Eastern Green Link 3

Marine Environmental Appraisal

Chapter 6 - Marine Physical Processes

Prepared for: Scottish Hydro Electric Transmission plc (SHE-T)

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Abbreviations/Glossary

ATT	Admiralty Total Tide
cAL	Cefas Action Level
Cefas	Centre for Environment, Fisheries and Aquaculture
CEMP	Construction Environmental Management Plan
CFE	Controlled Flow Excavator
CFSR	Climate System Forecast Reanalysis
EGL	Eastern Green Link
EMODnet	European Marine Observation and Data Network
ERL	Effective Low Range
ERM	Effective Range Median
GIS	Geographical Information Systems
HDD	Horizonal Directional Drilling
HVDC	High-Voltage Direct Current
ICES	International Council for the Exploration of the Sea
JNCC	Joint Nature Conservation Committee
km	Kilometre
KP	Kilometre Point
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
m/s	Metres per Second
MARPOL	International Convention for the Prevention of Pollution from Ships
MD-LOT	Marine Directorate – Licensing Operations Team
MEA	Marine Environmental Assessment
MEAp	Marine Environmental Appraisal
mg/l	Milligrams per Litre
MHWS	Mean High Water Springs
MSL	Mean Seal Level
NCMPA	Nature Conservation Marine Protected Area
NM	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
OWF	Offshore Wind Farm
PLONOR	Pose Little or No Effect
RLB	Red Line Boundary
SEPA	Scottish Environment Protection Agency
SOPEP	Shipboard Oil Pollution Emergency Plan
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SSC	Suspended Sediment Concentration
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bay
WFD	Water Framework Directive

6. Marine Physical Processes

6.1. Introduction

This chapter of the Marine Environmental Appraisal (MEAp) describes the potential impacts arising from the construction, operation and maintenance and decommissioning of the Proposed Development on marine physical processes. For the purposes of seeking the necessary consents, the Eastern Green Link (EGL) 3 Project has been split into different 'Schemes' i.e. English Onshore Scheme, English Offshore Scheme, Scottish Onshore Scheme and the Scottish Offshore Scheme (with the latter referred to as 'the Proposed Development'). Collectively all components of EGL 3 are referred to as "the Project".

A description of the works expected to be undertaken during construction, operation and maintenance and decommissioning of the Proposed Development is provided in **Chapter 3: Project Description**. The Proposed Development, defined spatially by the Red Line Boundary (RLB), includes approximately 145 kilometres (km) of subsea High Voltage Direct Current (HVDC) cables. The RLB extends from mean high water springs (MHWS) at the proposed landfall at Sandford Bay, Scotland, to the boundary with adjacent English waters and is nominally 700 metres (m) wide. This width is considered adequate to micro-site around sensitive seabed features or habitat, or to allow for the footprint of installation vessels and is the maximum extent of seabed in which construction and operation of the Proposed Development may take place. The RLB is shown in **Figure 6-1 (Drawing reference PCS_PU061_EG3_6_1)**.

As set out in **Chapter 1: Introduction**, cable installation and some associated activities beyond 12 nautical miles (NM) are exempt from the requirement to obtain a Marine Licence under the Marine and Coastal Access Act 2009 as well as repair of the installed cable in inshore and offshore waters. This chapter presents an assessment of the effects of the Proposed Development from MHWS at the Sandford Bay landfall to the border with English adjacent waters. This is to provide a holistic view of the Proposed Development and any associated impacts. However, consent is not being sought for the exempt cable (either installation or repair) and only cable protection would be included in the Marine Licence beyond 12 NM.

Kilometre Points (KPs) are used throughout this chapter to provide context as to where within the Study Area (see **Section 6.1.1** for definition of Study Area) a feature lies. KP 436 is defined at the border with adjacent English waters, while KP580 is defined at the proposed landfall in Sandford Bay, Peterhead.

This chapter should be read in conjunction with:

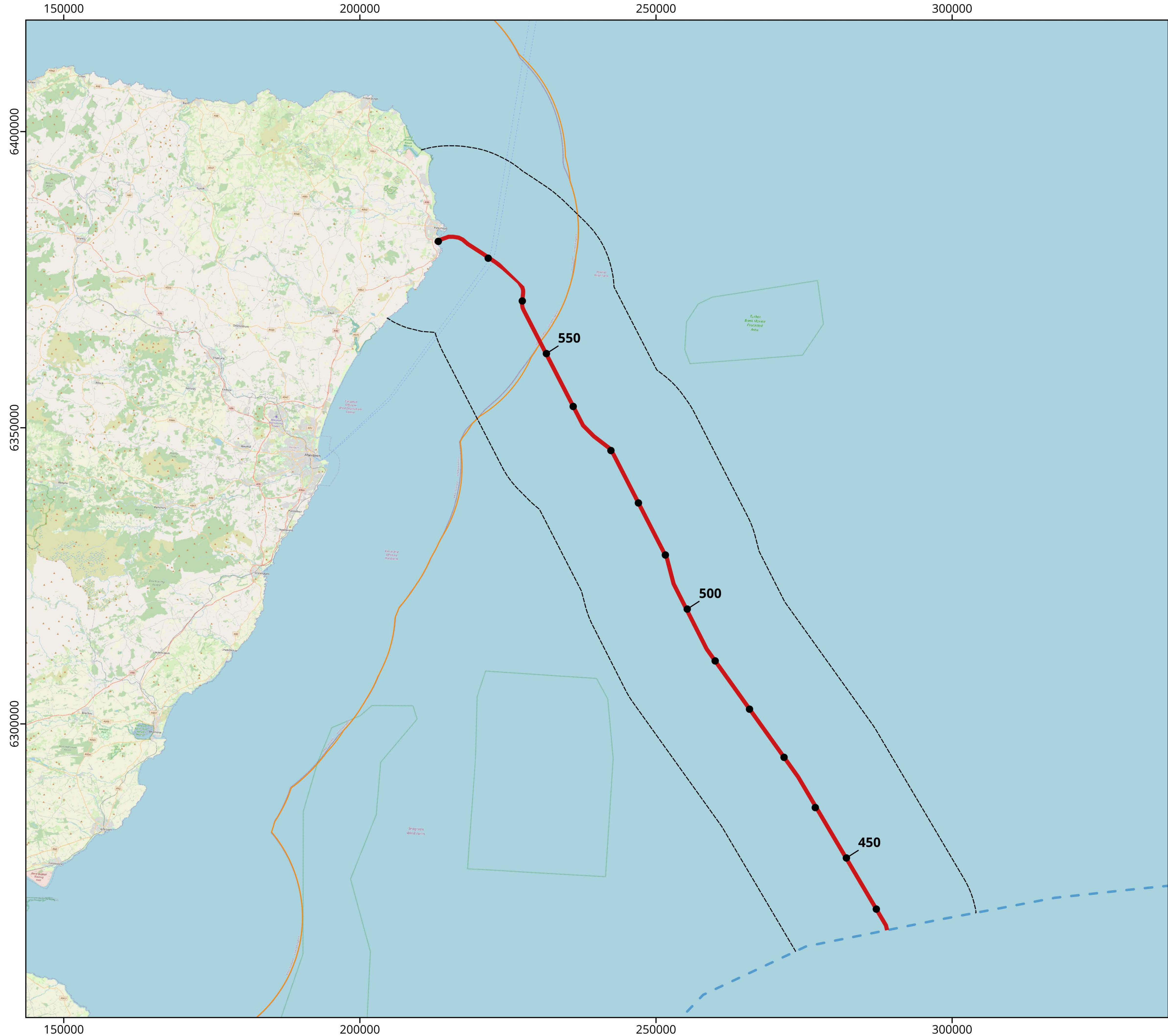
- **Chapter 3: Project Description**.

This chapter is supported by the following appendices:

- **Appendix 5A: Habitats Regulations Appraisal Stage 1 Screening**
- **Appendix 5C: Marine Protected Area Assessment**
- **Appendix 6A: EGL 3 Sediment Dispersion Assessment, Scottish ME, Spreadsheet-Based Modelling Tool.**

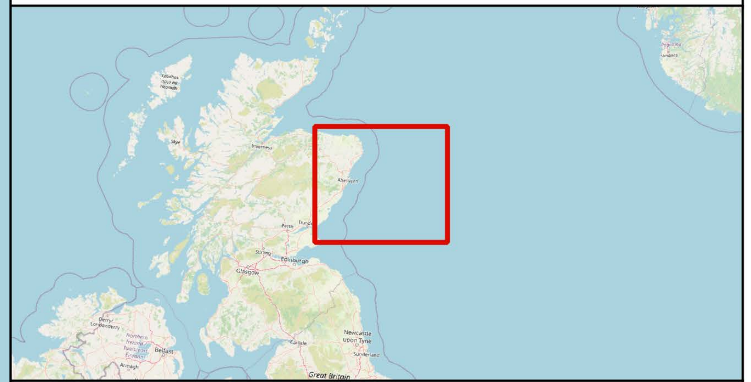
6.1.1. Study Area

The Proposed Development will route from MHWS at Sandford Bay, Peterhead, to the border between Scottish and English adjacent waters. The Study Area for marine physical processes, relevant to the Marine Environmental Assessment (MEA), includes the RLB to MHWS plus an additional 15 km buffer either side (hereafter in this chapter referred to as the "Study Area"). The UK Marine Renewables Atlas (ABPmer, 2017) indicates mean tidal excursions of around 10 km at the proposed landfall, reducing to around 4 km at the Scottish/English adjacent waters boundary. For a mean tidal excursion of 10 km, spring tidal excursions would be around 13 km and as such any impacts on marine physical processes would be expected to be constrained within the Study Area. 15 km is therefore a precautionary maximum zone of influence that encompasses the worst-case scenario of potential impact pathways. It has been validated by **Appendix 6A: EGL 3 Sediment Dispersion Assessment, Scottish ME, Spreadsheet-Based Modelling Tool, which** calculated the potential dispersion of sediment plumes arising from activities during construction, including sandwave clearance, excavation of HDD exit pits and cable trenching operations. All sediment plumes were within the 15 km Study Area. The Study Area is shown in **Figure 6-1 (Drawing reference PCS_PU061_EG3_6_1)**.



Study Area

PCS_PU061_EG3_6_1



Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

0 10 20 30 KM
0 5 10 15 NM
N

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Unit	meters
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Authorised	RW

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6.2. Data Sources

The marine physical processes baseline characterisation has been determined based on a review of publicly available information, project-specific survey data and consultation with relevant organisations. This provides a robust, up-to-date characterisation of the marine physical processes within the Study Area in accordance with relevant guidance for this topic.

6.2.1. Site-Specific Survey Data

Marine characterisation surveys were undertaken in 2023 and 2024 to provide a baseline of the intertidal and offshore areas within the Proposed Development; from the proposed landfall in Sandford Bay, Peterhead to the boundary with English adjacent waters, as detailed below. The survey area encompassed a 500 m wide area along the length of the Proposed Development, including the proposed landfall up to MHWS.

Environmental baseline assessment and habitat assessment surveys were carried out by Next Geosolutions in association with Benthic Solutions Ltd. The offshore and nearshore surveys were conducted between 20 June 2024 and 5 August 2024, and between 16 September 2024 and 8 October 2024, respectively.

Geophysical surveys were carried out by Deep BV and Shore Monitoring & Research on behalf of Next Geosolutions. The offshore and nearshore surveys were conducted between 14 August 2023 and 10 November 2023 and between 21 August 2023 and 5 October 2023 and 8 November 2023 and 25 January 2024, respectively.

Geotechnical surveys were carried out offshore and nearshore and conducted between 15 December 2023 and 25 June 2024 and between 7 July 2024 –and15 September 2024 and 1 November 2024 and 6 November 2024, respectively.

Of particular relevance to the marine physical processes, the surveys provided measurements of water depths and identified features such as boulder fields, sandwaves, bedrock and infrastructure crossings and obtained grab samples at 21 subtidal and nine intertidal locations for characterisation of sediment properties including particle size analysis (PSA) and chemical concentrations.

6.2.2. Publicly Available Data

A desk-based review of publicly available data sources (literature and GIS mapping files) has been used to supplement the results from the Proposed Development surveys and to describe the wider baseline marine physical environment. lists the key data sources used in the assessment.

Table 6-1: Key publicly available data sources for Marine Physical Processes

Data Source	Description
The European Marine Observation and Data Network (EMODnet, 2020)	Digital Terrain Model.
UK Hydrographic Office (UKHO, 2014)	Admiralty bathymetric survey data used to generate navigational charts and a major data source in the EMODnet Digital Terrain Model.
Admiralty Total Tide (ATT) software package	Tidal planes and tidal diamonds informing water levels and tidal flows.
Environment Agency Coastal Design Sea Levels for the UK (EA, 2018)	Coastal flood boundary conditions around the coast.
UK climate change projections (UKCP, 2018)	Sea level rise predictions along the coast.
Atlas of UK marine renewables resources (ABPmer, 2008)	Maps of tidal range (spring and neap), peak tidal flows (spring and neap) and mean tidal ellipses, annual wave heights and wind speeds.
SEASTATES (ABPmer, 2018)	Modelled hindcast wind and wave data.
Climate System Forecast Reanalysis (CFSR) (Saha *et al.*, 2010)	Hourly hindcast wind data at 0.2 degree resolution, spanning 44 years (1979 to 2024), used to drive SEASTATES.
British Geological Society (BGS, 2021)	Maps of seabed sediments, quaternary deposit thickness and structural geology offshore.
Joint Nature Conservation Committee (JNCC) Coasts and seas of the UK (Barne *et al.*, 1996)	Region 3 North-east Scotland: Cape Wrath to St. Cyrus – description of coastal landform, sediment transport and geology.
Kenyon and Cooper (2005)	Sediment transport pathways around the British Isles.

Data Source	Description
Cefas (2016)	Suspended Particulate Matter (SPM) – monthly, seasonal and annual maps.
Database on the Marine Environment (DOME, 2025)	Sediment quality data.
SEPA (Scottish Environment Protection Agency) bathing waters (SEPA, 2025a)	Water quality.
JNCC (2025)	Marine Designated Sites shape file layer.
Marine Directorate	Scoping reports on Scottish Offshore Wind Farm (OWF) developments including Morven (RPS, 2023a), Ossian (RPS, 2023b) and Muir Mhòr (GoBe, 2023).
SHE-T (2022)	Environmental Appraisal Report for the EGL 2 Marine Scheme.

6.3. Consultation

6.3.1. Non-statutory Scoping

In January 2024, a MEA Non-Statutory Scoping Report was submitted to the Scottish Government Marine Directorate - Licensing Operations Team (MD-LOT) as part of a pre-application consultation exercise for the Proposed Development. Responses from consultees were received on 15 July 2024. With respect to marine physical processes, the only consultation response received on the MEA Non-Statutory Scoping Report was from NatureScot who stated:

'We agree with the proposed approach and scoping assessment (table 6-5) for consideration of the development on this receptor.'

No other technical engagement has been undertaken that is relevant to marine physical processes.

6.3.2. Other consultations

No further non-statutory consultation, outside of scoping, has been undertaken for marine physical processes.

6.4. Baseline Characterisation

6.4.1. Overview

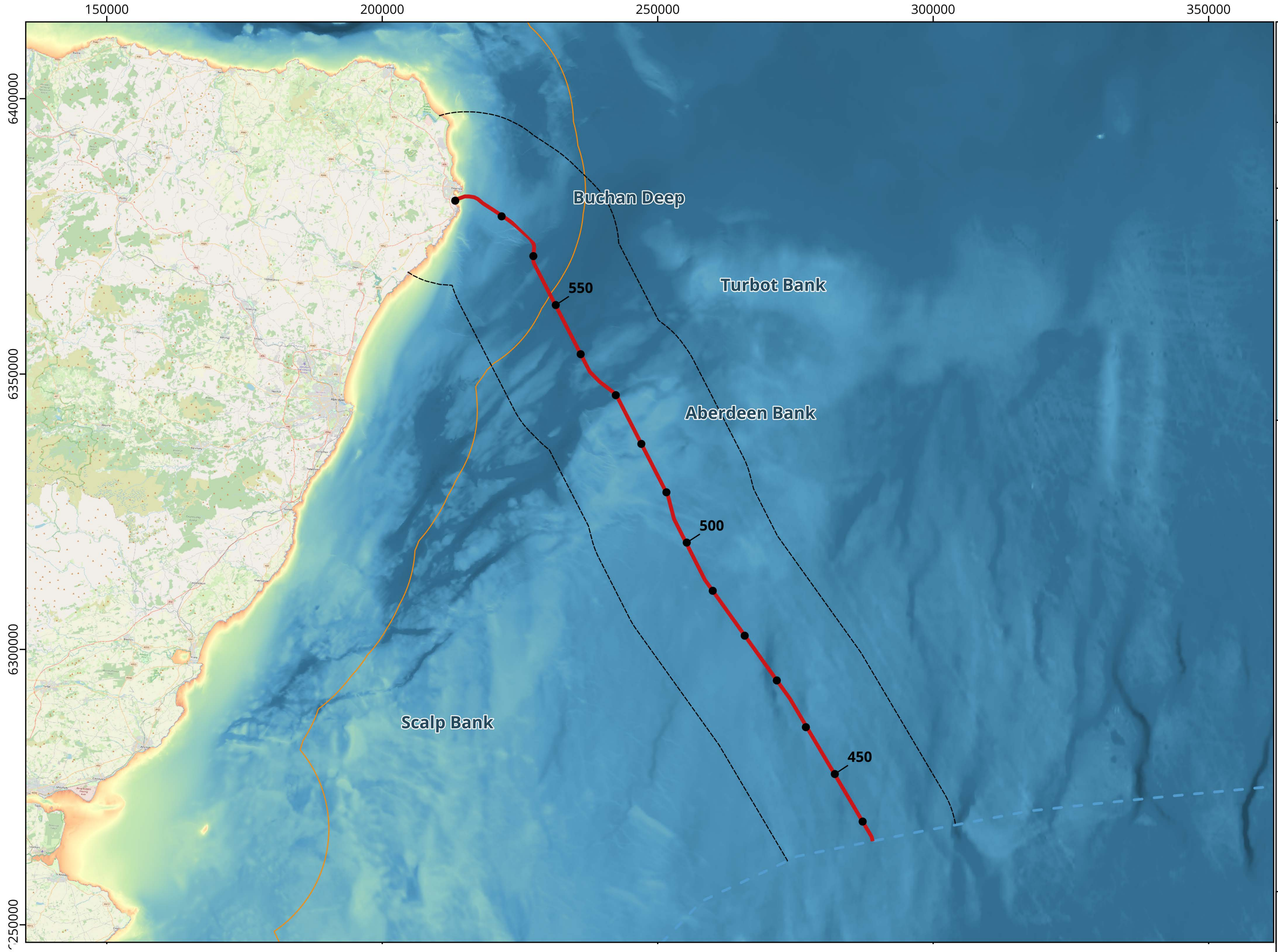
Marine physical processes cover the bathymetry, metocean, sediment, geology and geomorphology characteristics of the Study Area. The baseline environment has been described as follows:

- Bathymetry and Seabed Features
- Water Levels
- Tides and Currents
- Wind and Waves
- Geology and Seabed Sediments
- Geomorphology and Sediment Transport
- Coastal Geomorphology
- Designated Sites

6.4.2. Bathymetry and Seabed Features

The bathymetry in the Study Area is relatively flat, being approximately 70 m below Lowest Astronomical Tide (LAT) across much of the RLB. There is a local deepening of the seabed between KP 468 and KP 475, where the seabed is more than 85 m below LAT.

The seabed within the RLB is generally characterised as smooth and featureless, with some ripples, megaripples, sandwaves and boulders between KP 439 and KP 528, and undulating or wavy in character (due to the presence of more ubiquitous and larger seabed features) from KP 528 to the proposed landfall. Close to the Scottish coast, the bathymetry deepens to more than 100 m below LAT as the RLB crosses the southern edge of the Buchan Deep (approximately 40 km offshore) and then steeply shoals to the coast only shallowing below 30 m within 3 km of the coast **(Figure 6-2 (Drawing reference PCS_PU061_EG3_6_2))**.



Bathymetry

PCS_PU061_EG3_6_2

Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

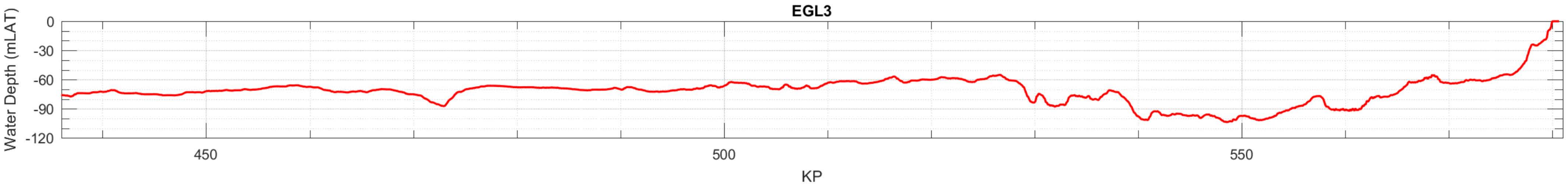
EMODnet Bathymetry (2024) Depth (mLAT)

- > -15
- -20
- -30
- -40
- -70
- -80
- < -100

0 10 20 30 KM

0 5 10 15 NM

N



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6.4.3. Water Levels

Data from the UK Renewables Atlas (ABPmer, 2017) and the ATT software package have been used to inform the baseline understanding on tidal levels across the Study Area, while data from the Environment Agency's coastal flood boundary conditions (EA, 2018) and from the UK climate change projections (UKCP, 2018) have been used to inform the baseline understanding of non-tidal influences on water levels.

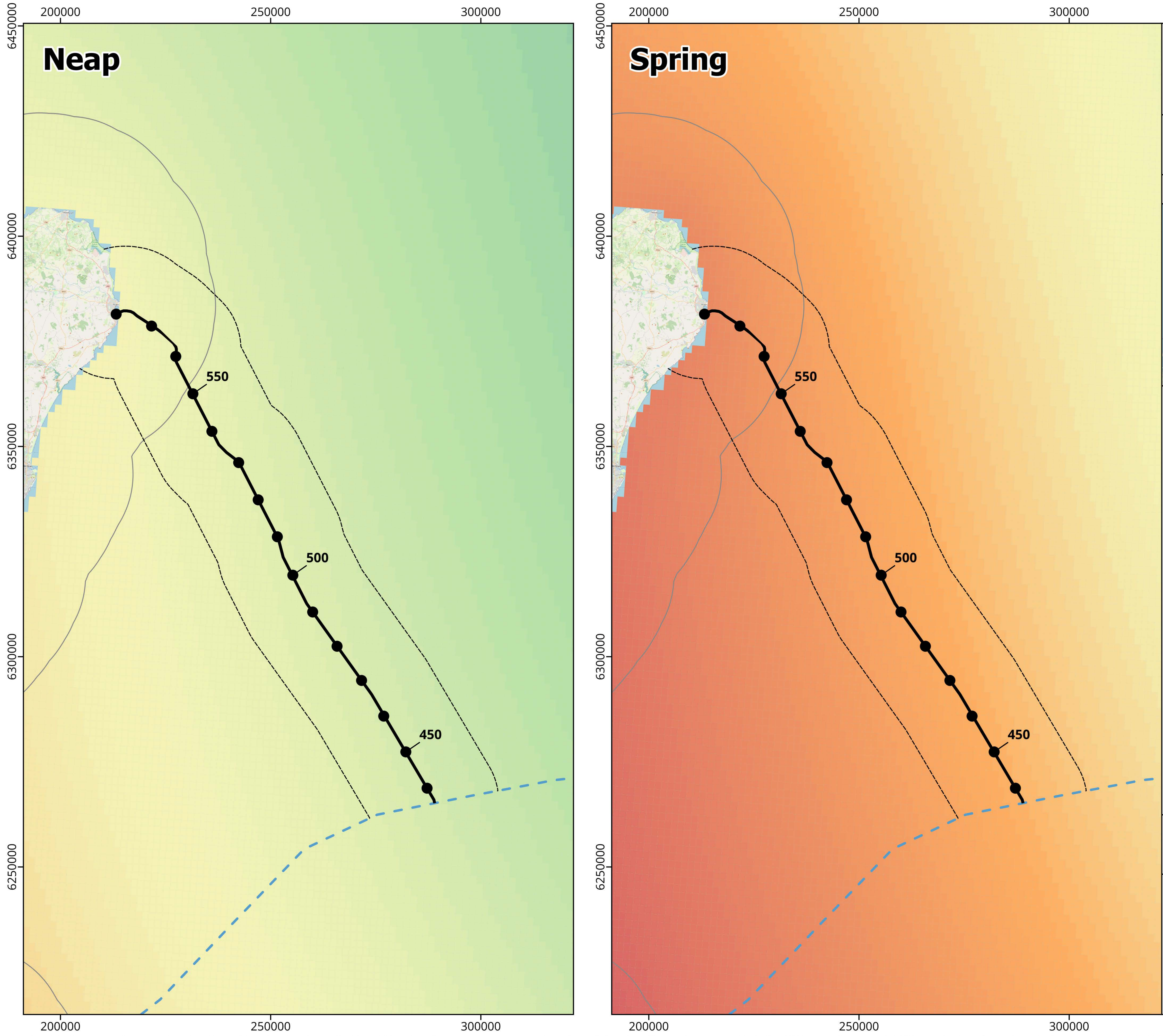
Water levels in the Study Area are predominantly driven by tidal processes. Tides in the Study Area are semi-diurnal, with two high and two low tides per day. The tides vary slightly across the Study Area, with spring tidal ranges of approximately 2.5 m at the southern extent, increasing to just over 3 m at the proposed landfall (Sandford Bay) **(Figure 6-3 (Drawing reference PCS_PU061_EG3_6_3))**. Tidal planes extracted from the ATT software are given in at Peterhead which lies approximately 2 km north of the proposed landfall; levels are quoted relative to LAT and relative to Mean Sea Level (MSL) which is 2.45 m above LAT at Peterhead. The tide arrives from the north so that the time of high water at the proposed landfall occurs approximately two to three hours before the time of high water at the southern extent of the Study Area.

Non-tidal or meteorological effects can also influence the water level. The height of a 1 in 200-year return period storm surge near the proposed landfall at Peterhead is 2.9 m above MSL (EA, 2018).

UKCP18 (UKCP, 2018) suggests an increase in MSL of 0.5 m to 0.6 m at 2100 along the Aberdeenshire coastline. Future changes in storm surges have been predicted to be indistinguishable from background variation (Lowe *et al.*, 2009), although extreme surge level event frequency is likely to increase (IPCC, 2021).

Table 6-2: Tidal levels extracted from ATT at Peterhead

Tidal Plane	Tide Level (m relative to LAT)	Tide Level (m relative to MSL)
Highest Astronomical Tide	4.3	2.0
Mean High Water Spring	3.9	1.6
Mean High Water Neap	3.1	0.8
Mean Low Water Neap	1.5	-0.9
Mean Low Water Spring	0.6	-1.8
Lowest Astronomical Tide	0	-2.4



Tidal Range for Mean Spring and Neap Tides

PCS_PU061_EG3_6_3

Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

Tidal Range (m)
ABPmer (2017)

- 0
- 0.5
- 1
- 1.5
- 2
- 2.5
- 3
- 3.5
- 4

0 10 20 30 KM
0 5 10 15 NM
N

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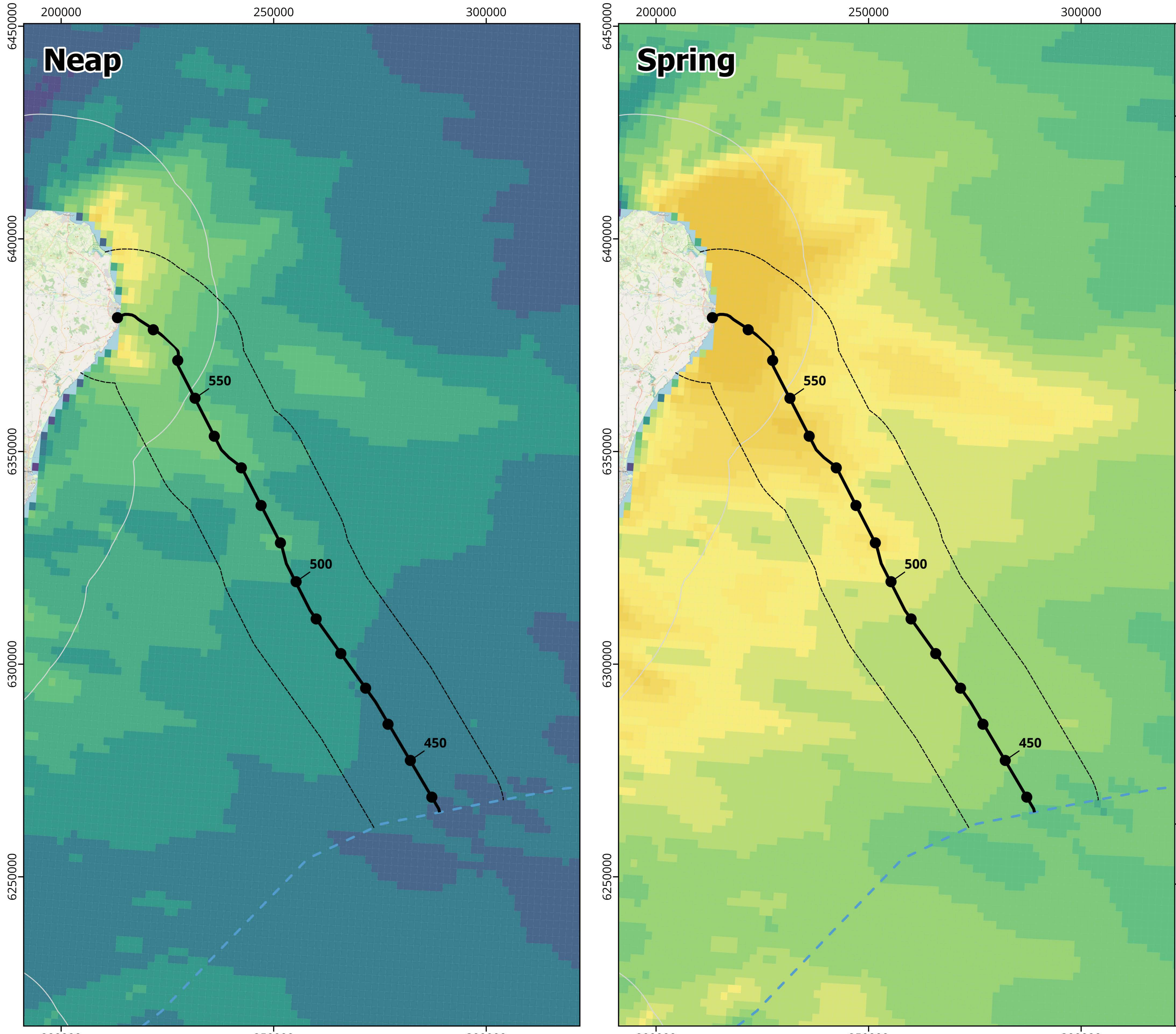
6.4.4. Tides and Currents

Data from the UK Renewables Atlas (ABPmer, 2017) and the ATT software package have been used to inform the baseline understanding on tidal flows across the Study Area. Tidal currents vary in terms of both current speed and direction across the Study Area. In the south of the Study Area tidal currents are orientated approximately north-south (with flows on the flood tide in a southward direction), while further north the currents realign northeast-southwest to follow the coastline. The currents are orbital offshore and become more bi-directional as the RLB approaches the proposed landfall.

Slowest currents occur in the southern part of the Proposed Development close to the Scottish/English adjacent waters boundary with spring tide current speeds of approximately 0.4 m/s at KP 420 to KP 440 **(Figure 6-4 (Drawing reference PCS_PU061_EG3_6_4))**. Current speeds increase in a northward direction with spring tide current speeds of 0.8 m/s at KP 558 and of more than 1.0 m/s close to the proposed landfall. Peak neap current speeds are just over half of the quoted peak spring tide current speeds.

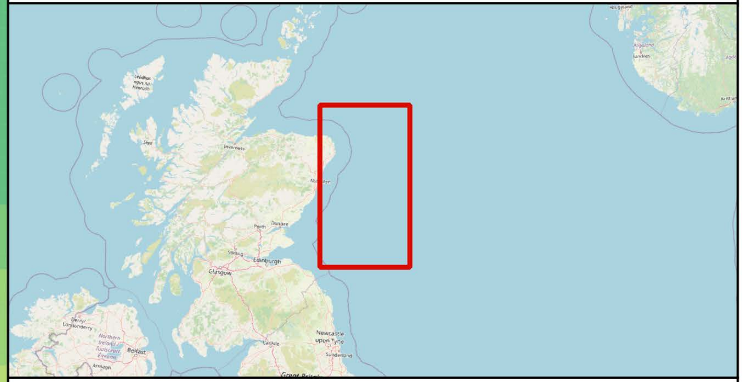
There is a slight dominance in the magnitude of peak northward flowing ebb currents, although the duration of the southward flowing flood currents tend to last slightly longer. The net effect is slight residual in northward tidal flow. Superimposed on this regional scale flow pattern, local flow variations can be expected to occur in response to bathymetric features (for example to realign with channel features).

Surge driven flows in the Study Area for a 1 in 50 year return period surge are predicted to be around 0.6 m/s, exceeding 0.8 m/s with a southward flow direction close to the proposed landfall (Flather, 1987).



Mean Spring and Neap Peak Tidal Flows

PCS_PU061_EG3_6_4



Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

Peak Flow (m/s) (ABPmer, 2017)

- 0
- 0.1
- 0.2
- 0.3
- 0.4
- 0.5
- 0.6
- >0.7

0 10 20 30 KM
0 5 10 15 NM
N

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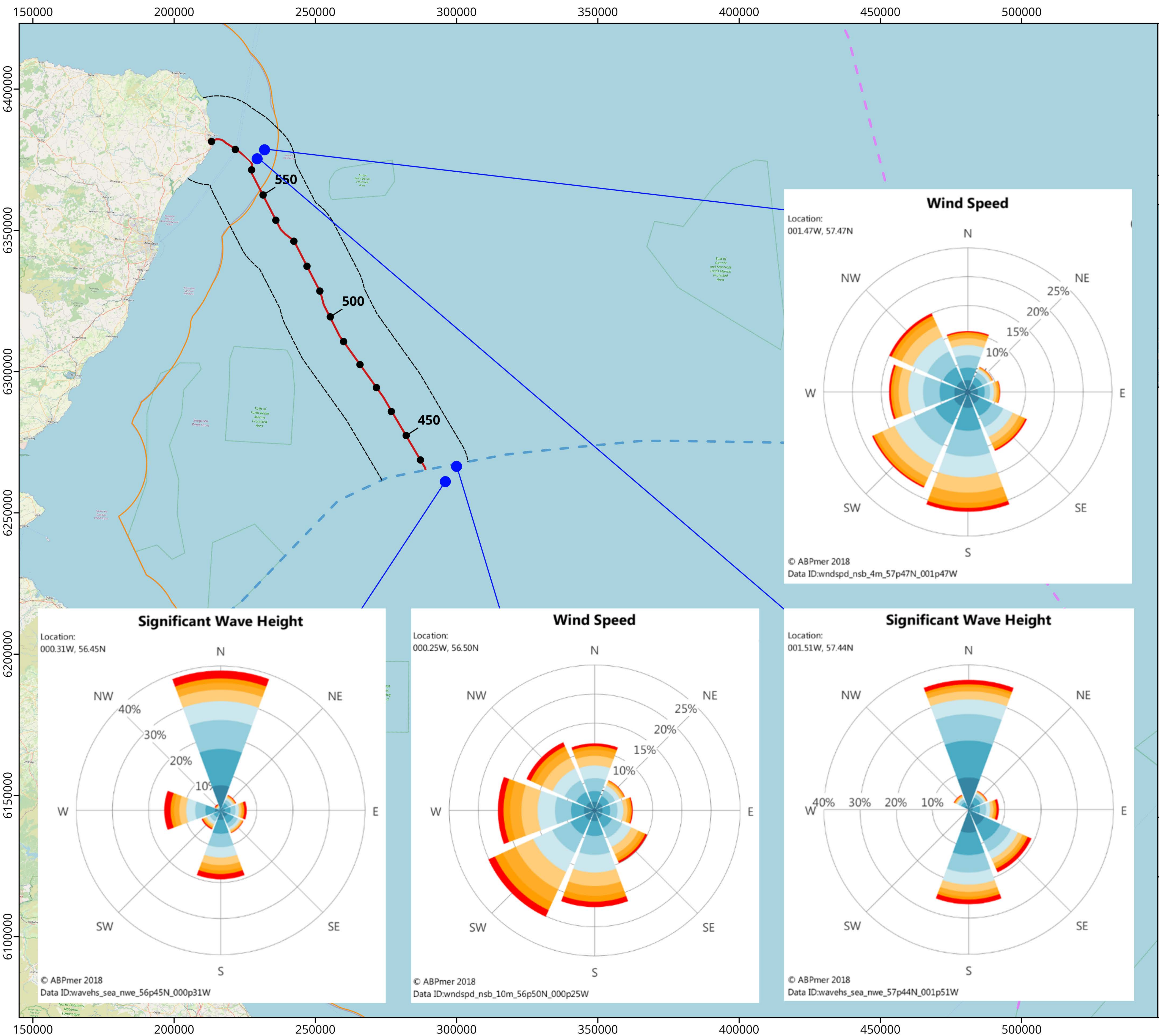
6.4.5. Wind and Waves

Climatological wind and wave data from SEASTATES (ABPmer, 2018) have been used to inform the baseline understanding of the wind and wave climate across the Study Area. SEASTATES is driven by the CFSR wind dataset (Saha *et al*., 2010).

Prevailing winds across the Study Area are from the south to west sectors. The strength of the winds increases with distance offshore (due to the effect of coastal sheltering), resulting in slightly higher wind speeds offshore of the Firth of Forth, with mean wind speeds of 8.1 m/s at KP 437, than at the proposed landfall (with a mean wind speed of 7.6 m/s at KP 568). Wind roses at KP 437 and KP 568 are shown in . Annual and monthly mean wind statistics based on historical measured wind data from the Peterhead Harbour weather station indicate an annual mean wind speed of 5.7 m/s, fastest mean wind speeds in February of 7.7 m/s and slowest mean wind speeds of 4.1 m/s in July (https://www.windfinder.com/).

The wave climate across the Study Area is controlled by a combination of locally generated wind waves and swell waves generated elsewhere in the North Sea. The primary wave direction along the proposed submarine cable corridor is from the north. The frequency of waves from other directions is controlled by the varying fetch lengths for different wind directions with distance along the Proposed Development, with waves from the south and west each occurring for around 15% of the time offshore of the Firth of Forth (at KP 437) and waves from the south and southeast occurring for around 20% of the time close to the proposed landfall (at KP 568). The baseline wave climate description is informed by a regional hindcast, and it is expected that at the proposed landfall, the dominance of waves from the north and the southeast will be significantly reduced by the sheltering effect of Little Petrie to the north and The Skerry to the southeast.

Mean significant wave heights in the Study Area are typically around 1.7 m, with higher mean significant wave heights of around 2.5 m in the winter. Wave roses at KP 437and KP 568 are shown in **Figure 6-5 (Drawing reference PCS_PU061_EG3_6_5)**.



Wind and Wave Roses

PCS_PU061_EG3_6_5

Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

Wind speed (ABPmer, 2018) (m): > 4; 3.5 to 4; 3 to 3.5; 2.5 to 3; 2 to 2.5; 1.5 to 2; 1 to 1.5; 0.5 to 1; 0 to 0.5

Significant Wave Height (ABPmer, 2018) (m/s): > 16; 14 to 16; 12 to 14; 10 to 12; 8 to 10; 6 to 8; 4 to 6; 2 to 4; 0 to 2

0 10 20 30 KM
0 5 10 15 NM

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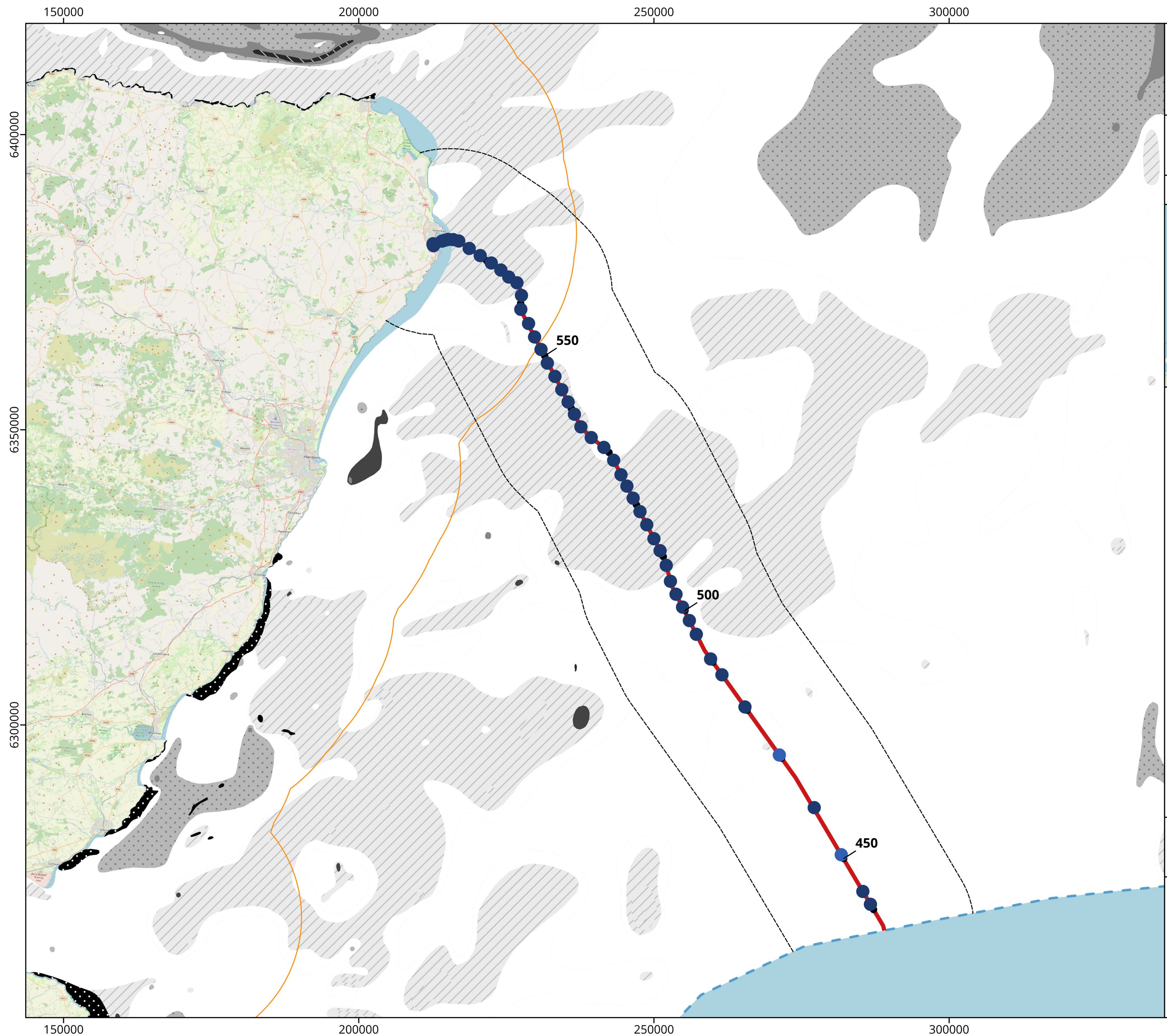
Authorised	RW

6.4.6. Geology and Seabed Sediments

The bedrock geology across the Study Area is characterised by Triassic rocks (mix of rock, siliciclastic, argillaceous and sandstone) along much of the proposed submarine cable corridor. Close to the proposed landfall the bedrock geology varies with areas of mudstone and gypsum-stone, old red sandstone and igneous rock (basalt).

The thickness of quaternary deposits across the Study Area is typically between 5 and 20 m, with an area of thicker deposits (30 to 50 m) close to the proposed landfall. Thinner surficial deposits (of around 0.5 m) were identified in some areas during the Proposed Development marine characterisation survey, particularly in the area close to the proposed landfall.

Results from the Proposed Development marine characterisation survey (including the geophysical and benthic surveys) indicates that surficial sediments in the Study Area are predominantly sand with some areas of coarse-grained sediment (close to the proposed landfall and around KP 500 to KP 550 (**Figure 6-6 (Drawing reference PCS_PU061_EG3_6_6), Figure 6-7 (Drawing reference PCS_PU061_EG3_6_7)** and **Figure 6-8 (Drawing reference PCS_PU061_EG3_6_8)**). The patches of coarse sediments included cobbles, interpreted as glacial deposits and aggregations of shelly material interspersed with sands and fine material. Cobbles and boulders were seen infrequently across the majority of the RLB, mainly being confined to the shallower regions of the RLB.



Seabed Sediments and Percentage of Fines from PSA

PCS_PU061_EG3_6_6

Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

% of Fines from PSA

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

Seabed Sediment Classification (EMODnet, 2022)

- Sand
- Coarse-grained sediment
- Muddy sand
- Sandy mud
- Mixed sediment
- Rock & boulders
- Mud

0 10 20 30 KM

0 5 10 15 NM

N

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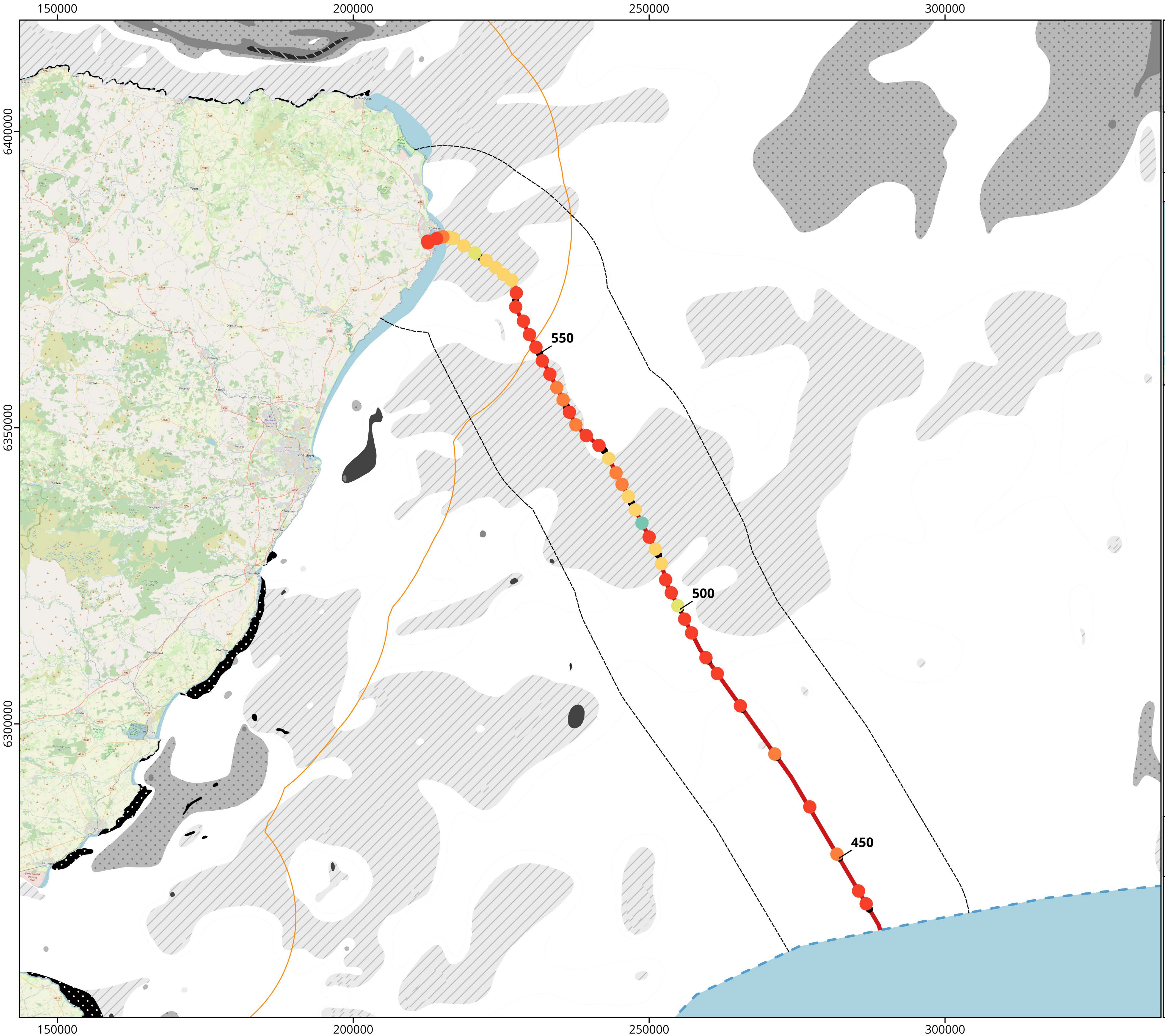

Seabed Sediments and Percentage of Sands from PSA

PCS_PU061_EG3_6_7

Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

% of Sands from PSA

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

Seabed Sediment Classification (EMODnet, 2022)

- Sand
- Coarse-grained sediment
- Muddy sand
- Sandy mud
- Mixed sediment
- Rock & boulders
- Mud

0 10 20 30 KM
0 5 10 15 NM
N

Date	28/05/2025
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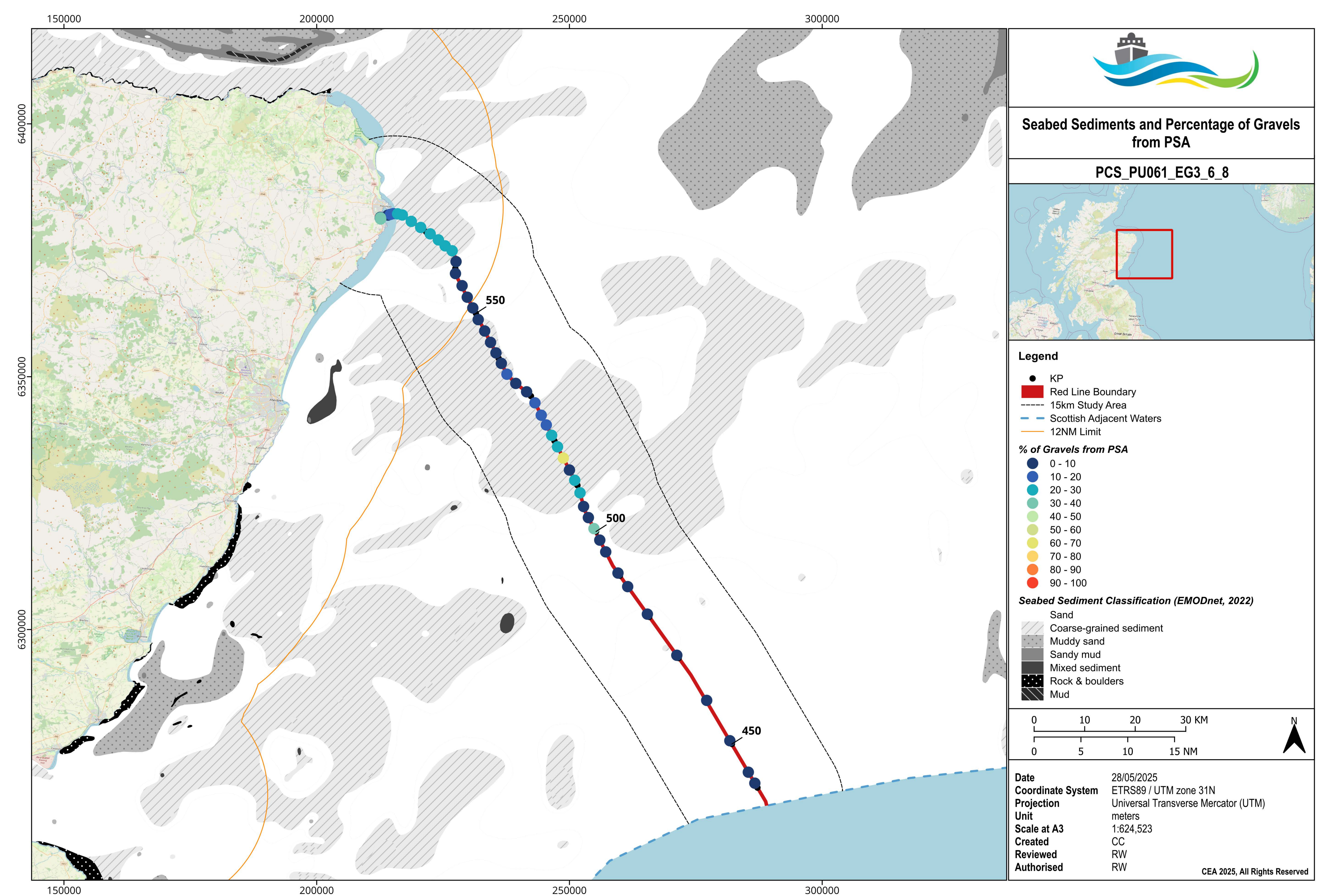

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6350000
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500
450
Seabed Sediments and Percentage of Gravels from PSA
PCS_PU061_EG3_6_8
Legend
KP
Red Line Boundary
15km Study Area
Scottish Adjacent Waters
12NM Limit
% of Gravels from PSA
0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100
Seabed Sediment Classification (EMODnet, 2022)
Sand
Coarse-grained sediment
Muddy sand
Sandy mud
Mixed sediment
Rock & boulders
Mud
0 10 20 30 KM
0 5 10 15 NM
N
Date 28/05/2025
Coordinate System ETRS89 / UTM zone 31N
Projection Universal Transverse Mercator (UTM)
Unit meters
Scale at A3 1:624,523
Created CC
Reviewed RW
Authorised RW
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6.4.7. Geomorphology and Sediment Transport

In the Study Area, the sediment transport is driven by wave action and the net sediment transport is low (with wave driven transport restricted to shoals and/or storm events). As the RLB approaches the proposed landfall, the net sediment transport is to the north, driven by tidal flows. At the northern end of the Study Area there is a bed-load convergence zone, indicated by the presence of large sandwaves (Kenyon and Cooper, 2005).

The direction of sediment transport is driven mainly by tidal currents, although the mobilisation of sediment is likely to be initiated by waves during storm events. Sand transport rates are generally relatively low due to the relatively deep depths and weak tidal currents. In addition, there are no local significant sediment sources (with low sediment inputs from rivers and the granite cliffs which are resistant to marine erosion). Surge driven flows in the Study Area are not expected to contribute significantly to sediment transport (Kenyon and Cooper, 2005).

Morven OWF is 1.98 km from the Proposed Development. The geophysical survey for the Morven OWF indicated that megaripples with heights of 0.5 m were present across much of the area surveyed (RPS, 2023a). The megaripples were reported to be generally orientated from west to east, with their lee slope facing south, indicative of a dominant southward current direction, this opposes the net transport further north along the coast. Numerous boulders and cobbles were found to be present, particularly in the troughs between megaripples, indicating that the surficial sands are likely to be relatively thin. Similarly, the geophysical survey for the Ossian OWF identified some megaripples and sandwaves indicative of a mobile bed, noting a net southward transport but at very low rates, expected to be driven by wave activity (RPS, 2023b).

The Proposed Development marine characterisation survey spanned a large local storm event within survey Block 24 (which is located near to the proposed landfall) surveyed both pre (data recorded before 10 October 2023) and post (data recorded after 22 October 2023) storm event. Large differences in seabed morphology were observed to have occurred over the 12 day period including:

- a shallowing (i.e. reduction in water depth) of 0.62 m in depths of around 17 m;
- a shallowing (i.e. reduction in water depth) of 0.86 m in depths of around 19 m;
- a deepening (i.e. increase in water depth) of 0.76 m in depths of around 23 m;
- a flattening of sandwave features with heights of 2 to 3 m and wavelengths of 50 to 60 m pre storm and with no sandwave features identified post storm;
- a reduction in the size of boulders on the bed; and
- a change from sandy sediment pre storm to sandy sediments interspersed with gravelly sand post storm.

6.4.8. Coastal Geomorphology

The coastline within the Study Area extends from Rattray Head in the north to just south of Whinnyfold. The coastline is characterised by alternating sections of cliffs (which vary in height from 20 m to 40 m) and sandy dune backed beaches (Barne *et al*., 1996). Sedimentary rocks are of the Old Red Sandstone Supergroup, with a few large masses of Caledonian intrusive rocks present including the Peterhead Granite, which outcrops for around 20 km between St. Fergus and Cruden Bay, forming rocky platforms and cliffs. The cliffs transition to a dune-backed bay-head beach at Cruden Bay.

The western central shoreline features supralittoral sand dunes backing mobile shingle, cobbles, and coarse substrata.

6.4.9. Sediment and Water Quality

Data from the Centre for Environment, Fisheries and Aquaculture (Cefas) Suspended Sediment Climatology model (Cefas, 2016) provides long term average (1998 to 2015) annual and monthly readings of non-algal SPM (note that Cefas use the term non-algal SPM rather than Suspended Sediment Concentration (SSC), but these terms are analogous and further discussion adopts the term SSC). An updated climatology considering data collected over a longer duration is believed to be under development but as of May 2025 has not yet been made publicly available.

The climatology shows that over the period between 1998 – 2015 annual mean SSC values are approximately 1 mg/l throughout much of the Study Area. SSC values increase slightly close to the proposed landfall, however, they remain low, being less than 3 mg/l (**Figure 6-9 (Drawing reference PCS_PU061_EG3_6_9)**). Winter and summer SSC (**Figure 6-10 (Drawing reference PCS_PU061_EG3_6_10)**) shows there is some seasonal variability but with SSC remaining low even during the winter months, with only relatively localised areas of SSC of more than 5 mg/l.

It should be noted that these measurements of SSC are representative of near-surface conditions under non-storm / cloud free conditions and as such are likely to provide an underestimate of average conditions, particularly in close proximity to the seabed.

Other studies have shown that there are likely to be frequent short-term increases in background SSC in the near-bottom waters as a result of natural events, with much higher values during storm events (UKMMAS 2010).

The Proposed Development passes through the Water Framework Directive (WFD) Ugie Estuary to Buchan Ness (Peterhead) water body, which is classed as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on navigation (Water body ID UKSC200131). There are two designated bathing waters within the Study Area, with Peterhead (Lido) around 1 km north of the proposed landfall (as the crow flies) classed as 'Excellent' since 2018, and Cruden Bay 9 km south of the proposed landfall also classed as 'Excellent' for 2024, upgraded from 'Good' status (held since its addition in 2019 until 2023). Although the Peterhead (Lido) bathing water is less than 1 km from the proposed landfall as the crow flies, the bathing water lies within Peterhead Harbour which is protected by two breakwaters extending across the harbour entrance. The travel distance between the proposed landfall and the Peterhead (Lido) bathing water is therefore closer to 3 km, although parts of the RLB (between KP 578 and KP 580) are within a travel distance of less than 2 km. A WFD compliance assessment is provided in **Appendix 6B: Water Framework Directive Assessment Report.**

The concentrations of metals in sediments within the North Sea are generally higher in the coastal zone and around estuaries, decreasing offshore indicating that river input and run-off from land are significant sources. The sediments within the Study Area are typically coarse sediments (sands and gravels with only low mud content), which pose a low risk for anthropogenic contaminants.

Sediment samples from the Proposed Development marine characterisation survey collected from 30 locations (21 subtidal and 9 intertidal) along the Proposed Development were analysed for trace and heavy metals, including aluminium, arsenic, barium, cadmium, chromium, copper, lead, lithium, mercury, nickel, tin and zinc. In addition, samples were analysed for total organic carbon and presence of polyaromatic hydrocarbons (PAH) and Total Petroleum Hydrocarbons (TPH).

A variety of sediment quality guidelines are used to assist in the interpretation of the sediment quality data as no approach is relevant for all the sediment quality analyses undertaken. Contaminant concentrations were compared with Cefas action levels (cAL) 1 and 2 (MMO, 2015). Cefas action levels are non-statutory and are intended to inform decision making on the disposal of dredged sediment to sea rather than as indicator of contamination. Levels below cAL1 are of no concern, while levels above cAL2 are generally considered to be unsuitable for disposal at sea. National Oceanic and Atmospheric Administration (NOAA) developed the Effect Range Low (ERL) and Effect Range Median (ERM) guidelines for hydrocarbons and metals, whereby at that level adverse effects were reported in 10% (ERL) and 50% (ERM) of the data (Buchman, 2008). In addition, where values exceed either cAL or ERL, the levels are considered relative to their background concentration established by the United Kingdom Offshore Operators Association (UKOOA) based on data collected between 1975 to 1995 in sediments more than 5km from existing oil and gas platforms. The UKOOA (2001) report (Harries *et al.*, 2001) provides 50th and 95th percentile levels in sediments which are presented for specific North Sea sectors, of which the Study Area lies in the Central North Sea Sector. No sediment quality guidelines were identified for aluminium, barium, lithium and tin.

Statistics for all intertidal and subtidal sampling stations are summarised in and , respectively, with reference given to the number of samples exceeding the cAL1 and ERL sediment quality guidelines. No intertidal samples exceeded cAL1 or ERL guidelines. Five subtidal samples exceeded cAL1 for Arsenic, with a higher number (15) exceeding ERL guidelines. The samples with highest Arsenic concentration samples were taken between KP 480 and KP 527 (approximately midway along the Proposed Development), with some slightly elevated concentrations also found at the nearshore and offshore extents of the RLB (**Figure 6-11 (Drawing reference PCS_PU061_EG3_6_11)**).

One sample exceeded both cAL1 and ERL for mercury, while a separate sample exceeded cAL1 (but was below ERL) for nickel. Both these samples were located close to the Scottish/English adjacent waters boundary. All samples (including mercury and nickel) were well below cAL2 and ERM guidelines.

No samples exceeded cAL1 for PAH, with a maximum concentration of 0.02 mg/kg (while the cAL1 is 0.1 mg/kg). The highest concentration of TPH from all samples was 0.13 mg/kg.

Table 6-3: Heavy and trace metal concentrations for subtidal samples.

Statistic	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
Mean (mg/kg)	14.5	0.06	12.6	4.5	9.2	0.02	8.8	28.7
Standard Deviation (mg/kg)	8.8	0.03	6.5	3.7	7.2	0.03	4.6	16.3
Variance (%)	60.8	55.1	51.5	82.8	78.9	163.1	52.1	56.8
Minimum (mg/kg)	2.2	0.04	5.3	1	3.7	0.01	4.1	11.6
Maximum (mg/kg)	31.6	0.15	29	15	33.6	0.16	21.1	70.2

Statistic	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
Number of samples above NOAA ERL	15	0	0	0	0	1	1	0
Number of samples above cAL1	5	0	0	0	0	0	1	0

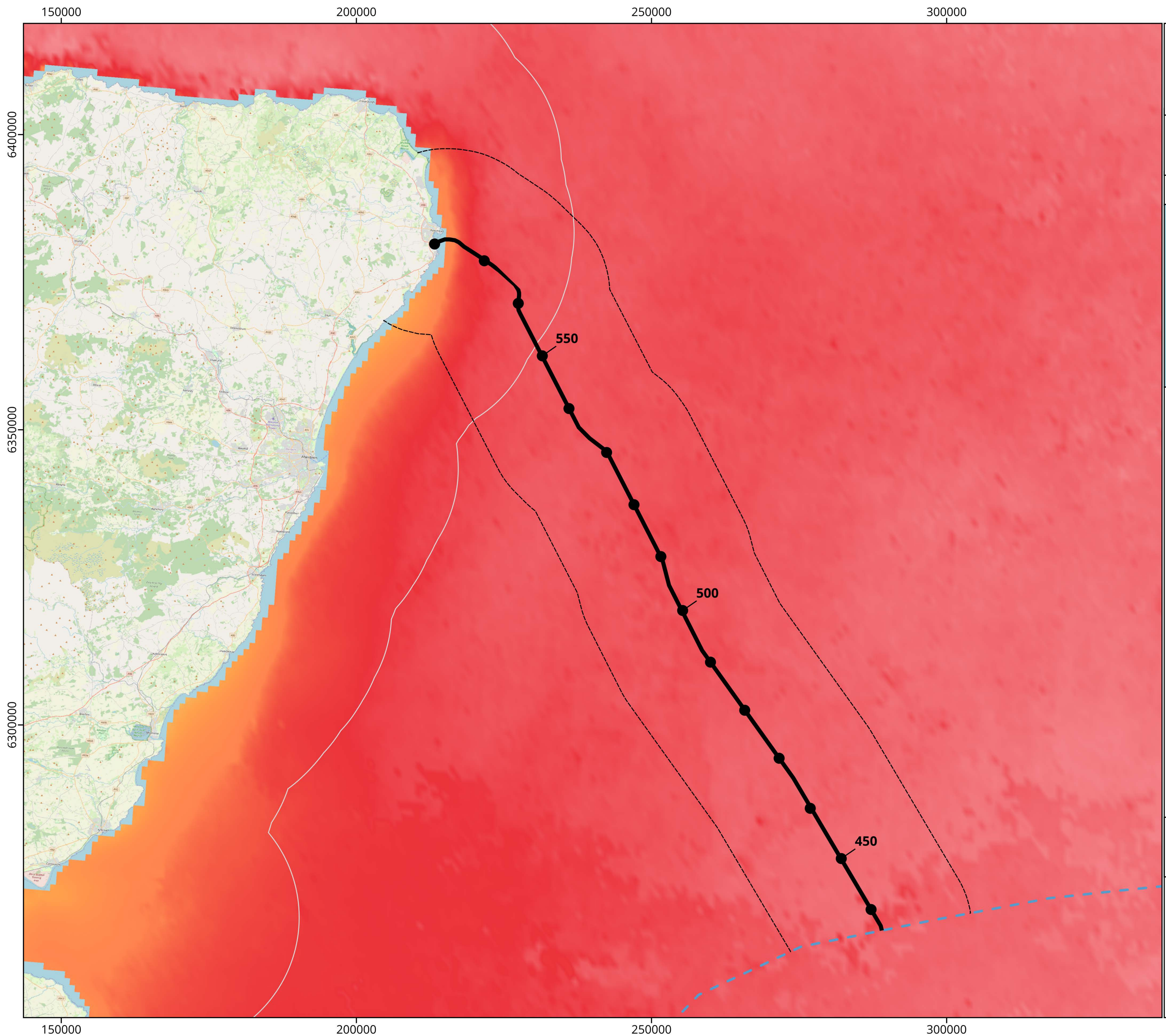
Table 6-4: Heavy and trace metal concentrations for intertidal samples.

Statistic	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
Mean (mg/kg)	2.7	0.07	3.6	3.3	3.8	0.01	3.4	16.9
Standard Deviation (mg/kg)	2.0	0.09	1.0	0.9	1.2	0.00	0.7	5.0
Variance (%)	74.9	126.3	29.2	27.9	31.1	0.0	19.9	29.8
Minimum (mg/kg)	1.5	0.04	2.7	2	2.9	0.01	2.6	10.4
Maximum (mg/kg)	8.1	0.32	5.9	5	6.5	0.01	4.9	25.9
Number of samples above NOAA ERL	0	0	0	0	0	0	0	0
Number of samples above cAL1	0	0	0	0	0	0	0	0

The results from the Proposed Development marine characterisation survey are consistent with results presented in the MEA Non-Statutory Scoping Report based on sediment quality samples from the International Council for the Exploration of the Sea (ICES) DOME Portal (DOME, 2023). Reported concentrations of arsenic, mercury, cadmium, chromium, copper, nickel, lead and zinc were checked for all available samples within the Study Area. For all sample records, contaminant levels were below cAL1. Sediment sampling from the Morven OWF (which is 3 to 5 km from the west of the RLB between KP 438 and KP 497) also found contaminants to be below cAL1, except for slightly elevated concentrations of arsenic at a single location in the far north of their study area (RPS, 2023a). However, levels remained below cAL2.

The heavy metal concentrations recorded across the survey area are attributed to the underlying local geology, particularly the Souter Head Subvolcanic Complex and Peterhead Pluton Granite (NextGeo, 2025). Therefore, the metal concentrations are reflective of ambient Central North Sea conditions (Harries et al, 2001). The low concentrations of contaminants indicate that the risk of disturbance of contaminants from sediment associated with the Proposed Development is low.

The Proposed Development passes through the now closed South Buchan Ness disposal area (CR100). Other closed disposal areas also lie within the Study Area including South Buchan Ness B (CR105), Middle Buchan Ness (CR090) and Middle Buchan Ness B (CR095). Two open disposal sites also lie within the Study Area including Peterhead (CR070) and North Buchan Ness (CR080) which are located approximately 2 km north of the Proposed Development.



Annual Mean Suspended Sediment Concentration

PCS_PU061_EG3_6_9

Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

SSC Monthly Mean Cefas 2016 (mg/l)

0
1
2
5
10
20
30
40
50
>=60

0 10 20 30 KM
0 5 10 15 NM
N

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Coordinate System	ETRS89 / UTM zone 31N
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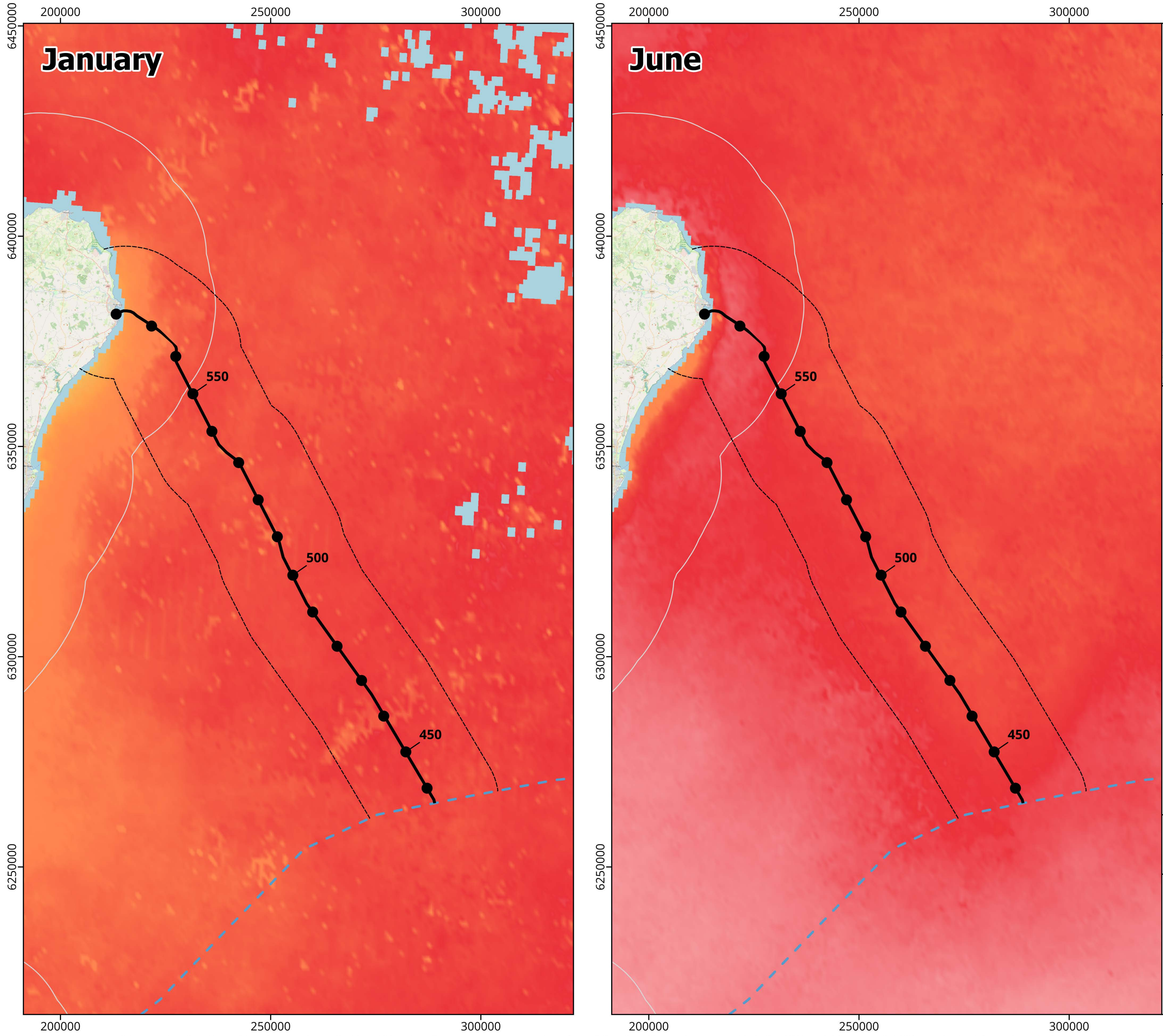
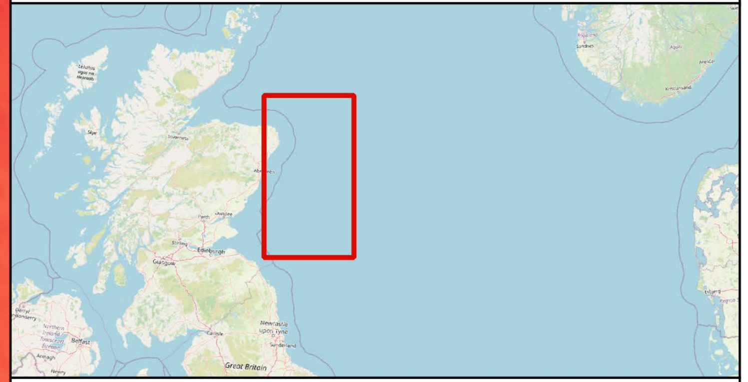


Seasonal Mean Suspended Sediment Concentration

PCS_PU061_EG3_6_10



Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

SSC Monthly Mean Cefas 2016 (mg/l)

0
1
2
5
10
20
30
40
50
>=60

0 10 20 30 KM
0 5 10 15 NM
N

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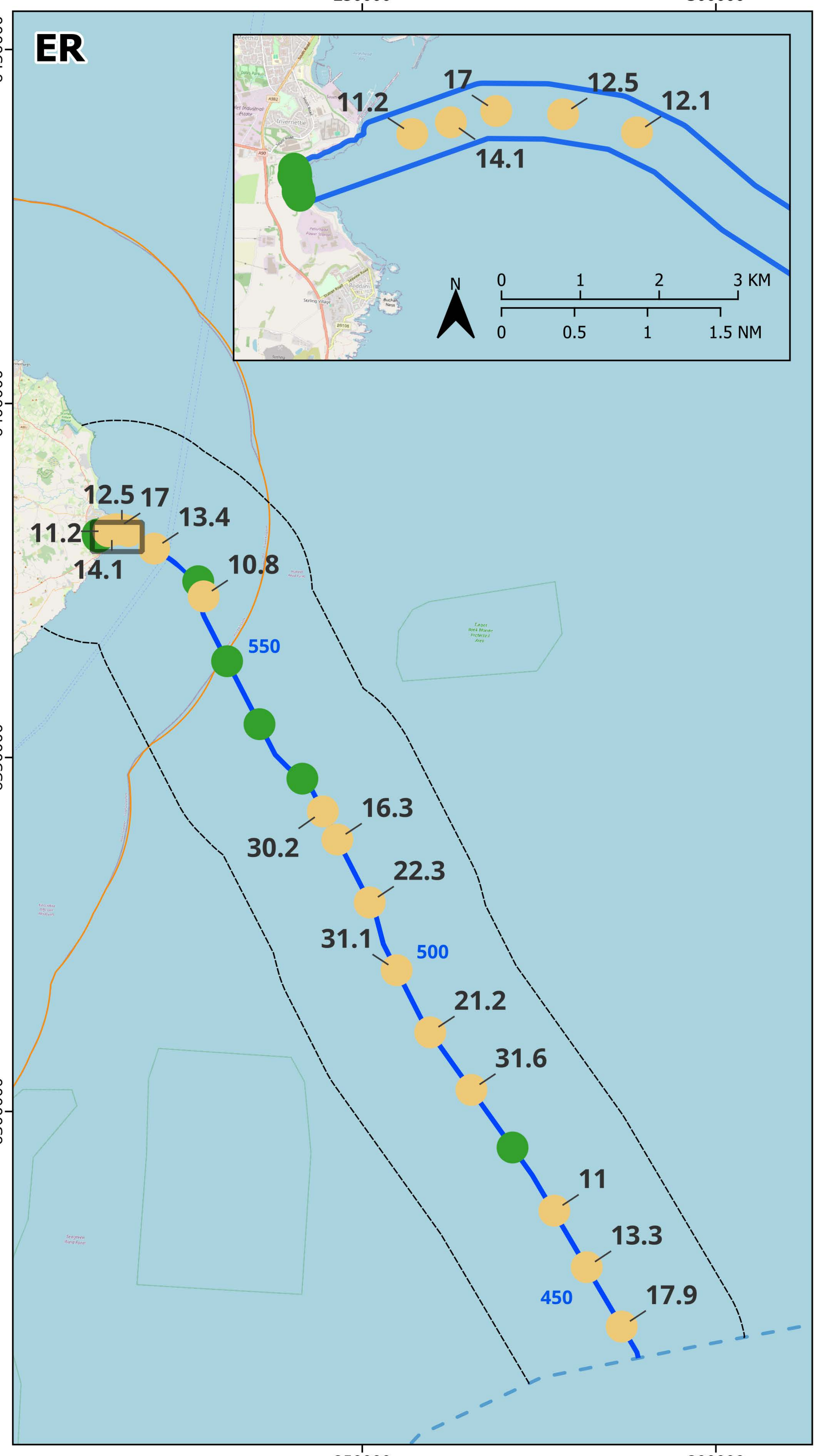
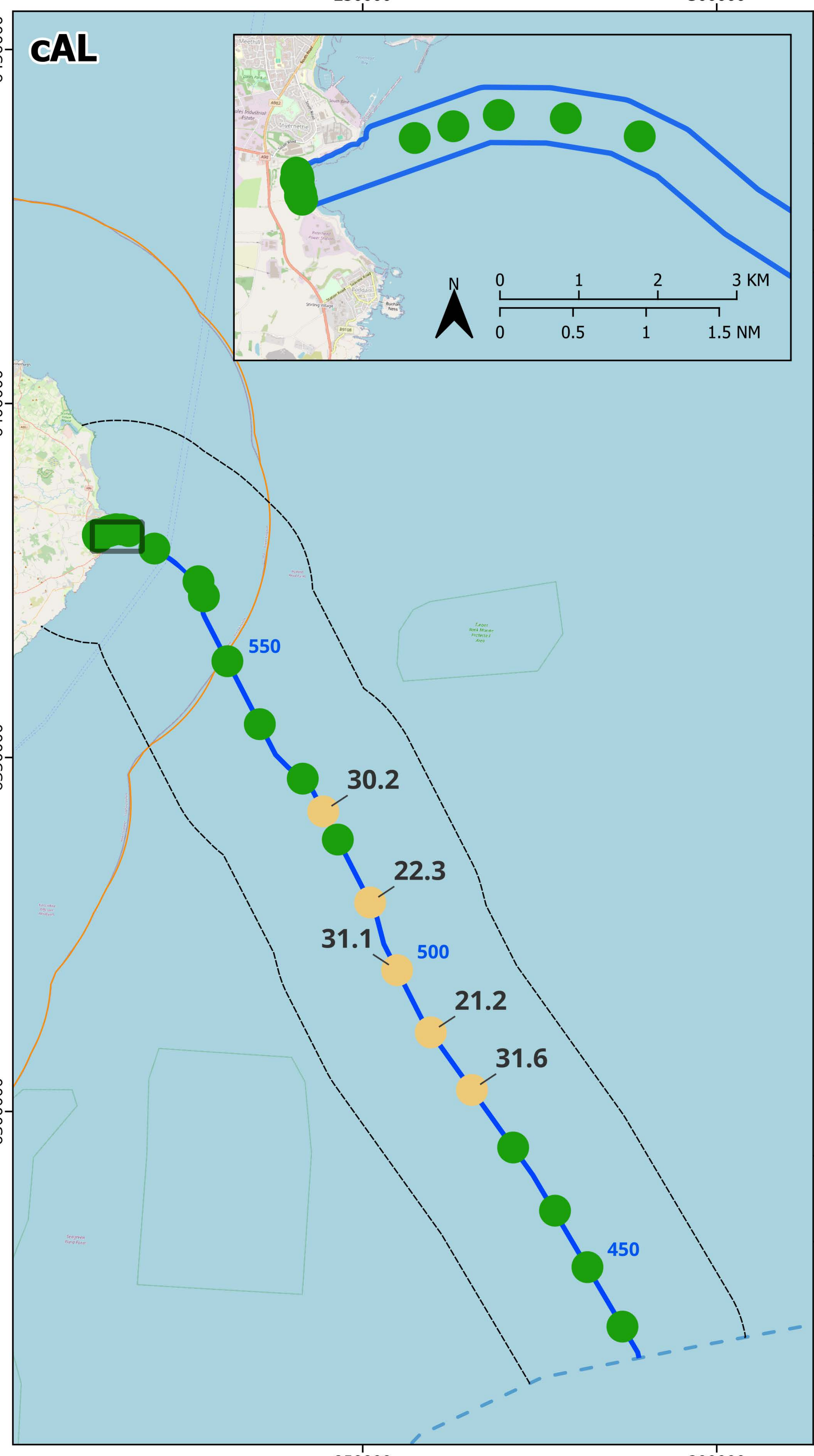
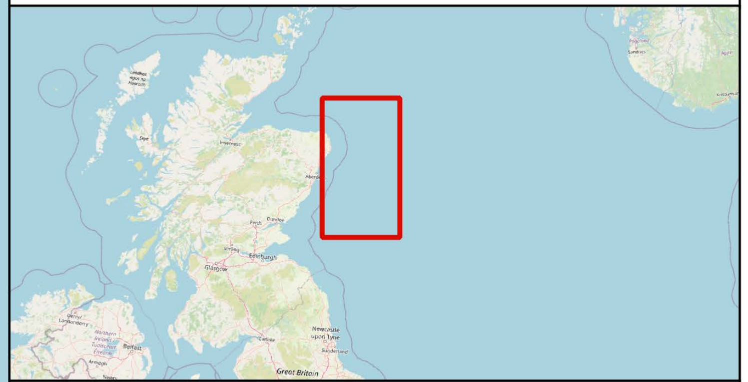




Arsenic Concentrations - NOAA Effect Range and Cefas Action Levels

PCS_PU061_EG3_6_11



Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit

NOAA Effect Range:

- Below ER
- ERL
- ERM

Cefas Action Level:

- Below cAL1
- cAL1
- cAL2

0 10 20 30 KM
0 5 10 15 NM
N

Date	23/05/2025
Coordinate System	ETRS89 / UTM zone 31N
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Unit	meters
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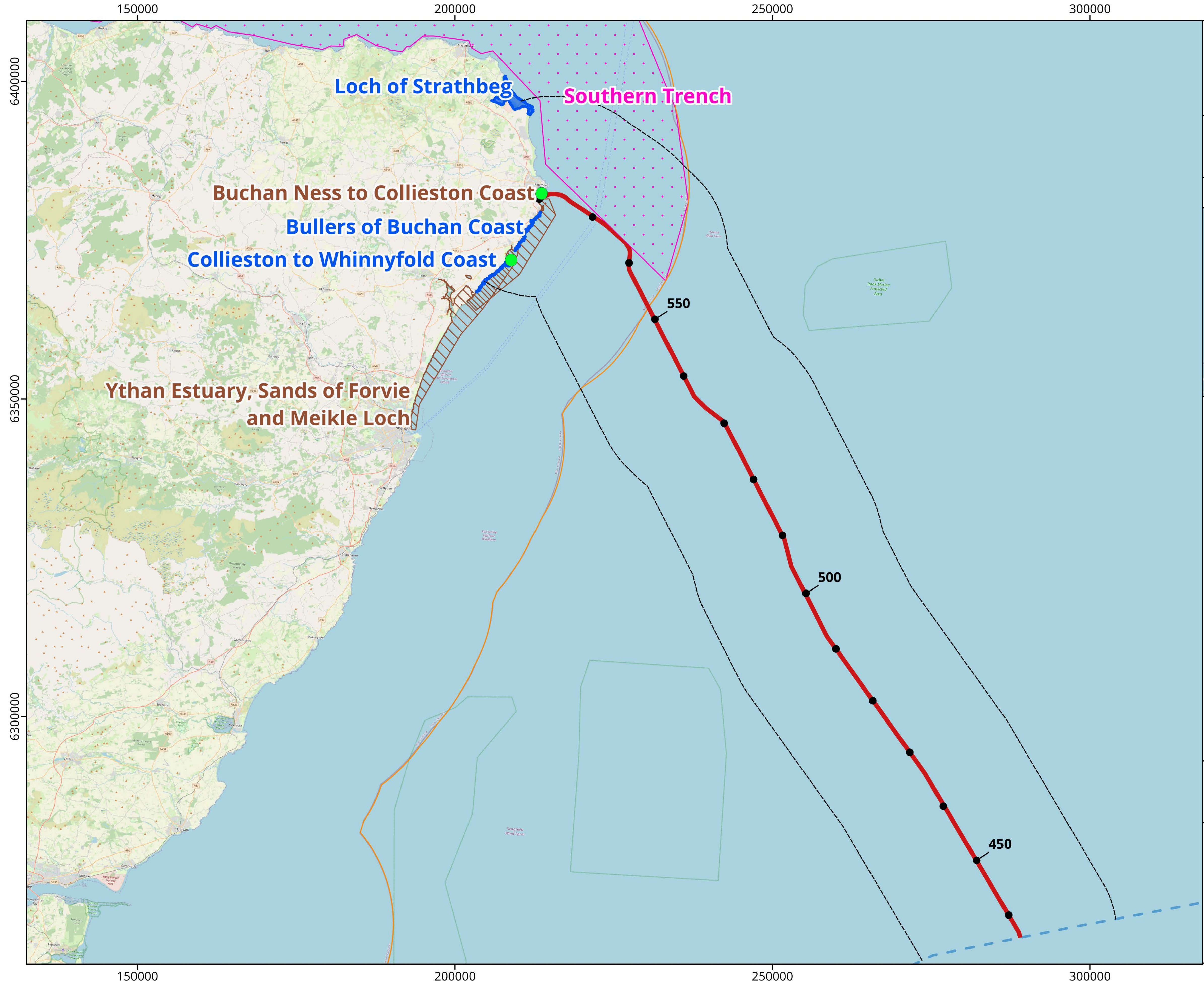
6.4.10. Designated Sites

Designated sites in the Study Area, which are designated for the protection and conservation of marine habitats of relevance to physical processes are shown in **Figure 6-12 (Drawing reference PCS_PU061_EG3_6_12)**. The RLB intersects the northern edge of Buchan Ness to Collieston Coast Special Protection Area (SPA) close to the proposed landfall. This SPA is designated for its vegetated sea cliffs and offshore stacks, which support a scattered but considerable colony of cliff-nesting seabirds.

The northern edge of the RLB is 0.001km off the Southern Trench Nature Conservation Marine Protected Area (NCMPA), (assessed in **Appendix 5C: Marine Protected Area Assessment**), designated for its broad range of marine life including burrowed order, featuring a dynamic mixing zone of warm and cold waters that attracts shoals of herring, mackerel and cod. The soft sands covering much of the area provide abundant habitat for sandeel. The presence of these key prey species in turn draws top predators like minke whale.

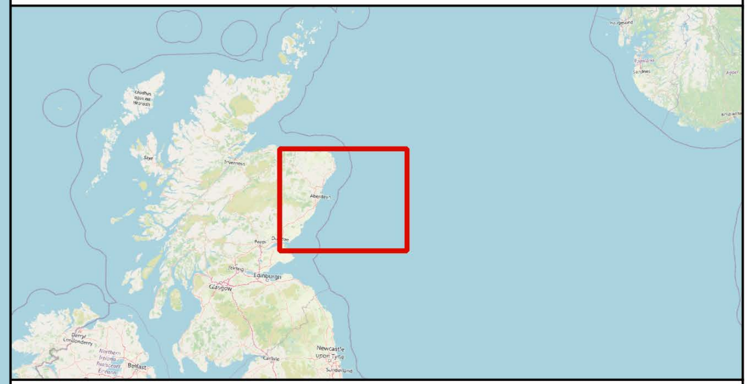
Other designated sites within the wider Study Area include:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA (assessed in **Appendix 5A: Habitats Regulations Appraisal Stage 1 Screening**), located 8.0 km to the south of the RLB, supports a breeding population of European importance of sandwich tern and little tern;
- Three coastal Sites of Special Scientific Interest (SSSIs):
    - Bullers of Buchan Coast: this is located approximately 2.1 km to the south of the proposed landfall and is designated for the cliffs, slopes and inshore stacks which are features of special geological and biological interest;
    - Collieston to Whinnyfold Coast: this is located approximately 11 km to the south of the proposed landfall and is designated for nationally important colonies of cliff nesting seabirds. It forms part of the Buchan Ness to Collieston SPA; and
    - Loch of Strathbeg: this is located approximately 12.6 km north of the RLB and is designated for nationally important colonies of waterbirds. The loch is separated from the sea by a 0.5-1 km wide dune system.



Designated Areas

PCS_PU061_EG3_6_12



Legend

- KP
- Red Line Boundary
- 15km Study Area
- Scottish Adjacent Waters
- 12NM Limit
- Marine Protected Area
- Special Protection Area
- Site of Special Scientific Interest
- Designated Bathing Water Site

0 10 20 30 KM

0 5 10 15 NM

N

Date	26/05/2025
Coordinate System	ETRS89 / UTM zone 31N
Projection	Universal Transverse Mercator (UTM)
Unit	meters
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6.5. Potential Pressure Identification and Zone of Influence

6.5.1. Spatial Scope

A precautionary maximum zone of influence of 15 km each side of the RLB has been used, which encompasses the potential impact pathways from increased suspended sediment concentrations. Maximum tidal excursions and sediment dispersion modelling (presented in **Appendix 6A: EGL 3 Sediment Dispersion Assessment, Scottish ME, Spreadsheet-Based Modelling Tool)** has confirmed that all sediment plumes were within this 15 km Study Area.

6.5.2. Temporal Scope

The temporal scope of the assessment of marine physical processes is consistent with the period over which the Proposed Development would be carried out. It assumes construction of the Proposed Development would commence at the earliest in 2028 at with the latest possible completion by 2033. Within this window, construction (including pre-lay activity) is expected to take 55 months. Operation would commence in 2033 with periodical maintenance required during the operational phase. It is assumed that maintenance and repair activities could take place at any time during the life span of the Proposed Development.

The Proposed Development is expected to have a life span of more than 40 years. If decommissioning requires cessation of operation and removal of infrastructure at this point in time, then activities and effects associated with the decommissioning phase are expected to be of a similar level to those during the construction phase works albeit with a lesser duration of two years. Acknowledging the complexities of completing a detailed assessment for decommissioning works up to 40 years in the future, based on the information available, the Applicant has concluded that impacts from decommissioning would be no greater than those during the construction phase. Furthermore, should decommissioning take place, it is expected that an assessment in accordance with the legislation and guidance at the time of decommissioning would be undertaken and a separate Marine Licence would be sought for decommissioning activities.

6.5.3. Identification of Pressure-Receptor Pathways

A range of potential impacts on marine physical processes which may occur during the construction, operation (including maintenance and repair), and decommissioning phases of the Proposed Development were identified in the MEA Non-Statutory Scoping Report. Impacts which could potentially be significant are further assessed within the MEA. Adopting a precautionary approach, where there is no strong evidence-base or the significance is uncertain, further assessment of the impact has been undertaken. A summary of the agreed assessment scope is provided in **Section 6.5.**

Marine physical processes are best described as pathways, rather than as receptors. While outputs from the marine physical processes assessments are reported in this MEA chapter, for the most part it is not practical for the outputs to be accompanied by statements of effect of significance. Instead, the information on changes to the marine physical processes pathways has been used to inform other MEA topics including:

- **Chapter 7: Intertidal and Subtidal Benthic Ecology;**
- **Chapter 8: Fish and Shellfish Ecology;**
- **Chapter 9: Intertidal and Offshore Ornithology;**
- **Chapter 10: Marine Mammals and Marine Reptiles; and**
- **Chapter 12: Commercial Fisheries.**

Indirect impacts from the identified marine physical processes pathways will be assessed within the relevant topics.

The physical processes features which are considered as potential receptors influenced by the tidal excursion include:

- The adjacent coastline, particularly at the proposed landfall and in the adjacent SSSI (Bullers of Buchan Coast SSSI);
- Nationally or internationally designated sites with seabed/sedimentary or geological interest features below MHWS, namely the Southern Trench NCMPA; and
- Designated bathing waters, in particular Peterhead (Lido).

The potential effects on marine physical processes receptors which were identified in the MEA Non-Statutory Scoping Report to have the potential to be significant and have therefore been taken forward for further assessment within this MEAp chapter include:

- Disturbance of sub-tidal seabed morphology during construction – despite routing to avoid notable seabed features where possible, there remains potential for some pre-sweeping and for deposits of external cable protection in some areas;

- Disturbance of intertidal morphology during construction – at the time of scoping no decision had been made on the installation technique across the intertidal and the requirement for a temporary cofferdam, which could impact along-shore sediment transport, had not been ruled out.
- Temporary increases in SSCs and subsequent deposition during construction – sediment suspended during construction of the subsea cable could result in temporary increases in SSC and subsequent deposition once material re-settles to the bed.

At this stage of the MEA and marine licensing process, the project description for the Proposed Development is indicative and the Rochdale Envelope approach has been adopted as described in **Chapter 3: Project Description**, with the maximum design scenario used for the assessment of impacts.

6.5.4. Guidance

Relevant technical guidance, specific to marine physical processes, that has informed this MEAp is summarised below:

- Natural England Offshore wind cabling: ten years' experience and recommendations (Natural England, 2018);
- Nature conservation considerations and environmental best practise for subsea cables for English Inshore and UK offshore waters (Natural England and Joint Nature Conservation Committee, 2022);
- Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry (BERR, 2008);
- OSPAR Assessment of the Environmental Impacts of Cables (OSPAR, 2009);
- OSPAR Guidelines on Best Environmental Practice (BEP) in cable laying and operation (OSPAR, 2012);
- Guidance Note. Marine Physical Processes Guidance to Inform Environmental Impact Assessment (EIA) (NRW, 2020);
- Nationally Significant Infrastructure Projects: Advice on the Water Framework Directive (Planning Inspectorate, 2025).
- Flood Risk Assessments: Climate Change Allowances (Environment Agency, 2015). and
- UKCP18 Science Overview Report (UCKP, 2018).

6.6. Key Parameters for Assessment

6.6.1. Realistic Worst-Case Design Scenario

The assessment has followed the Rochdale Envelope approach as outlined **Chapter 3: Project Description.** The assessment of effects has been based on the description of the Proposed Development and parameters outlined in **Chapter 3: Project Description**. Where there is uncertainty regarding a particular design parameter, the realistic worst-case design parameters are provided in **Table 6-5** below with regards to marine physical processes along with the reasons why these parameters are considered worst-case. The assessment for marine physical processes has been undertaken on this basis. Effects of greater adverse significance are not likely to arise should any other development scenario (e.g., different infrastructure layout within the RLB), to that assessed here, be taken forward in the final design plan, provided the development scenario is within the Rochdale Envelope parameters set out.

With regards to temporary physical disturbance specifically from unexploded ordnance (UXO) identification and clearance, it is assumed that UXO clearance would be undertaken under a separate Marine Licence and subject to its own environmental assessments and is therefore not considered within this assessment.

Table 6-5: Project worst-case design scenario

Impact Pathway	Parameter	Total area of seabed disturbed
Disturbance of sub-tidal seabed morphology during construction	Boulder Clearance	0.85 km^2
	Pre-sweeping	0.07 km^2
	PLGR	4.35 km^2
	Trial trenching	0.08 km^2
	Cable burial	2.32 km^2
	Cable protection (including infrastructure crossings)	0.135 km^2
	HDD Exit Pit Excavation	0.001125 km^2

Impact Pathway	Parameter	Total area of seabed disturbed
Disturbance to intertidal morphology during construction	HDD ducts	None – HDD ducts would pass under intertidal area
Temporary increase in suspended sediment concentrations and subsequent deposition during construction	Sandwave clearance, excavation of HDD exit pits and cable trenching operations can all result in suspended sediments within the water column	Coarse sediment will settle within the RLB and fine sediment plumes can travel up to 13.6 km and will cause light surface smothering of <1 mm.

6.7. Embedded Mitigation Measures

As set out in **Chapter 4: Marine Environmental Appraisal Scope and Methodology**, embedded mitigation measures form part of the design for which consent is sought and can be characterised as 'design measures' or 'control and management measures'. This embedded mitigation would be implemented as part of the Proposed Development and secured by way of condition in the Marine Licence as relevant.

Several management plans would be provided to discharge Marine Licence conditions prior to the start of construction. These would include a Construction Environmental Management Plan (CEMP), Marine Pollution Contingency Plan (MPCP), Marine Mammal Mitigation Plan (MMMP) and a Fisheries Management and Mitigation Plan (FMMP). These documents will outline measures to be implemented to comply with legislation, such as Prevention of Pollution at Sea (MARPOL) and Safety of Life at Sea (SOLAS), and the mitigation commitments proposed within this MEAp (Embedded Mitigation Measure OMT08). An Outline CEMP is provided as **Appendix 3B: Outline Construction Environmental Management Plan**. In addition, design measures identified through the MEA process have been applied to avoid or reduce potential significant effects.

Table 6-6 outlines the embedded mitigation measures that would be implemented for the Proposed Development that have been considered by the intertidal and subtidal benthic ecology MEA.

Table 6-6: Embedded mitigation measures used for marine physical processes assessment

Impact Pathway	Receptor	Embedded Mitigation Measure
Disturbance to intertidal or sub-tidal seabed morphology	Subtidal seabed morphology	MPP01 - Detailed route development and micro-routeing will be undertaken within the RLB, informed by pre-construction data evaluation to avoid or minimise localised engineering and environmental constraints.
	Subtidal and intertidal morphology	MPP03 - Where feasible, sediment displaced for HDD exit pits and cable installation (sandwave clearance and trenching) will be locally placed and used to backfill (either manually or naturally).
	Intertidal morphology	OMT01 - Intertidal zone would be crossed by HDD to avoid disturbance to surface sediments and habitats.
	Subtidal seabed morphology	OMT04 - Cable protection features would only be installed where considered necessary for the safe operation of the Proposed Development. This includes the repair of cables due to accidental damage, where depth of lowering is not achieved and at infrastructure crossings.
	Subtidal seabed morphology	OMT05 - Where possible, cable protection materials will be selected to match the environment (e.g., when cables are installed in areas of cobbles or other natural rock features, rock of similar diameter and material as the receiving environment should be used).

Impact Pathway	Receptor	Embedded Mitigation Measure
	Subtidal seabed morphology	OMT10 - Designated (and as minimal as possible) anchoring areas and protocols shall be employed during marine operations to minimise physical disturbance of the seabed.
Temporary increase in suspended sediment concentration and subsequent deposition during construction	Peterhead Lido	MPP02 - The Applicant will liaise with SEPA to communicate and agree timings of works at landfall.
	Water and sediment quality	OMT02 - Drilling fluids required for trenchless operations will be carefully managed to minimise the risk of breakouts into the marine environment. Specific avoidance measures would include: ▪ the use of biodegradable drilling fluids (pose little or no risk (PLONOR) substances) where practicable, ▪ drilling fluids will be tested for contamination to determine possible reuse or disposal; ▪ if disposal is required drilling fluids would be transported by a licensed courier to a licensed waste disposal site. ▪ Chemicals will be chosen from the list of chemicals approved under the Offshore Chemical Notification Scheme. https://www.cefas.co.uk/data-and-publications/ocns/ and a chemical risk assessment will be provided as part of the CEMP. Further measures including a Shipboard Oil Pollution Emergency Plan will ensure compliance with the Prevention of Pollution at Sea (MARPOL) and SOLAS conventions.
	Water and sediment quality	OMT08 - Several management plans would be provided to discharge Marine Licence conditions prior to the start of construction. These would include a Construction Environmental Management Plan (CEMP), Marine Pollution Contingency Plan (MPCP), Marine Mammal Mitigation Plan (MMMP) and a Fisheries Management and Mitigation Plan (FMMP). These documents will outline measure to be implemented to comply with legislation, such as the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Safety of Life at Sea (SOLAS) convention, and the mitigation commitments proposed within this MEAp.
	Water and sediment quality	OSU07 - Pollution events as the result of a collision will be managed through the Project Emergency Response Plan, MPCP and specifically the Shipboard Oil Pollution Emergency Plan (SOPEP).

6.8. Significance Assessment

The generic project-wide approach to the assessment methodology is set out in **Chapter 4: Marine Environmental Appraisal Scope and Methodology**. The criteria for characterising the value and sensitivity and magnitude for marine physical processes are outlined in and**,** respectively. The assessment of the significance of an effect is determined based on a matrix approach (see **Table 6-8)** which uses the magnitude of impact (defined by extent, duration, frequency and severity) and the sensitivity of receptors (which is a function of the capacity to accommodate change and recover). This assessment has used available Proposed Development marine characterisation survey data and background scientific literature, professional judgement and knowledge of marine physical processes to determine the level of impact.

The magnitude criteria in has been simplified from that provided in the MEA Non-Statutory Scoping Report based on advice on the English Offshore Scheme application for development consent received from Statutory Nature Conservation Bodies. These changes ensure consistency regarding how impacts are assessed across the Project as a whole. The magnitude criteria has been used throughout the assessment, with justified professional judgement applied, to assign impacts to an appropriate magnitude classification.

Table 6-7: Criteria for characterising the sensitivity of receptors

Sensitivity	Description of criteria
High	Receptor has low/no capacity to return to pre-impact conditions i.e., recovery will take longer than 10 years. The physical/or geological features are protected feature of an internationally designated site (e.g., SAC).
Medium	Receptor has intermediate capacity to return to pre-impact conditions i.e., between 5 to 10 years. The physical/or geological features are protected feature of a nationally designated site (e.g., MPA, SSSI).
Low	Receptor has high capacity to return to pre-impact condition within 1 year or up to 5 years. The receptor is common or widespread or designated as locally important.
Negligible	The receptor is tolerant to change with no effect on its character.

Table 6-8: Criteria for characterising the magnitude of an impact

Magnitude	Description of criteria
High	Impacts are of long-term (>15 years) through to long-term/permanent duration and/or on a regional or population/habitat level or major alteration to key elements/features of the baseline condition such that post-impact baseline character will be fundamentally changed. Natural recruitment will not return the population/habitat to the baseline condition.
Medium	Impacts are of medium term (7-15 years) duration and/or on a local level (wider than Proposed Development footprint) or alter an element of the baseline conditions such as that post-impact the damage to the baseline is above that experienced under natural conditions but with no permanent effect on integrity.
Low	Impacts are temporary (<1 year) or short term (1-7 years) in duration, site specific and/or a minor shift away from the baseline condition such as that experienced under natural conditions. Impacts limited to within the Proposed Development footprint. Negligible contribution to cumulative effects.
Negligible	Very little or no detectable change from baseline conditions. Disturbance is within the range of natural variability. Impacts predicted to be brief (one to two days) or for a short period (up to 3 months). No contribution to cumulative effects.

Table 6-9: Significance matrix

		Sensitivity			
		High	**Medium**	**Low**	**Negligible**
Adverse magnitude	**High**	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Minor	Negligible	Negligible
Beneficial magnitude	**Negligible**	Minor	Minor	Negligible	Negligible
	Low	Moderate	Minor	Negligible	Negligible
	Medium	Major	Moderate	Minor	Negligible
	High	Major	Major	Moderate	Minor

6.8.1. Disturbance of Sub-tidal Seabed Morphology during Construction

Seabed preparation and subsea cable installation activities (including boulder clearance, pre-sweeping of sandwaves, cable burial and trenching, deposits of external cable protection and HDD exit pits) have the potential to directly disturb the seabed morphology. While the Proposed Development has been routed to avoid seabed features such as boulder fields, sandbanks, sandwaves and notable bathymetric depressions as far as practical there are some sections where sandwave clearance and cable protection would still be required.

6.8.1.1. Boulder clearance

Where possible micro-routing around boulders would be undertaken, however, where there are large volumes of boulders present micro-routing may not be feasible and therefore clearance of boulders from the route of the cables would be required to allow the use of burial equipment. Where there are high volumes of boulders, a SCAR plough or similar would be used. The plough would push boulders to either side of the centreline, clearing a swathe of up to 17 m wide. Multiple passes may be required to achieve the required clearance.

Such activities would cause potentially permanent disturbance to the seabed bathymetry. Up to 50 km along the centreline of the Proposed Development within the RLB would be required to be cleared using this method (equivalent to a disturbed seabed area of 0.85 km^2). A grab tool would be used where feasible, reducing the overall footprint.

Seabed disturbance of this kind would therefore be localised and despite the potential permanent nature of the change, **sensitivity** has been assessed as **Low,** the **magnitude** of the impact has been assessed as **Negligible** and therefore the effect Has been assessed as **Negligible** and **Not Significant**.

6.8.1.2. Pre-sweeping

Discreet sections of the Proposed Development may require pre-sweeping of mobile megaripples (wave heights <1.5 m) and sandwaves (wave heights > 1.5 m). Such pre-sweeping will ensure that that the cable burial machine would not topple or tilt during installation and that the desired burial depth is reached, reducing the risk of cable exposure during operation. Approximately 2% of the Proposed Development (3.5 km) could require pre-sweeping, due to the presence of sandwaves. Indicatively, the total area of seabed disturbance for sandwave clearance is 0.07 km^2, with a sediment volume of 1,000 m^3.

The mere presence of sandwaves indicates an active and dynamic environment. Following pre-sweeping, new sandwaves can therefore be expected to form so that any change in bedforms will only be temporary. A study of seabed dynamics and morphology undertaken on behalf of Ørsted Energy to estimate restoration of seabed morphology after construction of the Race Bank OWF found that in the areas of high sediment mobility surveyed the seabed was found to be fully, or almost fully, recovered (>75% recovery in all areas) within the one to two years between the post trenching survey in 2016 to 2017 and the subsequent survey in 2018 (SHE-T (2022).

As noted in Section , the Proposed Development marine characterisation survey identified a number of sandwave features which were flattened by a large storm occurring in early October 2023, further evidencing the dynamic nature of the seabed in the Study Area.

The **sensitivity** of sandwaves has been assessed as **Low** as the temporary nature of the proposed works are not likely to influence the overall form and function of the bedform system which can be expected to recover through natural sediment transport processes in the short to medium term. Sandwave recovery will be aided by the sediment remaining within the local system. Therefore, the **magnitude** of the impact has been assessed as **Negligible**, and the significance of effect Has been assessed as **Negligible** and **Not Significant.**

6.8.1.3. Cable burial

In areas where cables are buried, trenches will be back-filled so that the seabed is returned to its baseline state (i.e., the change in bathymetry will be temporary). Any changes to sub-tidal seabed morphology resulting from the burial of the subsea cables will be localised and temporary and will not result in a change to the baseline character. The **sensitivity** to change has been assessed as **Low** and the **magnitude** of the effect has been assessed as **Negligible** and therefore the significance of the effect of changes to subtidal morphology Has been assessed as **Negligible** and **Not Significant**.

6.8.1.4. Cable protection

Where cable burial cannot be achieved, cable protection would be required. The areas where burial cannot be achieved include areas of hard substrate and areas where the Proposed Development crosses other infrastructure (e.g., cables or pipelines).

The percentage of the route requiring rock protection due to geology is indicatively 7% (10 km), covering an area of 0.1 km^2. In the instance of hard substrate, the addition of cable protection will not significantly alter the physical bed characteristics, although there will be a permanent change to bathymetry (at least for the lifetime of Proposed Development). These changes in bathymetry will be small relative to the baseline water depths, with berm heights of 1.5 m or less. The percentage change in water depth is expected to be of the order of 9.7% in the shallowest areas (nearshore across rocky habitats, as described in **Chapter 7: Intertidal and Subtidal Benthic Ecology**) and 5% or less thereafter (assuming these areas are in water depths of more than 30 m).

In the instance of infrastructure crossings, the addition of cable protection in areas of softer sediments will lead to localised change in substrate. Rock protection due to infrastructure crossings will cover an area of approximately 35,000 m^2 with up to seven crossing locations (three around KP561, one at KP562, three additional crossing KPs are not confirmed at the time of writing) required for the Proposed Development. The maximum berm height for infrastructure crossings is 2.2 m, which is less than 3% of the water depth at all of the crossing locations.

Where cable protection is used in areas of softer sediments, if the critical bed shear stress exceeds the threshold for motion (either as a result of near bed flow speeds or orbital wave motion reaching the bed), localised scouring could occur. To give an indication of whether the infrastructure crossing may be susceptible to scour, the baseline physical characteristics (including water depth and median grain size (d50) informed by the Proposed Development marine characterisation survey) were used to calculate the critical depth average flow speed (i.e. the flow speed which would result in sediment transport either as bedload or in suspension) based on Soulsby (1997). The critical depth average flow speed was compared to depth average peak spring and neap flow speeds (based on the ABPmer Renewables Atlas). The critical depth average flow speed for bedload was calculated to be 0.55 m/s, the critical depth average flow speed for transport in suspension was calculated to be 1.9 m/s and the peak spring and neap flow speeds are 0.8 and 0.4 m/s, respectively. This indicates that there is a low potential for scour, with the bed being mobile on spring tides when sand could be transported along the bed as bedload.

Where wave motions reach the bed, wave induced sediment transport could occur and increase the potential for scour. Despite the long period swell waves which can occur during storm events, the potential for wave induced flow at speeds sufficient to drive sand transport is very low.

The Proposed Development marine characterisation geophysical survey identified the presence of mega ripples and large regular sandwaves around the pipeline crossings and noted that the two pipelines were partially exposed. Given the presence of mobile bedforms and evidence of scour presently occurring in this area, some scour around the cable protection above the seabed could therefore be expected to occur. However, changes in depth from scour would be small in relation to the baseline water depth and existing natural variations in bathymetry (with scour holes from partially exposed cables indiscernible from natural bathymetric variations in the Proposed Development survey bathymetry).

Based on the information presently available, the **sensitivity** of subtidal morphology to change from cable protection Has been assessed as **Low**. Seabed disturbance will be localised and despite the potential permanent nature of the change, the **magnitude** of the impact has been assessed as **Negligible** and the significance of the effect Has been assessed as **Negligible** and **Not Significant**.

6.8.1.5. HDD exit pits

A trenchless technique such as HDD will be used to connect the offshore cable to the onshore cable at the proposed landfall. The HDD exit point ('punch out') locations will depend on the outcome of further technical studies and design but is expected to be in water depths between 8 m and 20 m LAT at an indicative distance of up to 1.6 km seaward of MHWS. Excavated exit pits could be required at the punch out locations, each requiring some up to 1,500 m3 of sediment to be excavated (over an area of up to 75 m x 15 m per exit pit, with a total of three exit pits). Excavation would either be by backhoe dredger or by controlled flow excavator (CFE), with excavated sediment to be placed back to the seabed local to where it was excavated. Ducts laid at punch out may require weighting using clump weights or rock bags. Once the cable is installed any weighting would be removed and material excavated for the exit pits would be used to backfill the pits (either manually or naturally). Peak spring flow speeds in this area are around 0.9 m/s and the median sediment grain size from samples collected during the Proposed Development marine characterisation survey is around 0.3 mm to 1 mm (medium to coarse sand). The excavated sediment would therefore be mobile under the action of peak spring tidal flows.

The sensitivity Has been assessed as **Low** due to the dynamic nature of the seabed, with displaced sediment expected to be driven by natural wave and tidal action so that the bed is returned to baseline conditions within a series of typical spring-neap cycles (with the time to infill dependent on the volume of the exit pit). As such, any changes to subtidal morphology associated with the exit pits will be localised and temporary and the **magnitude** of impact Has been assessed to be **Negligible.** The significance of effect has been assessed as **Negligible** and **Not Significant**.

6.8.2. Disturbance of Intertidal Morphology During Construction

Since the scoping stage the project design has been further developed and opencut trenching options which could require a temporary cofferdam (posing a barrier to along-shore coastal processes) have been ruled out. A trenchless technique such as HDD, will be used to connect the offshore cable to the onshore cable at the proposed landfall. Three ducts would be installed from the Transition Joint Bay (TJB) which would be positioned above MHWS to a point below LAT. The exact punch out locations for HDD depend on the outcome of further technical studies and design but is expected to be between 8 m and 20 m LAT at a maximum indicative distance of 1.6 km seaward of MHWS.

Given the decision to adopt trenchless installation techniques at the proposed landfall there will be no barriers posed to along-shore coastal processes and the **sensitivity** to change Has been assessed as **Low** and the **magnitude** of change to intertidal morphology has been assessed as **Negligible.** Overall, it is concluded that the significance of effect of changes to intertidal morphology are **Negligible** and **Not Significant**.

6.8.3. Temporary Increases in SSCs and Subsequent Deposition During Construction

Sediment suspended during installation of the subsea cables could result in temporary increases in SSC having an adverse effect on water quality. Subsequent deposition once material re-settles to the bed could result in smothering. There is also the potential for subsequent changes in seabed morphology, with a reduction in fines close to the disturbance site and with an increase in fines further away (due to the shorter settling times for coarser grained sediments).

A spreadsheet-based model was applied to assess the potential dispersion of sediment plumes arising from activities during construction, including sandwave clearance, excavation of HDD exit pits and cable trenching operations. Additional details on the spreadsheet-based modelling approach and results are provided in **Appendix 6A: EGL 3 Sediment Dispersion Assessment, Scottish ME, Spreadsheet-Based Modelling Tool.**

While there are several potential installation methods under consideration, following the Rochdale Envelope approach, the maximum design scenario has been used for the assessment of impacts. With respect to the potential for impacts from sediment disturbance and dispersion (for both cable burial and HDD exit pit excavation), a CFE is considered to be the maximum design scenario, disturbing sediment at a greater rate and at a greater height above the bed (maximising potential for sediment to travel greater distances as it settles back to the bed) than other options.

Settling velocities are provided along with settling distances for a release at 5 m above the bed (the maximum height considered applicable to sediment releases associated with operation of a CFE) for a range of peak flow speeds which occur on spring tides within the RLB in . The calculated settling distances indicate that only silts will disperse beyond the RLB. Silt sized material will remain in suspension for much longer durations and could disperse significant distances from the site of sediment release.

The spreadsheet model assumes that the maximum dispersion distance is the maximum tidal excursion associated with the peak flow speed. Typically, fine sediment particles will not travel in suspension beyond this distance, with sediment settling to the bed during the slack flow period associated with the turning of the tide or being carried back towards the release location by the reversing flow following the turning of the tide. However, for very fine particles which settle slowly to the bed and where there is either a notable tidal or non-tidal (surge) residual, sediment in suspension could travel beyond the maximum distances quoted. Given that dispersion processes will also act to dilute the concentration of fine grained sediment carried in suspension, elevated SSC levels at such large distances/long durations after release would be greatly reduced compared to those in close proximity to the site of sediment release (and would be unlikely to be at concentrations which could be measured above background concentrations).

Table 6-10: Estimated settling velocity for different size sediment grain sizes and associated settling times.

Peak flow speed (m/s)	Fines (<63 µm)		Very fine sand (125 µm)		Fine sand (250 µm)		Medium sand (500 µm)	
	Settling time (hours)	Settling distance (km)	Settling time (hours)	Settling distance (km)	Settling time (hours)	Settling distance (km)	Settling time (hours)	Settling distance (km)
1.05	0.5 to 400	1.8 to 13.6	0.1	0.5	<0.1	0.10	<0.01	<0.001
0.75		1.2 to 9.7		0.4		0.10		
0.50		0.8 to 6.5		0.1		0.01		

The rate of fine sediment disturbance was estimated for each installation activity based on information on project design information and results from the environmental surveys. The sediment release rates are summarised in **.** The release rates were calculated based on a productivity of 1,500 m^3 per hour, and assume that 70% of sediment disturbed would fall back to, or directly adjacent to, the disturbance location.

In the near-field (within 5 to 10 m of the activity) sediment disturbed by construction activities will result in very high sediment concentrations, which will last while the activity resulting in the sediment disturbance persists. A large proportion of this sediment will settle back onto the seabed within the RLB, with the amount depending on the grain size characteristics and the flow conditions.

As sediment in the plume is dispersed and deposited away from the site of the activity, sediment concentrations will reduce to much lower levels. The release rates detailed in were applied in the spreadsheet-based model to provide estimates of the maximum distance that increases in SSC would exceed 5 mg/l (also summarised in). The greatest impact distance predicted at KP 548, with peak SSC of more than 5 mg/l occurring up to 4.6 km from the point of release. Any exceedances of more than 5 mg/l will be of short duration beyond the RLB. Beyond the distances for settling of very fine sands, sediment deposits will be very thin (order of mm’s or less).

Table 6-11: Estimated rate of fine sediment release associated with different activities

Location	Percentage fines (%)	Dry sediment density (kg/m³)	Release rate (kg/s)	Maximum distance where SSC>5 mg/l (km)
Activity: Sandwave Clearance				
KP 548	8	1,460	14.6	4.6
Activity HDD exit pit excavation (and sandwave clearance)				
KP 579	2	1,520	3.8	2.4
Activity: Trenching				
KP 470	14	1,400	24.5	4.1
KP 564	2	1,520	3.8	2.4
KP 575	1	1,520	1.9	1.9

Based on the predicted impact distances, cable trenching close to the proposed landfall and exit pit excavation have the potential to increase SSC at the Buchan Ness to Collieston Coast SPA. Some sandwave clearance could also be required close to the exit pit excavation area and the results associated with exit pit excavation are also applicable to sandwave clearance in this area (with the same method being used for both). **Appendix 5A Habitats Regulations Appraisal Stage 1 Screening** assessed temporary increase and deposition of suspended sediments on the protected features of Buchan Ness to Collieston Coast SPA as having no likely significant effects (LSE); up to ~6% of the Buchan Ness to Collieston Coast SPA could experience increases in SSC of more than 5 mg/l at some point during construction, although the area of impact at any one time would be much less than this (<0.5%) and increased SSC would be constrained to a thin layer close to the seabed. Cable installation activities (including exit pit excavation, sandwave clearance and cable burial) between the proposed landfall and KP 577 (the area which could result in increased SSC within the Buchan Ness to Collieston Coast SPA) would take between 6 and 24 hours to complete, although increased SSC within the Buchan Ness to Collieston Coast SPA would not occur continuously during this time, with sediment transported north and away from the SPA for several hours on every tide during the ebb stage of the tide.

Based on the predicted impact distances cable installation activities close to the proposed landfall could also increase SSC at the Peterhead (Lido) bathing water. The bathing water profile for Peterhead (Lido) (SEPA, 2025b) notes the potential for nearby combined sewer/emergency overflows to affect bathing water quality.

KP 564 was selected as an area in close proximity to the Southern Trench NCMPA, with the southern boundary of the NCMPA just outside the northern edge of RLB between KP 563 and KP 568. Based on the predicted impact distances from the spreadsheet model, less than 2% of the Southern Trench NCMPA could experience increases in SSC of more than 5 mg/l at some point, although the area of impact at any one time would be much less than this (<0.1%) and increased SSC would be constrained to a thin layer close to the seabed. Cable installation between KP 558 and KP 577 (the area which could result in increased SSC within the Southern Trench NCMPA) would take between 38 and 190 hours (up to eight days), although increased SSC within the Southern Trench NCMPA would not occur continuously during this time, with sediment transported south and away from the NCMPA for several hours on every tide during the flood stage of the tide.

Based on these results, the **sensitivity** to change has been assessed to be **Medium** (due to the potential for impact at the bathing water), the **magnitude** of impact has been assessed as **Negligible** and the significance of effect Has been assessed to be **Minor** and **Not Significant**.

6.9. Project Specific Mitigation Measures

The significance of effect of temporary increases in SSCs and subsequent deposition (**Section 6.8.3**) was assessed to be Minor and Not Significant, and no other likely significant effects were identified in relation to the other impact pathways**.** Based on this assessment, no additional project specific mitigation is proposed.

6.10. Residual Effects

No additional project specific mitigation is proposed and therefore residual effects are not of relevance to the assessment of adverse effects to marine physical processes.

6.11. Cumulative Effects

If the construction or decommissioning of other plans and projects have a temporal overlap with the construction of the Proposed Development, there is potential for cumulative adverse effects on marine physical processes greater than that caused solely by the Proposed Development. As outlined by **Chapter 4: Marine Environmental Appraisal Scope and Methodology**, a four-stage approach has been undertaken to assess the cumulative adverse effects from other plans and projects in-combination with the construction of the Proposed Development.

6.11.1. Stage 1: Identification of ZoI

The application of a spreadsheet based model applied to assess the potential dispersion of sediment plumes arising from activities during construction, including sandwave clearance, excavation of HDD exit pits and cable trenching operations indicated that sediment plumes would be indistinguishable from background levels within 5 km of the RLB, while sediment redeposited back on the bed would be indistinguishable within a few hundred metres of the RLB **(Section 6.8.3).**

Therefore, the ZoI for the cumulative effects assessment for marine physical processes is 5 km. Any sediment in suspension or resettling on the seabed outside of this 5 km ZoI as a result of the Proposed Development will not cause significant cumulative adverse effects on marine physical processes receptors. All plans and projects within the ZoI are assessed in-combination with the Proposed Development to determine if there will be any significant cumulative adverse effects to marine physical processes (**Section 6.11.4**).

6.11.2. Stage 2: Shortlist of Plans and Projects Relevant to Marine Physical Processes

Chapter 4: Marine Environmental Appraisal Scope and Methodology outlines a longlist of plans and projects within 30 km of the Proposed Development. From this longlist, seven plans/projects within 5 km of the Proposed Development have been shortlisted to inform the cumulative effects assessment for marine physical processes (**Table 6-11**). Infrastructure within this ZoI that is already operational has been scoped out, since the effects of the maintenance of operational projects has influenced the baseline assessment.

Table 6-12: Shortlist of projects

Application Reference	Plan or Project	Type of Project	Distance from Proposed Development	Status
00010861	Ossian OWF	Offshore Windfarm	2.66 km	Application – EIA submitted
00010344	Morven OWF	Offshore Windfarm	1.98 km	Pre Application - Scoping Report
00009943	Eastern Green Link 2 (EGL 2)	Cable	0 km/crosses	Licence granted
06771 & 06870	NorthConnect	Cable	0 km/crosses	Licence expired
00011091	Cenos Floating OWF	Export cable	0 km/crosses	Application – EIA Reports
SCOP-0066	Aspen Floating OWF	Export cable	0 km/crosses	Pre Application – Scoping Report
SCOP-0020	MarramWind OWF	Export cable	0 km/crosses	Pre Application – Scoping Report

6.11.3. Stage 3: Information Gathering and Identification of Pressure-Receptor Pathways

Construction of the Proposed Development is scheduled to commence in 2028 with the latest possible completion by 2033. Within this window, construction (including pre-lay activity) is expected to take 55 months.

Ossian Floating OWF is situated approximately 2.66 km outside of the RLB, and is planning to commence construction in early 2030. The simultaneous or sequential construction of the two projects gives rise to the potential for cumulative adverse effects from temporary increases in SSCs and subsequent deposition during construction.

Morven OWF is situated approximately 1.98 km from the Proposed Development and is due to commence construction in 2027, with commercial operation scheduled to begin in 2030 (Power Technology, 2024). Thus, there would be a direct temporal overlap in construction between the two projects. As Morven OWF is situated outside of the RLB of the Proposed Development, simultaneous construction or sequential construction in quick succession of the two projects has the potential for cumulative adverse effects from temporary increases in SSCs and subsequent deposition during construction. Due to the application stage of Morven OWF, there is no EIA available for this project and its project-alone impact is unknown. Therefore, Morven OWF cannot be assessed in-combination with the Proposed Development and will not be taken forward to stage 4 of the cumulative effects assessment. As Morven OWF is at an earlier development stage than the Proposed Development it would need to complete a cumulative impact assessment and include the Proposed Development within its EIA.

The construction of EGL 2 is currently underway, with cable operation scheduled for 2029 (Eastern Green Link 2, 2025). Additionally, EGL 2 and the Proposed Development share the same landfall at Sandford Bay, Peterhead. Therefore, it is expected that there will be a temporal overlap in construction with the Proposed Development for one year. Consent for EGL 2 was granted on 20 May 2025, and can be viewed using MD-LOT's Marine Licence application database (case reference number: 00009943/00011033) (Scottish Government, 2025a).

NorthConnect is planned to cross the Proposed Development at approximately KP 576. However, construction of NorthConnect has been placed on hold by the Norwegian Government, and the current Marine Licence for this project has expired (expiration date 2024) (NorthConnect, 2025). As no new Marine Licence application has been submitted or Marine Licence granted for the project, it is assumed that this project will not have a temporal overlap in construction with the Proposed Development. Therefore, NorthConnect will not be assessed in-combination with the Proposed Development and will not be taken forward to stage 4 of the cumulative effects assessment.

Cenos Floating OWF's export cable corridor crosses the Proposed Development at KP576, utilising the DC routing of NorthConnect within 12 NM to reduce the need for additional infrastructure (Scottish Government, 2025b). Cenos Floating OWF is currently in its permitting phase, having submitted EIA in January 2025 (application reference number: 00011091) (Scottish Government, 2025b), and is scheduled to commence construction from 2030, with operation in 2031. As such, there may be a direct temporal overlap in construction between the two projects. As outlined in **Chapter 3: Project Description**, a worst-case scenario has been assumed that, where the developments cross, Cenos Floating OWF export cable will be constructed prior to the Proposed Development and the area of external cable protection required by the Proposed Development for this cable crossing is included in the worst-case scenario for permanent habitat loss outlined in **Table 6-5**. As Cenos Floating OWF's export cable corridor overlaps the RLB of the Proposed Development in the offshore, there is potential for cumulative adverse effects from: disturbance of sub-tidal seabed morphology during construction and temporary increases in SSCs and subsequent deposition during construction.

Aspen Floating OWF is currently in pre-application, having submitted a Scoping Report in May 2025 (application reference number: SCOP-0066) (Scottish Government, 2025c), and is scheduled to begin construction in 2027 with operation commencing in 2030. As such, there may be a direct temporal overlap in construction between the two projects. The export cable corridor scoping boundary of Aspen Floating OWF overlaps with the Proposed Development and, due to the uncertainty of overlap in construction timelines, it is unclear as to which project will carry out cable installation first. However, as outlined in **Chapter 3: Project Description**, a worst-case scenario has been assumed that, where the developments cross, Aspen Floating OWF will be constructed prior to the Proposed Development and the area of external cable protection required by the Proposed Development for this cable crossing is included in the worst-case scenario for permanent habitat loss (outlined in **Table 6-5**). Due to the application stage of Aspen Floating OWF, there is no EIA available for this project and its project-alone impact to benthic receptors is unknown. Therefore, Aspen Floating OWF cannot be assessed in-combination with the Proposed Development and will not be taken forward to stage 4 of the cumulative effects assessment.

MarramWind OWF is currently in pre-application, having submitted a Scoping Report in January 2023 (application reference number: SCOP-0020) (Scottish Government, 2023). Construction is scheduled to begin in the late 2020s, following planning decisions in 2026, and MarramWind OWF is scheduled to be operational in the 2030s. Therefore, there may be a direct temporal overlap in construction between the two projects. The scoping boundary of MarramWind OWF overlaps with the RLB of the Proposed Development at Peterhead nearshore. However, as outlined in **Chapter 3: Project Description**, a worst-case scenario has been assumed that, where the developments cross, MarramWind OWF will be constructed prior to the Proposed Development and the area of external cable protection required by the Proposed Development for this cable crossing is included in the worst-case scenario for permanent habitat loss (outlined in **Table 6-5**). Due to the application stage of MarramWind OWF, there is no EIA available for this project and its project-alone impact to benthic receptors is unknown. Therefore, MarramWind OWF cannot be assessed in-combination with the Proposed Development and will not be taken forward to stage 4 of the cumulative effects assessment

6.11.4. Stage 4: Assessment

6.11.4.1. Disturbance of Sub-tidal Seabed Morphology during Construction – EGL 2 and Cenos Floating OWF

EGL 2 overlaps with the Proposed Development at the proposed landfall and Peterhead nearshore (KP 580 – KP 579 and KP 575) and Cenos Floating OWF export cable corridor overlaps the RLB of the Proposed Development at Peterhead nearshore (at KP 576), resulting in a potential for a cumulative effect from the three projects on the sub-tidal seabed morphology during construction.

Construction of the Proposed Development is scheduled to commence in 2028, construction of EGL 2 is currently underway, with cable operation scheduled for 2029, and Cenos Floating OWF is scheduled to commence in 2030. Therefore, it is unlikely that cable construction activities for all three projects within Peterhead nearshore will occur simultaneously, and, due to engineering constraints, the projects will be cable trenching sequentially with sufficient time in between to allow for recovery from seabed disturbance.

For all construction activities affecting sub-tidal seabed morphology (including boulder clearance, pre-sweeping, cable burial, cable protection and excavation of HDD exit pits) the sensitivity of the impact was assessed as low for both the Proposed Development (**Section 6.8.1** of this MEAp) and EGL 2 (National Grid, 2022), while the magnitude of the impact was assessed to be negligible and the effect was assessed as negligible and not significant. Additionally, Cenos Floating OWF EIA concludes that there are no project alone adverse effects on seabed morphology and benthic habitats for the designated sites crossed by the project (Scottish Government, 2024). The cumulative effect on sub-tidal seabed morphology during construction has been similarly assessed as **Negligible** and **Not Significant**, due to the temporary and localised nature of impacts.

6.11.4.2. Disturbance of Intertidal Morphology During Construction – EGL 2

EGL 2 overlaps with the Proposed Development at the proposed landfall and Peterhead nearshore (KP 580 – KP 579 and KP 575). Both EGL 2 and the Proposed Development will use HDD at landfall, avoiding intrusive works in the intertidal area. Each project will have separate cable ducts, adjacent to one another. The exit point for the cable ducts would be deeper than LAT so that there would be no disturbance to the intertidal morphology.

Given the adoption of trenchless installation techniques at the landfall for both developments, there will be no barriers posed to along-shore coastal processes and the sensitivity to cumulative change has been assessed as low and the magnitude of change to intertidal morphology has been assessed as negligible**.** Overall, the cumulative significance of effect of changes to intertidal morphology has been assessed as **Negligible** and **Not Significant**.

6.11.4.3. Temporary Increases in SSCs and Subsequent Deposition During Construction – EGL 2 and Cenos Floating OWF

EGL 2 and Cenos Floating OWF overlap with the Proposed Development at Peterhead nearshore. If sediment plumes from each project were to overlap, this would increase SSC and smothering within the RLB of the Proposed Development.

As previously noted, construction for the Proposed Development is scheduled to begin in 2028, construction of EGL 2 is currently underway, with cable operation scheduled for 2029, and Cenos Floating OWF is scheduled to commence in 2030. It is unlikely that simultaneous construction of all three projects would occur in Peterhead nearshore, and, due to engineering constraints, the projects would be cable trenching sequentially with sufficient time in between to allow for smothering to disperse and SSC to decrease to background levels. Furthermore, it is also assumed the Proposed Development would cross Cenos Floating OWF’s export cable corridor, thus heavy smothering from the construction activities of Cenos Floating OWF would disperse by construction of the Proposed Development within the same area. Therefore, a cumulative effect of increase in SSC within Buchan Ness to Collieston Coast SPA, Peterhead (Lido) bathing water and the Southern Trench NCMPA is unlikely to occur. The cumulative magnitude of temporary increases in SSCs and subsequent deposition during construction has been assessed as low.

As outlined in **Section 6.8.3** of this MEAp, the sensitivity to this effect has been assessed as medium, and the project alone impact has been assessed as not significant. EGL 2 EIA (National Grid, 2022) and Cenos Floating OWF EIA (Scottish Government, 2024) also assess project alone impacts of increased SSC and deposition to be not significant.

The cumulative effect of temporary increases in SSCs and subsequent deposition during construction has been assessed as **Minor** and **Not Significant**.

6.11.4.4. Temporary Increases in SSCs and Subsequent Deposition During Construction – Ossian OWF

Ossian OWF array area lies within 5 km to the northeast of the Proposed Development between KP 437 and KP 463 and between KP 476 and KP 485, but is only within 4.1 km (the distance from construction activities that SSC is predicted to exceed 5 mg/l) between KP 437 and KP 448.

Construction of the Proposed Development is scheduled to commence in 2028 with the latest possible completion by 2033. Construction of Ossian OWF is due to commence in 2030 and construction activities could overlap for a four-year period between 2030 and 2033.

There is therefore potential for sediment plumes from construction related activities from the two projects to be present at the same time (increasing the overall footprint of impact) and potentially to overlap, increasing the magnitude of the impact. However, given the distance between the two projects, only the edges of the sediment plumes from construction of the Proposed Development could overlap with sediment plumes from construction at the Ossian OWF. The SSCs in the area of overlap would therefore only be marginally above 5 mg/l above background. Sedimentation beyond the RLB of each project is unlikely to be at thicknesses of more than 1 mm and therefore there will be no measurable cumulative effect. The magnitude of the cumulative effect of temporary increases in SSCs and subsequent deposition during construction has been assessed as low.

As outlined in **Section 6.8.3** of this MEAp, the sensitivity to this effect has been assessed as medium, and the project alone impact has been assessed as not significant. Ossian OWF EIA also concludes there are no project alone adverse effects of increased SSC (RPS 2024).

The cumulative effect of temporary increases in SSCs and subsequent deposition during construction has been assessed as **Minor** and **Not Significant**.

6.11.4.5. Stage 4 Assessment Conclusion

The cumulative effect of disturbance of sub-tidal seabed morphology during construction has been assessed in-combination with EGL 2, Cenos Floating OWF and the Proposed Development, and the cumulative effect of disturbance of intertidal morphology during construction has been assessed in combination with EGL 2 and the Proposed Development. The cumulative effect of temporary increases in SSCs and subsequent deposition during construction has been assessed in-combination EGL 2, Cenos Floating OWF, Ossian OWF and the Proposed Development. In all instances, the cumulative effects have been assessed as **Negligible** or **Minor** and **Not Significant.**

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