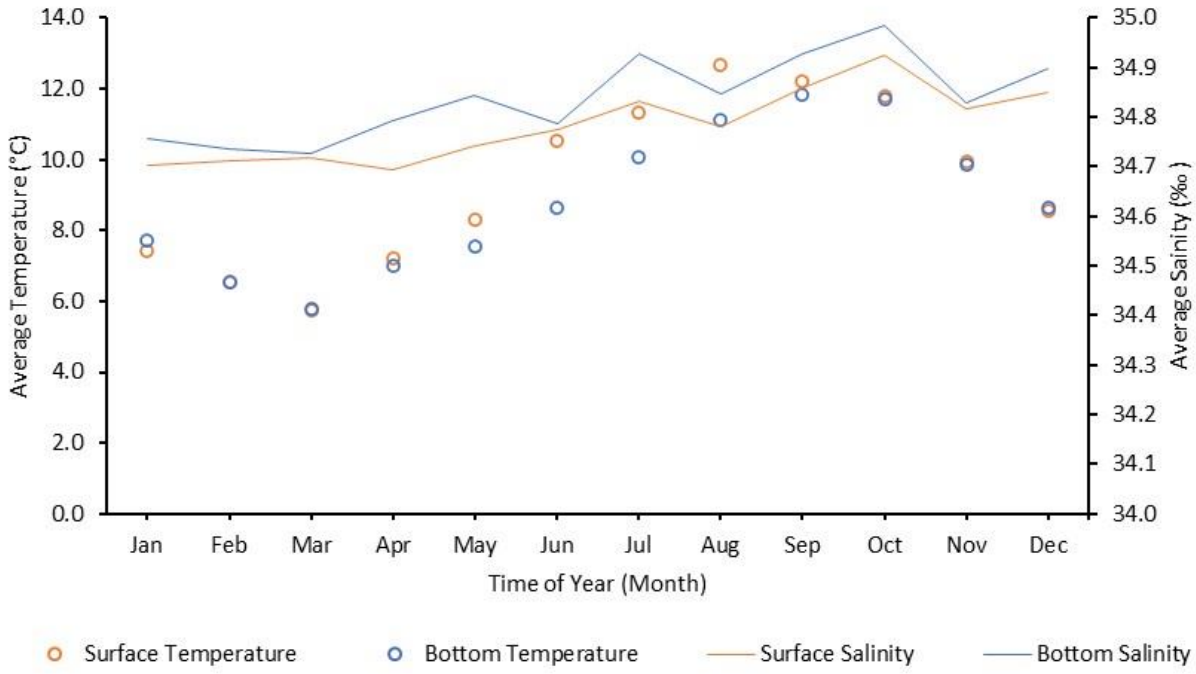

Figure 2-1: Monthly mean sea surface and bottom temperature and salinity within the Caledonia OWF based on climatology data between 1971 and 2000. Source: Marine Directorate (2024[1]).

2.3 Caledonia OECC

2.3.1.1 Salinity data was extracted from Scotland's NMPi Map (detailed in Section 2.1) for all coordinates available within the Caledonia OECC. The annual mean surface salinity (‰) was reported to remain fully marine at around 34.74‰ with minimal fluctuations throughout the year (ranging from 34.63‰ in April to 34.89 ‰ in October) (Table 2-2). A slight variation in salinity was recorded in the depth of the water column where the annual average reported a variance of 0.06‰ favouring a slightly more saline environment at the sea bottom.

2.3.1.2 Scotland's NMPi placed Aprils monthly average sea surface salinity within Caledonia OECC at 34.70‰. A site-specific survey of the Caledonia OECC conducted in April observed a comparable sea surface salinity between 33.8psu and 34.40psu (Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)). Sampled stations within the Caledonia OECC reported slightly decreased salinity in surface waters. This reduced salinity in surface waters, and therefore development of a halocline, is consistent with the freshwater input from river catchments which flow into the Moray Firth.

2.3.1.3 Temperature data was extracted from Scotland's NMPi Map for all coordinates available within the Caledonia OECC. Temperature values exhibited a strong seasonal signal with highs of 12.88°C in September and lows of 5.58°C in March. Moreover, during the summer months (May, June, July, and August), a slight temperature variation was observed in the depth

of the water column with variations of up to 2.04°C in June between mean surface and mean bottom temperatures (Figure 2-2). This is in line with anticipated seasonal temperature stratification resulting from solar heating forming a weak thermocline.

2.3.1.4 Scotland's NMPi placed Aprils monthly average sea surface temperature within the Caledonia OECC at 7.17°C. A site-specific survey of the Caledonia OECC conducted in April observed a comparable range of sea surface temperatures between 6.9°C and 8.2°C depending on the measurement location (Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)). The survey data reported a general increase in sea surface temperature associated with distance from shore, where the nearshore Station ENV17 recorded a temperature of 6.9°C which increased to 8.1°C at the furthest offshore Station ENV36. In addition, a clear thermocline was observed at depths ranging from c. 10 to 15m in the offshore environment, whereas nearshore stations recorded a well-mixed profile throughout. Reports observed a narrowing temperature range (approximately 0.5°C) beyond depths of 30m which continued until temperature remained relatively stable at 40m and beyond (ranging from 7.2°C to 7.6°C).

2.3.1.5 In summary, these values reported for temperature and salinity of the Caledonia OECC are characteristic of a typical coastal environment throughout an annual cycle with inputs from freshwater sources.

Table 2-2: Mean monthly sea temperature (surface and bottom) and salinity (surface and bottom) across the Caledonia OECC based on climatology data between 1971 and 2000. Source: Marine Directorate (2024[1]).

Month	Sea Surface Temperature (°C)	Sea Bottom Temperature (°C)	Sea Surface Salinity (‰)	Sea Bottom Salinity (‰)
January	7.29 (± 0.03)	7.59 (± 0.04)	34.64 (± 0.04)	34.71 (± 0.02)
February	6.39 (± 0.05)	6.42 (± 0.04)	34.66 (± 0.03)	34.69 (± 0.02)
March	5.58 (± 0.05)	5.71 (± 0.01)	34.68 (± 0.02)	34.69 (± 0.01)
April	7.17 (± 0.02)	6.92 (± 0.03)	34.63 (± 0.03)	34.74 (± 0.02)
May	8.32 (± 0.05)	7.47 (± 0.02)	34.69 (± 0.02)	34.78 (± 0.02)
June	10.73 (± 0.14)	8.69 (± 0.15)	34.72 (± 0.02)	34.75 (± 0.02)
July	11.40 (± 0.03)	10.13 (± 0.10)	34.78 (± 0.05)	34.90 (± 0.01)
August	12.88 (± 0.05)	11.24 (± 0.11)	34.75 (± 0.01)	34.81 (± 0.02)
September	12.33 (± 0.07)	12.01 (± 0.11)	34.82 (± 0.02)	34.89 (± 0.03)
October	11.82 (± 0.00)	11.75 (± 0.02)	34.89 (± 0.03)	34.95 (± 0.03)
November	9.79 (± 0.04)	9.71 (± 0.05)	34.76 (± 0.03)	34.75 (± 0.04)
December	8.49 (± 0.07)	8.65 (± 0.04)	34.83 (± 0.02)	34.88 (± 0.02)
Annual Average	9.35 (± 2.37)	8.86 (± 2.03)	34.74 (± 0.08)	34.80 (± 0.08)

Note, mean (± standard deviation) are shown for each parameter (n = 9).
Source: Marine Directorate (2024[1]).

Figure 2-2: Monthly mean sea surface and bottom temperature and salinity across the Caledonia OECC based on climatology data between 1971 and 2000. Source: Marine Directorate (2024[1]).

3 Dissolved Oxygen

3.1 Overview

3.1.1.1 Dissolved oxygen levels are indicative of oxygen sufficiency, with concentrations below 6mg/l considered oxygen deficient and below 2mg/l as hypoxic. Typical dissolved oxygen concentrations in the North Sea range from 6mg/l to 10mg/l (Mahaffey *et al*., 2020[3]). In the OSPAR Quality Status Report (2023[4]), a dissolved oxygen concentration of >6mg/l near the seafloor is used as an indicator of a healthy marine environment.

3.2 Caledonia OWF

3.2.1.1 Dissolved oxygen was recorded throughout the water column for ten locations across the Caledonia OWF associated with CTD profiling (Table 3-1). As a result, measured dissolved oxygen concentrations are available as profiles through the water column, with a summary for each sample station presented in Table 3-1. In the OSPAR Quality Status Report (2023[4]), a dissolved oxygen concentration of >6mg/l near the seafloor is used as an indicator of a healthy marine environment. All dissolved oxygen concentrations were >6mg/l throughout the water column for each sampled station within the Caledonia OWF, based on the minimum and maximum levels and water column profiles (Table 3-1).

3.2.1.2 Results indicate that concentrations of dissolved oxygen range from a minimum of 9.1mg/l to a maximum of 11.4mg/l. The highest dissolved oxygen concentrations were reported in surface samples within the top 10m of the water column. This is consistent with literature that suggests surface mixing contributes to heightened air-sea gas exchange. Stations ENV12, ENV15 and ENV21 located in the southern region of the Caledonia OWF recorded maximum dissolved oxygen concentrations between a water depth of 10 m to 20 m (Table 3-1). An observed decline in dissolved oxygen was evident below the well mixed upper layer down to approximately 30m. These data are characteristic of a typical offshore coastal region of the North Sea (Mahaffey *et al*., 2020[3]). The observed decline of dissolved oxygen throughout the water column may be due to a variety of physical (e.g. stratification and mixing) and/or biological factors (e.g. variations in production via photosynthesis and respiratory consumption by a wide range of organisms).

Table 3-1: Dissolved oxygen concentrations throughout the depth of the water column and across the Caledonia OWF (corresponding to sample stations in Figure 1-1) (Source: Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)).

Sample Station	Range of Dissolved Oxygen (mg/l)			Dissolved Oxygen at Specific Depths (mg/l)			Station Depth (m LAT)*
	Min	Max	Surface	25m	50m	Max Depth	
ENV07	9.4	10.0	10.0	9.5	9.4	9.4	53
ENV12	9.1	11.3	10.0	9.9	9.2	9.1	69
ENV15	9.6	11.4	11.3	9.8	9.6	9.6	62
ENV18	9.9	10.1	10.1	9.9	9.9	9.9	54
ENV21	9.1	11.1	10.8	9.9	9.5	9.1	102
ENV22	9.1	10.7	10.7	9.6	9.1	9.1	62
ENV24	9.9	11.0	11.0	9.9	9.9	9.9	62
ENV33	10.0	10.3	10.3	10.1	10.0	10.0	54
ENV34	9.3	10.0	10.0	9.7	9.4	9.3	66
ENV35	9.8	10.4	10.4	9.9	9.9	9.9	54
* Note, the maximum station depth is consistent across all sample stations for dissolved oxygen measurements taken in the Caledonia OWF.							

3.3 Caledonia OECC

3.3.1.1 Dissolved oxygen was recorded throughout the water column for eight locations across the Caledonia OECC associated with the CTD profiling (Table 3-2). All dissolved oxygen concentrations were > 6mg/l throughout the water column for each samples station within the Caledonia OECC (Table 3-2), indicating a healthy marine environment (OSPAR, 2017[5]).

3.3.1.2 Survey results showed concentrations of dissolved oxygen range from a minimum of 9.0mg/l to a maximum of 10.7mg/l. The highest dissolved oxygen concentrations were reported in surface samples within the top 5 m to 10 m of the water column (Table 3-2). This is consistent with literature that suggests surface mixing contributes to air-sea gas exchange and corresponds to the fresher inputs recorded in the salinity profiles. These data are characteristic of typical dissolved oxygen concentrations in offshore coastal region of the North Sea (Mahaffey *et al.*, 2020[3]). The observed decline of dissolved oxygen throughout the water column may be due to a variety of physical (e.g., stratification and mixing) and/or

biological factors (e.g., variations in production via photosynthesis and respiratory consumption by a wide range of organisms).

Table 3-2: Dissolved oxygen concentrations throughout the depth of the water column and across the Caledonia OECC (corresponding to sample stations in Figure 1-1) (Source: Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)).

Sample Station	Range of Dissolved Oxygen (mg/l)			Dissolved Oxygen at Specific Depth (mg/l)			Station Depth (m LAT)*
	Min	Max	Surface	25m	50m	Max Depth	
ENV53	9.4	9.6	9.6	N/A	N/A	9.5	28
ENV17	9.0	10.4	10.3	9.4	9.1	9.1	73
ENV26	9.0	10.2	10.2	9.5	9.1	9.0	109
ENV04	9.1	10.6	10.6	9.6	9.2	9.1	81
ENV13	9.0	10.4	10.3	9.5	9.1	9.0	62
ENV29	9.2	10.4	10.4	9.6	9.3	9.2	81
ENV31	9.0	10.2	10.2	9.5	9.2	9.1	73
ENV36	9.0	10.7	10.7	9.5	9.3	9.0	71
* Note, the maximum station depth is consistent across all sample stations for dissolved oxygen measurements taken in the Caledonia OECC.							

4 Turbidity and Suspended Particulate Matter

4.1 Overview

4.1.1.1 Suspended Particulate Matter (SPM) concentrations differ between the northern and southern regions of the North Sea. The northern North Sea with weaker tidal currents and deeper waters, has lower SPM concentrations compared to the southern region. Baseline SPM values in the Study Area are generally low (<5mg/l) (United Kingdom Marine Monitoring and Assessment Strategy, 2018[6]). However, storm events can temporarily increase near seabed SSC due to wave action. Coarser sediments are transported short distances before redeposition, while finer materials are carried further in the direction of net tidal flow (Cefas, 2016[7]).

4.1.1.2 Turbidity in the North Sea varies by location, season, weather and human activities. Typical turbidity levels in the North Sea are generally low to moderate, where coastal or estuarine environments are more turbid. In the relatively clear offshore waters of the North Sea, turbidity levels may range from around 1 to 5 Formazan Turbidity Units (FTU) under normal conditions. However, turbidity levels can be higher in nearshore areas, especially in areas influenced by river runoff, coastal erosion, or industrial activities.

4.2 Caledonia OWF

4.2.1.1 A site-specific survey (Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)) measured the turbidity within the Caledonia OWF in FTU, results of which are presented in Table 4-1. Overall, turbidity profiles revealed that the water turbidity remained relatively consistent throughout the water column. A minor increase in turbidity was noted below 60m at Station ENV21 (see Table 3-1), the deepest station, with turbidity increasing from 1.4 FTU to 3.3 FTU. A range of factors may be used to explain the increased turbidity at the deepest station, such as sediment resuspension, vertical mixing, anthropogenic activities and/or natural processes.

Table 4-1: Summary of turbidity (FTU) throughout the water column and across the Caledonia OWF (Source: Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)).

Sample Station	Range of Turbidity (FTU)			Turbidity (FTU) at Specific Depth		
	Min	Max	Surface	25m	50m	Max Depth
ENV07	1.2	5.1	1.4	1.3	1.4	1.4
ENV12	1.3	4.3	1.4	1.4	1.9	2.5
ENV15	1.2	5.8	1.4	1.5	1.7	1.9
ENV18	1.3	5.4	1.5	1.5	1.6	1.8
ENV21	1.2	3.5	1.3	1.4	1.5	2.8
ENV22	1.2	2.9	1.6	1.4	2.1	2.0
ENV24	1.3	5.1	1.4	1.5	1.6	1.8
ENV33	1.3	8.3	1.5	1.7	1.8	1.6
ENV34	1.2	2.5	1.4	1.4	1.4	1.5
ENV35	1.4	5.2	1.5	1.6	1.8	1.6

4.3 Caledonia OECC

4.3.1.1 A site-specific survey (Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)) measured the turbidity within the Caledonia OECC in FTU, the results of which are presented in Table 4-2. Overall, turbidity profiles indicate that the water turbidity was relatively consistent throughout the water column. A slight increase in turbidity, together with data spikes, were observed in the deepest 5m to 10m at most stations. The data spikes are consistent with the instrument sensor becoming momentarily obscured by suspended particles, debris or fauna in the water column. For example, the nearshore Station ENV53 generally exhibited more turbidity than the offshore stations, which may be attributed to the spring plankton bloom observed in the seabed imagery at this station (Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)).

Table 4-2: Summary of turbidity (FTU) throughout the water column and across the Caledonia OECC (Source: Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)).

Sample Station	Range of Turbidity (FTU)			Turbidity (FTU) at Specific Depth		
	Min	Max	Surface	25m	50m	Max Depth
ENV53	1.8	6.7	2.1	N/A	N/A	2.7
ENV17	1.3	4.1	1.6	1.5	1.8	2.0
ENV26	1.4	2.8	1.5	1.5	1.6	2.2
ENV04	1.3	3.3	1.5	1.5	1.8	2.4
ENV13	1.4	4.3	1.5	1.6	2.2	2.2
ENV29	1.4	2.7	1.5	1.5	1.5	2.1
ENV31	1.4	3.4	1.6	1.6	1.8	2.4
ENV36	1.2	2.7	1.7	1.4	1.3	2.5

5 pH

5.1 Overview

5.1.1.1 Fluctuations in pH can indicate changes in water chemistry, such as inputs of acid or alkaline substances from natural sources or human activities (such as coastal runoff). Monitoring pH helps assess the health and stability of marine ecosystems and identify potential sources of pollution or environmental stress. Overall, maintaining stable pH levels in seawater is essential for supporting healthy marine ecosystems, regulating biogeochemical cycles, and sustaining valuable ecosystem services provided by the oceans. The normal pH of seawater in the Moray Firth can vary depending on factors such as location, season, weather conditions, and local environmental influences.

5.1.1.2 Data extracted from Copernicus for pH levels between 2021 and 2024 (Copernicus, 2024[8]), focusing on a central data point within the Caledonia OWF, indicates an annual average pH of 8.06. The typical pH of seawater in the Moray Firth varies based on location, season, and environmental influences. Air-sea interaction with carbon dioxide generally keeps seawater pH within a range of 7.5 to 8.5, aligning with the survey results.

5.2 Caledonia OWF

5.2.1.1 A site-specific survey measured pH levels at various depths in the water column across the Caledonia OWF (Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)), results of which are displayed in Table 5-1. The pH values remained relatively stable throughout the water column and across the Caledonia OWF. However, there were slight increases in pH observed in conjunction with the presence of thermoclines. These increases in pH associated with thermoclines could be attributed to changes in water chemistry or biological activity influenced by the stratification of water masses which is common during the spring/summer months.

Table 5-1: Summary of pH throughout the water column across the Caledonia OWF (Source: Volume 7B, Appendix 4-1: Environmental Baseline Report (Array Area)).

Sample Station	Range of pH			pH at Specific Depth		
	Min	Max	Surface	25m	50m	Max Depth
ENV07	8.0	8.0	8.0	8.0	8.0	8.0
ENV12	7.9	8.1	8.1	8.0	8.0	8.0
ENV15	7.9	8.1	8.1	8.0	7.9	7.9
ENV18	8.2	8.3	8.2	8.2	8.3	8.3
ENV21	7.9	8.1	8.1	8.0	8.0	7.9
ENV22	7.9	8.1	8.1	8.0	7.9	7.9
ENV24	8.0	8.1	8.1	8.0	8.0	8.0
ENV33	8.0	8.0	8.0	8.0	8.0	8.0
ENV34	7.9	8.0	8.0	8.0	8.0	7.9
ENV35	8.0	8.0	8.0	8.0	8.0	8.0

5.3 Caledonia OECC

5.3.1.1 A site-specific survey measured pH levels at various depths in the water column within the Caledonia OECC (Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)), the results of which are displayed in Table 5-2. The pH values remained relatively stable throughout the water column and across the Caledonia OECC. However, there were slight increases in pH observed in conjunction with the presence of thermoclines. Air-sea interaction with carbon dioxide ensures seawater is generally within a range of 7.5 to 8.5, which is in agreement with the survey output.

Table 5-2: Summary of pH throughout the water column across the Caledonia OECC (Source: Volume 7B, Appendix 4-2: Environmental Baseline Report (Offshore Export Cable Corridor)).

Sample Station	Range of pH			pH at Specific Depth		
	Min	Max	Surface	25m	50m	Max Depth
ENV53	8.0	8.0	8.0	N/A	N/A	8.0
ENV17	7.9	8.0	8.0	7.9	7.9	7.9
ENV26	7.9	8.0	8.0	8.0	7.9	7.9
ENV04	7.9	8.1	8.1	8.0	7.9	7.9
ENV13	7.9	8.1	8.0	8.0	7.9	7.9
ENV29	7.9	8.1	8.1	8.0	7.9	7.9
ENV31	7.9	8.1	8.1	8.0	7.9	7.9
ENV36	7.9	8.1	8.1	8.0	7.9	7.9

6 References

[1] Marine Directorate (2024) 'The Marine Scotland NMPi Maps'. Available at: https://marinescotland.atkinsgeospatial.com/nmpi (Accessed 21/05/2024)

[2] Sharples, J. *et al*. (2006) 'Inter-annual variability in the timing of stratification and the spring bloom in the north-western North Sea'. Continental Shelf Research 26(6): 733–751

[3] Mahaffey, C., Palmer, M., Greenwood, N. and Sharples, J. (2020) 'Impacts of climate change on dissolved oxygen concentration relevant to the coastal and marine environment around the UK'. MCCIP Science Review 2020: 31-53

[4] OSPAR (2023) 'Quality Status Report'. Available at: https://www.ospar.org/work-areas/cross-cutting-issues/qsr2023 (Accessed 16/07/2024)

[5] OSPAR (2017) 'Intermediate Assessment 2017'. Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/ (Accessed 30/05/24)

[6] United Kingdom Monitoring and Assessment Strategy (2018) 'Turbidity - Marine online assessment tool'. Available at: https://moat.cefas.co.uk/ocean-processes-and-climate/turbidity/ (Accessed 21/05/24)

[7] Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2016) 'Suspended Sediment Climatologies around the UK'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf (Accessed 20/05/24)

[8] Copernicus Marine Service (2024) 'Atlantic – European North West Shelf – Ocean Biogeochemistry Analysis and Forecast'

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